Cyfoeth Naturiol Cymru
Natural Resources Wales

Proposal to extend and reclassify Ynys Feurig, Cemlyn Bay and The Skerries Special Protection Area and rename it as

ANGLESEY TERNS / MORWENOLIAID YNYS MÔN SPECIAL PROTECTION AREA

Advice to the Welsh Government

NATURAL RESOURCES WALES

October 2016

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Mae'r ddogfen hon yn cynnwys argymhellion Cyfoeth Naturiol Cymru i Lywodraeth Cymru ynglŷn â chynigion i ymestyn Ardal Gwarchodaeth Arbennig Ynys Feurig, Cemlyn Bay and The Skerries, a'i hailenwi yn Ardal Gwarchodaeth Arbennig Anglesey Terns / Morwenoliaid Ynys Môn.

Yr oedd fersiwn blaenorol o'r ddogfen hon (dyddiedig Mehefin 2015) yn destun ymgynghoriad cyhoeddus a gynhaliwyd gan Cyfoeth Naturiol Cymru rhwng 19 Ionawr - 3 Mai 2016. Mae yr ymatebion i'r ymgynghoriad hwnnw wedi cael eu cymryd i ystyriaeth wrth baratoi'r argymhellion.

Mae'r argymhellion hyn wedi'u bwriadu i helpu i gyflawni rhwymedigaethau'r Deyrnas Unedig o dan Erthygl 4 o Gyfarwyddeb Adar yr UE (2009/147/EC), sy'n ei gwneud yn ofynnol i Aelod Wladwriaethau ddosbarthu fel Ardaloedd Gwarchodaeth Arbennig (AGA) y tiriogaethau mwyaf addas ar dir a môr i rywogaethau adar a restrir yn Atodiad I at y Gyfarwyddeb ac i rywogaethau mudol a welir yn rheolaidd. Mae'r canllawiau ar ddethol safleoedd yn AGA yn y Deyrnas Unedig wedi'u nodi yng nghanllawiau dethol AGA y Deyrnas Unedig (y Cydbwyllgor Cadwraeth Natur 1999).

Fel sy'n ofynnol yn ôl Erthygl 4 o'r Gyfarwyddeb Adar, diben AGA yw ei gwneud yn bosibl rhoi mesurau cadwraeth arbennig ar waith yn ymwneud â chynefinoedd rhywogaethau Atodiad I a/neu rywogaethau mudol a welir yn rheolaidd (ar wahân i'r rhai sydd wedi'u rhestru yn Atodiad I) i sicrhau eu bod yn goroesi ac atgenhedlu yn eu hardal ddosbarthiad.

Diddordeb cymhwyso

Mae AGAa Anglesey Terns / Morwenoliaid Ynys Môn yn cymhwyso o dan Erthygl 4.1 o'r Gyfarwyddeb Adar drwy gynnal yn rheolaidd fwy nag 1% o boblogaeth Prydain o bedair rhywogaeth o adar môr – gweler Tabl 1. Felly, mae'r safle hwn yn gymwys i'w ddynodi'n AGA yn unol â cham 1.1 o'r canllawiau dethol AGA.

Ffiniau'r safle

Cynigir ehangu ffiniau'r AGA fel y bydd yn cwmpasu tri safle bridio sydd o fewn yr AGA bresennol yn barod ynghyd ag ardal forol a ddefnyddir gan y morwenoliaid i chwilota am fwyd. Mae'r ffiniau estynedig wedi'u seilio ar waith yn modelu defnydd morwenoliaid o ardaloedd môr o amgylch yr holl AGA nythfeydd bridio morwenoliaid ar draws y Deyrnas Unedig. Defnyddiai'r modelau gyfuniad o ddata arsylwi ar ymddygiad chwilota am fwyd morwenoliaid a data ar newidynnau amgylcheddol i ragfynegi ble mae morwenoliaid yn chwilota am fwyd, gan gynnwys ardaloedd lle nad oes dim neu fawr ddim data arsylwi ar forwenoliaid. Defnyddiwyd techneg a elwir yn grymedd mwyaf i ddiffinio ardaloedd defnydd mawr (gan forwenoliaid) wedi'i fodelu i'w cynnwys o fewn ffiniau AGA arfaethedig. Mae'r ffiniau a argymhellir i'w gweld yn Ffigur 8.

Mae Tabl 1 yn dangos rhywogaethau a niferoedd yr adar môr y mae'r AGA bresennol wedi'i dynodi o'u herwydd ac mae'n cyfateb i'r wybodaeth a gyhoeddwyd yn Adolygiad AGA 2001 (Stroud *et al*. 2001). Mae data cyfrif adar mwy diweddar ar gael ond nid yw wedi'i ddefnyddio yma i asesu'r safle yn erbyn canllawiau dethol AGA y Deyrnas Unedig. Y rheswm am hynny yw bod yr ardal forol arfaethedig yn cael ei chyflwyno fel estyniad at AGA bresennol nad yw ei sail i gymhwyso fel AGA wedi newid ers i'r AGA gael ei hailddosbarthu yn ystod 2008, a hynny'n cynnwys gweithredu canfyddiadau arolwg AGA 2001. Byddai'r rhywogaethau dan sylw yn cymhwyso pe caent eu hasesu yn erbyn data mwy diweddar.

Tabl 1. Crynodeb o'r diddordeb adaregol cymhwyso yn AGA ddrafft Anglesey Terns / Morwenoliaid Ynys Môn.

Rhywogaeth	**Cyfrif**[1]	**% o'r boblogaeth berthnasol**	**Math o ddiddordeb**
Môr-wennol gyffredin *Sterna hirundo* (yn bridio)	189 pâr	1.5% o boblogaeth Prydain Fawr	Rhywogaeth Atodiad I
Môr-wennol y Gogledd *Sterna paradisea* (yn bridio)	1,290 pâr	2.9% o boblogaeth Prydain Fawr	Rhywogaeth Atodiad I
Môr-wennol wridog *Sterna dougalli (*yn bridio)	3 phâr	5% o boblogaeth Prydain Fawr	Rhywogaeth Atodiad I
Môr-wennol bigddu *Sterna sandvicensis* (yn bridio)	460 pâr	3.3% o boblogaeth Prydain Fawr	Rhywogaeth Atodiad I

[1] O adolygiad AGA 2001 (Stroud *et al.* 2001)

Summary

This document contains Natural Resources Wales' recommendations to the Welsh Government regarding proposals to extend the Ynys Feurig, Cemlyn Bay and The Skerries SPA, and rename it as the Anglesey Terns / Morwenoliaid Ynys Môn SPA.

The previous version of this document (dated June 2015) was the subject of a public consultation carried out by NRW from 22 January to 3 May 2016. The responses to that consultation have been taken into account in preparing these recommendations.

These recommendations are intended to support the delivery of the UK's obligations under Article 4 of the EU Birds Directive (2009/147/EC), which requires Member States to classify as SPAs the most suitable territories on land and at sea for bird species listed in Annex I of the Directive and for regularly occurring migratory species. The guidelines for the selection of sites as SPAs in the UK are set out in the UK SPA selection guidelines (JNCC 1999). As required by Article 4 of the Birds Directive, the purpose of SPAs is to enable the application of special conservation measures concerning the habitats of Annex I species and/or regularly occurring migratory species (other than those listed in Annex I) in order to ensure their survival and reproduction in their area of distribution.

Qualifying interest

Anglesey Terns / Morwenoliaid Ynys Môn pSPA qualifies under Article 4.1 of the Birds Directive by regularly supporting more than 1% of the GB population of four species of seabirds - see Table 1. Therefore, this site qualifies for SPA designation in accordance with stage 1.1 of the SPA selection guidelines.

