Population viability analysis for harbour porpoise and common dolphin in the Iberian Peninsula, incorporating fishery bycatch mortality and expected effects of PCB bioaccumulation on individual fecundity

Diego Fernández-Fernández[1], Paula Gutiérrez-Muñoz[2], Fiona L. Read[3,5], Alfredo López[4], Pablo Covelo[4], Camilo Saavedra[2], Begoña Pérez-Fernández[2], Lucía Viñas-Dieguez[2], Graham J. Pierce[1,3]

1. IIM-CSIC, Instituto de Investigaciones Marinas
2. Instituto Español de Oceanografía, Centro Oceanográfico de Vigo
3. University of Aberdeen
4. CEMMA- Coordinadora para o Estudio dos Mamíferos Mariños
5. Life History Studies, Aberdeen

» diegoferfer0525@gmail.com

Population viability analysis offers a means to examine the expected trajectories of populations and explore the consequences of conservation management measures. Common dolphin and harbour porpoise are among the most frequently seen cetaceans along the Atlantic coast of the Iberian Peninsula. Both species are known to suffer significant fishery bycatch mortality and to have high concentrations of PCBs in their blubber, although there is also high between-individual variability. Stochastic population models were constructed using the best available mortality rate data derived from strandings for the Iberian Peninsula. Empirical data on PCB concentrations in blubber versus age in males and in neonates were used to derive plausible initial PCB burdens and annual rates of PCB intake. The plausibility of these estimates was checked, comparing them respectively with estimates derived from expected daily food intake and PCB concentrations in fish, and published estimates of maternal transfer of PCBs from female dolphins to their calves. Individual fecundity was initially set to the maximum plausible value of 1.0 (100% of reproduction probability) prior to accounting for effects of PCBs, assuming a linear decline in fecundity between the lower threshold for onset of reproductive effects and the upper threshold for infertility based on published values. Population level fecundity was then a function of age at maturity and population age structure, which was initially set to a plausible distribution based on strandings data, adjusted for underrepresentation of the youngest animals. Results indicate a high likelihood of extinction within a few decades in the case of the small Iberian porpoise population while the Iberian portion of the Northeast Atlantic common dolphin population shows different trajectories depending mainly in the amount of bycatch events.