Little Terns at Great Yarmouth
Disturbance to birds and implications for strategic planning and development control

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Date: March 2008
Recommended citation: Liley, D. (2008) Little Terns at Great Yarmouth. Disturbance to birds and implications for strategic planning and development control. Unpublished report commissioned by Great Yarmouth Borough Council and the RSPB. Footprint Ecology, Wareham, Dorset.
Report commissioned by Steve Jones, RSPB, Norwich.

Introduction

This work was commissioned in response to concern about development issues in Great Yarmouth, Norfolk, and possible impacts on the Little Tern colony at North Denes, on the northern edge of the town, and at Winterton. Little Terns have declined within the UK and the colony at Great Yarmouth holds c.10% of the UK population. A Habitats Directive Assessment of the East of England Regional Spatial Strategy (RSS)[1] highlights existing disturbance impacts and future impacts arising from built development in the Great Yarmouth. This is the largest little tern colony in the UK and is designated as a Special Protection Area (SPA). This designation ensures a high degree of protection.

The aim of this document is to briefly consider the potential implications of future development and how this may affect the tern colony. We highlight research which may shed further detail where there is a current lack of understanding. We also suggest measures which may serve to mitigate future impacts. This scoping study, and the recommendations within it, have the potential to form the first stage in the development of a Habitats Regulations Assessment of the Great Yarmouth Core Strategy and assocaited local development documents.

Ecology of Little Terns

The Little Tern is the smallest of Europe's terns. It is a summer migrant (present from mid April to October). Their diet of small fish and invertebrates are caught by diving and the birds tend to feed on their own or in small parties in inshore waters. The nest is a shallow scrape in sand or shingle in which usually two to three eggs are laid, between mid May and the end of June. Up to two replacement clutches can be laid if the eggs are lost. Nest failure rates vary markedly between years. Predation is the main cause of nest failure; other factors include flooding, disturbance and predation by dogs (Medeirosa *et al.*, 2007). Most colonies are small and typically transitory, birds moving with food supplies, or as a result of other factors (Brown & Grice, 2005).

In 1998-2002, England supported about 1520 pairs, some 79% of the British total, around 7-9% of the European total and some 1-3% of the global total (Mitchell *et al.*, 2004). Across Europe the species has suffered a long-term decline in numbers and some contraction of the breeding range (Burfield & Van Bommel, 2004; Tucker & Heath, 1994), and is thus regarded as of conservation concern in a European and United Kingdom context.

Great Yarmouth Little Tern Colony

Detailed accounts of the history of the Little Tern colony at Great Yarmouth are provided by Allard (Allard, 1990) and also by (Brown & Grice, 2005), who compare the numbers of nesting terns in each year with other major colonies.

There were no records of Little Terns nesting in the area until the second world-war. In the early years birds nested on off-shore sand banks and on the main beach area, but breeding success was poor and numbers very low and breeding erratic, perhaps due to disturbance?. Around 1985 a substantial colony became established close to a large caravan park. Fifty-five

[1] http://www.gos.gov.uk/goee/docs/193657/193668/Regional_Spacial_Strategy/recreation1

pairs nested in 1986. Rapid action by Yarmouth RSPB members' group, supported by the RSPB regional office and volunteers from Strumpshaw reserve and with support of Yarmouth Borough Council resulted in the colony being roped off. A full-time RSPB warden was quickly appointed and 96 flying young were fledged. The following season the Yarmouth colony was again highly successful despite often abysmal weather. The favoured stretch of shingle beach and marram was again fenced off and seventy pairs nested. Numbers continued to rise and peaked in 1991, when 277 pairs nested. Since 1991 numbers have fluctuated markedly, with 369 nests in 2006 and 276 nests[2] in 2007. In 2007 the average fledging success was a little over half a chick per pair. Some nests were lost to high tides and foxes, related in part to the untypical weather.