Site boundary

An extended SPA boundary is proposed, encompassing the three breeding sites already within the existing SPA, together with a marine foraging area used by the terns. The extended boundary is based on modelling of tern usage of sea areas around all tern breeding colony SPAs around the UK. The models used a combination of data on observed tern foraging behaviour and data on environmental variables to predict where terns forage, including in areas with little or no tern observation data. A technique called maximum curvature was used to define areas of high modelled tern usage for inclusion within a proposed SPA boundary. The recommended boundary is shown in Figure 8.

Table 1 shows the species and numbers of seabirds the existing SPA is designated for and corresponds to the information published in the 2001 SPA Review (Stroud *et al*. 2001). More recent bird count data are available but have not been used here to assess the site against the UK SPA selection guidelines. This is because the proposed marine area is being taken forward as an extension to an existing SPA whose basis for qualification as an SPA has not changed since the SPA was reclassified in 2008 to give effect to the findings of the 2001 SPA review. The species concerned would qualify if assessed against more recent data.

Table 1. Summary of qualifying ornithological interest in Anglesey Terns / Morwenoliaid Ynys Môn pSPA.

Species	Count[1]	% of relevant population	Interest type
Common tern *Sterna hirundo* (breeding)	189 pairs	1.5% of GB population	Annex I species
Arctic tern *Sterna paradisea* (breeding)	1,290 pairs	2.9% of GB population	Annex I species
Roseate tern *Sterna dougalli (*breeding)	3 pairs	5% of GB population	Annex I species
Sandwich tern *Sterna sandvicensis* (breeding)	460 pairs	3.3% of GB population	Annex I species

[1] From 2001 SPA review (Stroud *et al.* 2001)

1. Introduction and background

This document contains NRW's advice to the Welsh Government regarding proposals to amend the basis on which Ynys Feurig, Cemlyn Bay and The Skerries SPA is classified under the EC Birds Directive. The proposals are:

(i) To extend the boundary of the SPA to include adjacent sea areas that are used by birds from within the existing SPA for foraging during the breeding period;

(ii) To rename the site from 'Ynys Feurig, Cemlyn Bay and The Skerries to 'Anglesey Terns / Morwenoliaid Ynys Môn'.

1.1 The legal framework

The EU Birds Directive (2009/147/EEC[2]) provides a legislative framework for the protection, management and control of naturally occurring wild birds of EU Member States.

Article 4 of the Birds Directive requires Member States to classify the 'most suitable territories in number and size' as special protection areas for the conservation of species listed in Annex I to the Directive, and to take similar measures for 'regularly occurring migratory species'. The classification of SPAs is to take into account the species' protection requirements in the geographical sea and land area where the Directive applies. According to case law of the Court of Justice of the EU (CJEU), the selection of areas as SPAs and the determination of their boundaries should not take account of social or economic considerations, but reflect only ornithological information.

SPAs in Wales are classified by the Welsh Ministers under section 2 of the European Communities Act 1972.[3] Decisions to classify SPAs in England and Wales must be preceded by consultation, in accordance with Regulation 12B of the Conservation of Habitats and Species Regulations 2010, as substituted.

Once classified, SPAs become 'European sites' or 'European marine sites' under the Conservation of Habitats and Species Regulations 2010, and are subject to the provisions of those Regulations and Articles 6(2) to 6(4) of the Habitats and Species Directive.[4] According to Welsh and UK Government policy, **potential SPAs** (that is proposed SPAs that are the subject of consultation prior to a decision on whether to formally classify them) should have the same degree of protection as classified SPAs.

Ynys Feurig, Cemlyn Bay and The Skerries SPA was first classified in 1992 by the then UK Secretary of State for the Environment.

1.2 The 2001 SPA review

All SPAs in the UK are classified on the basis that they support populations of one or more named species of birds, or an assemblage of birds, that are considered of European importance.

The 2001 SPA review was carried out by the Joint Nature Conservation Committee (JNCC), English Nature (now Natural England), Scottish Natural Heritage and Countryside Council for

[2] Formerly 79/409/EEC
[3] This is a general provision empowering Ministers to give effect to obligations arising from EU legislation.
[4] 92/43/EEC

Wales (now Natural Resources Wales) and published in 2001 (Stroud *et al*. 2001). Its overall aim was to establish a consistent basis for the identification of the UK's suite of terrestrial SPAs, based on data mainly from the mid 1990's. One of the main outputs of the review was a series of 'site accounts' for 243 individual SPAs in the UK, setting out the basis on which each site is considered to qualify as an SPA under the Birds Directive. These site accounts were derived using the best available ornithological data available at the time, generally covering the period 1991/1992 to 1995/1996, unless there were compelling reasons to use earlier or later data. These were the most current data available at the start of the review. The recommendations in the review are based on application of the 1999 SPA selection guidelines, which are published by JNCC on behalf of the UK statutory conservation agencies and relevant government departments (JNCC 1999).

Most of the sites included in the 2001 review were already classified as SPAs. In many cases the site accounts in the 2001 review identify different species as qualifying interests to those listed on extant SPA citations, or identify the same qualifying species but on the basis of different population numbers. In these cases, the intended function of the 2001 SPA review is to provide the basis for reclassification of the sites.

Ynys Feurig, Cemlyn Bay and The Skerries SPA, originally classified in 1992, was included in the 2001 SPA review. The citation was subsequently updated in 2008 to reflect the 'site account' in the 2001 review. This entailed changing the bird population estimates on the basis of which the site is considered to qualify as an SPA. It did not entail any changes to the list of qualifying species or to the boundary of the SPA.

1.3 Proposed foraging extensions to Tern SPAs.

Although the UK's series of SPAs currently includes appropriate areas of terrestrial habitat for seabird interests, the requirement now is to identify more fully the most suitable territories, taking into account the species' protection requirements at sea, noting that the UK's obligations to identify SPAs applies equally to the UK's land and sea area. The 2001 SPA review did not consider marine SPAs, other than in relation to coastal and estuarine sites designated on the basis of their breeding seabird and waterbird interests.

Accordingly, the JNCC, on behalf of the UK conservation agencies, has considered the requirements of four types of marine SPAs:

1. Marine extensions to existing seabird colony SPAs (McSorley *et al*. 2006);
2. Inshore areas used by waterbirds (e.g. seaduck, divers and grebes) outside the breeding season.
3. Inshore and offshore areas used by seabirds for feeding and other activities at any time of year (Kober *et al.* 2010, Kober *et al.* 2012); and
4. Other types of marine SPA not covered by the above types, e.g. foraging areas for breeding terns, wintering areas for Balearic shearwater *Puffinus mauretanicus* and feeding areas for breeding red-throated diver *Gavia stellata*.

More information about this work can be found on the JNCC website (http://www.jncc.gov.uk/page-1414).

Ynys Feurig, Cemlyn Bay and The Skerries SPA is a breeding colony SPA. The current proposal is in relation to type 4 above.

1.4 Proposed Change of Name.

It is proposed that, since the new site would include a substantial area of sea around Anglesey as well as the original tern breeding colonies themselves, the name of the site should be changed from 'Ynys Feurig, Cemlyn Bay and The Skerries' to 'Anglesey Terns / Morwenoliaid Ynys Môn'.

2. The extant Ynys Feurig, Cemlyn Bay and The Skerries SPA.

The SPA was first classified in 1992 by the then Secretary of State of the Environment. The designated species are common tern (*Sterna hirundo*), Arctic tern (*Sterna paradisea*), roseate tern (*Sterna dougalli*) and sandwich tern (*Sterna sandvicensis*) each of which meets Stage 1.1 of the UK 1999 SPA selection guidelines (area is used regularly by at least 1% of the GB population of a species listed in Annex 1 of the Birds Directive). The original citation for the SPA stated that the site qualifies as an SPA on the basis of 840 pairs of Arctic tern, 170 pairs of common tern, 517 pairs of sandwich tern and 45 pairs of roseate tern.

