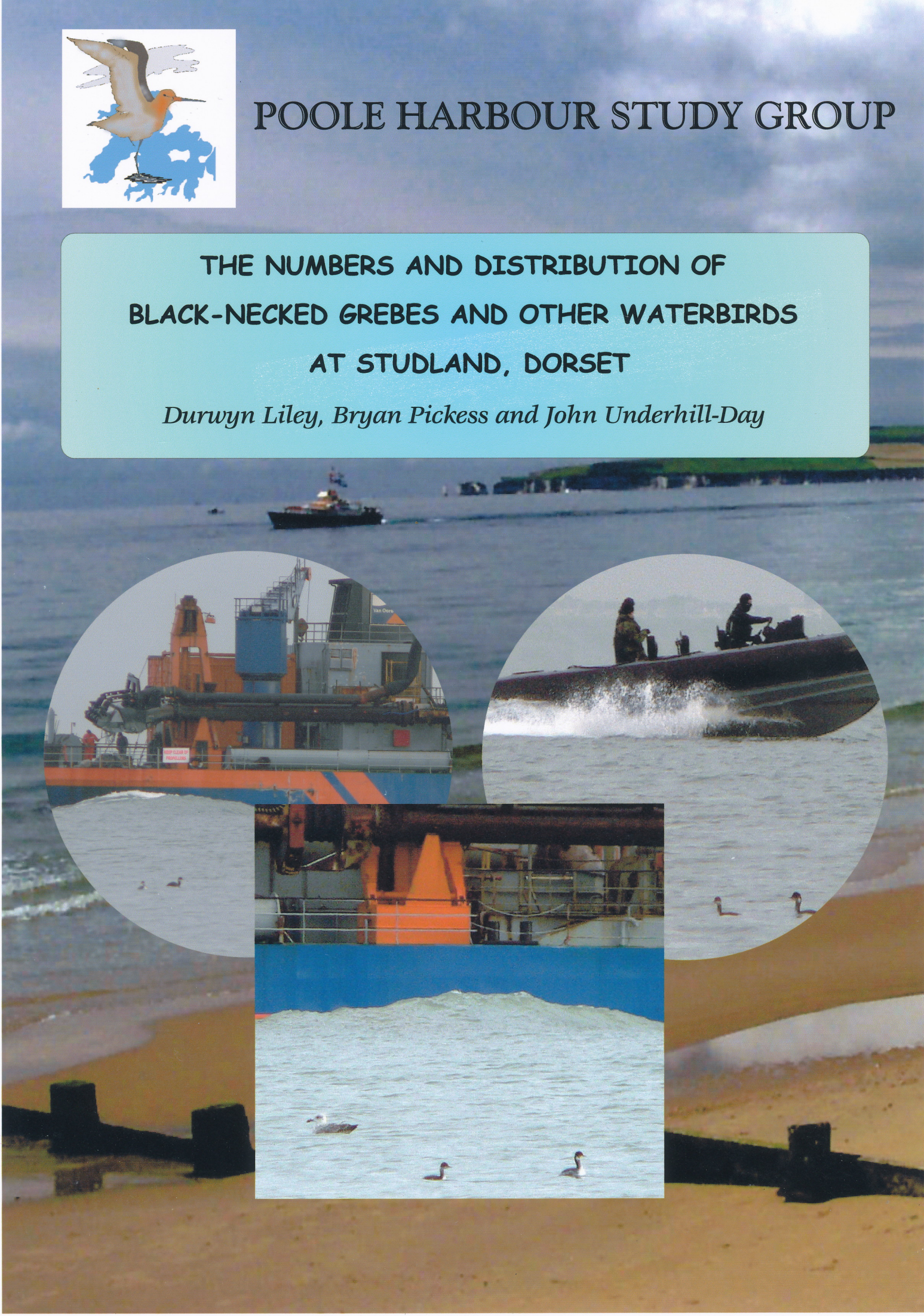

POOLE HARBOUR STUDY GROUP

THE NUMBERS AND DISTRIBUTION OF BLACK-NECKED GREBES AND OTHER WATERBIRDS AT STUDLAND, DORSET

Durwyn Liley, Bryan Pickess and John Underhill-Day

Poole Harbour Study Group: Publication No. 6

The Numbers and Distribution of Black-necked Grebes and other Waterfowl at Studland, Dorset

Report of a study undertaken during the winter of 2005/06

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Summary

The waters immediately off shore from Studland, Dorset are well known for supporting good numbers of wintering waterfowl, particularly black-necked grebes. Numbers of black-necked grebes, occasionally over 20, mean this site is one of the principal sites for the species in winter in the UK and holds approximately one sixth of the UK wintering population.

The area is popular with local bird watchers, yet it does not receive any regular monitoring or standardised counts and is not part of the WEBS count area, despite the very close proximity to Poole Harbour. There is evidence that the numbers of grebes do fluctuate both during the year and between years. This report addresses the gaps in regular WEBS monitoring by providing detailed counts of birds wintering off Studland, and these are placed in a wider context by dovetailing with counts of the wider area (Poole Harbour and Poole Bay) in attempt to quantify the number of birds present. Additional data on boats and the number of people on the beach is presented, and these data analysed to determine the extent to which the high human pressure on the area may explain the fluctuation in numbers and distribution of birds present.

We conducted 29 standardised counts at Studland between October 2005 and March 2006. Time of day and day (weekends and weekdays) were varied. All waterfowl within the bay were counted and the initial location when first observed mapped. All birds on the beach itself were also counted. The number of people on the beach were counted and categorised according to different activities. All boats were also counted and mapped, allowing direct comparison with bird distribution.

On two occasions (in December and February), the number of waterfowl within the entire Poole Bay and Poole Harbour area was also counted, in order to highlight the relative importance of the Studland Bay area. These wider "co-ordinated" counts were conducted by a number of observers, spread along the shoreline from Studland to Hengistbury, supplemented by counts from a boat of the deeper water areas within Poole Harbour and the offshore areas within Poole Bay.

The standardised counts showed a high human use of the beach areas in the winter, especially at weekends. A total of 1927 people were counted on the entire beach over the 29 counts. Most were walking, but a range of activities were recorded. A total of 417 dogs were counted and 30 horses. Boat traffic included commercial boat vessels, military and recreational craft. The numbers of boats correlated with the number of people on the beach on a given day; a total of 264 boats were counted and mapped across the 29 standardised counts, with the maximum on any one date being 45.

The standardised counts showed a marked variation in the numbers of birds present. Few birds (mainly waders, gulls, crows and pied wagtails) were recorded on the beach itself. More birds tended to be present at Shell Bay than on Knoll Beach. Counts on both beaches were erratic, but on no occasions were there high counts of people and high counts of birds. Counts of all birds (i.e. all species) on the beach were significantly higher on weekdays than weekends at Shell Bay, but not on Knoll Beach (where the majority of counts were of no birds).

A range of species were recorded off-shore, many only sporadically, and with the more common species numbers fluctuated between visits, suggesting that all species were quite

mobile. Species recorded (with maximum counts) included great-northern diver (2), black-throated diver (2), great-crested grebe (15), black-necked grebe (14), slavonian grebe (2), eider (1), red-breasted Merganser (32) and common scoter (42). Comparison of these count data with the data for Poole Harbour and Poole Bay highlights the importance of the Studland area, but also suggests that, as might be expected, many species occur in all areas, and there is likely be much movement between the different areas. For example, a total of 53 great-crested grebes were recorded on the December co-ordinated count, with 31 present within Poole Harbour and 22 within the entire Poole Bay. Red-breasted Mergansers were similarly counted in high numbers within both the Harbour and the off-shore areas – a remarkable 377 were counted in February, with the majority in the Harbour itself, and 29 within Poole Bay.

The black-necked grebes, although occasionally recorded within the Harbour, clearly show a strong preference for the Studland offshore waters. Unlike other species, such as great-crested grebes, black-necked grebe sightings were very clumped in their distribution, with three areas preferred. Most sightings were either in Shell Bay or in the southern-central area of Studland Bay. There were a few further sightings around the Training Bank. The sightings around the Training Bank and in Studland Bay were in the area of the eel grass (*zostera* spp) beds, whereas Shell Bay is not known to hold *zostera*, suggesting that the foraging habitat may be different at these locations.

The three areas are all relatively shallow, but the favoured area at Shell Bay was especially close to the beach. No birds were seen to fly on any day, so we believe birds swam between the three areas. There was a negative relationship between the number of people on the beach at Shell Bay and the number of grebes counted there. A similar relationship was not found within Studland Bay, in fact numbers of black-necked grebes within Studland Bay were negatively correlated with the number in Shell Bay, suggesting that when there were many people present on the beach, birds moved from Shell Bay into Studland Bay. Based of 100mx100m squares (pixels), drawn over the study area, we used logistic regression to explore the factors explaining the presence / absence of black-necked grebes within a pixel on a given date. After accounting for spatial autocorrelation, both distance from the beach and the number of people on the beach were significant variables within the model.

There is no evidence that black-necked grebes have declined, and while the analysis shows that the grebes may redistribute themselves as a result of human disturbance, there is no evidence for actual population effects. There is, however, evidence for a marked decline in some other species of wintering waterfowl at Studland, especially Slavonian grebe. We recommend that both human pressures and birds are monitored at Studland occasionally in the future. We recognise that the black-necked grebe is not a high profile species of European conservation concern (the UK is on the edge of its range and it is very common abroad), however the wintering population at Studland is of national importance and perhaps the largest wintering concentration of the species within the UK.

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Introduction

Overview

During the 1990's Poole Harbour and Studland Bay were listed either seperately or together as being of national importance for wintering Slavonian (*Podiceps auritus*) and black-necked grebes (*Podiceps nigricollis*) in the Wetland Bird Survey Reports published by the BTO. In recent years there has been no monitoring within the area, and the only data available on waterfowl in the area has been ad hoc data from visiting birdwatchers within the Dorset County Bird Report. The 2000/2001 WEBS report specifically mentions the absence of Studland Bay figures and recent counts from the county bird report from the site suggest that numbers of the smaller grebes have declined in the area.

