ECOREGION General advice
SUBJECT Ecological quality objective for seabird populations in OSPAR Region III (Celtic Seas)

Advice summary

ICES collated and analysed the data for the ecological quality objective (EcoQO) indicator on breeding seabird population trends in OSPAR Region III for the period 1986–2011. ICES considers that the proposed EcoQO indicator was not achieved in 1986, 1989–1992, 1996 and in consecutive years during 2003–2011.

ICES advises that special attention is given to six bird species (Northern fulmar, Arctic skua, European shag, herring gull, black-legged kittiwake, and roseate tern) that are all below the lower target levels.

ICES made two separate assessments of the EcoQO: one using both the upper and the lower target level, the other using only the lower target level. ICES recommends excluding the upper target level of 130% when calculating the EcoQO.

ICES recommends to continue testing the application of alternative statistical methods in order to reduce the uncertainty linked to the rather wide confidence intervals when calculating the EcoQO.

ICES advises that the target levels of the EcoQO may also be used in determining good environmental status (GES). The lower target levels of 70% or 80% (depending on the number of eggs) can be considered as corresponding to GES for the individual species.

Birds that are above the 130% target level and are likely to have significant negative impacts on other species may be of concern, and ICES advises to consider these cases when assessing the GES.

Request

ICES is requested to:

i) update the value of the draft EcoQO indicator on Seabird Population Trends in OSPAR Region III (Celtic Seas) and make any relevant recommendations and,

ii) consider whether or not the target thresholds [both a) the target for a species-specific trend in abundance (e.g. 70% or more of the baseline); and b) the target for the proportion of species meeting species-specific targets (e.g. 75% or more)] used in the EcoQO would be indicative of a seabird community that is at GES.

ICES advice

Request item i) *Update the value of the draft EcoQO indicator on Seabird Population Trends in OSPAR Region III (Celtic Seas) and make any relevant recommendations.*

Introduction

The EcoQO on seabird population trends was adopted by OSPAR's Biodiversity Committee (BDC) in 2012 (OSPAR Commission, 2012): *Changes in breeding seabird abundance should be within target levels for 75% of species monitored in any of the OSPAR regions or their sub-divisions.*

To date, assessments of the EcoQO have used target levels originally suggested by ICES (2008): intra-specific annual abundance should be less than or equal to 130% of the baseline and more than or equal to 80% of the baseline, for species that lay only one egg, or more than or equal to 70% for species that lay more than one egg. It has been debated whether or not an upper target level should be applied when establishing the EcoQO.

To help resolve the issue, ICES made two separate assessments of the EcoQO: one uses the upper target of 130% for all species, and another which does not use the upper target for any species.

ICES (2012) collated and analysed the most recent data for the EcoQO indicator on Seabird Population Trends in OSPAR Region III (Celtic Seas) (Figure 1.5.5.1.1).