The citation for the SPA was updated in 2008 by the Welsh Ministers, so as to be in line with the 'site account' published in the 2001 SPA Review (Stroud *et al.* 2001). There were no changes to the boundary of the SPA or to the list designated species, but the population estimates for the four designated species were changed to: 1290 pairs of Arctic tern, 189 pairs of common tern, 460 pairs of sandwich tern and 3 pairs of roseate tern

More recent bird count data are available but have not been used to re-assess the site against the UK SPA selection guidelines. This is because the proposed marine area is being taken forward as an extension to an existing SPA whose basis for qualification as an SPA has not changed since the SPA was reclassified in 2008 to give effect to the findings of the 2001 SPA review. The species concerned would qualify if assessed against more recent bird data.

The colonies of the four species of tern for which the SPA is classified are situated at three different sites: Ynys Feurig, Cemlyn Bay and The Skerries (see Figure 1). Ynys Feurig is a series of small islets off the west coast of Anglesey which are joined to the Anglesey mainland at mid to low tide. The majority of tern species nesting at this part of the SPA are Arctic terns with a smaller breeding population of common terns. The Skerries is a group of sparsely vegetated rocky islets, approximately 17ha in extent lying 3 km off the north western coast of Anglesey. The vast majority of terns breeding on The Skerries are Arctic terns with a much smaller population of common terns. The other colony which makes up this SPA is at Cemlyn Bay on the north coast of Anglesey, which comprises a saline lagoon separated from the sea by a shingle ridge. At this site, the terns (mainly sandwich terns with much smaller numbers of common and Arctic terns) breed on two small islands within the lagoon.

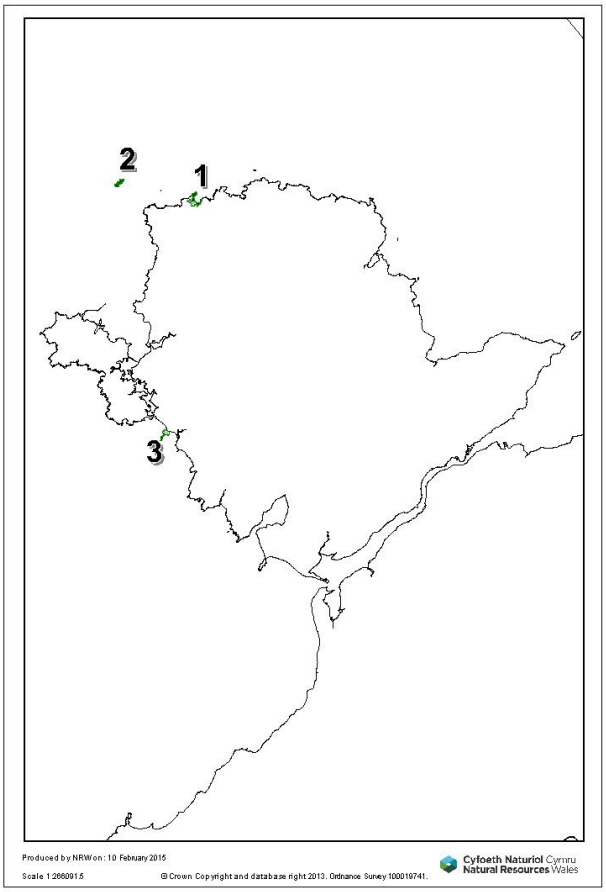


Figure 1. Location of Ynys Feurig (3), Cemlyn Bay (1) and The Skerries (2) SPA.

3. Proposed foraging extension

3.1. Rationale

All five species of tern that breed in the UK (Arctic, common, sandwich, roseate and little) are listed as rare and vulnerable on Annex I of the EU Birds Directive and thus are subject to special conservation measures including the classification of Special Protection Areas (SPAs). In the UK there are currently 57 SPAs where breeding populations of one or more species of tern are qualifying features (see Figure 2). However, additional important areas for terns at sea have yet to be identified and classified as marine SPAs to complement the existing terrestrial suite. Since 2007, the JNCC has been working with the four Statutory Nature Conservation Bodies (SNCBs) towards the identification of such areas (Wilson *et al*. 2014).

Resource constraints prevented detailed surveys of tern foraging behaviour at all 57 tern colony SPAs across the UK. Therefore a statistical modelling approach was taken which used data collected from a sub-sample of tern breeding colonies to a) characterise the types of marine environments that are used by foraging terns, and b) use this information to identify potential feeding areas around all colony SPAs (Wilson *et al.* 2014).