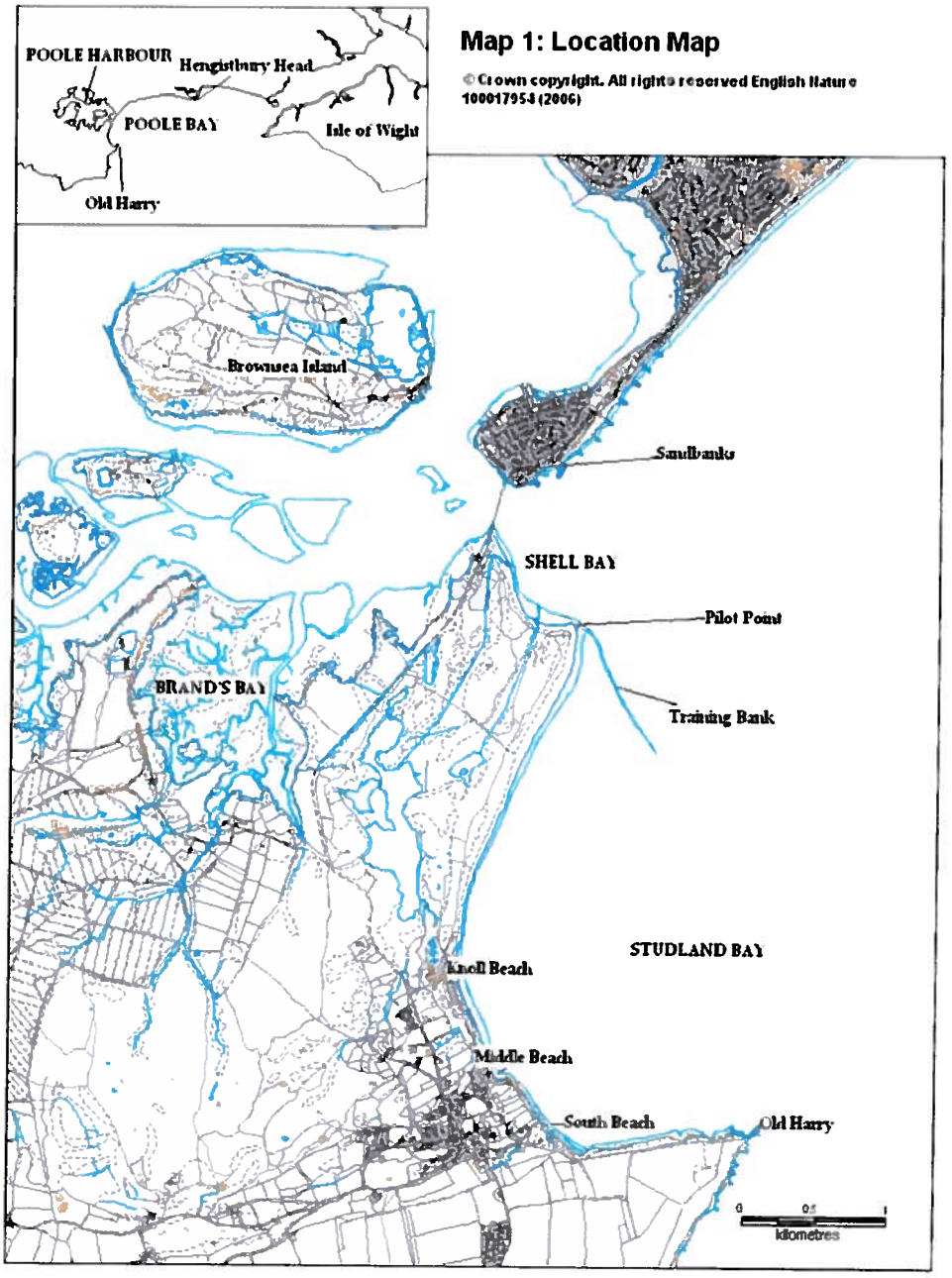
In order to redress this lack of recent counts we provide repeated counts from the Studland shoreline. We aim to document the current wintering population of grebes and other birds within the area, compare this with previous years' data and to explore issues which may be affecting the birds wintering in the area.

The Studland / Poole Harbour area

Poole Harbour is designated as an SPA, SAC, Ramsar site and is part of the World Heritage Coastline. Studland NNR occurs to the south of the Harbour mouth. A long sandy beach stretches from Shell Bay to South Beach (see Map 1). The beach is backed by extensive dunes and heathland. To the south of south beach, the Purbeck Ridge meets the shore, and a line of chalk cliffs, culminating at Old Harry, forms the southern edge of Studland Bay. Studland village is just inland of South Beach.

There are four large car-parks, managed by the National Trust providing access onto Studland Beach. The area is a popular with people at all times of year. During the winter, the long, flat sandy beach attracts many walkers, often with dogs. An equestrian centre also uses the beach for horse riding. The mouth of the Harbour is very narrow, and as such the density of boats in this area is particularly high. The MOD also uses the Studland area for some water based Training.

Key locations mentioned in the text are shown in Map 1.



Map 1: Location Map

The small grebes and previous counts at Studland / Poole Harbour

Slavonian grebes

Slavonian grebes have a circumpolar breeding distribution somewhat further north than other small grebes (1977 - 1995). Birds wintering in the UK are thought to come from several breeding areas with south coast birds originating from Fenno-scandia and further north from breeding areas in Greenland and Iceland and northern Norway. (Wernham et al 2002, Collier et al 2005). Slavonian grebes winter mainly in sheltered inlets, bays and estuaries, feeding on small fish, especially sculpins, and crustaceans, (mysids, amphopods and decapods) insects and molluscs (Cramp 1977).

Birds leave their breeding grounds in Sweden, Finland and the Baltic States and start arriving in eastern and southern England in late August with the main arrivals in October and November. Spring departures are during March and April (Wernham et al 2002). There has been only one recovery of a foreign ringed bird, from northern Russia, found in Yorkshire (Hudson, 1964). In recent years the only UK sites of international importance (≥35 individuals) have been in Scotland, but nationally important sites in southern England (≥7 individuals) include The Blackwater Estuary, Pagham Harbour and North West Solent.

The Winter Atlas, based on fieldwork during winters 1981-84 estimated a total wintering population of 400 Slavonian grebes in Britain excluding Ireland (Chandler in Lack, 1986), considerable smaller than the estimate by Prater (1981) of 670. However, a more detailed examination of the available data by Evans (2000) estimated a mean number of 648 between Dec-Feb for England, Scotland and Wales, and put Poole Harbour among the top ten sites of national importance for this species.

Until the early 1970's, although a regular winter visitor to Poole harbour, in most years less than 10 were present but with a two counts of 30 during the twenty years up to 1974 (Boys 1974). Mean peak numbers during 1970-71 to 1979/80 were 19, and this increased to 22 during 1980/81 to 1990/91. During 1990/91 to 1997/98, mean peak numbers had dropped to 14 (Pickess & Underhill-Day 2002).

Counting grebes in Poole Harbour and Studland Bay presents some difficulties, as birds apparently move between the Harbour and the open sea (Collins, 1985), and this can lead to double counting or birds being missed. Collins (1985) also noted that birds moved into the Harbour during strong easterly winds. Counts which included Poole Bay, Studland Bay and Poole harbour were undertaken with some consistency during 1970/71 to 1999/00. During these 30 years, peaks counts were mostly between Jan-Mar (63%) (Dorset Bird Reports). Of the mean number of 269 wintering birds in England, 64 (24%) were in Cornwall, 43 (16%) in Sussex, 29 (11%) were in Dorset, 25 (9%) in Devon and 18 (7%) in Hampshire (Evans 2000). Thus some 67% of the wintering birds in England were on the south coast, most of them probably of the race *auritus* (Brown & Grice, 2005).

Black-necked grebe

Black-necked grebes have their main breeding distribution across the North western American continent and in western Asia and eastern Europe. There are scattered breeding areas across western Europe including the UK, the Mediterranean Basin and the near East, down as far as South Africa (Cramp 1977). No ringed birds have been recovered in the UK, but birds wintering in southern England may be of continental origin (Wernham et al 2002). Black-necked grebes winter on large ice-free freshwater lakes, inland seas, reservoirs and salinas, sometimes in huge concentrations (Cullen, Jehl & Nuechterlein, 1999; Wernham *et al.*, 2002). Although Black-necked grebes are believed to be the most abundant grebe species in the world (Cullen 1999), and there are between 117,000-450,000 birds wintering in Europe and North Africa (Delany & Scott, 2002), the Atlantic and north Sea coasts hold only limited numbers (Hagemeijer & Blair, 1997), maybe as few as 2,000 birds (Lack, 1986). Chandler (in Lack 1986) estimated the UK wintering population as 120 birds.

The main wintering locations are Langstone Harbour, Poole Bay and the Fal Estuary and Carrick Roads in Cornwall. In southern England, the main concentrations are on salt water in sheltered inshore waters, estuaries and bays. During the breeding season Black-necked grebes are largely insectivorous, but little is known about their winter diet. In Denmark, Madsen (in Cramp 1977)) recorded grebe stomach content as containing remains of goby and *Mysis*, a shrimp. In America, black-necked grebes are known to feed on brine shrimps (*Artemia* spp.), brine flies (*Ephydra* spp.) and water boatmen (*Corixids*) in winter (Caudell & Conover, 2001).

Up to 40 black-necked grebes were recorded from Poole Harbour with little change over the decades from the 1930's until the mid 1960's (Prendergast & Boys, 1983). A major oiling incident in the Harbour in 1964 (Ranwell & Hewett, 1964) could have affected numbers. During the winter 1971/72 the Birds of Estuaries Enquiry Report noted that Black-necked grebes were recorded in only nine estuaries, and at only three of these were there more than 2 birds, Burry Inlet with four, Loch Ryan with five and Poole Harbour with 11. During the 1980's, mean peak numbers in Poole Harbour were 18.5, and during the seven years to 1997/98, the mean peak for non Webs counts was 16 (WEBS counts mean peak was 8), (Pickess & Underhill-Day 2002).