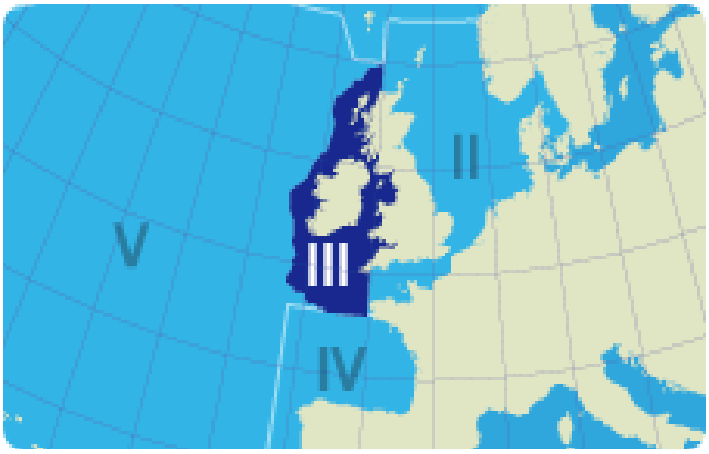


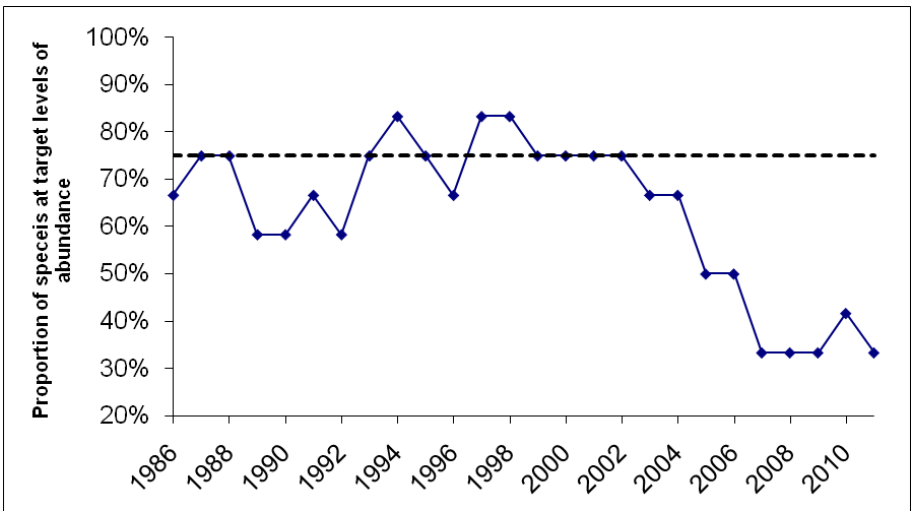
Figure 1.5.5.1.1 OSPAR Region III.

Data for OSPAR Region III are collected as part of the UK and Ireland's Seabird Monitoring Programme (SMP). The ICES (2012) advice included data from 1986–2010 on twelve species (Northern fulmar, European shag, herring gull, great black-backed gull, black-legged kittiwake, Sandwich tern, common guillemot, razorbill, Arctic skua, great cormorant, little tern, and roseate tern). In this update data from 1986–2011 are included and one more species – common tern – is added: the indicator is now based on thirteen species. Most colonies in OSPAR Region III were not surveyed in each year of the time-series, so imputation techniques were used to estimate the missing counts. The imputation methods and reference values used in this update are identical to those described and used in ICES (2010, 2011) and Annex 1.

Development of the EcoQO for OSPAR Region III

Using the 'old targets' option that includes the upper target level, the EcoQO was not achieved in 1986, 1989–1992, 1996, and in consecutive years during 2003–2011 (see Figure 1.5.5.1.2a). Using the 'new target option' based only on the lower target levels, the EcoQO was not achieved in 1986, 1989–90, 1992, and consecutively from 2005–2011 (see Figure 1.5.5.1.2b).

a) 'Old targets' option



b) 'New targets' option

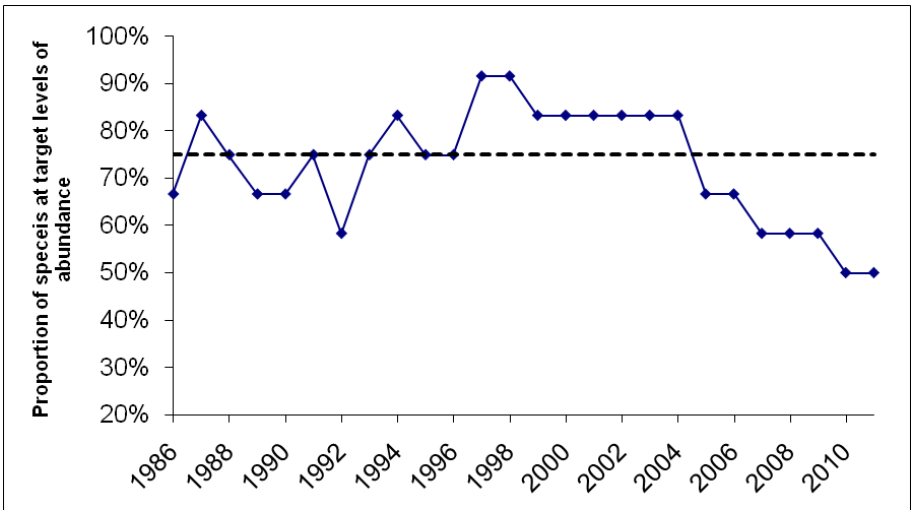
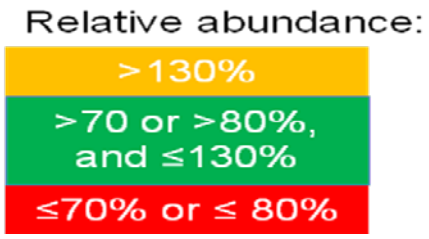