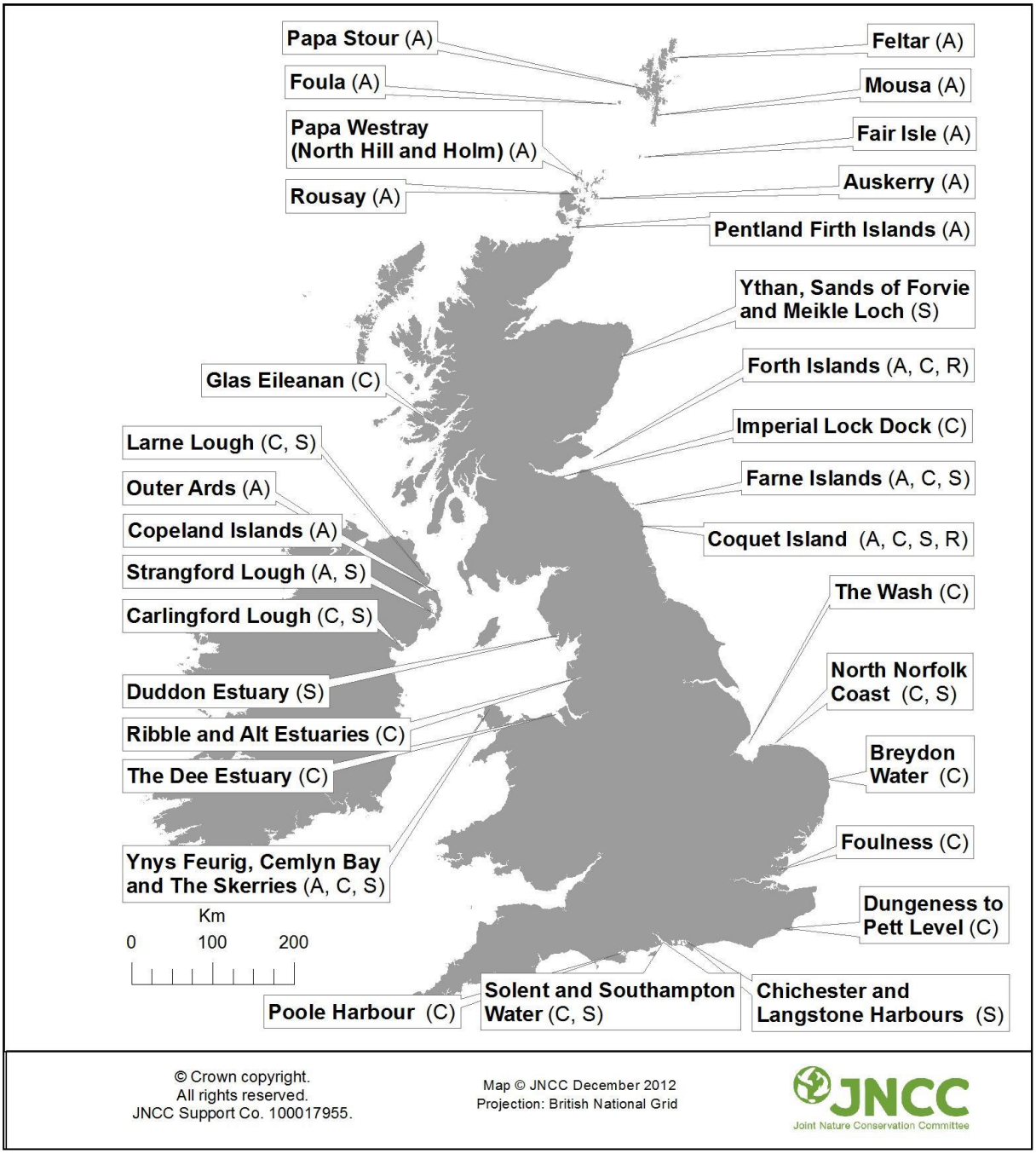


Figure 2. Map showing tern colony SPAs and the relevant tern species used in the analysis (A=Arctic, C = common, S = sandwich and R = roseate tern) (Wilson *et al*., 2012).

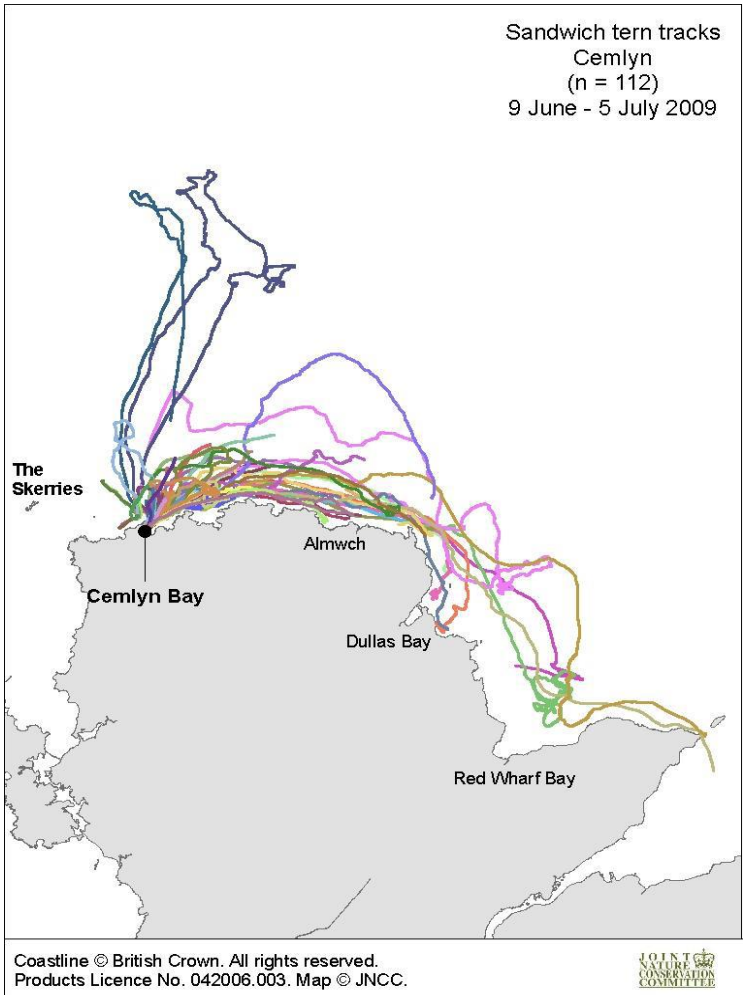
3.2. Data collection

To acquire information on the at-sea foraging distributions of breeding terns, three years of targeted data were collected and/or commissioned by JNCC around selected tern colonies from 2009 to 2011, using a combination of visual tracking and transects. The visual tracking technique involved observers on board rigid-hulled inflatable boats (RIB) following individual terns during their foraging trips. An on-board GPS recorded the boat's track, which was used to represent the track of the bird. Observations commenced immediately adjacent to the SPA colony. The actual starting position was varied to capture the full range of departure directions of the birds. Observers maintained constant visual contact with each followed bird (by maintaining

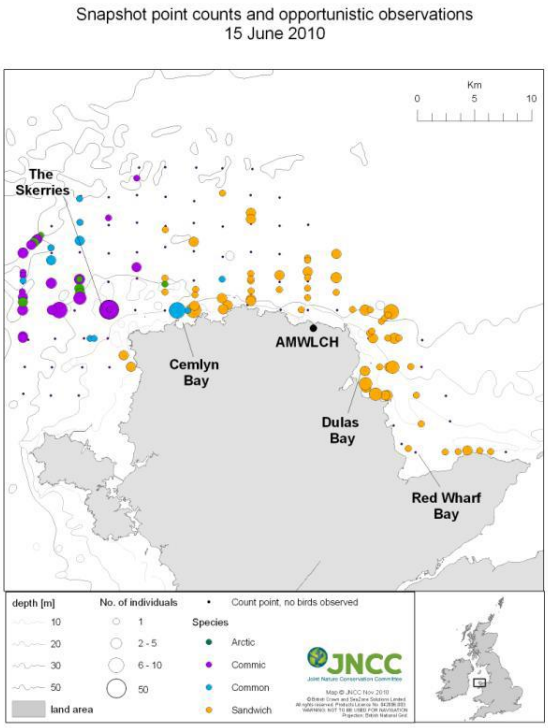
the RIB c.50-200m from the bird) and recorded any incidence of foraging behaviours, along with their associated timings. Behaviours could then be assigned to a distinct location within the GPS track by matching the timings. This technique was used out of Cemlyn Bay in 2009, mainly looking at sandwich tern, but also common tern foraging from that site (see Figure 3).

Owing to financial constraints and the high cost of direct tracking of foraging birds, tracking was only used in 2009. In the other two summers 2010 and 2011, boat based transects where used to survey tern use around Anglesey rather than tracking. The boat transects followed evenly spaced straight line routes which went out to 14 km from the east, north and west coasts of Anglesey, approximately perpendicular to the general line of the coast. At 2 km intervals, the observers noted the number, species and behaviour of terns observable in any direction from that point (Figures 4a-c and 5a-b).

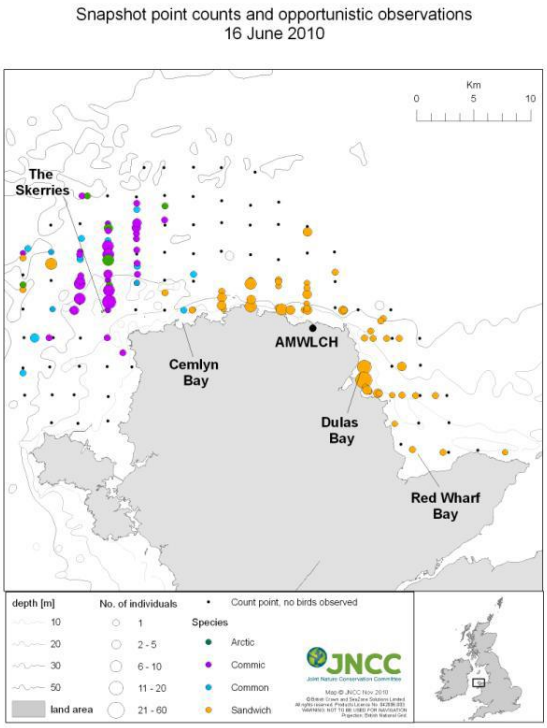
Figure 3. Sandwich tern tracks from the Cemlyn Bay colony (Wilson et al. 2009)



