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, Ivona Pawliczka¹⁰, Ivar Jüssi¹¹, Radomil Koza¹⁰, Bartłomiej Arciszewski¹⁰, Anders Galatius⁶, Martin Jabbusch¹², Jussi Laaksonlaita⁹, Sami Lyyninen⁹, 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 Research
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

July 29, 2021

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.

Hosted file