Figure 1.5.5.1.2 The proportion of species in OSPAR Region III that were within target levels of abundance during 1986–2011. The EcoQO was not achieved in years when the proportion dropped below 75%. a) The "Old targets" option with an upper target level of 130% of the baseline and a lower target of 80/70% of the baseline. b) The "New target" option with no upper target level.

For both options, the lower target levels were not achieved by six species in 2011, showing no change compared to the last updates in 2009 and 2010 (ICES, 2010, 2011). The six species are: Northern fulmar, Arctic skua, European shag, herring gull, black-legged kittiwake, and roseate tern. An overview of species with their Latin names is given in Table 1.5.5.1.1 below.

Table 1.5.5.1.1 Species-specific assessment of relative breeding abundance in the Celtic Seas in 2011. Green cells indicate that the species-specific targets have been met; orange cells indicate that the lower species-specific target has been met but that relative abundance has exceeded 130%; red cells indicate that the lower species-specific targets have not been met. Arrows indicate recent trends in relative abundance (2010–2011)[1]. See also Figure 1.5.5.1.A1 in Annex 1.

	Species	English name	
1	*Fulmarus glacialis*	Northern fulmar	↓
2	*Carbo aristotelis*	European shag	↓
3	*Carbo carbo*	great cormorant	↓
4	*Stercorarius parasiticus*	Arctic skua	↓
5	*Sterna sandvicencis*	Sandwich tern	↓
6	*Sternula albifrons*	little tern	↑
7	*Sterna dougalii*	roseate tern	↑
8	*Sterna hirundo*	common tern	↓
9	*Larus argentatus*	herring gull	↓
10	*Larus marinus*	great black-backed gull	↓
11	*Rissa tridactyla*	black-legged kittiwake	↔
12	*Uria aalge*	common guillemot	↓
13	*Alca torda*	razorbill	↑



Roseate tern abundance has been below the lower target throughout 1986–2011, but has steadily increased during this period from 18% to 48% of the reference level.

European shag abundance was relatively lower than roseate tern in 2011 (i.e. 29% of reference level). Shag numbers have been at or below the lower target since 1993, but have been declining further since 2004.

Herring gull numbers have been in decline since the early 1970s, but the reference level was set at the mid-1980s level because numbers were thought to have been previously elevated by anthropogenic activities (e.g. commercial fisheries). Numbers have been steadily decreasing since 2000 and fell below target levels from 2003 onwards. They are currently at 53% of the reference level.

Arctic skua numbers have been below the lower target since 2005 and were at 40% of the reference level in 2011.

The decline in Northern fulmar numbers started in the mid-1990s but was steeper during 2005–2008. Their numbers dropped below the target level in 2007, remained stable at 73% of the reference level in 2009 and 2010, but declined to 68% in 2011.

Black-legged kittiwake numbers have been declining since around 2000 and dropped just below the target level in 2008, 2010, and again in 2011.

Great black-backed gull numbers have remained within target levels throughout 1986–2011 and have shown a slight decrease the last years. Razorbill and common guillemot numbers increased steadily during the 1980s and 1990s. Guillemot numbers are more or less stable. Razorbill numbers peaked between 2002 and 2005 but subsequently dropped a little and have remained within target levels since 2006.