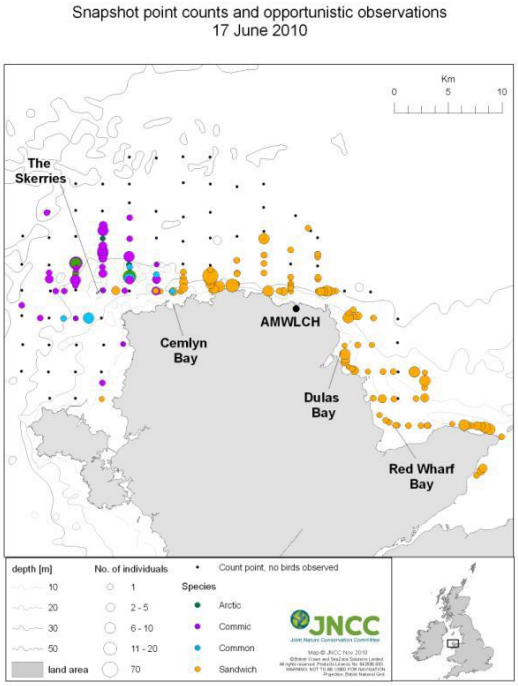
a)



b)

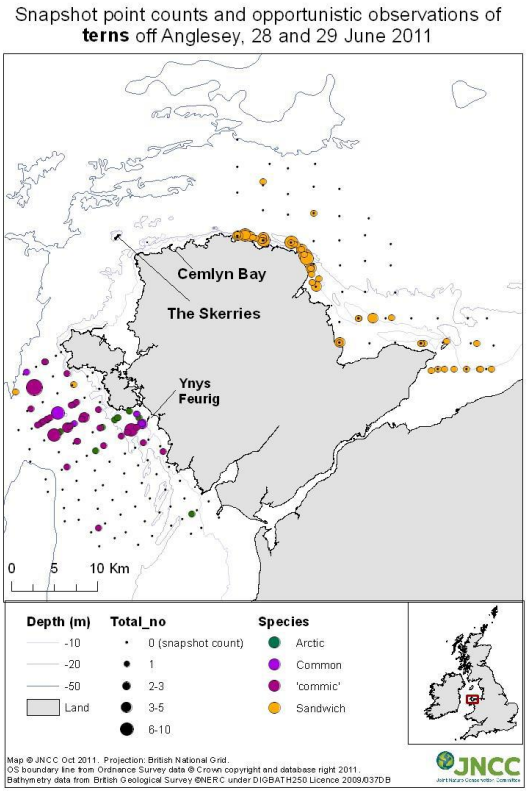


c)

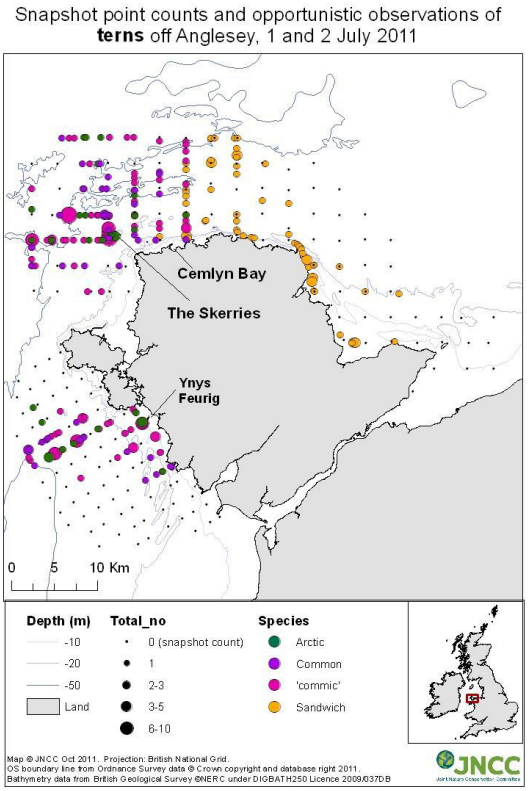


Figures 4 a-c. Transect results around Anglesey in 2010, showing the positions of Arctic, common and sandwich terns observed (Wilson *et al*. 2010).

a)



b)



Figures 5a-b. Transect results around Anglesey in 2011, showing the positions of Arctic, common and sandwich terns observed. (Wilson *et al.* 2011).

The majority of the data from both the tracking and transects were collected during the chick-rearing period (June to early July), a highly demanding period for breeding adult terns due to food gathering and chick feeding. The need to regularly return to the colony results in a higher number of foraging trips within a generally more restricted foraging range, than when the adults are incubating their eggs. Accordingly, areas used during the chick-rearing period are considered as crucial for overall survival and are thus high priority for site-based conservation.

3.3. Data analysis and modelling

Information on habitat conditions was gathered from various sources and used, along with the data on tern distribution at all UK SPA breeding colonies, to develop models which can predict the distribution of terns around the colonies. These so-called 'environmental covariates' were chosen for their potential to explain the observed tern distribution data. Due to a lack of information on actual distribution of the terns' normal prey species (e.g. sandeels, clupeids such as herring and sardine), environmental covariates which could relate to the occurrence or availability of these prey species were used instead, such as water depth, temperature, salinity, current and wave energy, frontal features, chlorophyll-a concentrations, seabed slope and type of sediment as well as distance to colony, as a proxy for energetic costs (Black 2014).

In order to identify the preferred type of area used for feeding, the analysis compared environmental covariates at locations where terns were observed foraging, with environmental covariates at locations where terns were observed not foraging. By looking at the environmental conditions at observed tern foraging locations, the models can predict the areas that other terns at the same colony, and that terns at other colonies, are likely to use for foraging (Black 2014).

Two types of models where used:

- Colonies where **sufficient tracking data** were available had colony-specific models created for them. In the case of Ynys Feurig, Cemlyn Bay and The Skerries SPA, this was only the case for common and sandwich terns breeding at the Cemlyn Bay site.

- Colonies with **insufficient tracking data** to produce a colony-specific model had a generic model applied to them. This was generated from a UK wide analysis of foraging terns around multiple colonies.

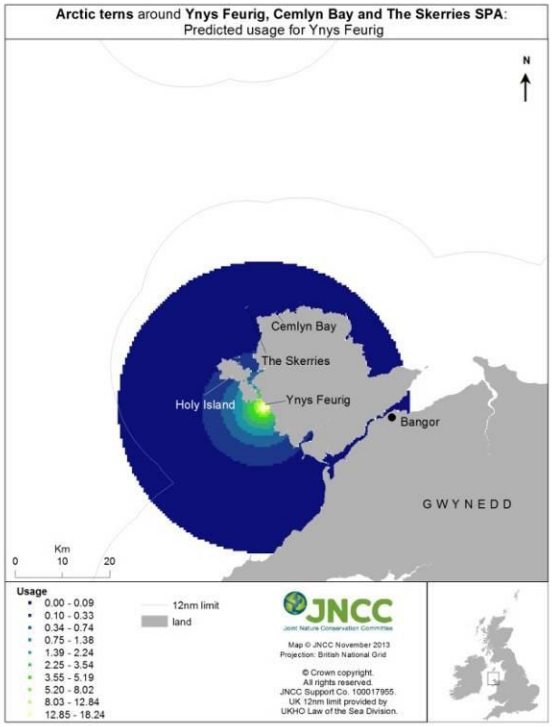
Table 2 shows which model and which environmental covariates were used for each species and each of the three breeding colonies in the existing SPA.

