Identification of important marine areas for little terns around breeding colony SPAs

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1. Background and overview

The EC Birds Directive requires Member States to classify Special Protection Areas (SPA) for birds which are either listed as rare or vulnerable on Annex I to the Directive or are regularly occurring migratory species. Within the UK, the little tern (*Sternula albifrons*) qualifies for protection under both categories.

Little terns nest on sand or shingle beaches, islets and spits, often very close to the high water mark and are among the rarest seabird species breeding in the UK. There are currently 28 breeding colony SPAs designated within which little terns are protected. The marine areas they use while foraging to provide for their young have not yet been identified and classified as SPAs to complement the existing terrestrial suite. Since 2009, the JNCC has been working with the four Statutory Nature Conservation Bodies (SNCBs) towards the identification of such areas.

Shore-based and boat-based survey work was undertaken which allowed characterisation of the distances that little terns fly from their colony in order to find food. Boundaries of important foraging areas can be drawn based on the distances which little terns fly along the coast, and distances which they fly out to sea.

This document summarises such surveys and analyses work undertaken between 2009 and 2013, which focussed on those colony SPAs which have been regularly occupied by significant numbers of little tern pairs over the last 5-10 years (13 colony SPAs). Detailed description of this project can be found in JNCC report 548. Parallel work to quantify important marine areas for the larger tern species (Arctic, common, Sandwich and roseate tern) is reported separately in JNCC report 500.

2. Data collection

The study aimed to provide three years of colony specific data for all regularly occupied[1] breeding SPAs of little terns. However logistics, colony failure, and other factors meant the data coverage for each colony varied. Surveys were timed to coincide with chick rearing, which is the period of greatest energetic demand to adult birds during the breeding season and therefore critical to the maintenance of the population.

Two types of survey (boat- and shore-based observations) were applied in order to estimate both seaward and alongshore (coastal) extent of little tern foraging areas (both shown in Figure 1).

[1] 'Regularly occupied' was defined where the mean peak breeding numbers of the most recent five years equalled or exceeded the 1% of the national population.

2.1 Seaward extent of little tern distribution (boat-based survey)

Boat-based surveys were carried out to assess the distance little terns would fly from the colony out to sea to catch their food (i.e. to confirm their maximum seaward foraging extent). Surveys involved the boats travelling along a series of parallel lines through a survey area around each colony. These surveys extended to 6km from the coast to approximate the mean maximum extent as revealed from the literature (e.g. Thaxter *et al.* 2012) and from preliminary JNCC observations. All birds seen within a 180° arc (out to a maximum estimated distance of 300m from the boat) were recorded.

2.2 Alongshore extent of little tern distribution (shore-based surveys)

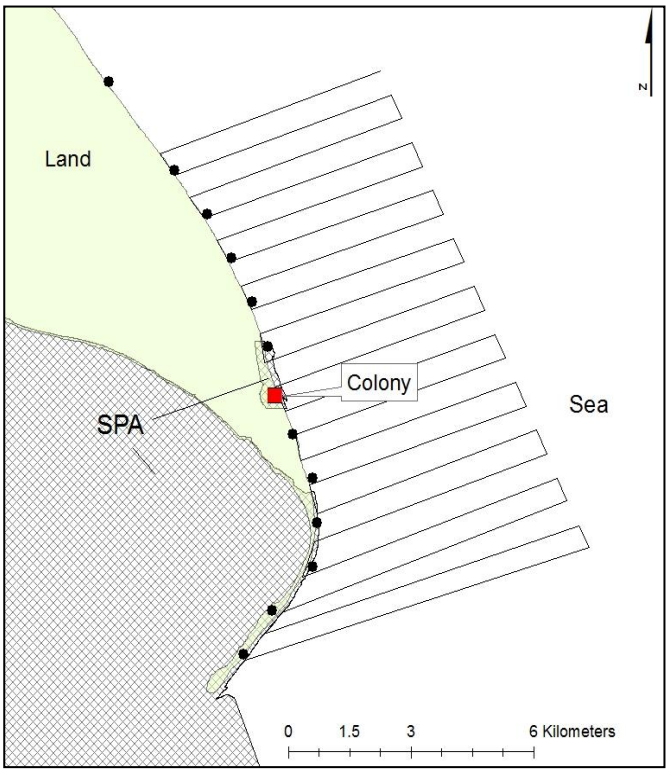

Figure 1: Survey design. The lines show the boat-based transects, following lines perpendicular to the coast. The black dots show shore-based count survey points regularly spaced along the coast to either side of the colony.

Shore-based observations aimed to assess to what extent little terns would forage away from their colony along the coast. Observation points were chosen at 1km intervals to either side of the colony, up to a distance of 6km along the coast, according to the mean maximum distance indicated by the literature. If preliminary observations found birds going further than 6km, more observation points were added at successive 1km intervals. Birds were counted within a distance of 300m to either side of the observation point (resulting in a 180° arc). Ideally, counts at different observation points were done concurrently, lasting at least 30 minutes at each observation point. Care was taken to cover a range of tidal states, as variation in water levels between the high and low water mark are likely to play a significant role in determining the foraging locations of little terns.

3. Data analysis

Given the type and amount of data that could be collected for little terns, boundary delineation methods applied for seabird and waterfowl species were not applicable to little tern data. Instead, JNCC developed a method for boundary delineation which would work with this type of data.

Analysis found that colony size and density had only a weak effect on the extent of little tern foraging ranges. Therefore data was combined across all study sites. Analyses of shore-based counts considered the cumulative proportion of the observations of little terns, against distance from colony alongshore. Analyses of boat-based surveys considered the cumulative proportion of the observations of little terns, against distance from colony out to sea.

