

Indicator name			Version
NB6b/NB17b: Abundance of wintering water birds			August 2018
Indicator type:	Risk/opportunity	Impact	Action
		X	
SCCAP Theme	SCCAP Objective	CCRA risk/opportunity	
Natural environment	N2: Support a healthy and diverse natural environment with the capacity to adapt	BD9: Changes in species migration patterns	

At a glance

- Climate change is already affecting the migration patterns of wintering waterbirds.
- The impact of climate change and other environmental drivers can be seen in the highly divergent trends in abundance for different species/groups.
- It is expected that wintering water birds will continue to be affected by environmental change, with new species overwintering in Scotland and existing species shifting locations, both within Scotland and across Europe.
- This has consequences for designated protected sites, and it highlights the need for monitoring to ensure protection is put in place in new locations as required.

Latest Figure	Trend
(2015/16) 118% of the 1975/6 baseline	Divergent for different groups. The overall number of wintering waterbirds peaked in 1997/98 at 153% of the 1975/76 baseline, then gradually declined to 2012, since when there has been a slight upturn.

Why is this indicator important?

There is clear evidence that bird migration patterns are changing. It is considered highly likely that this change will continue in response to climate change and other environmental drivers such as habitat change and alteration in species interactions (Brown et al, 2012).

Scotland is on the migratory route of many birds that breed in the Arctic. The coasts and inland waters provide an important overwintering habitat for migratory waterbirds, that are attracted by relatively mild winters and extensive wetland habitats. International laws require the UK to conserve and protect both the birds and their habitat, and the Scottish Biodiversity Strategy clearly identifies this priority (SESO, 2015). The non-estuarine coast is internationally important for specialist species including purple sandpiper and turnstone, while migratory geese overwinter in the agricultural lowlands and the islands (SNH, 2018).

This indicator measures the abundance of wintering waterbirds to help our understanding of the extent to which climate change is impacting upon migratory populations in Scotland. A changing abundance of such populations may have wide ranging implications for land management, including for Scotland's network of designated sites, if the qualifying features for which the sites were designated move to other locations in response to climate change. Additional species which begin to use Scotland within their migration pattern may create opportunities for the designation of new sites.

The abundance of wintering waterbirds is a Scottish Biodiversity Indicator and uses data from the Wetland Bird Survey (WeBS), which monitors non-breeding wintering waterbirds. Species are grouped into four categories:

Geese, ducks and swans, waders and waterbirds (comprising the four remaining species – little grebe, great crested grebe, cormorant and coot) (SNH, 2018).

Related indicators:

NB6a/NB17a Abundance and productivity of breeding sea birds

What is happening now?

As Figure 1 illustrates, the trends in abundance since 1975 have been strongly divergent for different groups. Using the winter of 1975/76 as a baseline (100%), overall waterbird numbers peaked in 1997/98 at 153% of the 1975/76 baseline, then gradually declined to 2012, since when there has been a slight upturn. In winter 2015/16 numbers were at 118% of the baseline. The peak was 153% in 1997/98.

Numbers of geese overwintering have increased significantly and reached an all-time high of nearly four times the 1975/76 levels in 2015/16.

Numbers of ducks and swans declined to 79% of the baseline in 1978/7. Numbers increased to a peak of 136% in 1995/96. A gradual decline followed, then a slight recovery from 2011 to 2015. In winter 2015/16 they were at 114% of the baseline.

Wader numbers have declined since the mid/late-1990s and in 2015/16 were at 79% of the baseline level, an all-time low.