Both types of models were validated. This was done by creating a model of tern foraging based on two colonies to predict foraging at a third colony which had good data on tern foraging. The prediction was then compared with the real foraging data at that third colony to see how similar the modelled foraging distribution was to the observed distribution (Black 2014). The models were applied to the three Anglesey tern colonies to produce maps of predicted foraging usage for each species at each colony (Figures 6a-g).

Table 2. Models and environmental covariates used for each species/location for Ynys Feurig, Cemlyn Bay and The Skerries SPA (Wilson *et al*. 2014).

Species	Colony	Model	Terms (covariates)
Arctic tern	Ynys Feurig	Generic	Distance to colony, bathymetry
	The Skerries	Generic	Distance to colony, bathymetry
	Cemlyn Bay	Generic	Distance to colony, bathymetry
Common tern	Ynys Feurig	Generic	Distance to colony, distance to shore, bathymetry
	The Skerries	Generic	Distance to colony, distance to shore, bathymetry
	Cemlyn Bay	Site specific	Distance to colony, salinity in spring
Sandwich tern	Cemlyn Bay	Site specific	Distance to colony, distance to shore, salinity in spring

(a)


Arctic terns around Ynys Feurig, Cemlyn Bay and The Skerries SPA:
Predicted usage for Ynys Feurig
N
Cemlyn Bay
The Skerries
Holy Island
Ynys Feurig
Bangor
GWYNEDD
Km
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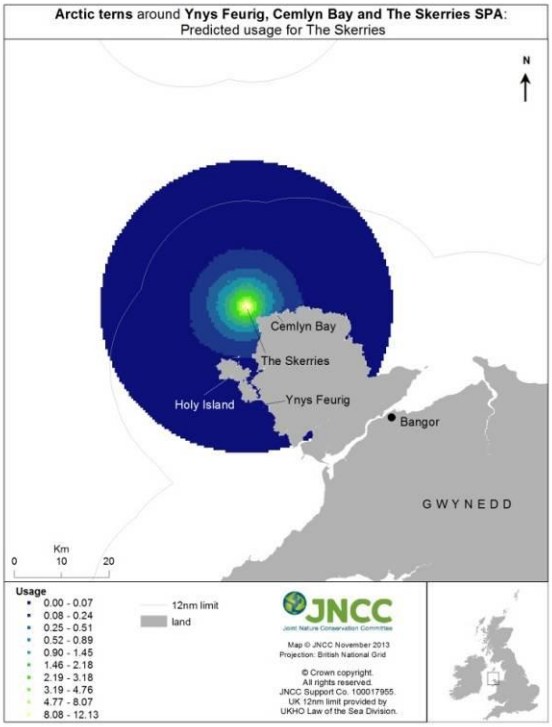
Usage
0.00 - 0.09
0.10 - 0.33
0.34 - 0.74
0.75 - 1.38
1.39 - 2.24
2.25 - 3.54
3.55 - 5.19
5.20 - 8.02
8.03 - 12.84
12.85 - 18.24
12nm limit
land
JNCC
Joint Nature Conservation Committee
Map © JNCC November 2013
Projection: British National Grid
© Crown copyright.
All rights reserved.
JNCC Support Co. 100017955.
UK 12nm limit provided by
UKHO Law of the Sea Division.

(b)


Arctic terns around Ynys Feurig, Cemlyn Bay and The Skerries SPA:
Predicted usage for The Skerries
N
Cemlyn Bay
The Skerries
Holy Island
Ynys Feurig
Bangor
GWYNEDD
Km
0 10 20
Usage
0.00 - 0.07
0.08 - 0.24
0.25 - 0.51
0.52 - 0.89
0.90 - 1.45
1.46 - 2.18
2.19 - 3.18
3.19 - 4.76
4.77 - 8.07
8.08 - 12.13
12nm limit
land
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UK 12nm limit provided by
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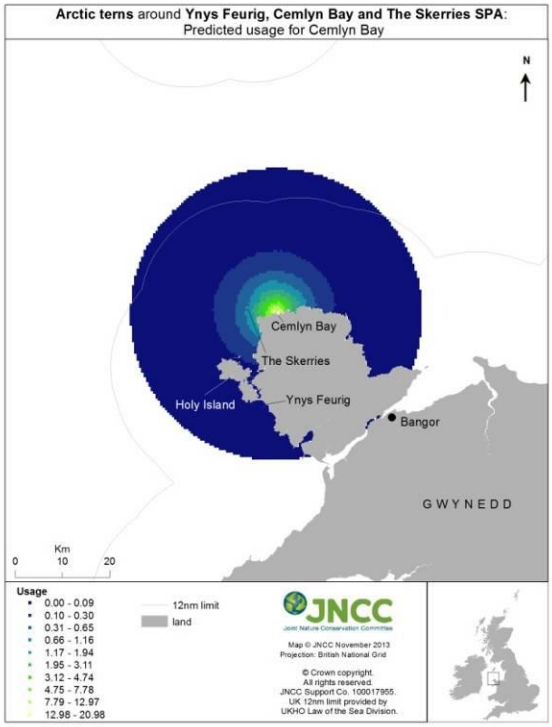
(c)


Arctic terns around Ynys Feurig, Cemlyn Bay and The Skerries SPA:
Predicted usage for Cemlyn Bay
N
Cemlyn Bay
The Skerries
Holy Island
Ynys Feurig
Bangor
GWYNEDD
Km
0 10 20
Usage
0.00 - 0.09
0.10 - 0.30
0.31 - 0.65
0.66 - 1.16
1.17 - 1.94
1.95 - 3.11
3.12 - 4.74
4.75 - 7.78
7.79 - 12.97
12.98 - 20.98
12nm limit
land
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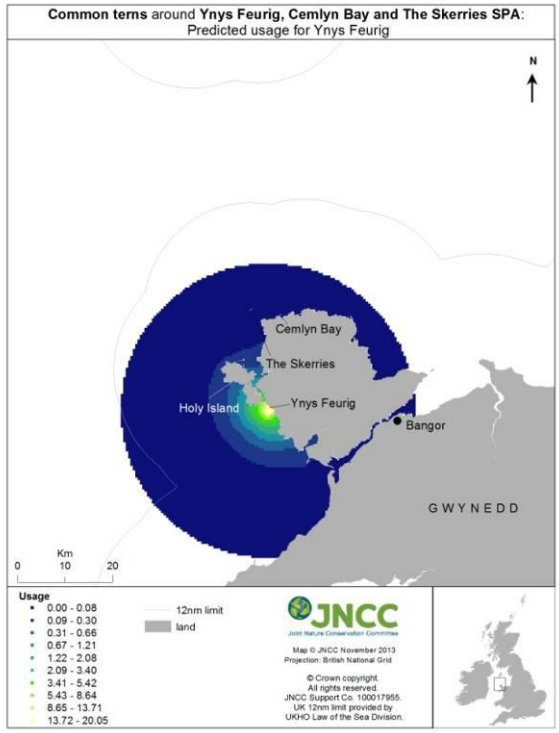
(d)