During the early 1970's the Birds of Estuary Enquiry figures suggested that Poole Harbour held 15-35% of the national wintering population although it is likely that UK coverage was incomplete. No national data was given for grebes in the Wildfowl and Wader reports during 1979/80 to 1990/91. During the 23 winters 1980/81-2002/03, black-necked grebe numbers peaked during Nov in 2 (9%) years, in Dec 9 (39%), Jan 3 (13%), Feb 8 (35%) and Mar 1 (4%). This suggested that birds may have been moving through the area in December and January, although the constancy of count numbers from 2005/06 suggests some are present all winter.

Other waterbirds

Poole Harbour is of national importance for red-breasted merganser (*Mergus serrator*), with a five year mean population of 424 to 2003/04, second only to the Forth Estuary in importance in the UK (Collier *et al.*, 2005). During the 1990's, merganser numbers were slowly rising (Pickess & Underhill-Day 2002), but now seem to have stabilised. There is some movement between the Harbour and the open sea, and it would be surprising if there was not some interchange between the Poole Bay area and Weymouth Bay and the Fleet, which with a five year mean of just under 400, is the third most important site for the species in the UK. Dusk counts suggest that most mergansers remain within the Harbour to roost.

Poole Harbour is also of national importance for cormorant (*Phalacrocorax carbo*) with a five year mean of 445. Pickess & Underhill-Day (2002), note that despite considerable fluctuations, cormorant numbers have remained fairly stable during the 1990's, and that numbers tend to be highest in the autumn and decline slowly during the winter. Cormorants have favourite hauling out sites, particularly Brownsea Island lagoon, but during any period of observation of the Harbour or Studland/Shell Bay, cormorants can be seen fishing, flying past or resting on posts and buoys.

No other species reach nationally important numbers in or around Poole harbour. Red-throated (*Gavia stellata*), black-throated (*Gavia arctica*) and great northern divers (*Gavia immer*) are all regular wintering species in small numbers (less than six of each in most years), although sea counts, particularly of red-throated divers off Portland Bill, indicate that considerable numbers are present in the area during the winter.

Small numbers of great-crested (*Podiceps cristatus*) and red-necked grebes (*Podiceps grisegena*), auks and sea ducks are also recorded in the area during the winter.

Pilot point has historically been a roost site for waders and the foreshore does still occasionally attract small numbers of waders, but counts of roosts involving 1000s of birds (Aspinall & Tasker, 1990)have not been recorded for well over a decade.

Need for further work

There is some evidence of a decline in the numbers of small grebes and waders using the Studland Bay in the winter. The small grebe declines are of some concern because the previous estimates of populations on these inshore waters have been of national importance. There is currently no systematic recording of birds here as WEBS counts are no longer conducted on the beach or the sea.

There are a number of issues which may be affecting the birds wintering in the area. Coastal wildfowl are a group specifically identified as a priority for further research on recreational disturbance (Liley, 2001) and recreational disturbance has been shown to impact grebes (Keller, 1989). During the non-breeding season, the main impact of disturbance on birds is likely to be a disruption to their feeding. Birds can move to alternate feeding areas, although displacement may be to poorer quality

feeding habitat (Stalmaster & Kaiser, 1997). However, during times of particularly high energy demand (such as severe weather) birds may not be able to obtain sufficient food to off-set disturbance effects. For example pochard and tufted duck increased daytime feeding during periods of especially low temperatures (Marsden, 2000) and a reduction in available feeding time under such weather conditions can result in increased mortality, eg of waders (Clark *et al.*, 1993). Disturbance at this time would have the most impact as birds are already under energetic constraints, even though they may be more approachable (Stillman & Goss-Custard, 2002).

Aims of this report

We conducted regular counts from the Studland foreshore and co-ordinated counts of the entire Poole Bay area over the winter 2005-6 with the following aims

- To provide estimates of the number of small grebes and wintering wildfowl within the Studland area over the winter period
- To provide regular counts to determine the extent to which numbers of waterfowl and waders fluctuate within the Studland area
- To determine the local importance of the Studland area and to allow estimates of the total wintering population of small grebes and other waterfowl within the bay during the winter
- To summarise boat use and visitor numbers in the Studland area and to analyse these data to determine the extent to which these might influence the number and distribution of small grebes within the area.

Methods

Standardised counts

Regular counts were conducted through the winter from the Studland area. These standardised counts were only done in good visibility and when the sea state was calm. Time of day and day of the week were varied, to provide counts when visitor numbers and boat use were also likely to vary.

Counts were started at the northern end of the Studland area, from the beach at Shell Bay in front of the car-park near the ferry toll booth. During the walk to Pilot Point, all birds on the beach were counted, between the harbour mouth and pilot point. At the point itself, a count of all people and dogs visible on the beach to the north was made. People were categorised and counted according to activity, giving the number of dogs, dogs walkers, fishermen, joggers etc.

Birds (apart from gulls) on the water within Shell Bay and around the Training Bank and towards Knoll Beach were mapped from the top of the large dune on pilot point. Base maps showing buoys and landmarks on the horizon were used. The large number of buoys, marking the shipping channel, and the markers along the Training Bank provided useful markers for both distance from the observer and precise bearing. A sighting compass was occasionally used as necessary. Birds were located by repeated scanning with binoculars and telescope, and all areas of the water visible were scanned repeatedly. All individual birds were mapped once, at the location where first observed. In addition, all boats were plotted (as points indicating the location where first seen), categorised as motor boat, ferry, dredger, MOD or sailing boat.

A second count was then conducted from Knoll Beach. All birds on the water and all boats were plotted as above. All people visible on the beach were also counted, as above

A third count (of birds and boats) was then conducted from Middle Beach, from the car-park on top of the cliffs.

Co-ordinated counts

In order to be able to provide context to the standardised counts, co-ordinated counts were conducted across both Poole Harbour and Poole Bay. Counters were given discrete sections of the bay – from Hengistbury Head round to Old Harry and were asked to count all birds on the water. Counts were all conducted at the same time, lasting one hour mid-morning.

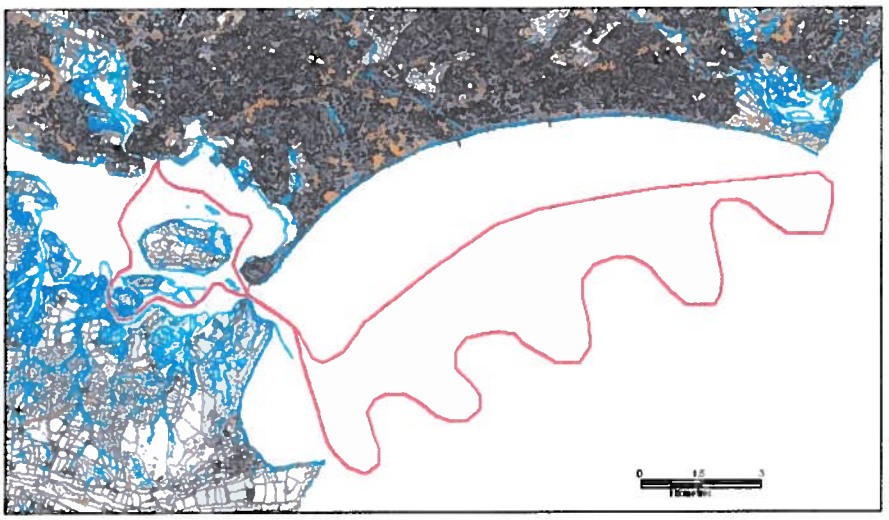
Two counts were conducted, in December and February. It was initially aimed to conduct the counts on the same days as WEBS counts, to allow direct comparison

with the data from Poole Harbour. This was only achieved for the February count (Sunday 12/2/2006) due to rough weather on the WEBS count date in December. The December count was conducted on Wednesday 15/12/2005.

To supplement the counts from the shore, a boat was also used on the two count dates. The boat was used to count birds within the deeper water areas of Poole Harbour and then the offshore areas of Poole Bay. We followed the standard guidelines for surveying from boats (Camphuysen *et al.*, 2004), with the boat speed held constant at 8 knots and all observations conducted in sea conditions below sea state 5. Birds were detected using the naked eye as a default, occasionally scanning ahead with binoculars. The boat used was a motor boat with an upper viewing deck (c. 6m), from which all counting was conducted. The route followed was recorded in the field using a hand-held WAAS enabled GPS and is shown in Map 2. This route was chosen to supplement the shore counts, and to give good coverage of the offshore areas and deeper water within Poole Harbour. The off-shore zig-zags between Old Harry and Hengistbury Head were preset using the ship's on board satellite navigation system and the same route repeated on both dates.

Counts from the boat and from the shore counters were summed to give total counts for Poole Harbour and Poole Bay. A distance was recorded for all bird sightings, providing the potential to estimate density, however as sample sizes were small for all species offshore, and the sampling method within the harbour not randomised, density estimates were not calculated.

Map 2: Boat Route



Additional sightings

Various ad hoc sightings from the Studland area and Poole Harbour were provided by local birdwatchers and the county recorder. A request for sightings and counts from the area was placed on the Dorset Bird Club website. These additional counts provide further useful data, and for most other years, are the only data available from the Studland area. These records and counts are summarised as an appendix to the report.

GIS data

Detailed analyses of the Black-necked Grebe distribution was conducted using a grid of 100m x 100m squares (pixels), drawn over the Studland area. For each pixel the following data was extracted, using the GIS:

1) **Water Depth.** Raster images of admiralty charts were provided by English Nature, and these charts provided depth (from the MHWM) measurements at specific points through the study area. These depths were plotted as point data and these data used to generate a raster layer of water depth using the inverse distance weighting interpolation function within MapInfo (7.5). The depth measurement used in the analysis was the depth at the centre of each pixel.

2) **Distance from land.** Ordnance Survey MasterMap files were provided by English Nature under OS copyright. The shortest distance, from the mean high water mark to the centre of each pixel, was calculated using the GIS. This was done for both the entire shoreline, and also the beach (ie Shell Bay, Knoll Beach and Middle Beach). The shoreline measurement therefore gives the distance offshore (i.e. distance from the nearest land, whether cliffs or beach), whereas the distance from the beach gives a distance from the sandy beach areas with high public access levels.