Since 2000 the numbers of great cormorant increased but have declined since 2009, returning within target levels.

Common tern, Sandwich tern, and little tern have been increasing since late 1990s. Numbers of common tern and Sandwich tern, though lower in 2011 compared to 2010, remain substantially above the target level. Little tern numbers dipped dramatically between 2006 and 2010, but in 2011 numbers were once again well above the target level.

[1] There may be a need to define how to assess the trends.

ICES notes that it is useful to report on the trends in the different bird species as well. However, it is unclear how these trends should be established and reported, e.g. over how many years etc. ICES recommends that clear guidelines for reporting of seabird trends are developed.

Uncertainty and confidence intervals

The inherent uncertainties of the recorded (mean) trends are a cause for concern (see Figure 1.5.5.1.A1 in Annex 1). Disregarding uncertainty when reporting the EcoQO limits the usefulness of the results. The results in terms of meeting the target levels are interpreted mainly from the mean trends. Accordingly, the uncertainty of the trends is not assessed in relation to the targets for species-specific trends in abundance and the target for the proportion of species meeting species-specific targets (e.g. 75% or more) used in the EcoQO. As an example, the lower target levels were not achieved by six species; Northern fulmar, Arctic skua, European shag, herring gull, black-legged kittiwake, and roseate tern. By inspection of the upper confidence levels, however, only Arctic skua and shag did not meet the species-specific target levels in 2011. Yet, the confidence intervals are not explicitly used when making conclusions, neither on these two species nor on the four species of seabirds for which the declines are dubious. As a result, the failure to meet the overall target of the EcoQO in Region III is not questioned. On the other hand, when using the lower confidence intervals, also great cormorant, great black-backed gull, and common guillemot are below the lower target. The problem with using the confidence intervals is obvious and ICES advises not only the continued use of the mean value when assessing the EcoQO, but also to consider improving the statistical uncertainty.

Although the Seabird Trend Wizard (see Annex I) has provided reliable confidence intervals computed by bootstrapping the count data, the confidence intervals are rather wide for most species. Obviously, sources of variation exist in the data which influence the uncertainty of the estimated trends. In addition, the Wizard does not smooth the count data which makes it sub-optimal for reproducing long time-series, with alternating periods of increases and declines. Both issues may be addressed in the further application of the EcoQO. ICES recommends to continue testing the application of alternative statistical methods like TrendSpotter, Generalised Additive Models, and Bayesian time-series models capable of smoothing the time-series and including co-variables, which may reduce the amount of residual 'noise' present in the data.

Considerations

The failure to achieve the EcoQO in OSPAR Region III in consecutive years between 2005 and 2011 (for both target setting options) does give rise to concern as 4–6 of the thirteen species sampled were below the lower target levels during this period, and five species have shown substantial declines. ICES advises that special attention is given to discover the possible causes of decline of these species and to take appropriate action.

The declines in three of these species: roseate tern, Arctic skua, and herring gull have already been highlighted within the UK and have been listed on the UK Biodiversity Action Plan and on the Red list of Birds of Conservation Concern in the UK. Roseate tern numbers have been increasing as a direct result of intensive management of colonies in Ireland. Arctic skua are relatively scarce in OSPAR Region III but the trend in the region is following a steeper decline in the neighbouring Northern Isles (OSPAR Region II) where impacts of climate and fishing on food supply have been exacerbated by increased predation and competition from great skua. The cause of the decline in herring gulls throughout the UK and Ireland is less well understood and ICES advises further work on this species.

The EcoQO highlights a substantial decline in shag numbers in OSPAR Region III. Declines have occurred in the rest of the UK but not to the same extent. ICES advises further investigation into the cause of the decline.