A plot of the cumulative proportion of observations and distance along the shore (Figure 2 for an example) shows the proportion of observations which are seen within successive distances from the colony.

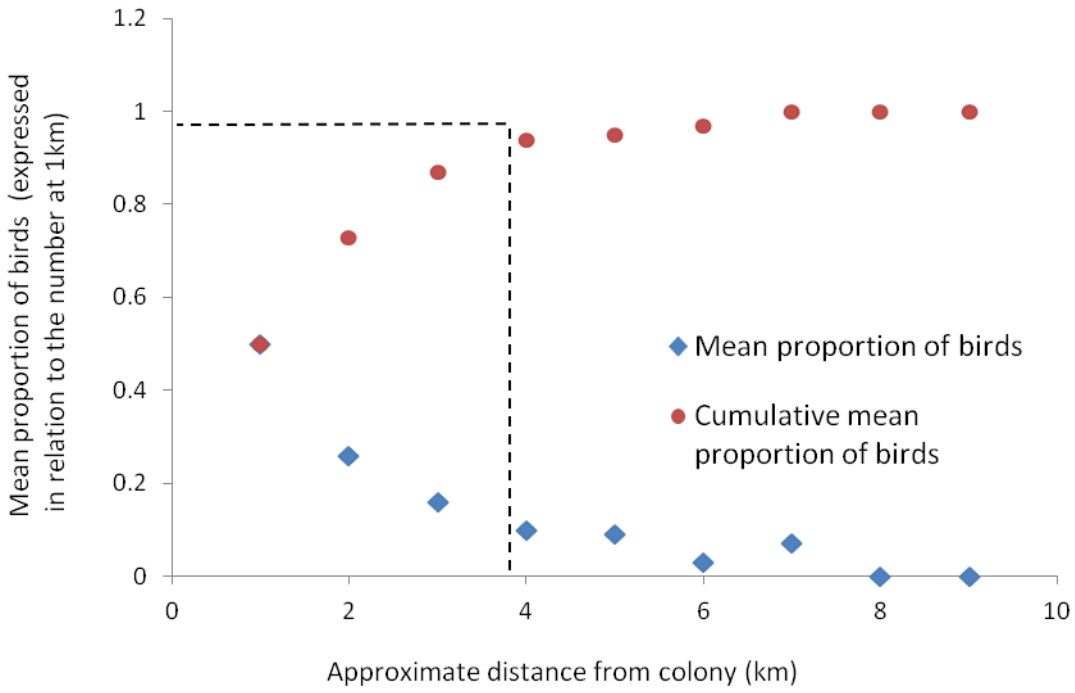

Figure 2: Proportion of the total little terns seen that are within each additional 0.5km distance from colony. The red dots show the cumulative proportion, and show that by around 3.9km, there are very few further observations of little terns, i.e. almost 100% of observations are within this distance from the colony, in this example.

If we take the maximum distance along the shore from the colony that a little tern was seen, for each SPA colony that was surveyed, we can combine these numbers and take a mean, which is the 'mean max'. This value represents what the maximum distance a little tern

would travel along the coast from the colony might be at an 'average' colony. We can do the same analysis for observations of distance out to sea from the coast based on the boat-based surveys.

These mean max foraging extents (along shore and out to sea) could be used to dictate how far a boundary for important foraging areas could go for a colony SPA which has little (or no) data collected around it.

Where there is a lot of data for a colony SPA, then the maximum along-shore and the maximum out to sea distances observed could be used to dictate a boundary at that site.

The following rule set has been proposed for estimating the spatial extent of foraging areas for breeding little terns:

3.1 Site-specific options

For colonies with sufficient data to describe either or both seaward and alongshore extents, it is proposed to use the following site-specific metrics:

A) Seaward extent

The **site-specific seaward** extent of foraging areas should be determined by the **mean of the maximum extents** of little tern observations from repeated surveys at that site.

Using the mean of repeated surveys aims to represent the maximum foraging distance used by an average little tern and is therefore moderately conservative, however, it avoids the risk of outliers having a large influence on the extent, as would be the case if the 'maximum extent' observed at a site was used.

B) Alongshore extent

The **site-specific alongshore** extent of foraging areas should be determined by the **maximum extent** of alongshore distribution at a site.

Because there were relatively few survey data available at each site, and there was a tendency for count points furthest away from the colony having received slightly less counting effort, a more precautionary approach appeared reasonable in this case. There appeared to be very few outliers and these were not influencing the extents chosen using this method.

3.2 Generic options

For colonies with insufficient or missing data, generic options were applied to describe either or both seaward and alongshore extents, for which it is proposed to use the mean of the site-specific options, in other words the mean along-shore as measured for all sites as above, and the mean seaward as measured for all sites as above.

A) Seaward extent

The **generic seaward** extent of foraging areas should be determined by the **mean** of the **mean maximum extent** obtained from site-specific data.

B) Alongshore extent

The **generic alongshore** extent of foraging areas should be determined by the **mean** of the **maximum alongshore extent** obtained from site-specific data.

4. Boundary drawing

At each colony SPA, an assessment was made on the quality and quantity of data for seaward extent, and for alongshore extent. If the quality or quantity was felt to be insufficient, then the generic option was applied at that colony. If the data at that site was felt to be sufficient, then the site-specific options, as described above, were applied at that colony.

Boundaries for little tern foraging areas were simply drawn as straight lines perpendicular to the coast at the alongshore extent on each side of the colony, reaching as far as the seaward extent out to sea. These lines are then joined up using a line parallel to the coast which is at the seaward extent distance from the coast.