3) **Boats.** Two measures of boat traffic were extracted. The total number of boats was a figure for each pixel that reflected the total number of boats counted across all visits within that pixel. Secondly the number of boats within 200m was determined for a given date. A buffer of 200m was drawn around each boat plotted within the GIS. Any pixels which intercepted the 200m buffer were then extracted, resulting in a value, for each 100m x 100m pixel, of the number of boats within 200m on a given date.

4) **Number of people on the beach.** This figure was the combined count of the total number of people, per visit, recorded on Knoll and Shell Bay beaches combined.

5) **Presence or absence of Black-necked Grebe.** These data were extracted separately for each day. Each pixel was given a value of 1 if a black-necked grebe was recorded in that square on a given date and 0 if none were recorded.

There were a total of 1081 pixels within the study area. Black-necked grebes were recorded, on at least one date, in 102 of these pixels. Of these 102 pixels where grebes were recorded, 74 contained grebes on a single date only, and in the remaining 24 pixels grebes were seen on multiple visits. For the 24 pixels with multiple sightings, the first date when grebes were recorded within the square was used and the remaining data removed. This resulted in a dataset with 102 different pixels, each of which could be related to data specific to a given date, such as boat distribution and

the number of people on the beach. For comparison, we selected an equivalent 102 pixels where no grebes had been recorded. These were selected at random, stratifying them geographically to both sample the whole study area and to reduce spatial autocorrelation (i.e. to reduce the probability of using adjacent pixels). The number of random points selected is important because prevalence (the ratio of positive to negative pixels) affects the outcome of model performance testing in logistic regression as used here.

The presence / absence of black-necked grebes was then analysed in relation to the range of explanatory variables. Initial exploration was through univariate analysis, comparing the data from the random squares with those where grebes were recorded. Logistic regression (SPSS 14.0, 2005) was then used to construct a predictive model to explain the probability of a grebe occurring in a pixel on a given date. The following variables were included:

	Description
• Boats within 200m	Number of boats within 200m of pixel on a given date
• People on beach	Number of people on beach on a given date
• Distance to shore	Distance (m)from centre of pixel to nearest shoreline
• Distance to beach	Distance (m) to nearest part of sandy beach
• Depth	Water depth (m), from seabed to MHWM.
• SAC	Autologistic term
• People * Distance to beach	Interaction term for people and the distance to the beach
• weekend	Categorical term, included within the model as a factor with two levels, indicating whether a weekend (1) or not (0)

The maximal model was fitted and simplified by step-wise deletion of the least significant term. This was repeated until the minimum adequate model was attained (i.e. all remaining terms significant at $p<0.05$). The significance of interaction terms was assessed first and then main effects.

Spatial autocorrelation affects significance tests on logistic regression coefficients and, as no satisfactory method exists at present to correct for this, caution is needed in their interpretation. Conventional statistical modelling on spatial data ignores spatial autocorrelation in the residuals due to the ecological likelihood that neighbouring pixels will have dependent probabilities of use. To overcome this we adopted the approach of (Augustin, Mugglestone & Buckland, 1996) by incorporating an autologisitic term in the models. A moving window was used to calculate the average probability of occupation among the eight adjacent pixels, weighted by the inverse of the Euclidean distance. This autologistic term and was added as an additional covariate in the logistic model (Augustin *et al.*, 1996).

Results of logistic regression models are often judged successful if predicted probabilities >0.5 correspond with observed occurrences and values with <0.5 with absences. This dichotomy is, however, arbitrary and lacks any ecological basis. In addition to a standard contingency table showing the number of pixels correctly assigned by the logistic regression models, we also use a more powerful approach to assess model success, using receiver operating characteristics (ROC) plots (see Finney & Suki, 2004; Osborne, Alonso & Bryant, 2001). The area under the curve (AUC) provides a convenient measure of overall fit and varies from 0.5 (for a chance performance) to 1.0 (for a perfect fit). We generated ROC plots using SPSS software and calculated the AUC $\pm$ its standard error using a non-parametric approach.

Historical data

Data for Black-necked Grebes and Slavonian Grebes within the harbour and Poole Bay was extracted from the Dorset County Bird Reports, going back to 1991. In addition data from the 1993/94 winter was provided by P. Williams, who counted birds from the same area as the standardised counts on six separate dates over that winter.

These data were compared directly with the data from the 2005/6 winter to determine the extent to which the numbers of small grebes and other birds had changed within the bay.

Results

Summary of people count data

Spot counts were conducted from pilot point and from the knoll café. A variety of activities were recorded, but most people were walking (Table 1). A total of 446 dogs were counted, equating approximately to one dog for every four people counted. Most dogs were off the lead (85% of dogs), and approximately one in ten (13% of dogs) were swimming or in the water. There were significant differences in the number of people and dogs counted at weekends compared to weekdays, with more people and dogs present at weekends. This was the case for Shell Bay (total people, weekend median = 36.5, weekday median = 3, Mann-Whitney W = 196, $p < 0.001$; total dogs, weekend median = 4.5, weekday median = 1, Mann-Whitney W = 216, $p < 0.01$) and Knoll Beach (total people, weekend median = 104, weekday median = 18, Mann-Whitney W = 196, $p < 0.001$; total dogs, weekend median = 19.5, weekday median = 6, Mann-Whitney W = 228, $p < 0.001$).

Table 1: People, dogs and vehicles counted on the beach. Data from 29 different spot counts. Ten counts were conducted at weekends and 19 during the week.

	Total Count (from 29 spot counts)			Shell Bay		Knoll Beach	
	Shell Bay	Knoll Beach	Whole Beach	Weekend median (& range)	weekday median (& range)	Weekend median (& range)	weekday median (& range)
People							
walkers	425	1436	1861	31.5 (11-58)	3 (0-32)	101 (39-178)	16 (4-72)
joggers	0	3	3	0 (0-0)	0 (0-0)	0 (0-2)	0 (0-1)
windsurfers	1	1	2	0 (0-1)	0 (0-0)	0 (0-1)	0 (0-0)
on beach fishermen	8	1	9	0 (0-7)	0 (0-0)	0 (0-0)	0 (0-1)
horse riders	15	15	30	0 (0-6)	0 (0-4)	0 (0-4)	0 (0-7)
cyclists	3	0	3	0 (0-3)	0 (0-0)	0 (0-0)	0 (0-0)
kite flyers	5	4	9	0 (0-4)	0 (0-1)	0 (0-2)	0 (0-0)
NT staff	0	6	6	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-6)
birders	2	2	4	0 (0-2)	0 (0-0)	0 (0-2)	0 (0-0)
total people	459	1465	1927	36.5 (11-58)	3 (0-37)	104 (39-178)	18 (4-72)
Dogs							
dogs on lead	14	51	65	0.5 (0-6)	0 (0-1)	3.5 (1-5)	0 (0-5)
dogs off lead on beach	61	243	304	4 (0-8)	1 (0-4)	14 (6-27)	5 (0-14)
dogs off lead in sea	9	39	48	0 (0-1)	0 (0-5)	1 (0-4)	0 (0-11)
total dogs	84	333	417	4.5 (1-14)	1 (0-5)	19.5 (8-32)	6 (1-20)
Vehicles							
4x4	2	2	4	0 (0-1)	0 (0-1)	0 (0-1)	0 (0-1)

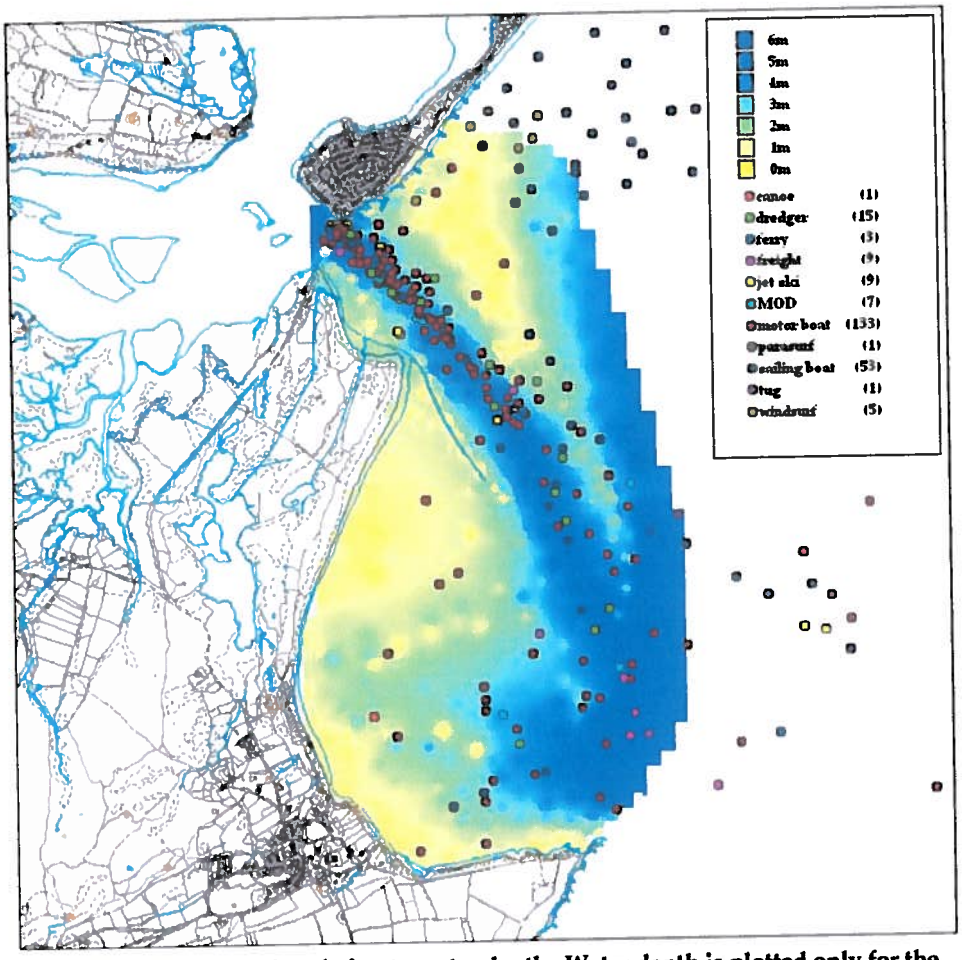
Summary of boat data

The variety of boat traffic included both commercial and leisure vessels (Table 2). The number of boats counted on a given day ranged from 0 to 45. There were significantly more boats at weekends compared to weekdays (median count on weekdays = 5, at weekends = 12.5, Mann-Whitney W = 204, $p<0.001$). The total number of boats (including jet skis and windsurfers) on a given day correlated with the number of people counted on the beach (Pearson correlation coefficient = 0.482, $p<0.01$).