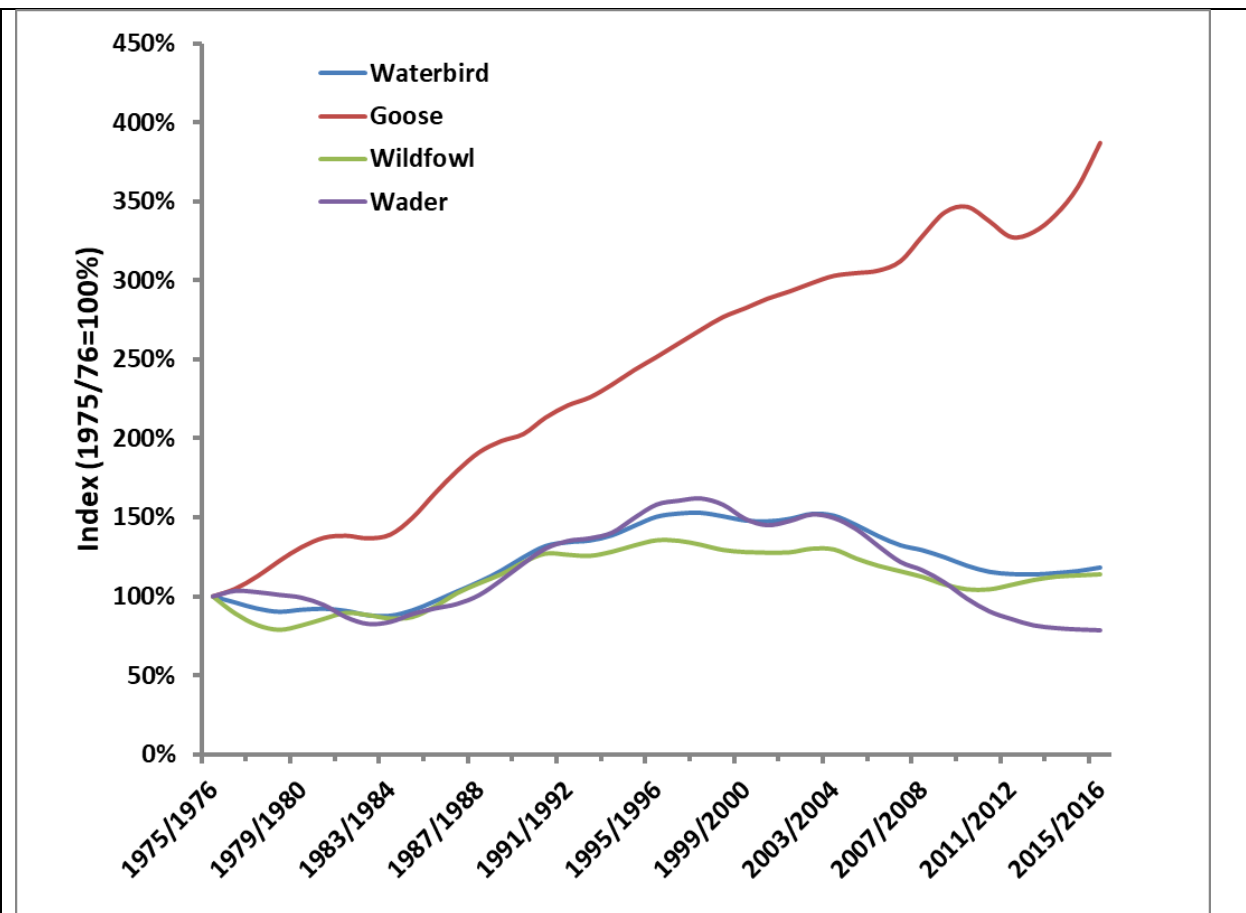


Figure 1: Abundance of Wintering Waterbirds in Scotland, 1975/76-2015/16

Source: Wetland Bird Survey Results (WeBS)/SNH, 2018

Within Europe, there has been a significant north-east shift in the distribution of some wading species leading to a decline in the number of overwintering species using UK east coasts sites in favour of The Netherlands (MacLean et al, 2008). However, this pattern may have reversed as a consequence of recent cold winters (Holt et al, 2012). In general, species associated with warmer winters have increased in number whereas those associated with cooler winters have declined in number (Pearce-Higgins & Holt, 2013).

The movement of other groups of waterbird species to more favourable shores can be seen on the east coast of Scotland where the velvet scoter and long-tailed duck are in decline (Pearce-Higgins & Holt, 2013). The Slavonian grebe although in decline in the south and east coast of England is increasing in number in Shetland and the west coast of Scotland (Harvey & Heubeck, 2012).

What has happened in the past?

See above

What is projected to happen in the future?