Common terns around Ynys Feurig, Cemlyn Bay and The Skerries SPA:
Predicted usage for Ynys Feurig
N
Cemlyn Bay
The Skerries
Holy Island
Ynys Feurig
Bangor
GWYNEDD
Km
0 10 20
Usage
0.00 - 0.08
0.09 - 0.30
0.31 - 0.66
0.67 - 1.21
1.22 - 2.08
2.09 - 3.40
3.41 - 5.42
5.43 - 8.64
8.65 - 13.71
13.72 - 20.05
12nm limit
land
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UK 12nm limit provided by
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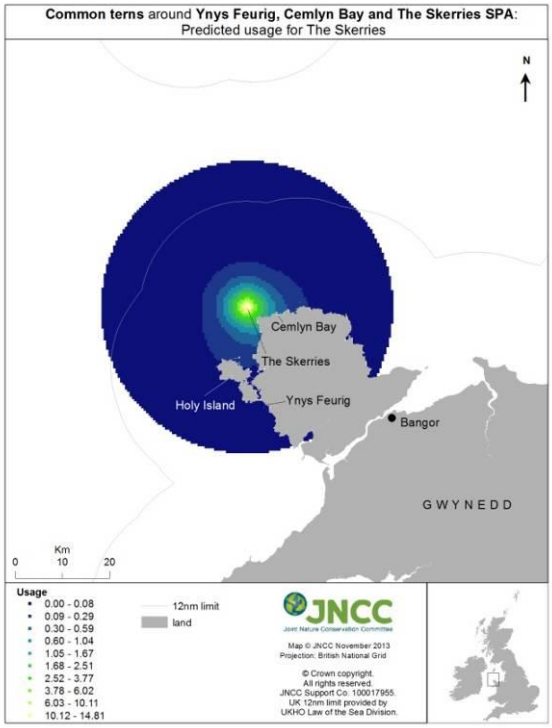
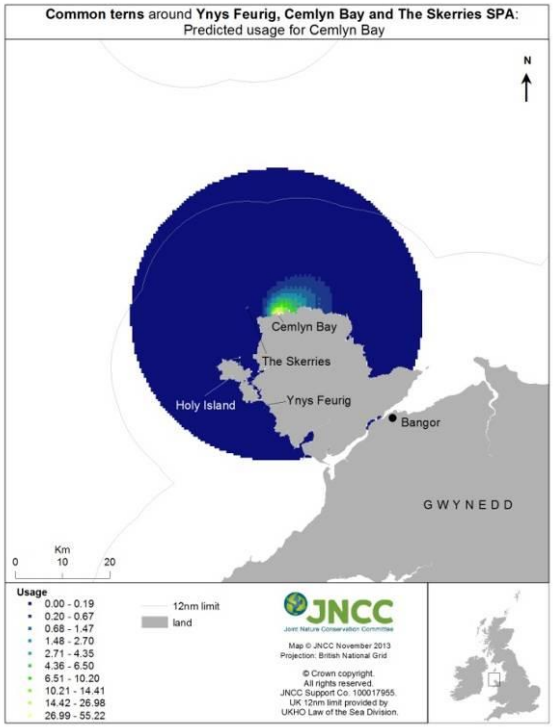
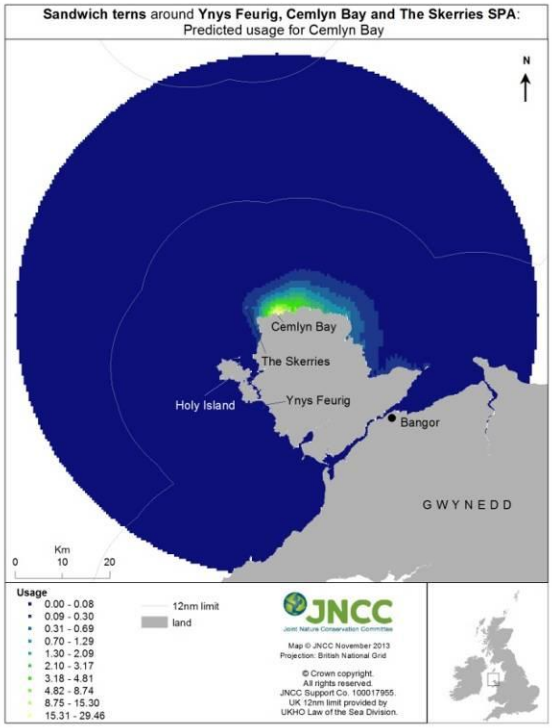
(e)



(f)



(g)



Figures 6 a-g. Predicted usage of the waters around (a) Ynys Feurig, (b) The Skerries and (c) Cemlyn Bay for Arctic terns; and around (d) Ynys Feurig for common terns (e) The Skerries and (f) Cemlyn Bay for common terns; and around (g) Cemlyn Bay for sandwich terns (Wilson et al. 2014)**.**

3.4. Developing a site boundary

While Figure 6a-g clearly shows how modelled tern usage varies across the study area, it does not provide a clear and objective basis for defining a boundary to include the high usage areas, since this depends on what threshold is taken as the cut off. A technique called 'Maximum curvature' was used to identify a threshold.

Maximum curvature is a way of defining the optimum trade-off between number of birds included and the area included. The study area was divided into a grid of data cells. All cells within the mean maximum foraging range for each species were ranked according to their modelled usage value. Starting with the highest density cell, cells were selected for inclusion in a draft SPA boundary in declining order of density. At first, because the analysis starts with the highest density cells, the number of birds selected increases rapidly compared to the increase in area selected. Then, as more lower density cells are added, the rate of increase in the number of birds starts to go down, while the area selected increases at the same rate (i.e. by 1 km^2 for each cell added). Therefore, adding further cells beyond the point of maximum curvature adds a disproportionately large area compared to the number of birds being added. The point of maximum curvature is where the ratio of predicted bird numbers against the size of the area supporting that number of birds, changes the most rapidly (Webb *et al.* 2009).

The selected cells for all species were overlain and a boundary was drawn to encompass the cells selected for all species, with the following additional steps applied:

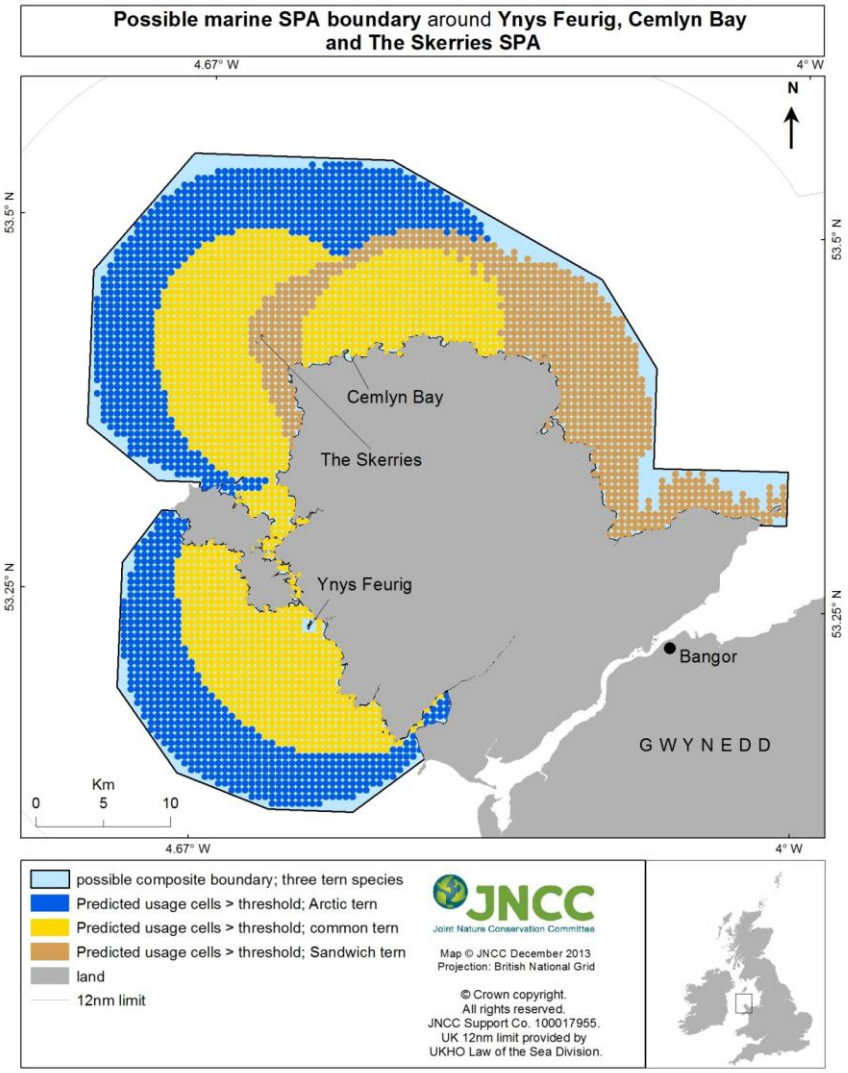
a) The boundary was simplified by using straight lines (rather than to precisely follow the boundary of each 1km^2 cell, which would result in a complex 'jagged' boundary);

b) lines of longitude and latitude were used as much as possible without excluding selected cells or including large numbers of unselected cells

c) the boundary was drawn so as to always be a minimum of 250m from any cell with a predicted density greater than the threshold density.