Table 2: Boat traffic recorded from the 29 standardised counts

	No of dates recorded	Total (all dates)	Max on any one date
windsurfer	1	5	5
parasurfer	1	1	1
jet ski	6	10	3
motor boat	26	143	24
sail boat	14	50	25
ferry	5	5	1
MOD craft	4	15	5
dredger	14	15	2
freight	7	10	2
tug	4	4	1
canoe	2	6	5
all boats	29	264	45

Most boat traffic was within the shipping channel and most remained within the deeper water. Within Studland Bay itself there were relatively few boats recorded (Map 3).



Map 3: Distribution of boats in relation to water depth. Water depth is plotted only for the immediate study area (i.e. the area where it was felt possible to accurately map birds), boats plotted outside this are estimated locations only. ©Crown Copyright. All rights reserved, English Nature 100017954 (2006).

Birds on the beach

A number of gulls, waders and passerines were recorded on the beach. More species were recorded at Shell Bay than Knoll Beach. Counts were erratic, with no birds present on the beach on many days (see table 3). There were significantly more birds present during weekdays than weekends at Shell Bay. On Knoll Beach counts of birds were too low at both weekends and weekdays to allow any meaningful comparison. On both beaches, there were no days when both high numbers of birds and high counts of people were on the beach (Figure 1).

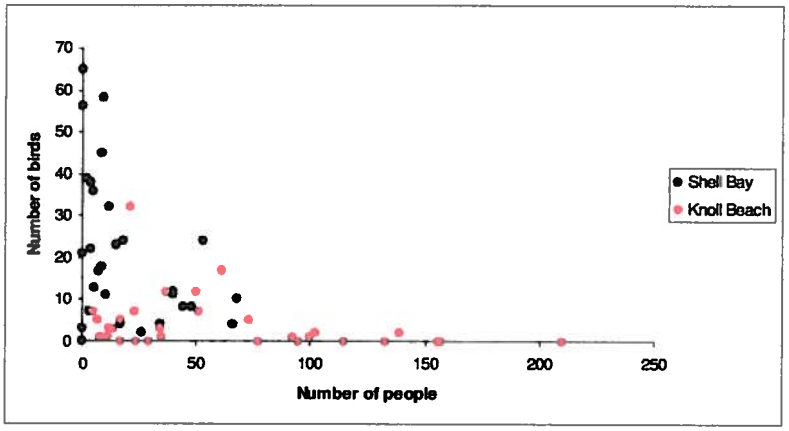


Figure 1: Numbers of birds (spot counts, all species combined) on the beach and people (spot counts) present on the beach.

Table 3: Total number of birds counted and median counts for birds on the beach at Shell Bay and Knoll Beach. Data are from 29 counts, 10 at weekends and 19 on weekdays. Counts are spot counts on the beach. Significance ("sig") gives the Mann-Whitney test statistic and significance, calculated only for the two species groups (gulls and waders), and all birds.

	Shell Bay					Knoll Beach				
	Total (all days)	range	Median weekends	Median weekdays	Sig.	Total (all days)	range	Median weekends	Median weekdays	Sig.
Brent Goose	41.00	0-25	0.00	0.00		11	0-11	0	0	
Black-headed Gull	190.00	0-23	1.00	7.00		11	0-6	0	0	
Common Gull	0.00	0-0	0.00	0.00		1	0-1	0	0	
Herring Gull	25.00	0-9	0.00	1.00		9	0-4	0	0	
Mediterranean Gull	1.00	0-1	0.00	0.00		0	0	0	0	
Great black-backed Gull	1.00	0-1	0.00	0.00		1	0-1	0	0	
Total gulls	216.00	0-24	1.50	9.00	W = 324, p = 0.04	22	0-11	0	0	
Oystercatcher	112.00	0-19	0.00	3.00		15	0-15	0	0	
Grey Plover	33.00	0-17	0.00	0.00		0	0	0	0	
Ringed Plover	21.00	0-11	0.00	0.00		0	0	0	0	
Sanderling	36.00	0-14	0.00	0.00		0	0	0	0	
Dunlin	12.00	0-5	0.00	0.00		0	0	0	0	
Redshank	2.00	0-1	0.00	0.00		0	0	0	0	
Turnstone	7.00	0-4	0.00	0.00		0	0	0	0	
Total waders	223.00	0-52	0.50	4.00	W=312.5, ns	15	0-15	0	0	
Pied Wag	24.00	0-4	0.00	0.00		13	0-5	0	0	
Mipit	2.00	0-1	0.00	0.00		0	0	0	0	
Crow	108.00	0-9	2.00	4.00		64	0-15	0	1	
All birds	615	0-65	8	22	W = 338.5, p = 0.02	125	0-32	0	3	W = 318, p = 0.12

Summary of standardised counts and co-ordinated counts from Poole Bay

Table 4 summarises the data from the coordinated counts, giving the total number of birds recorded with Poole Bay and within the harbour. The table provides context for the other count data included within this report. As would be expected, the Harbour clearly holds the majority of mergansers and Goldeneye (*Bucephala clangula*), whereas Poole Bay holds larger numbers of divers, grebes and auks.

A comparison with the data from the standard counts (the column in Table 4 is taken from Table 5) highlights the importance of the Studland area for waterfowl. Poole Bay covers some 6700ha, the standard counts cover some 1000ha, approximately one sixth of the area of the bay.

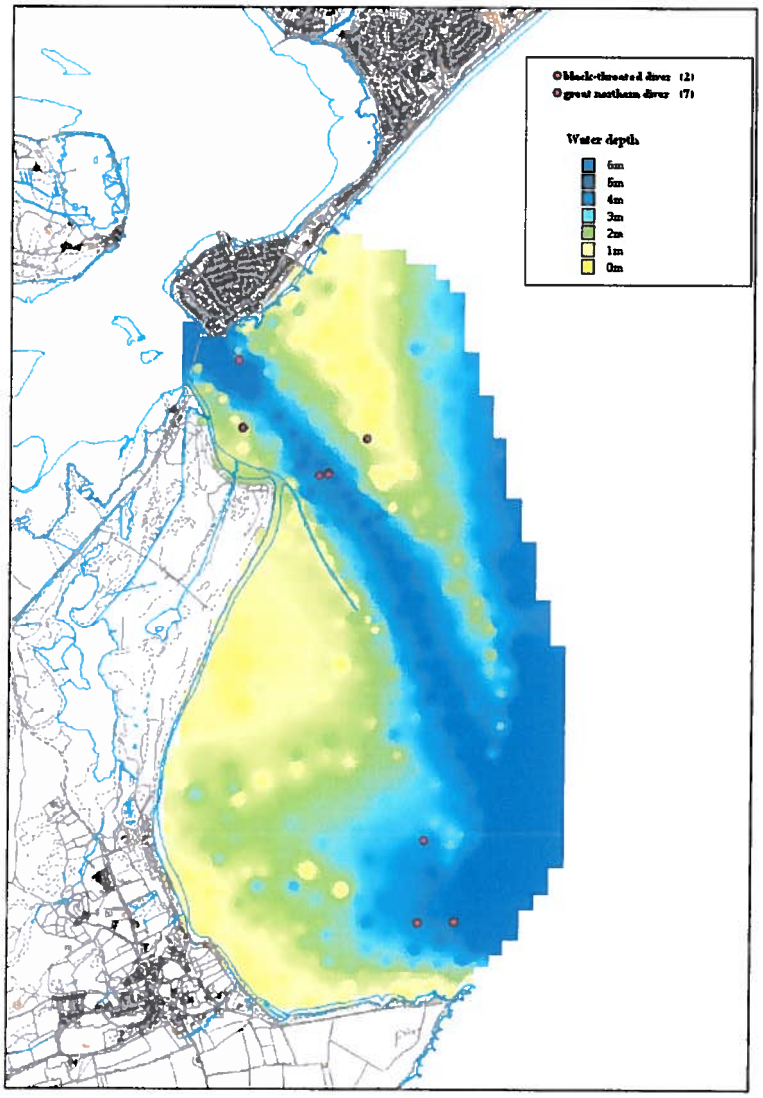
Table 4: Totals from co-ordinated counts covering Poole Bay and Poole Harbour simultaneously. For comparison the threshold values for a site to be of national importance (Pollitt *et al.*, 2003)and the maximum totals from the regular, standardised counts at Studland and Shell Bay are also included. The standardised count data is taken from table 5.