There have been problems. Numbers have fluctuated markedly. Predation rates have often been high. Large colonies tend to attract predators, such as mustelids, foxes, hedgehogs, Sparrowhawks, gulls and crows. Kestrels have been a particular problem at Great Yarmouth, and in previous years artificial feeding of the local kestrels has been necessary to distract them away from the tern colony. Human pressures have also taken their toll. The site virtually destroyed by vandals in 2002[3]. Electric fences were ripped up and eggs smashed.

Being located on a popular tourist beach, the location of the tern colony is under intense pressure. In the absence of the current colony protection scheme, it is highly unlikely that the colony would remain viable. Access is carefully controlled by RSPB staff and fencing, and visitors are encouraged to use vantage points from which they can view terns without disturbing them. Current management and protection is currently funded by the RSPB and Natural England. Further, the use of the surrounding dune and beach area is intense and probably increasing, and this is likely to be damaging the area outside of the protected colony. Access to the remainder of the beach is open to the public

The colony is designated as a SPA (Special Protection Area). The designation covers c.149ha that includes both the Great Yarmouth North Denes SSSI and some of Winterton-Horsey Dunes SSSI.

The species does also occur along the coast to the north and south, with colonies at Benacre / Covehithe, Walberswick and Minsmere to the south and at Waxham and Winterton to the north. There were 83 pairs at Winterton (the nearest colony) in 2007. An Appropriate Assessment of future development in Great Yarmouth will need to consider the potential for adverse effects at both North Denes and Winterton.

Overview of disturbance and urban effects

Human disturbance of birds has become a key issue for both conservationists and researchers in recent years. Disturbance can be defined as any human activity that influences a bird's behaviour or survival. There are a wide variety of studies which describe disturbance effects (for reviews see Hill *et al.*, 1997 ; Nisbet, 2000; Woodfield & Langston, 2004). The range of studies is potentially bewildering, demonstrating a range of different impacts, in different circumstances, to different species. There is still contention about the applicability of the methods of study and the impacts on bird populations (Gill, 2007).

[2] http://www.surfbirds.com/sbirdsnews/archives/2007/09/
[3] http://news.bbc.co.uk/1/hi/england/2029292.stm

Most studies of disturbance demonstrate behavioural effects, such as birds changing their feeding behaviour (e.g. Burger, 1991; Fitzpatrick & Bouchez, 1998; Thomas *et al.*, 2003; Verhulst *et al.*, 2001) or taking flight (e.g. Blumstein, 2003; Blumstein *et al.*, 2003 ; e.g. Burger, 1998; Fernandez-Juricic *et al.*, 2001; Fernandez-Juricic *et al.*, 2005; Stalmaster & Kaiser, 1997; Webb & Blumstein, 2005). Other studies have focused on physiological impacts, such as demonstrating changes in the levels of stress hormones (Remage-Healey & Romero, 2000; Tempel & Gutierrez, 2003; Walker *et al.*) or monitoring changes in heart rate (Nimon *et al.*, 1996; Weimerskirch *et al.*, 2002). While behavioural and physiological studies show an impact of disturbance, it is usually difficult to understand whether the disturbance does actually have an impact on the population size of the species in question. For example, the fact that a bird takes flight when a person approaches is to be expected and a short flight in unlikely to have a major impact on the individual in question, let alone the population as a whole.

Certain impacts of disturbance are perhaps more likely to effect population size. Direct mortality resulting from disturbance has been shown in a few circumstances (Liley, 1999; Yasue & Dearden, 2006) and many (but not all) studies have shown a reduction in breeding success where disturbance is greater (e.g. Arroyo & Razin, 2006; Bolduc & Guillemette, 2003; Murison, 2002; Ruhlen et al., 2003). There are also many examples of otherwise suitable habitat being unused as a result of disturbance (Gill, 1996; Kaiser *et al.*, 2006; Liley *et al.*, 2006a; Liley & Sutherland, 2007). Very few studies have actually placed disturbance impacts in a population context, showing the actual impact of disturbance on population size (Liley & Sutherland, 2007; Mallord *et al.*, 2007; Stillman *et al.*, 2007; West *et al.*, 2002).