The recent declines in kittiwake and fulmar numbers in OSPAR Region III are worth continued monitoring and further investigation is required to determine likely causes. Kittiwake colonies within OSPAR Region III have been more successful than colonies on the east coast of Britain (in OSPAR Region II), which have been in decline in some areas since the late 1980s. A shortage of sandeels off the east coast is probably responsible for poor breeding there, but kittiwakes at colonies in western Britain tend to feed on other species of fish. ICES advises more research into the variation in availability of these prey species and the link with the decline of seabird populations.

The continued increase in guillemot numbers may be surprising when other predators of small shoaling fish (kittiwakes and shag) have been declining and razorbill numbers have levelled off. The large increase in common terns and Sandwich tern numbers is probably due to improved protection from predators at colonies. Despite the 2011 resurgence, the declines in little tern numbers over the previous four years may be of concern and reasons for the decline should be investigated.

ICES debated whether or not the upper target level should be applied when establishing the EcoQO. ICES (2011) considered applying the upper target level only to predatory species that are likely to have significant negative impacts on other species but recommended that the EcoQO should remain unaltered, because it should be "*a value-free*,

objective metric that makes no assumptions about the underlying causes of individual seabird species population change." However, in 2012 a group of UK experts considering UK MSFD targets recommended that the EcoQO be used without the upper target threshold for abundance of any species. The lack of any upper threshold was considered to be more objective than applying it only to certain species and would mean that the EcoQO would be much more straightforward.

ICES has the following considerations. In OSPAR Region III the old target level (130%) was exceeded by populations that were previously in poor health (most tern species) or by species that were very scarce (cormorant), whereas the 130% level should rather be a warning for possible negative interactions with other species. The terns are not considered to have negative impacts on other species. This might be different for cormorants that compete with other species for space and with fisheries. However, the *carbo* subspecies is relatively scarce with just 52 000 pairs globally, and is culled both legally and illegally in the UK and Ireland. Also, the historical baseline will often reflect the onset of national monitoring schemes that in many cases are established after periods of large human impact. This makes the 130% target level questionable as a valid parameter for use in the context of EcoQO. However, birds that are above the 130% target and are likely to have significant negative impacts on other species could be of concern. Therefore, ICES recommends that species above the 130% target are also reported.

Consequently, ICES recommends excluding the upper target threshold of 130% when calculating the EcoQO.

Further development is recommended with respect to complementary quality objectives based on parameters such as breeding success, development of interpretation models in relation to foodwebs (information on relevant prey trends), arranging trend data into functional groups of seabirds, and inclusion of data regarding relevant sea duck species (ICES, 2012).

Request item ii) *Consider whether or not the target thresholds [both a) the target for a species-specific trend in abundance (e.g. 70% or more of the baseline); and b) the target for the proportion of species meeting species-specific targets (e.g. 75% or more)] used in the EcoQO would be indicative of a seabird community that is at GES.*

ICES notes that GES is rather a national concern, whereas EcoQO targets refer to larger regions more in line with biogeographical populations. National fluctuations in seabird abundance can be very large for some species and might be linked to fluctuations in neighbouring countries, especially when considering numbers outside the breeding season. Setting the right national reference levels (baseline) and selecting the right species thus seems very important when the EcoQO is to be used as an indicative value of a seabird community in the context of GES.

When suggesting lower target levels of 70% or 80% depending on the number of eggs, ICES (2008) considered them as values of abundance that management should be trying to maintain with high probability. This is the same rationale that underlies target-setting to reflect the achievement of GES under MSFD. ICES advises that the lower target levels of 70% or 80% can be considered as corresponding to GES for the individual species.

There is clearly more debate required about the inclusion of an upper target threshold for species-specific abundance for the GES. It is questionable whether a GES only based on the lower target levels is adequate enough to establish the environmental status. Birds that are above the 130% target and are likely to have significant negative impacts on other species may be of concern and ICES advises to consider these when assessing the GES.