	15th December			12th February			Max count from standardised counts	Threshold for national significance
	Harbour	Bay	**total**	Harbour	Bay	**total**		
Diver sp	0	0	**0**	0	1	**1**		
Red-t Diver	0	6	**6**	0	1	**1**	**0**	**50**
B-t Diver	0	1	**1**	0	1	**1**	**2**	**7**
Great N Diver	1	7	**8**	0	4	**4**	**2**	**30**
G-c Grebe	22	31	**53**	12	17	**29**	**15**	**100**
Slavonian Grebe	0	3	**3**	0	2	**2**	**2**	**4**
Little Grebe	0	0	**0**	1	0	**1**	**0**	**30**
Black-necked Grebe	0	22	**22**	0	11	**11**	**14**	**1**
Common Scoter	0	8	**8**	0	2	**2**	**42**	**275**
Eider	0	0	**0**	0	4	**4**	**1**	**750**
Goldeneye	35	0	**35**	43	0	**43**	**0**	**170**
Red-breasted Merganser	153	67	**220**	348	29	**377**	**32**	**100**
Cormorant	19	74	**93**	11	19	**30**	**6**	**130**
Shag	9	37	**46**	18	16	**34**	**27**	
Guillemot	0	15	**15**	0	1	**1**	**1**	
Razorbill	0	5	**5**	0	0	**0**	**0**	

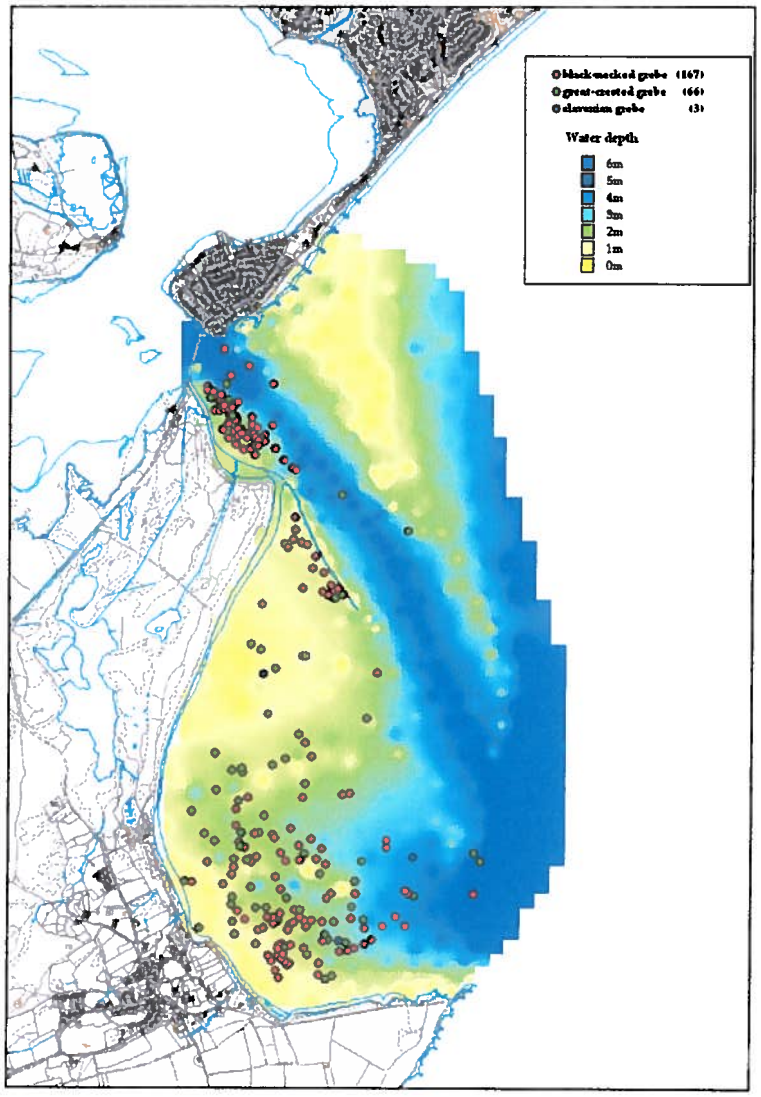
Table 5: Count data from standardised counts at Studland and Shell Bay, all counts over the whole winter

Date	G-N. Diver	B-t. Diver	Slav. Grebe	B-n Grebe	G.C Grebe	Shag	Cormorant	Brent	Eider	R-b merg	Common scoter	Mallard	Guillemot
11/11/2005	1	0	1	0	0	12	2	2	0	0	0	0	0
13/11/2005	0	0	0	0	1	7	0	0	0	0	0	0	0
20/11/2005	0	0	0	5	7	3	4	0	0	0	42	0	1
22/11/2005	0	0	0	7	3	2	1	0	0	0	22	1	0
23/11/2005	0	0	0	5	0	13	0	0	0	0	0	0	1
30/11/2005	0	0	0	9	6	20	2	5	0	8	21	0	2
04/12/2005	0	0	0	9	4	17	1	12	0	2	24	0	0
06/12/2005	0	2	0	8	4	24	1	7	0	1	0	0	0
16/12/2005	1	1	2	6	7	27	2	50	0	32	2	0	0
26/12/2005	0	0	0	12	2	8	0	24	0	6	0	0	0
29/12/2005	0	0	0	7	0	2	3	2	0	13	2	0	0
07/01/2006	0	0	0	8	3	4	6	229	0	8	0	0	0
13/01/2006	1	0	0	9	3	5	0	155	1	10	1	0	0
17/01/2006	1	0	0	11	1	10	1	110	0	18	0	0	0
20/01/2006	2	0	0	4	4	3	0	102	0	24	0	0	0
22/01/2006	0	0	0	11	15	4	0	0	0	3	0	0	0
25/01/2006	0	0	0	10	0	5	0	19	1	10	0	0	0
28/01/2006	0	0	0	7	3	4	0	0	1	2	0	0	0
31/01/2006	0	0	0	11	1	14	0	29	0	2	0	0	0
03/02/2006	1	0	0	13	3	2	0	156	1	27	1	0	0
04/02/2006	0	0	0	7	1	9	0	0	0	0	0	0	0
10/02/2006	0	0	0	14	2	2	0	15	0	4	0	0	0
17/02/2006	2	0	0	14	3	4	0	0	0	0	0	0	0
21/02/2006	0	0	0	5	1	4	0	0	0	4	0	0	0
27/02/2006	0	0	0	8	1	7	0	43	0	22	0	0	0
04/03/2006	0	0	0	2	0	1	0	0	0	0	0	0	0
09/03/2006	0	0	0	9	3	5	1	0	0	6	1	0	0
11/03/2006	0	0	0	6	5	1	1	0	0	6	0	0	0
17/03/2006	0	0	0	5	0	1	1	2	0	6	0	0	0
Maximum	2	2	2	14	15	27	6	229	1	32	42	1	2
Minimum	0	0	0	0	0	1	0	0	0	0	0	0	0
Mean	0.31	0.10	0.10	7.66	2.86	7.59	0.90	33.17	0.14	7.38	4.00	0.03	0.14

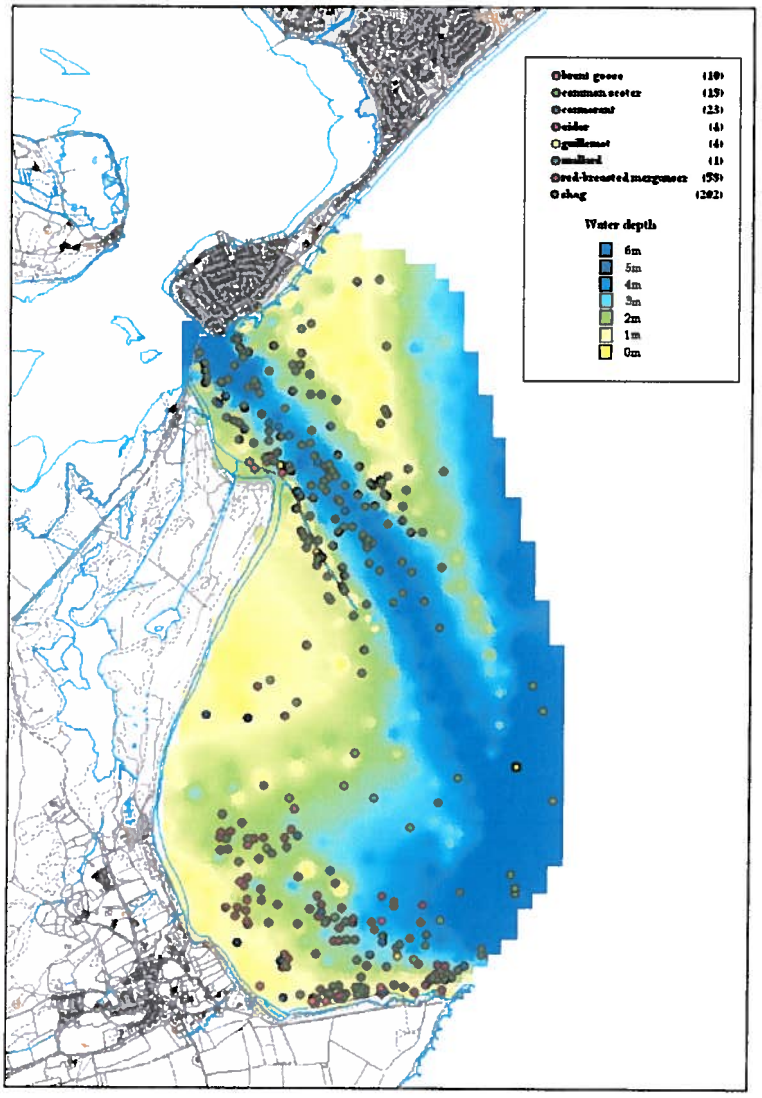
The spatial distribution of birds recorded during the standardised counts is shown in Maps 4 – 6. These maps also show the depth data. Clear differences are evident for different species. The few diver records were largely from the deeper water. With the grebes, Great-crested Grebes showed a general scatter throughout Studland Bay and were rarely recorded from Shell Bay. Black-necked Grebes showed a markedly clumped distribution, with records from Shell Bay, the Training Bank and the southern corner of Studland Bay.



Map 4: Diver records (all records from the 29 standardised counts) ©Crown Copyright. All rights reserved, English Nature 100017954 (2006).



Map 5: Grebe records (all records from the 29 standardised counts) ©Crown Copyright. All rights reserved, English Nature 100017954 (2006).



Map 6: Other waterfowl records (all records from the 29 standardised counts) ©Crown Copyright. All rights reserved, English Nature 100017954 (2006).

Detailed analysis of data on small grebes

Very few Slavonian Grebes were recorded during the standard counts. With birds recorded on just two dates (2 birds on the 16/12/05 and a bird on the 11/11/2005), detailed analyses was not possible for this species.

Black-necked Grebes

There were three distinct areas where black-necked grebes were regularly recorded: Shell Bay, the Training Bank and the centre of Studland Bay (Map 5). The first sightings of the winter, in late November, were all within Studland Bay (Figure 2). The maximum number of birds recorded on any one visit was 14, but numbers fluctuated on the standard visits, with some counts as low as 4. On the days with the lowest counts there were disturbance events that could account for the low numbers (see the annotations on Figure 2). The count on 21/2/2006 was an exception, as no birds were recorded within Studland Bay on this date. Strong onshore winds and rough water on this date may have either pushed the birds elsewhere or hindered counting.