Evidence for disturbance effects for Little Terns and efficacy of protection

There are few direct studies of Little Terns and the impacts of disturbance. In North America the Least Tern –a near identical species – has been shown to avoid nesting in areas with high disturbance but otherwise suitable habitat (Gochfeld, 1983). In Portugal Little Terns have shifted away from nesting on sandy beaches and instead they are using man-made Salinas. This shift is thought the be linked to human disturbance and habitat loss (Catry *et al.*, 2004).

In Portugal low breeding success of Little Terns has shown to be associated with human activities (Calado, 1996). Detailed nest monitoring has evaluated the influence of human disturbance on breeding success of little terns and the interaction with the seasonal variation in the birds' breeding biology (Medeirosa *et al.*, 2007). The percentage of nests producing hatched chicks varied between 26.7% and 66.4% in different years and habitats. The main causes of hatching failure varied between years and habitats, but predation, flooding and human activities were very common. The presence/absence of protective measures (warning signs and wardening) was the most important predictor of nesting success, with birds being up to 34 times more likely to succeed with protective measures. Nests were also more likely to succeed earlier in the season.

While there are few studies, there is direct evidence of disturbance impacts. The work in Portugal clearly shows benefit of protecting colonies. Many colonies in the UK are protected and measures employed at colonies include reducing disturbance by people and dogs through wardening, public education and fencing, moving nests to safer locations, raising individual nests

or even whole nesting areas above the level of high spring tides. These measures can result in large, dense colonies in fixed locations, which in turn acts as a focus for predators.

Fewer large colonies may also likely to be more vulnerable to single events, such as storm surges or vandalism. We therefore have no understanding of how disturbance may impact Liitle Terns at a population level. There are a complex range of factors, including predation, site management and coastal dynamics that will interact with disturbance. If disturbance leads to birds clustering into large colonies that are fixed then there are long term risks in terms of predation, vandalism etc.

Consequences for land-use planning and development control

The SPA is clearly already vulnerable and this may increase as a consequence of planned growth. There is a requirement, under Article 6(2) of the Habitats Directive, to take appropriate steps to avoid deterioration and disturbance to European Protected sites and the species they support. Existing protection and management goes some way to achieving these 'appropriate steps'.

Tourism-related policies may well add to the intensity of disturbance. Current housing allocations of c.6000 new dwellings for the Borough are likely to be focused on Great Yarmouth itself, with 80% of proposed priority dwellings likely to occur in Great Yarmouth or Gorleston.

The cumulative effects of new housing development are difficult to quantify. New housing will change the spatial distribution of where people are living and is likely to result in an increase in people living in the area. Possible impacts are suggested in Table 1. These effects are speculative and there is little evidence to suggest which may actually occur. The scale of any impact will be determined by the scale of new development, where the new housing occurs and possibly also the type and style of new housing or other forms of development.

Table 1:Possible impacts of new development on the tern colony.

Consequence of development	Effect on tern colony	Impact
Increased number of people visiting the area (around the tern colony) for recreation	Increase in disturbance to the tern colony, from people and dogs	Reduced breeding success Reduction in numbers breeding
	Increased use of beach sites around colony, further containing colony in fenced area	Colony increasingly becoming fixed in space.
Increase in activity in the water, from small craft etc,	Increase in disturbance to foraging birds	Foraging impaired.
Increase in people living in the area	Increased risk of vandalism	Destruction of infrastructure (fencing etc) and impact on breeding success
Changes in light levels	Influence on predator behaviour and use of area at night by birds	?
Increase in noise levels	Disturbance / stress to birds in colony	? reduction in breeding success or reduction in numbers using colony

The Conservation (Natural Habitats &c.) Regulations 1994, normally referred to as the 'Habitats Regulations,' transpose the requirements of the European Habitats Directive 1992[4] into UK law.

[4] Council Directive on the conservation of natural habitats and of wild fauna and flora of 21st May 1992 (92/43/EEC)

The EC Habitats Directive and UK Habitats Regulations afford protection to plants, animals and habitats that are rare or vulnerable in a European context.