The EcoQO target threshold of 75% or more species meeting their abundance targets was recently put out to public consultation in the UK as part of its implementation of MSFD. Several NGOs suggested raising the threshold to 90%. Examination of Figure 1.5.5.1.2 (and applying a 90% threshold) shows that in OSPAR Region III, the EcoQO would not have been met at all during 1986–2011 under the "old targets" option and met in just two years under the "new target" option. Instead, the UK decided to keep the 75% threshold with the caveat that no species should be consistently missing their individual targets, where the cause of that decline can be directly linked to human activity. ICES supports the conclusions of the UK and recommends to keep the 75% target threshold.

Sources

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Annex I

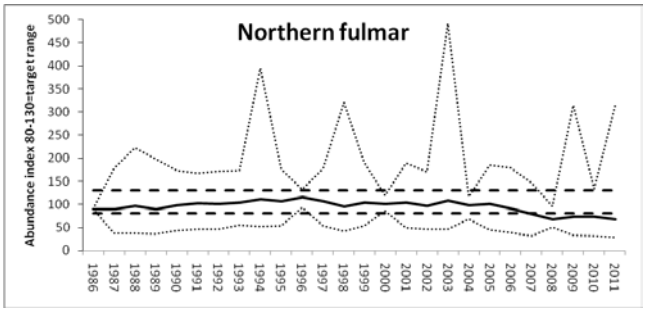
Methods

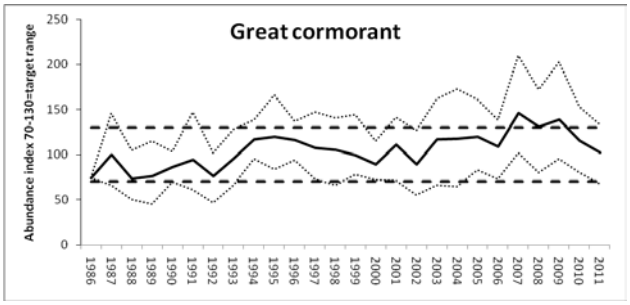
Since the first assessment of the EcoQO (ICES, 2008), the Joint Nature Conservation Committee (JNCC) in collaboration with Biomathematics and Statistics Scotland developed an analytical 'wizard' for estimating trends in breeding numbers of individual species at various geographical scales, including OSPAR regions. The seabird trend wizard uses a modified chain method, first developed by Thomas (1993), to impute values of missing counts based on information in other years and sites (details of the Thomas method are given in Annex 3 of ICES (2008)). The wizard is a small Delphi application that retrieves counts from an Access database and generates script files and a DOS batch file that instruct R to conduct the trend analysis using the Thomas (1993) method. A further advantage of the new wizard is that the analyses can incorporate both whole colony counts and plot counts, even when they exist for the same colony in the same year.

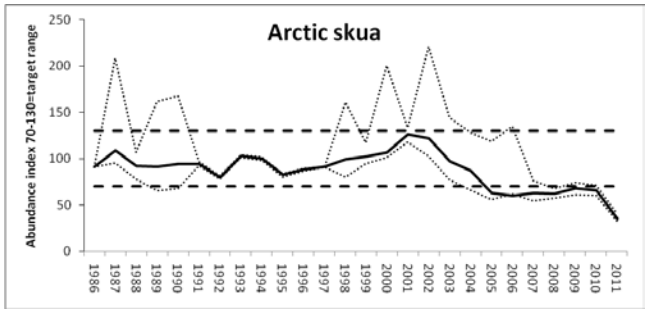
The accuracy and precision of the modelled regional trend for Northern fulmar were increased by restricting data input from only those colonies that had been surveyed for five years or more during 1986–2011. Data from all other species contained colonies that were surveyed in two or more years during 1986–2011 (as in ICES 2008, 2010, 2011). This reduced the sample size for fulmar to just 7% of the total number of pairs known to breed in OSPAR Region III (1998–02 Census; Mitchell *et al.*, 2004), compared to over 50% in all other species.