As Figure 2 shows, counts were the most erratic around the Training Bank, with birds recorded here on twelve of the twenty-nine visits.

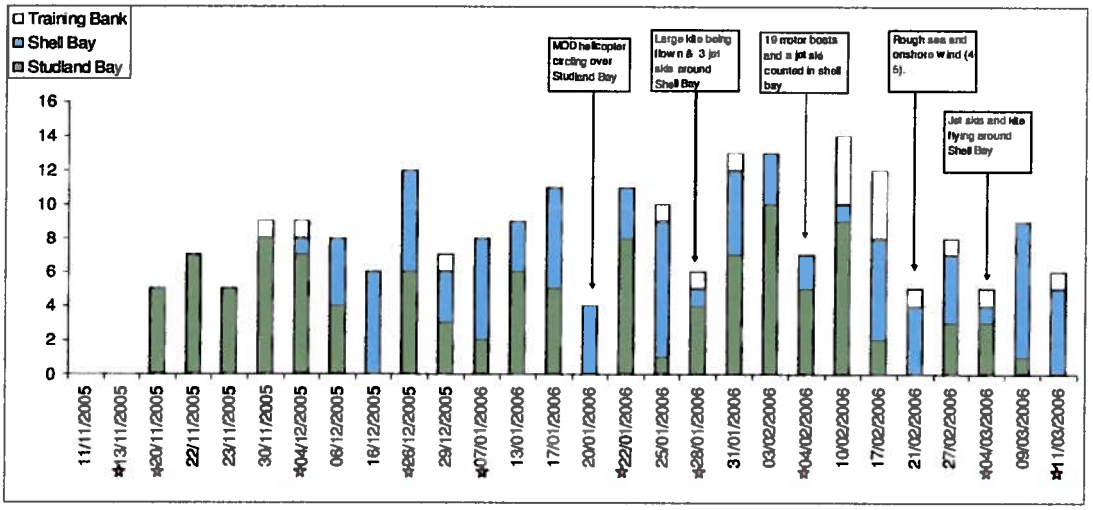


Figure 2: Results of standardised counts of black-necked grebes. Red stars indicate weekends. Annotations give details of activities recorded on the dates with low counts.

The fluctuation in total numbers recorded over the winter suggests some movement in and out of Studland / Shell Bay, and it is difficult to estimate the total number of individuals wintering in the general area. The co-ordinated count on the 15th December counted 22 individuals, the largest count of the winter. These birds were mostly within Shell Bay and Studland Bay, but did include one individual feeding at the base of Old Harry. An interesting count of 21 black-necked grebes was made in Studland Bay on 15th January (TE), at dusk, and the birds were thought to be roosting. These count data would suggest that the wintering population in the area peaked in the low 20s, and that birds moved between different feeding areas over the winter.

No birds were counted within the harbour during the two counts from the boat. Black-necked grebes do regularly occur within Poole Harbour, and were recorded in the harbour during the winter, for example: 2 in Brands Bay 25/2/2006 (PE), 8 counted between Brownsea and harbour mouth, 10/12/2005 (AB), and 4 on 4/12/2005 (from 'bird boat'). The high count on the 10/12/2006 coincided with a low count from Shell Bay (Figure 2) and would suggest that perhaps birds do move between the Harbour and Poole Bay.

Taking the total number of grebes counted on a given visit, there was no correlation with the number of grebes and the number of people on the beach, the number of motor boats recorded or the number of motor boats and jet skis (Table 6). There was no difference in the number of black-necked grebes recorded on weekdays compared to weekends (Mann Whitney W = 111.5, p = 0.464).

Table 6: Pearson correlation coefficients for total disturbance events (boats and people) and the number of Black-necked grebes on a given date. Data from standardised counts, all dates (n=27) from 20/11/2006 (the first date black-necked grebes were recorded). Asterisks give significance (to 0.01, * to 0.05).**

	No. of jet skis & motor boats	No. of people on the beach	No. of Black-necked Grebes
No of boats (all kinds of boats)	0.895 **	0.427 *	-0.065
No. of jet skis and motor boats		0.301	-0.158
No. people on the beach			0.067

If the two principal areas (ie Shell Bay and Studland Bay) used by the grebes are treated separately, the number of people walking on the beach at Shell Bay was a significant predictor of the number of black-necked grebes directly off-shore there, with 25 % of the variance in the number of grebes being explained by the number of people on the beach (Figure 3). No similar relationship was found for Studland Bay, where there is a larger off-shore feeding area available, (Figure 3). There was no relationship with the number of grebes counted within either shell bay (p=0.497) or studland bay (p=0.773) and the number of boats that day within each respective bay on the given day.

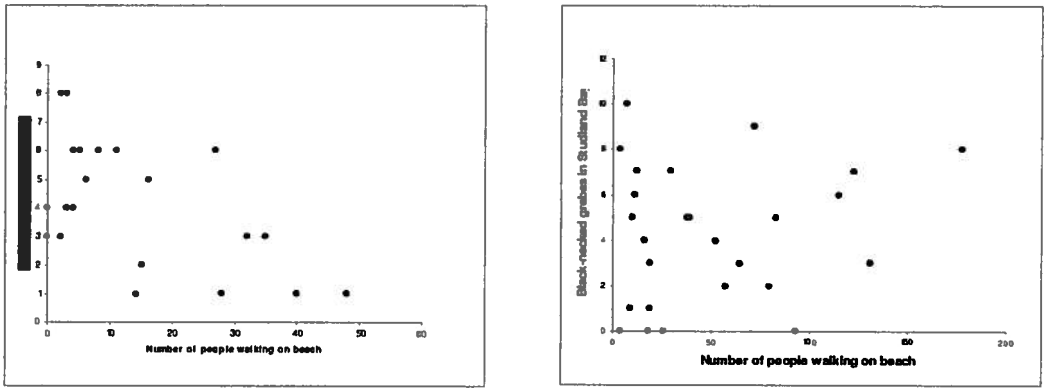


Figure 3: Number of black-necked grebes counted and the number of people on the beach, for Shell Bay (left) and Studland Bay, right. There is a significant negative relationship for Shell Bay: No of grebes = 5.12 - 0.0781*people, $r^2 = 25.6$, p = 0.008. The regression is still significant with the point at the bottom right of the graph removed.

There was a negative correlation between the number of black-necked grebes in Studland Bay and the number within Shell Bay (Pearson's Correlation coefficient = -0.483, p=0.02). This would suggest that birds move between the two sites and that Shell Bay is avoided when there are high numbers of people on the beach.

Black-necked grebes were recorded around the Training Bank on twelve occasions, and only on two of these were more than a single bird present.

The univariate comparison of random pixels with those used by Black-necked Grebes, highlighted the habitat preferences of the grebes, with shallower water, occurring close to the beach / shore preferred (Figure 4). Given the problems of spatial autocorrelation (for example depth and distance from the shore correlate) it is not possible to identify which of these factors explains the distribution of the grebes.

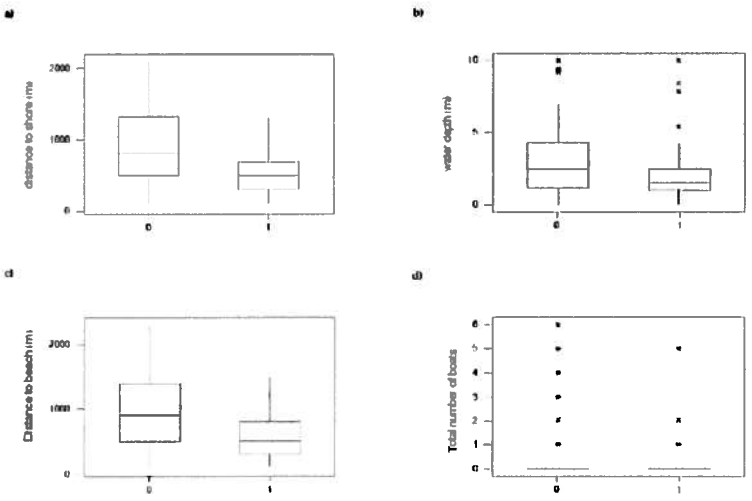


Figure 4: Comparison of pixels where grebes were recorded (102) with a random selection of those where grebes were not recorded (102 pixels). The differences are significant in each case a) distance to the shore, Mann Whitney W = 8211, p<0.0001; b) water depth, Mann Whitney W = 9109.5, p=0.0014; c) distance to the beach Mann Whitney W = 8170, p<0.0001, d) Number of boats, W = 9796.5, p=0.01

Logisitic regression

In the logisitic regression model variables were systematically removed to produce the most parsimonious model which predicted the probability of a given cell holding a black-necked grebe on a given date. After inclusion of the autocorrelation term, distance from the beach was the only habitat variable within the model (Table 7), and in addition the number of people on the beach was also significant. The interaction term between people and distance from the beach was not significant, indicating that, rather than move away from the beach if more people were present on the beach, the grebes moved to different areas.

The model correctly assigned grebe presence / absence to 75% of pixels (Table 8). The AUC value was 0.837 $\pm$ 0.028, indicating a reasonable fit.

Table 7: Logisitic regression results. See methods for details of the approach.

	Coefficient	*SE*	*Wald*	*p*
Distance from the beach	-0.001	0.0001	22.542	>0.001
People	0.005	0.055	24.420	>0.001
Autologistic term	0.270	0.002	4.173	0.041

Table 8: Percentage of pixels correctly assigned by the model in Table 7 as holding a black-necked grebe on a given date.

	predicted		% correct
observed	absent	present	
absent	91	11	89
present	40	62	61
overall percentage			75

Trends in the numbers of small grebes and other species at Studland

Slavonian grebes have clearly declined over recent years, with counts above ten recorded in most years between 1991 and 2000, and very few in recent years, a situation which is confirmed by the count data in this report. Black-necked grebes, in contrast, appear to fluctuate between years but there is no evidence of an overall decline in numbers since 1991(Figure 5).

