

## Aerial surveys of Harbour Seals in the Wadden Sea in 2013

- Is the population growth rate slowing down?

In 2013 the coordinated aerial surveys for harbour seal counts of the entire Wadden Sea were performed as in previous years (started in 1975). The counts are synchronised between the three Wadden Sea countries: Denmark, Germany and the Netherlands in order to obtain a single estimate for the number of harbour seals in the entire Wadden Sea and the number of pups born. Seals are counted when hauling out on sandbanks and counts are carried out when low-tide occurs during midday.

### Results and Interpretation

In August 2013 a total of 26,794 harbour seals were counted in the entire Wadden Sea, corresponding to a moderate increase of 2% compared to 2012. The number of pups born in 2013 showed a decrease compared to 2012: a total of 7,071 pups were counted, equivalent to a decrease of 3%. However, due to bad weather conditions not all areas were surveyed during the expected peak in harbour seal pupping.

The total moult count of 26,794 harbour seals in the Wadden Sea was composed of 2,759 in Denmark, 8,348 in Schleswig-Holstein, 8,082 in Lower Saxony and Hamburg and 7,605 in the Netherlands (see figure below). These detailed results reveal regional fluctuations: in Denmark there was a decrease of 30%, in Schleswig-Holstein the decrease was 10%, while the numbers increased by 25% and 16% in Lower Saxony/Hamburg and in the Netherlands, respectively.

The harbour seal counts during the moult for 2013 showed an increase in the western part and a decrease in the eastern part compared to 2012. This indicates that the spatial distribution of seals can shift considerably over time, as seen in previous years, and emphasizes that the harbour seal population in the Wadden Sea must be regarded as a whole. Seals move around possibly to optimise feeding and breeding and avoid disturbance. This also underlines the need for reporting the population status by coordinated flights covering the entire Wadden Sea.

The decrease in number of pups compared to 2012 derived from a pronounced decline in Lower Saxony/Hamburg (-31%; 1,373), whereas higher numbers were found in Schleswig-Holstein (+13%; 3,682). The pup counting results in Denmark (+8%; 613) and the Netherlands (-5%; 1,403) were similar to those from the last two years. The numbers may be underestimated in 2013, as weather conditions only permitted a limited number of surveys in June/July in some areas. However, the percentage of pups born per year has stagnated or declined since 2010, as also observed in the period 2005-2008 (see figure below).

The variation in the number of seals hauling out may be affected by weather, disturbance, food availability close to the haul out sites, or a change in the age and sex composition of the population. As animals of different age and sex do not moult at the same time (Härkönen *et al.* 1999), changes in the age composition of the population would result in shifts in the timing of the peak numbers. However, it is not possible to discern the different age and sex classes during the aerial surveys.

Since the last epidemic in 2002 the Wadden Sea harbour seal population showed an annual average growth of 9.6%. If the population growth rate is estimated using only two years, the variation caused by other factors than seal abundance (e.g., weather conditions) may have a significant effect on the estimates. Such effects are much reduced if a longer sequence of years is used in the calculations (Meesters *et al.* 2007, Teilmann *et al.* 2010). In 2008, the average growth rate for the first five years after the 2002 epidemic was 13.4%, just above

the theoretical maximum annual growth rate of a harbour seal population of 13% per year (Härkönen et al. 2002). Since then, the sliding 5-year average growth rate has been decreasing (11.1% in 2009, 9.3% in 2010, 9.0% in 2011, 8.3% in 2012 and 5.8% in 2013). The decreasing growth rate might occur due to the harbour seal population approaching the carrying capacity of the current environmental conditions in the Wadden Sea or that the moulting peak has shifted over the years. This needs to be investigated further by exploring pup survival and the timing of the peak of the moult.

The estimate for the total Wadden Sea harbour seal population, including seals being in the water during the survey, can be calculated using a correction factor estimated by Ries et al. (1998). They found that on average 32% of the seals were in the water at any time. By using this correction factor the total population size of harbour seals in the Wadden Sea in 2013 was about 39,400.

## References

- Härkönen T, Harding KC, Heide-Jørgensen MP (2002) Rates of increase in age-structured populations – a lesson from the European harbour seals. *Canadian Journal of Zoology* 80: 1498-1510.
- Härkönen T, Harding KC, Lunneryd SG (1999) Age- and sex-specific behaviour in harbour seals *Phoca vitulina* leads to biased estimates of vital population parameters. *Journal of Applied Ecology* 36: 825-841.
- Meesters E., Reijnders P., Brasseur S., Siebert U., Stede M., Tougaard S. & Härkönen T. (2007) An effective survey design for harbour seals in the Wadden Sea: tuning Trilateral Seal Agreement and EU-habitat Directive requirement. In: The meeting of the Trilateral Working Group TWG 07/1, Delfzijl, The Netherlands, 18-19 April, The Netherlands. Wilhelmshaven: Trilateral Working Group 2007.
- Ries EH, Hiby, L. R., and Reijnders, P. J. H. (1998) Maximum likelihood population size estimation of harbour seals in the Dutch Wadden Sea based on a mark-recapture experiment. *Journal of Applied Ecology* 35: 332-339.
- Teilmann, J., Riget, F. & Härkönen (2010). Optimising survey design for Scandinavian harbour seals: Population trend as an ecological quality element. *ICES Journal of Marine Science*, 67: 952-958.

## Trilateral Seal Expert Group (TSEG):

Sophie Brasseur, IMARES, Texel, The Netherlands  
Britta Diederichs, LKN Schleswig-Holstein, National Park Administration, Tönning, Germany  
Richard Czeck, National Park Administration Wadden Sea of Lower Saxony, Wilhelmshaven, Germany  
Lasse Fast Jensen, Fisheries and Maritime Museum, Esbjerg, Denmark  
Anders Galatius, Department of Bioscience, Aarhus University, Roskilde, Denmark  
Sven Ramdohr, LAVES Cuxhaven, Lower Saxony, Germany  
Ursula Siebert, ITAW, University of Veterinary Medicine Hannover, Büsum, Germany  
Jonas Teilmann, Department of Bioscience, Aarhus University, Roskilde, Denmark (Chair of the TSEG)  
Peter Körber, State Ministry for Urban Development and the Environment, National Park Wadden Sea of Hamburg, Hamburg, Germany  
Sascha Klöpffer, Common Wadden Sea Secretariat, Wilhelmshaven, Germany (Secretary of TSEG)