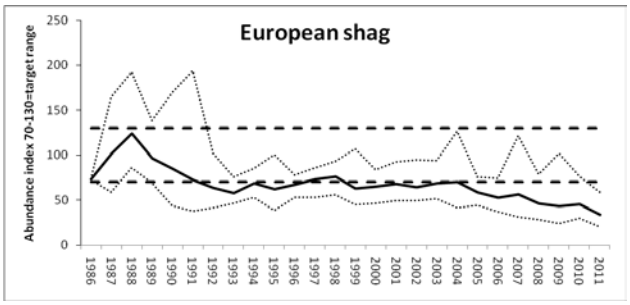
Baselines for each species were the same baselines used in ICES (2008, 2010, 2011).

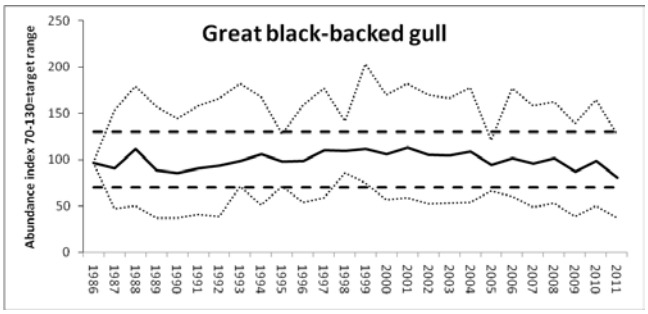
Ecological quality objectives on seabird population trends in OSPAR Region III

