

Estimating the abundance of the critically endangered Baltic Proper harbour porpoise (*Phocoena phocoena*) population using passive acoustic monitoring

Mats Amundin¹, Julia Carlström², Len Thomas³, Ida Carlén⁴, Jens Koblitz⁵, Jonas Teilmann⁶, Jakob Tougaard⁷, Nick Tregenza⁸, Daniel Wennerberg¹, Olli Loisa⁹, Monika Kosecka¹⁰, Line A. Kyhn⁶, Cinthia Tiberi Ljungqvist¹, Signe Sveegaard⁶, Louise Burt³, Iwona Pawliczka¹⁰, Ivar Jüssi¹¹, Radomil Koza¹⁰, Bartłomiej Arciszewski¹⁰, Anders Galatius⁶, Martin Jabbusch¹², Jussi Laaksonlaita⁹, Sami Lyytinen⁹, Jussi Niemi⁹, Aleksej Šaškov¹³, Jamie MacAulay¹⁴, Andrew Wright⁷, Anja Gallus¹², Penina Blankett¹⁵, Michael Dähne¹², Alejandro Acevedo-Gutiérrez¹⁶, and Harald Benke¹²

¹Kolmarden Wildlife Park

²AquaBiota Water Research

³University of St Andrews

⁴AquaBiota Water Reserach

⁵Max Planck Institute of Animal Behavior

⁶Aarhus Universitet

⁷Aarhus University

⁸Chelonina Ltd

⁹Turku University of Applied Sciences

¹⁰University of Gdansk Institute of Oceanography

¹¹Pro Mare MTÜ

¹²German Oceanographic Museum

¹³Klaipeda University

¹⁴Sea Mammal Research Unit

¹⁵Ymparistoministerio

¹⁶Western Washington University

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Abstract

Knowing the abundance of a population is a crucial component to assess its conservation status and develop effective conservation plans. For most cetaceans, abundance estimation is difficult given their cryptic and mobile nature, especially when the population is small and has a transnational distribution. In the Baltic Sea, the number of harbour porpoises (*Phocoena phocoena*) has collapsed since the mid-20th century and the Baltic Proper harbour porpoise is listed as Critically Endangered by the IUCN; however, its abundance remains unknown. Here, one of the largest ever passive acoustic monitoring studies was carried out by eight Baltic Sea nations to estimate the abundance of the Baltic Proper harbour porpoise for the first time. By logging porpoise echolocation signals at 298 stations during May 2011-April 2013, calibrating the loggers' spatial detection performance at sea, and measuring the click rate of tagged individuals, we estimated an abundance of 66-1,143 individuals (95% CI, point estimate 490) during May-October within the population's proposed management border. The small abundance

estimate strongly supports that the Baltic Proper harbour porpoise is facing an extremely high risk of extinction, and highlights the need for immediate and efficient conservation actions through international cooperation. It also provides a starting point in monitoring the trend of the population abundance to evaluate the effectiveness of management measures and determine its interactions with the larger neighbouring Belt Sea population. Further, we offer evidence that design-based passive acoustic monitoring can generate reliable estimates of the abundance of rare and cryptic animal populations across large spatial scales.

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