Figure 7 shows the selected cells for each species overlain, and a possible boundary for the pSPA.

Figure 7. Cells selected using maximum curvature method for each modelled species of the Ynys Feurig, Cemlyn Bay and The Skerries SPA, and a proposed boundary for Anglesey Terns / Morwenoliaid Ynys Môn pSPA fitted (Wilson et al. 2014).



4. Recommended extended boundary for the SPA

In the interests of clarity and ease of implementation, wherever possible the recommended boundary follows lines of latitude and longitude (Table 3). Figure 8 shows the recommended boundary for the extension of the SPA to include the tern foraging area. The extended SPA would include the land area at the three breeding colonies within the existing Ynys Feurig, Cemlyn Bay and The Skerries SPA, but would not include any additional areas above the mean high water mark, other than a number of small islets within the marine area. The final recommended boundary covers an area of 101,931 ha in total. The proposed extension includes an area off the east coast of Anglesey which lies within the Liverpool Bay / Bae Lerpwl SPA.

JNCC guidance on selecting marine SPAs states that where the distribution of birds is likely to meet land, landward boundaries should be set at mean high water mark (MHWM) “unless there is evidence that the qualifying species make no use of the intertidal region at high water” (Webb & Reid 2004). Observations indicated that little terns forage both in the intertidal zone and subtidal zone (Parsons *et al.* 2015). The likely use of such areas by all larger tern species is also supported by information in the scientific literature: A review of tern foraging ecology (Eglington 2013) notes that all five species of tern considered here routinely forage in areas of shallow water. There is no reason on the basis of that review to consider it likely that that these birds will not forage over intertidal areas. Thus the landward boundary generally follows MHWM, except where the SPA abuts Glannau Ynys Gybi / Holy Island Coast SPA, where the boundary follows MLWM.

Figure 8. Recommended boundary for the Anglesey Terns / Morwenoliaid Ynys Môn pSPA

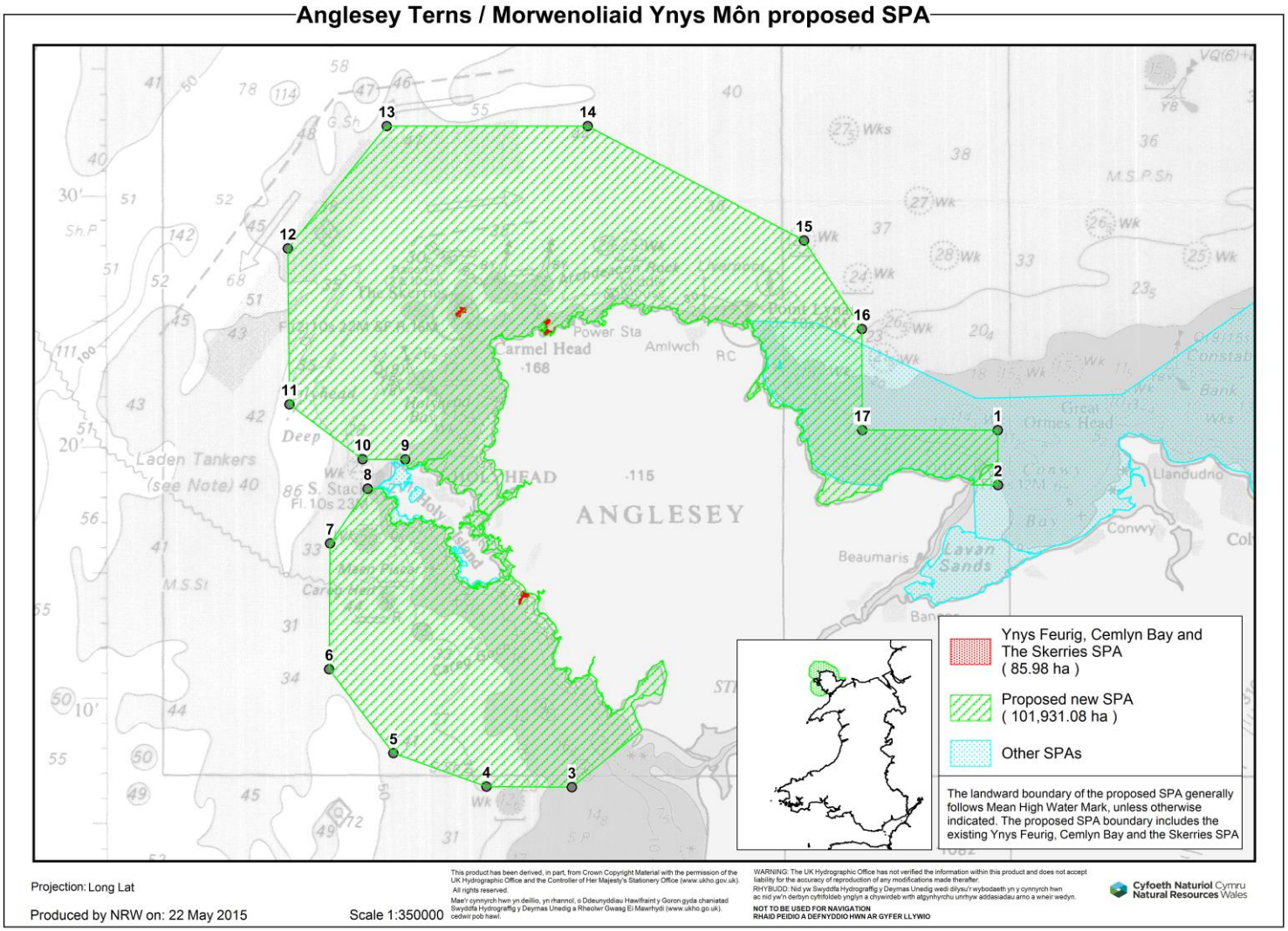


Table 3. Coordinates of proposed new boundary for Anglesey Terns / Morwenoliaid Ynys Môn pSPA

Point number in Figure 8	Longitude	Latitude
1	-4.0139	53.3445
2	-4.0139	53.3084
3	-4.4861	53.1080
4	-4.5798	53.1080
5	-4.6819	53.1299
6	-4.7528	53.1855
7	-4.7528	53.2695
8	-4.7111	53.3056
9	-4.6694	53.3250
10	-4.7167	53.3250
11	-4.7972	53.3611
12	-4.7972	53.4633
13	-4.6875	53.5438
14	-4.4652	53.5438
15	-4.2277	53.4694
16	-4.1639	53.4111
17	-4.1639	53.3445
Coordinates are shown here in decimal degrees to 4 decimal places. Coordinates of the boundary as shown in Figure 8 were drawn to 8 decimal places		

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