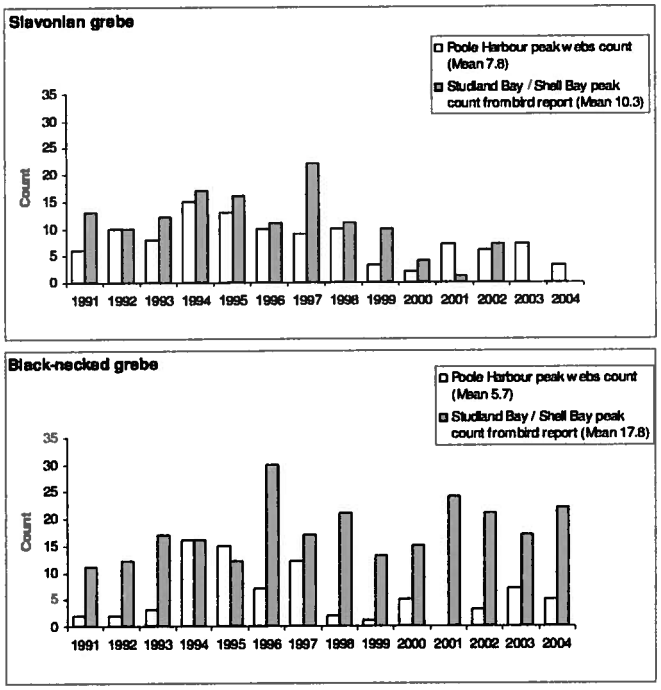


Figure 5: Numbers of Slavonian and black-necked Grebes from the county bird reports for the period 1991 – 2004.

P. Williams conducted counts of waterfowl on a monthly basis during the winter 1993 – 1994. The count area was identical to that used here and direct comparison is possible (Table 9). The median count for four species (Slavonian grebe, cormorant, common scoter (*Melanitta nigra*) and red-breasted merganser) was significantly higher in 1993-4 than 2005-6. There were no species more common in 2005-6.

Table 9: Comparison of count data from 1993-4 (PW) and 2005-6. ** indicates significant differences (p<0.01).

Species	*1993 – 94 (6 visits)*			*2005-2006 (29 visits)*		
	Total	Max	Median	Total	Max	Median
R-t diver	1	1	0	0	0	0
B-t diver	2	1	0	3	2	0
G-N diver	1	1	0	9	2	0
G-c grebe	33	11	5.5	83	15	3
Slav. grebe**	30	8	5.5	3	2	0
B-n grebe	37	11	7.5	222	14	8
Cormorant**	76	18	12.5	26	6	0
Canada Goose	23	23	0	0	0	0
Brent Goose	241	59	45.5	969	229	2
Shelduck	12	12	0	0	0	0
Wigeon	21	21	0	0	0	0
Eider	18	11	1.5	4	1	0
C. Scoter**	40	12	7	116	42	0
R-b Merganser**	134	30	22.5	214	32	4

Discussion

The Studland area clearly holds a notable concentration of wintering waterfowl, especially black-necked grebe. There is clear evidence from the work presented here that birds do move between the Studland area and Poole Harbour, yet, for species such as black-necked grebe the Studland area is the principal wintering location.

Numbers of black-necked grebes have not declined in the Studland area, but a few species, in particular Slavonian Grebe, have shown marked declines over recent years. There were very few records of this species from Studland over the 2005-6 winter.

We present detailed analysis of the distribution of black-necked grebes. Two areas off-shore from Studland are particularly favoured by this species, namely Shell Bay and the southern part of Studland Bay. These areas contain relatively shallow (c. 2m) water. The distribution of the black-necked grebes is markedly clumped around these two areas, with some additional records from around the Training Bank. The analyses suggest that the number of people on the beach at Shell Bay does influence the choice of feeding location, with fewer birds counted at Shell Bay when there are many people on the beach there. The displaced birds move into Studland Bay, where the feeding area is not so close to the beach nor the shipping channel.

Interpretation

While there are some clear patterns within the data, interpretation is difficult due to the correlation between water depth, distance from the shore, boat use (boat traffic is largely in the shipping channel which holds the deeper water) and people counts (the days with more boats were also the days with more people). In addition there was strong spatial correlation in the distribution of the black-necked grebes. They were often recorded in small groups and very rarely was one seen alone. Most sightings involved two birds feeding relatively close. From February onwards birds were occasionally seen displaying, and they were starting to attain summer plumage. There were clearly social interactions between the birds, making it difficult to justify the assumption that sightings were independent. While all counts were carried out in reasonably calm and settled weather, the possibility that small differences in wind and current could have affected grebe distribution cannot be wholly discounted.

Conservation importance

Disturbance effects for waterfowl, especially grebes, on the sea have rarely been documented and are, perhaps, unexpected (but see Bright *et al.*, 2003; Bright, Waas & Innes, 2004; but see Keller, 1989). With the black-necked grebes high numbers of people on the beach causes the grebes to move to alternative areas, but there is no evidence of a change in numbers in recent years, and therefore perhaps little cause for concern. From the data collected it is not possible to determine whether intake

rate is affected, nor whether there is likely to be any population consequences as a result of this behavioural response to disturbance. We are also not able to determine whether disturbance effects are likely to be different in different weather conditions (such as severe winter weather). The fact that black-necked grebe numbers in shell bay were high when people counts were low does suggest that the birds are opportunistic and able to use the area to feed when conditions allow. Other studies have shown that birds can sometimes compensate for lost feeding time (Urfi, Goss-Custard & Lev. Dit Durell, 1996). Although Poole Harbour is one of the few sites within the UK recognised as nationally important for wintering black-necked grebes, the species is on the edge of its range within the UK and very common elsewhere. The numbers in the UK are not therefore of high conservation concern, although the species is amber listed within the UK on the basis of a mean breeding population of less than 300 pairs (Gregory *et al.*, 2002).

The marked clustering of the black-necked grebe sightings around three areas (Shell Bay, the Training Bank and within Studland Bay) are of particular interest. The Studland Bay area and Training Bank sightings coincide very closely with the distribution of eel grass (*Zostera* spp) (K, Collins pers. comm.) whereas the sightings in Shell Bay do not. This might suggest that the feeding is different in Shell Bay. Within Shell Bay itself it is perhaps also to be expected that the strong currents around the harbour mouth may cause prey to be trapped at certain times. If the feeding is different in these different areas, then to fully understand the impact of disturbance a much greater understanding of diet and feeding behaviour is required.

Recommendations

The Studland and Shell Bay areas are clearly important for wintering birds and are closely linked to the Harbour. We have collated casual sightings and some of the historical data, and presented the count data from the 2005-6 winter in a way that it will provide a clear baseline data set for comparison in future years. This comparison may well be useful if marked declines in bird numbers occur, or should habitat change occur, for example a result of the dredging of the shipping channel. While the area is not included within the WEBS counts we strongly recommend that systematic counts are made in some years – perhaps in five or ten year intervals. The area does receive many thousands of visitors, even in the winter, and the off-shore area can be very busy with boat traffic. We recommend that boat traffic and people counts are also conducted in future years to allow comparisons with the data presented here.

There are clearly some particular areas favoured by waterfowl. Were it possible to control or restrict boat traffic, we would recommend promoting a low speed limit for the shipping channel adjacent to Shell Bay and perhaps trying to control or limit boat traffic with an area of Studland Bay. The maps included within this report clearly highlight the area favoured by the black-necked grebes.

The area is popular with visiting birdwatchers and it would be useful to ensure that any counts from the area are archived, and it would be useful if visiting birdwatchers

were able to record whether birds were in Shell Bay or Studland Bay. It is hoped most records would be submitted to the county bird recorder, but it might be possible to help promote recording of birds at the site – either through interpretation, through the Dorset Bird Club website or through a log book to be kept at the National Trust café.

The response of the grebes to different types of boat traffic (vigilance, diving times etc) and disturbance events (people on the beach etc) could warrant further study. Further behavioural work could also determine how birds move between the different feeding areas. A comparison of dive times and feeding behaviour at the different locations may be informative.

Appendix 1

Ad hoc sightings of selected species from birdwatchers. We are grateful to local bird watchers and the county recorder for these data. For initials, see acknowledgements. All records from Studland / Shell Bay unless stated otherwise.

Great Northern Diver

1 Studland Bay 3/12/2005 (SJ)
1 Studland Bay 27/11/2005 (JH)

inside harbour:
2 on 7/12/2005 (JH),
2 on 4/12/2005 (from 'bird boat')
1 seen from South Haven, flying into harbour 5/11/2005 (MC)

Black-throated Diver

3 Studland Bay, 3/12/2005 (MG)
2 Poole Bay, 5/11/2005 (MC)

Slavonian Grebe

7 middle beach on 17/2/2006 (NU),
2 on 7/2/2006 (SC),
2 on 11/2/2006 (SC),
3 on 17/12/2005 (AB).
1 Studland Bay, 3/12/2005 (MG)
3 Studland Bay, 25/11/2005 (IL)
1 Studland Bay 17/11/2006 (JL)
1 Studland Bay, 31/12/2005 (NH)

Red-necked Grebe

1 Studland Bay & Shell Bay (in flight) 5/11/2006 (MC)
3 Studland Bay 30/11/2006 (SS)
2 Studland Bay 24/11/2006 (TE)

Eider

1 on 7/2/2006 Studland Bay (SC)
1 on 8/2/2006 Studland Bay (JH)
1 on 29/1/2006 Studland Bay (SJ)

Scaup

1 Studland Bay 5/1/2006 (JH)

Common Scoter

4 Studland Bay 26/11/2005 (SC)
6 Studland Bay 4/121/2005 (JM)
15 Studland Bay, 3/12/2005 (MG)
34 Studland Bay, 27/11/2005 (SS)
9 Studland Bay, 25/11/2005 (IL)
19 Studland Bay 24/11/2006 (TE)
17 Studland Bay 19/11/2006 (PE)
34 Studland Bay 17/11/2006 (JL)
1 Shell Bay 25/2/2006 (PE)
1 Studland Bay, 31/12/2005 (NH)
1 Studland Bay, 28/12/2005 (JH)

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