Earlier European legislation, known as the Birds Directive 1979[5], protects rare and vulnerable birds and their habitats and includes the requirement for all Member States to classify 'Special Protection Areas' (**SPA**) for birds. This involves each State identifying the most suitable areas of land, water and sea for the protection of rare and vulnerable species listed in the Directive, and areas which are important for migratory species, such as large assemblages of waterfowl.

The Habitats Directive increased the protection afforded to plants, habitats and animals other than birds, through stricter protection of species and by the creation of 'Special Areas of Conservation' (**SAC**). Firstly, Article 6(2) requires the member state (represented, in this case, by Great Yarmouth Borough Council) to 'take appropriate steps to avoid deterioration or disturbance' to/of SPAs. In addition, Article 6(3) and (4) of the Habitats Directive, and Regulations 48 and 85A - 85E of the Habitats Regulations, impose duties on all public bodies to follow strict regulatory procedures in order to protect the European sites from the effects of plans or projects.

Until recently, the assessment of the potential effects of a spatial or land use plan upon European sites was not considered a requirement of the Habitats Directive. A judgment of the European Court of Justice[6] required the UK to extend the requirements of Article 6(3) and (4) of the Directive to include the assessment of the potential effects of spatial and land use plans on European sites. The Habitats Regulations have been amended accordingly[7].

The site(s) affected could be in or outside the relevant plan area. Depending on the outcome of the Habitats Regulations Assessment, the LPA may need to amend the plan to eliminate or reduce potentially damaging effects on the European site. If adverse effects on the integrity of sites cannot be ruled out, the plan can only be adopted in accordance with Regulations 85C to 85E, where there are no alternative solutions that would have a lesser effect and there are imperative reasons of overriding public interest sufficient to justify adopting the plan despite its effects on the European site(s).

The Government is likely to expect that a plan will only need to proceed by way of these later tests in the most exceptional circumstances because a LPA should, where necessary, adapt the plan as a result of the Habitats Regulations Assessment, to ensure that it will not adversely affect the integrity of any European site. The considerations of Regulations 85C to 85E are not applicable in this case.

An Appropriate Assessment of the Core Strategy and associated local development documents will need to consider other factors which may relate to, or have impacts to the tern colony. Climate change is likely to be important. The dunes around the colony are currently accreting, but this may not always be the case. Rising sea levels will change the Norfolk coastline. This

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[5] Council Directive on the conservation of wild birds of 2nd April 1979 (70/409/EEC)
[6] ECJ case C-6/04, *Commission of the European Communities v United Kingdom of Great Britain and Northern Ireland*, 20th October 2005.
[7] The addition of Part IVA (Regulations 85A-85E) to the Habitats Regulations in 2007, under the title "*Appropriate Assessments for Land Use Plans in England and Wales*".

may lead to potential breeding locations for Little Terns or conversely may reduce alternative sites, potentially meaning the Great Yarmouth colony may continue to grow in size.

Climate change may well affect access patterns too. Weather influences the number of people likely to visit the coast and what they do. Warmer weather in the early seasons may well increase the numbers of people in the beach area in May and they may spend longer when they visit.

Further work

Great Yarmouth Borough Coucnil intends to undertake an Appropriate Assessment of their Core Strategy and associated documents. In order to be able to complete this AA, a number of pieces of work will be required.

We suggest the following as pieces of additional work necessary to increase our understanding and determine the scale of any impacts:

1) Determining scale of change, and location,of housing

Current housing levels around the tern colony, at different distance bands from the colony, should be calculated. This can be done relatively simply in GIS using postcode data. The method used should be similar to that used in similar AA excercises such as for various Dorset Heathland Districts and the New Forest National Park (e.g. Liley *et al.*, 2006b; Sharp *et al.*, 2008). Likely levels of new housing should be plotted to show the level of change – i.e. the likely percentage increase in housing in the area around the colony. This will give context to the scale of change that might result from new development, and can help one pinpoint how financial contributions can be secured to support mitigation within the SPA.