As we have already seen changes in migratory patterns with a changing climate, it is expected such changes will continue. Global populations of some species are projected to fall due to the impact of climate change in reducing the quality of breeding grounds in the Arctic. For other species, Scottish and UK populations will fluctuate in size due to changes in wintering locations. Some species have declined in the UK and are wintering further north and east, a shorter migration from their Arctic breeding grounds. Winter warming is at least partly responsible, however the impact of land use

change and availability of suitable habitat are also factors. Changing migration patterns have seen many species overwintering in unprotected areas, as they have shifted from their traditional sites where protection measures are often in place. There is a clear need for monitoring of future range changes and to ensure protective measures can be aligned with the adaptive behaviour of the birds (LWEC, 2014).

Patterns of change

Within the groups of waterbirds surveyed, there are marked differences in trends for different species.

The Icelandic population of greylag geese have remained fairly stable, with numbers now at 146% of the 1975 baseline... Barnacle geese populations from both Svalbard and Greenland increased significantly, as did pink-footed geese. However, Greenland white-fronted geese numbers have been in a prolonged decline since the late 1990s, although this has slowed over the last ten years.

Among ducks and swans, ten species increased in abundance and six species have declined. Numbers of gadwall are at an all-time high, while mallard, pochard and scaup are at an all-time low. Numbers of waders have declined most markedly with four species (golden plover, purple sandpiper, dunlin, and turnstone) at an all-time low in 2015/16. However, numbers of black-tailed godwit have significantly increased, and abundance of sanderlings has increased steadily. Black-tailed godwit in Scotland are generally from the Icelandic sub-population, and the increase is a response to a combination of agricultural and climatic change (Gill et al, 2007; cited in SNH, 2018).

Of the waterbirds not included in the above groups, there were increases in little grebe and cormorant, but declines in great crested grebe and coot (SNH, 2018).

Populations of the little egret are expanding in English estuaries and are likely to expand into Scotland if warming continues (Pearce-Higgins & Holt, 2013). Other herons, such as the great white egret and cattle egret, are showing similar patterns (Pearce-Higgins & Holt, 2013).

Interpretation of indicator trends

There is a lack of evidence to explain the above trends. However for some waders, such as purple sandpipers, declines have been attributed to poor breeding success, others may have shifted in range to less well monitored areas, or to other areas within Northwest Europe. This is expected to be the situation for dunlin, for example.

Changes occur not just due to conditions in Scotland, but in other areas, e.g. changes in Arctic climate/environment affecting breeding success and en-route changes (LWEC, 2014)

Numbers can fluctuate year on year due to a number of factors: milder weather attracts different species, natural population fluctuations and fluctuations in productivity (SESO, 2015).

The abundance of many migratory overwintering waterbirds is predicted to increase across the UK as a result of climate change due to more favourable conditions (Pearce-Higgins et al, 2011). Modelling work by Pearce-Higgins et al (2011) suggest these wading and overwintering waterbirds show a positive relationship between density and winter temperature. Conversely, if the climate continues to warm, we may see declines in UK abundance as species ranges shift further north and east forcing some overwintering species to leave our coasts for more favourable shores (Pearce-Higgins & Holt, 2013).

Limitations

Confidence in the accuracy of the data is high. However, species in the main coastal/estuarine sites are better monitored than those dispersed in smaller sites, and particularly those in the north and west. In some cases, species may have moved to new sites that are not monitored and are therefore not recorded (SESO, 2015).

This indicator measures only abundance, not distribution, of populations. To build understanding of shifting migration patterns and ensure protection of overwintering sites it may be helpful in future to also assess spatial distribution of wintering waterbird populations.

References

Brown, I et al (2012) *Climate Change Risk Assessment for the biodiversity and ecosystem services sector*. UK CCRA <https://www.gov.uk/government/policies/adapting-to-climate-change>

Gill, J.A., Langston, R.H.W., Alves, J.A. et al (2007) Contrasting trends in two black-tailed godwit populations: a review of causes and recommendations. *Wader Study Group Bulletin*, **114**, 43-50.

Harvey, P.V. and Heubeck, M. (2012) Changes in the wintering population and distribution of Slavonian Grebes in Shetland. *British Birds*, **105**, 704-715.

Holt, C.A., Austin, G.E., Calbrade, N.A., Mellan, H.J., Hearn, R.D., Stroud, D.A., Wotton, S.R. and Musgrove, A.J. (2012) *Waterbirds in the UK 2010/11: The Wetland Bird Survey*. BTO/ RSPB/JNCC. BTO Thetford.

