Wintering distribution changes & EU protected areas under climate change. The case study of the Smew (*Mergellus albellus*)

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Context

- Increasing winter temperature in northern Europe creates newly available (unfrozen) wintering sites closer to breeding grounds. Many suitable wintering areas in the Baltic Sea where frozen three decades ago but nowadays remain ice-free.
- Waterbirds are responding to climate change by changing their distribution polewards.
- This creates concern about the effectiveness of the current network of protected areas (PAs).
- Newly colonized wintering areas are can be unprotected because they were not available for waterbirds when the PA network was established in the northern archipelago of the Baltic Sea.
- EU Birds Directive: Protection of all European birds and their habitat through the classification of Special Protection Areas (SPAs).

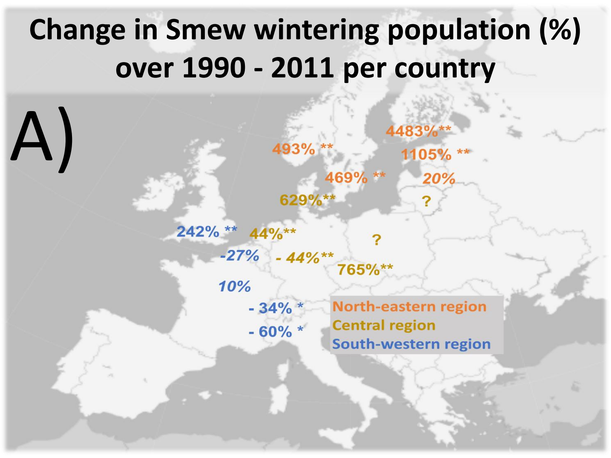
Hypotheses

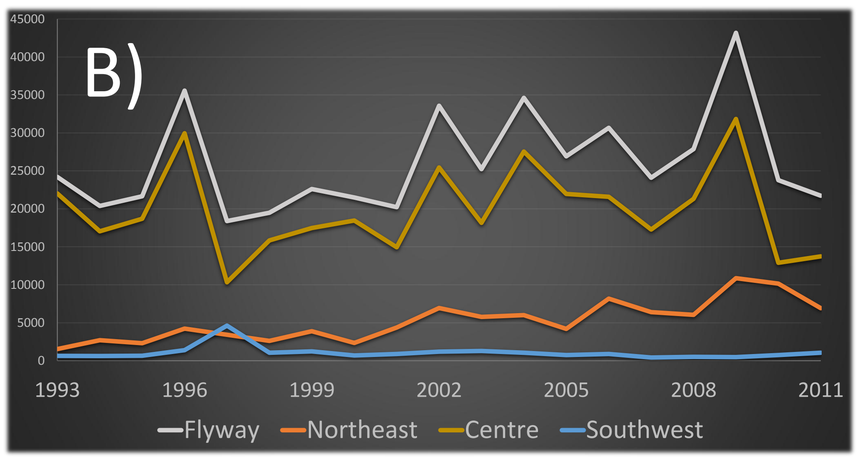
I. Increasing wintering numbers of Smew in northeastern Europe (NE) & declining numbers in southwestern (SW) in the past two decades following climate change predictions.

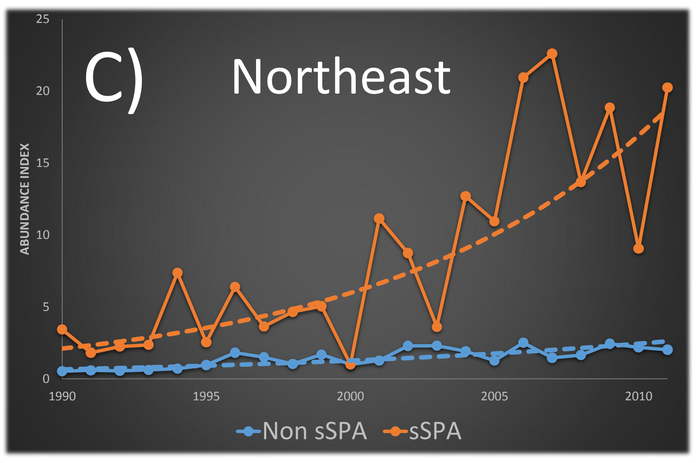
II. Negative correlation between wintering numbers in SW and temperature in northern Europe & positive correlation between wintering numbers in NE and temperature.

III. More positive trends inside Special Protection Areas.

Results







Population trends at country level over the whole study period (A) and estimated wintering numbers at regional and flyway level (B) were calculated with TRIM. Asterisk in panel A), denotes level of significance. Not significant trends in *italics*. Uncertain trends for countries with question mark (?). Data: International Waterbird Census (IWC) from 16 countries (whole flyway). Panel C) shows the statistically significant ($p < 0.001$) difference in trends inside versus outside Special Protection Areas (SPAs) in the NE part of the wintering range.

Discussion

I. WINTERING POPULATION TRENDS DIFFER BETWEEN REGIONS

- Numbers increased in the north-eastern (NE) edge of the range due to availability of new wintering sites close to the breeding grounds and consequently declined in the central part of the range.
- Declining numbers in the central and south-western (SW) part of the range were more markedly in the last decade suggesting a more recent shift northeastwards of the wintering population.

II. TEMPERATURE HAD IMPORTANT ROLE DRIVING THESE CHANGES IN ABUNDANCE

- Autoregressive models showed negative correlation between temperature in northern Europe and wintering numbers in the SW part of the range and some evidence of positive effect of temperature on wintering numbers in the NE: The warmer the winter is in northern Europe the more individuals are wintering in NE and fewer fly further to the SW part of the range.

III. SPA NETWORK FACILITATES RE-DISTRIBUTIONS BUT NEEDS REVISION AND IMPROVEMENT

- Wintering numbers in NE increased twice as fast inside SPAs than outside SPAs, but not in the centre or SW.
- Gap in SPA network: 85 – 98% of wintering individuals are found outside protected areas in Finland, Sweden and Latvia.

FINAL REMARK

Currently, 1/3 of the wintering population winters in the northern archipelago of the Baltic Sea (compared to 6% in 1990s) and large proportion of these individuals do so in unprotected areas. This may have detrimental consequences in the future for the population. Given the current rapid changes in waterbird distributions, there is an urgent need to identify key sites that now attract internationally important numbers, to reassess their legal designation status and establish appropriate adaptive management plans and conservation regimes that maintain a coherent and comprehensive network of protected sites that are responsive to (climate-driven) distribution changes throughout the flyway.