2) Visitor survey work

It will be necessary to establish both the current levels of use of the area (and so to quantify impacts) and to project future use of the area given growth projections (and so quantify how pressures are likely to evolve through time). Visitor surveys should be aimed at identifying how many people currently visit the general area (both the colony and surrounding areas) and where they come from. Questionnaires are likely to be the best way of gaining the necessary data. The survey would separate tourists from local people. Home postcodes are a useful way of determining where people have come from in the local area (for example see Clarke *et al.*, 2006 for approach; Liley *et al.*, 2006c). The questionnaires should ask about means of transport used to reach the area, for those that parked where they parked. It should determine why they visit and where they go. It might also be useful to ask about the other sites that people go to. The survey should also calculate visitor rates – i.e. numbers of people visiting. In order to achieve this it will be necessary to sample visitor numbers at different times of day (for example early morning to catch dog walkers) and different days (weekends and weekdays for example), and to count visitor numbers. The analysis from the survey work should look at the distance people travel and the proportion of people visiting from different distance bands. It is important to be able to quantify and characterise existing and future visitor numbers, rather than to simply assume current and future levels, because developers will wish to be assured that the mitigation they are being asked to support is underpinned by robust evidence; further, the local planning authority will need to be assured that the impacts are properly identified and that mitigation will actually be effective.

3) Distribution and availability of open space

The visitor survey will provide an indication of the types of people visiting the area around the tern colony and why they visit. It will be necessary to determine what alternative sites are available for people to visit that are away from the tern colony. These sites should be mapped and looked at critically to determine how they could be improved to attract people

that otherwise might be visiting the tern colony. This could form part of the mitigation strategy by diverting some proportion of additional people into less sensitive areas; it may also reveal a deficit in available alternative open spaces and where additional green space might be located to have a diversionary effect.

4) Options for extending the colony

Ideally the terns would have a range of different locations that offer safe breeding and, if scattered over a large area, the terns are likely to be less vulnerable to vandalism etc and also less likely to attract predators. Long term opportunities for areas of beach with low disturbance levels should be explored.

5) Disturbance effects to Little Terns

The effect of disturbance to Little Terns has been identified as a research priority in a national review of research relating to access and birds (Liley & Slater, 2007 unpublished). Such a piece of work would ideally cover a range of sites, but should include the Great Yarmouth colony, given its size and importance. The research would be complex and would need to cover a number of different seasons. It would look at breeding success and explore the interaction between timing of breeding, predation and disturbance for different types / sizes of colony under different management regimes. This work should ideally start in 2008 in order for it to yield evidence to underpin submission documents.

Possible mitigation

The work above will provide the evidence base needed to underpin any Habitat Regulations Assessment of future development. Such assessments will need to consider, systematically, a range of potential mitigation measures. The following measures are suggested as potential means of ensuring no adverse effects will occur as a result of new development

- Management of the tern colony established in such a way as to ensure protection, wardening, fencing etc in the long term. The RSPB already has a mitigation package in place but this will need to be critically evaluated to determine that it is necessary and sufficient.
- A mechanism to ensure funding and resources will need to be identified and secured. Possible options will include contributions from developers, perhaps established in a similar fashion to other parts of the UK such as the Dorset Heaths.
- Measures to stop vandalism at night, such as CCTV or night time wardening put in place and mechanisms for securing long term provision established.
- Extension of the fenced area and ideally the creation of zones of low disturbance within the wider area. The aim would be to extend the area of habitat and the increase the number of locations where the terns breed. This would be informed by the work listed above (4). Access management measures in the wider area (such as reducing parking, limiting dogs on the beach, charging for parking etc) may help to reduce visitor numbers in key locations.
- Improvement and provision of alternative sites. If the visitor surveys (further work option 2 above) highlight particular user groups, such as dog walkers, then the provision and enhancement of alternative sites should be explored. The likely success of such measures and effectiveness will be informed by the visitor work (further work 2) and open space assessment (further work 3).

- Monitoring of Little Terns and effectiveness of management. The colony should be monitored annually to check that any mitigation package is working effectively. Such monitoring should be comparable between years and potentially include the number of pairs of terns, their breeding success, predators and people (visitor numbers).

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