Living With Environmental Change(LWEC) (2014) *Terrestrial Biodiversity Climate Change Impacts: Report Card 2012-13* <http://www.lwec.org.uk/resources/report-cards/biodiversity> (accessed February 2015)

Maclean, I.M.D., Austin, G.E., Rehfisch, M.M., Blew, J., Crowe, O., Delany, S., Devos, K., Deceuninck, B., Günther, K., Laursen, K. et al. (2008) Climate change causes rapid changes in the distribution and site abundance of birds in winter. *Glob. Change Biol.*, **14**, 2489-2500.

Pearce-Higgins, J.W., Johnston, A., Ausden, M., Dodd, A., Newson, S.E., Ockendon, N., Thaxter, C.B., Bradbury, R.B., Chamberlain, D.E., Jiguet, F. et al. (2011) *CHAINSPAN final report. Final Report to the Climate Change Impacts on Avian Interests of Protected Area Networks (CHAINSPAN) Steering Group*. Defra Ref: WC0750/CR0440

Pearce-Higgins, J.W. and Holt, C.A. (2013) Impacts of climate change on waterbirds, *MCCIP Science Review 2013*, 149-154, doi:10.14465/2013.arc16.149-154

SESO (2015) *Scottish Environment Statistics Online* <http://www.scotland.gov.uk/seo/RecentChanges.aspx> (accessed February 2015)

SNH (2018) *Scottish Natural Heritage Biodiversity Indicator: S004 Abundance of wintering water birds*. <https://www.nature.scot/sites/default/files/2018-09/Scottish%20Biodiversity%20Indicator%20-%20S004%20-%20Abundance%20of%20Wintering%20Waterbirds.pdf>

Further information

Acknowledgements

This is a Scottish Biodiversity indicator and information in this document is drawn from SNH's reporting of this indicator (see SNH, 2018). The primary data source is the volunteer survey, the Wetland Birds Survey (WeBS).

Suzanne Martin (RBGE) and Andrew Blight (MASTS) contributed to the 2016 version of this indicator.

Appendix One: Indicator metadata and methodology

Table 1: Indicator metadata

	Metadata
Title of the indicator	NB6b/NB17b Abundance of wintering water birds
Indicator contact: Organisation or individual/s responsible for the indicator	Ruth Monfries (Royal Botanic Garden Edinburgh/ClimateXChange)
Indicator data source	The Wetland Bird Survey, with additional information from Non-Estuarine waterbird surveys.
Data link: URL for retrieving the indicator primary indicator data.	www.bto.org/volunteer-surveys/webs

Table 2: Indicator data

	Indicator data
Temporal coverage: Start and end dates, identifying any significant data gaps.	1975/6 to 2015/16
Frequency of updates: Planned or potential updates	Annual
Spatial coverage: Maximum area for which data is available	Wetland sites in Scotland
Uncertainties: Uncertainty issues arising from e.g. data collection, aggregation of data, data gaps	Accuracy is high, but waterbird species that are widely dispersed in the countryside are relatively less well monitored than species concentrated on major wetlands (SESO, 2015)
Spatial resolution: Scale/unit for which data is collected	All major estuaries in Scotland (and the UK), with additional information from Non-Estuarine Waterbird Surveys
Categorical resolution: Potential for disaggregation of data into categories	Trends are monitored for 41 species of waterbirds that occur in Scotland. This includes ducks and swans, waders, cormorant, grebes and coots and can be disaggregated into categories (as used in this indicator: geese, ducks and swans and waders). Species data can be extracted by site, habitat, county or country.

Data accessibility: Restrictions on usage, relevant terms & conditions

Publicly available, charge applies for data requests from BTO

Table 3 Contributing data sources

Contributing data sources

Data sets used to create the indicator data, the organisation responsible for them and any URLs which provide access to the data.

See above

Table 4 Indicator methodology

Indicator methodology

The methodology used to create the indicator data

The data is compiled using annual estimated numbers of wildfowl, waders and other waterbirds using key wetland and coastal sites during winter.

The Index (including historic data) is remodelled each year, so that the Index for previous years is not necessarily comparable with previously produced indicators.

Further information about the methodology can be found at: <http://www.bto.org/volunteer-surveys/webs>