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Ecology and population dynamics of the common eider in the Dutch Wadden Sea

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Summary

Eiders *Somateria mollissima* have expanded their range and their numbers have increased dramatically during the last two centuries. This study analyses the situation for Eiders in The Netherlands. Eider colonies in the Dutch Wadden Sea settled with one or a few pairs. Their starting phase with numbers of less than 10, lasted 5 to 20 years in the various colonies. Hereafter, each colony showed a period of rapid growth with an increase of about 20% per year. At present this growth is slowing down and numbers have become more or less stable in the older colonies, but growth is still exponential in the younger ones.

There is no difference in mean clutch size between small and large colonies, but the average number of fledglings per nesting female is negatively correlated with colony size. Duckling survival was highly variable in the old colonies. Food density and feeding possibilities appear most important for survival of young ducklings, while diseases are important mortality factors in older ones. Duckling survival shows no negative relation with the number of gulls. Gull predation was a secondary effect since they only removed weak and undernourished ducklings.

Ringing showed that young females breeding for the first time are usually faithful to their natal colony. Once recruited, the females do not change their breeding colony. In males, natal dispersal is roughly estimated at 78% and breeding dispersal at 15% per year. I conclude that re-uniting is normal in Eiders. Dispersing males settled in a large area, up to about 1,700 km from the original colony. In females, ringing recoveries always peak in May and June, in males less pronouncedly between January and August. Annual female survival amounts to 0.95, except during a period of pesticide pollution in the 1960s. Duckling survival from fledging up to recruitment was sufficient to explain both colony growth and their later stability by local reproduction.

In addition to its being a breeding area, the Wadden Sea is also used by moulting and wintering Eiders from the Baltic Sea. They outnumber the local ones. The annual consumption by Eiders in the whole Wadden Sea is estimated at $9 \cdot 10^6$ kg ash-free dry organic mass per year, which means a predation pressure of 1.2 $g \cdot m \cdot^2 \cdot y^{-1}$, or an average of about 100 bird•days per ha per year. Numbers have not increased over the last 20 years, while the Baltic population has doubled. It is therefore likely that carrying capacity in the Wadden Sea has been reached.

The hypothesis is put forward that the increase in numbers and the expansion of the range southward is a recolonization after local extinction due to human predation. A decrease of the human predation pressure in remote coastal areas and islets during the so-called "Little Ice Age", and a concentration of humans into towns combined with changes in the food habits by the Industrial Revolution, may have made possible the beginning of the Eider's increase and expansion. Growing wealth, and concomitant changes in human attitude towards nature, supported by legislation and creation of coastal bird reserves, contributed to a continued expansion that is still going on. The same may hold true for other seabirds that have increased in the North Atlantic during the last centuries.