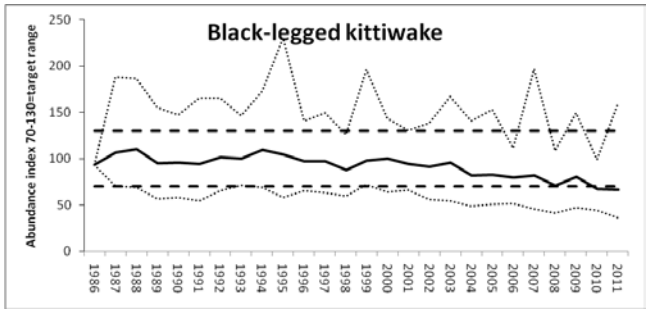


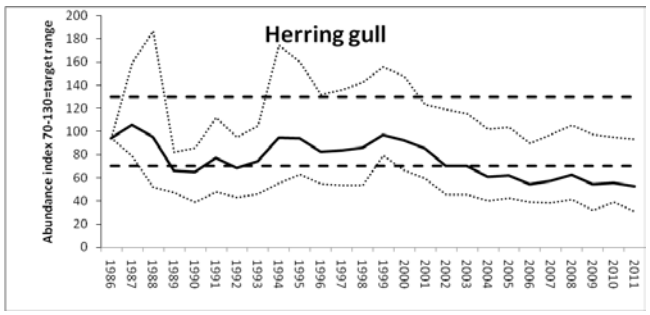


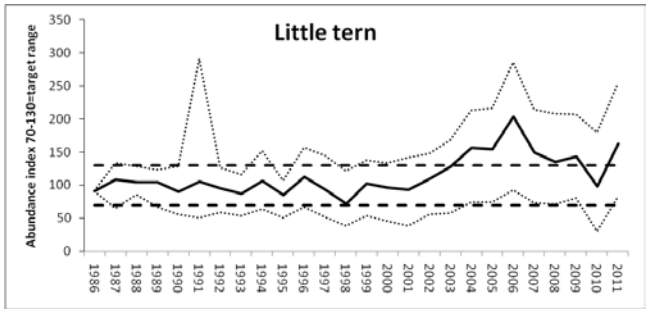


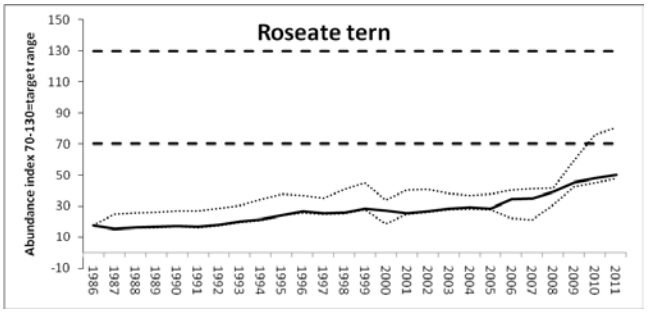


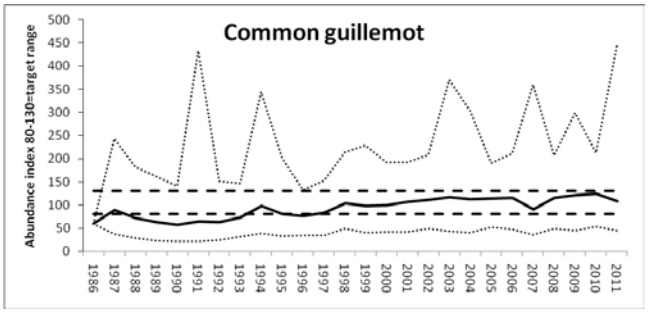












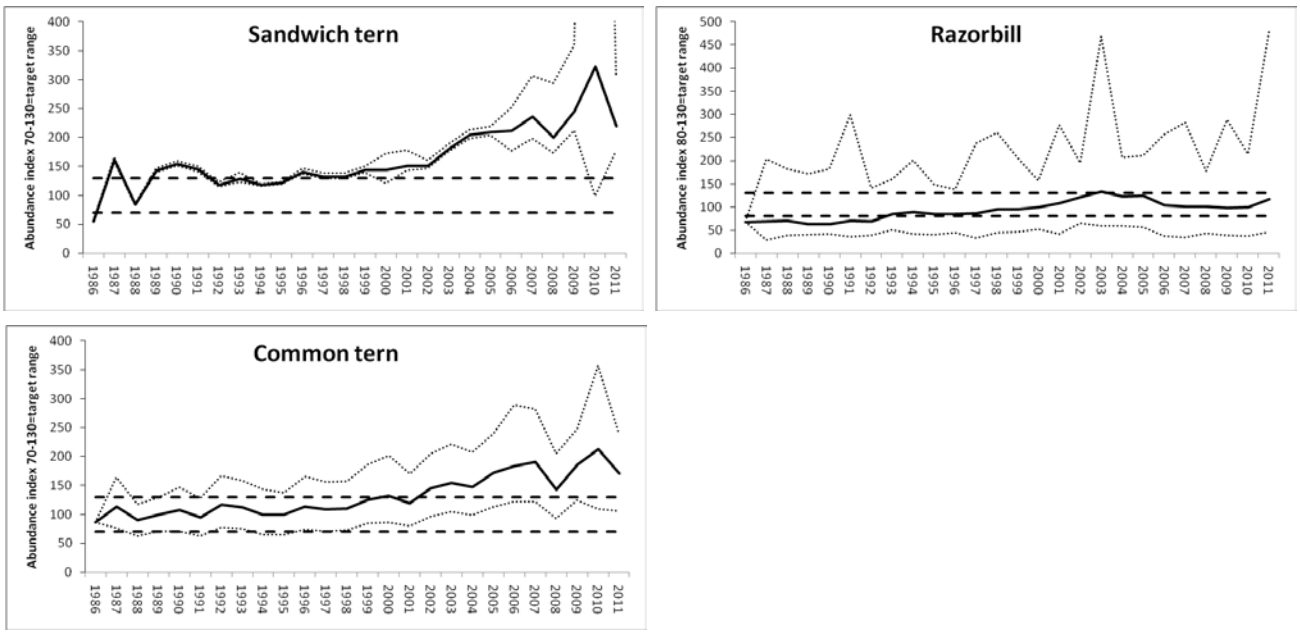


Figure 1.5.5.1.A1 Trends in abundance of individual species in OSPAR Region III, 1986–2011. Fine dotted lines indicate the upper and lower boot-strapped confidence limits. Bold dashed lines indicate the upper and lower target levels; 100 = reference level (baseline). For fulmars only colonies with minimum five years of data are used.