

SC/66a/SM/20

Progress on Lagenorhynchus research:
Pacific white-sided dolphin demography in
Canada, and a proposed workshop at
Society for Marine Mammalogy

Erin Ashe, Rob Williams, Alexandra Morton and Philip
S. Hammond



INTERNATIONAL
WHALING COMMISSION

Progress on *Lagenorhynchus* research: Pacific white-sided dolphin demography in Canada, and a proposed workshop at Society for Marine Mammalogy

Erin Ashe, Rob Williams, Alexandra Morton and Philip S. Hammond

New information Pacific white-sided dolphin population parameters

The Scientific Committee last considered the status of *Lagenorhynchus* at its 1996 meeting in Aberdeen, Scotland. At that time, new information on Pacific white-sided (*L. obliquidens*) dolphin life history parameters (Heise 1996b) and diet (Heise 1996a) were presented, relying primarily on data from stranded and bycaught animals.

Morton (2000) initiated a photo-identification study of Pacific white-sided dolphins in 1987. Pacific white-sided dolphins recolonised inshore waters of British Columbia (BC), Canada in 1984 after decades of very few or no sightings (Morton 2000), although the dolphins had previously been observed in BC's offshore and continental shelf waters (Leatherwood et al. 1984; Morton 2000). Morton (2000) documented the relative increase in dolphin abundance in BC's Broughton Archipelago region over a period of approximately 15 years. Ashe resumed the study in 2007, and conducted field and analytical studies to: (i) explore the dolphins' ecology; (ii) conduct mark-recapture statistical analyses of demography; (iii) initiate a pilot study of acoustics as a tool to discriminate among social units; and (iv) search for evidence of sociality in dolphins using BC inshore waters.

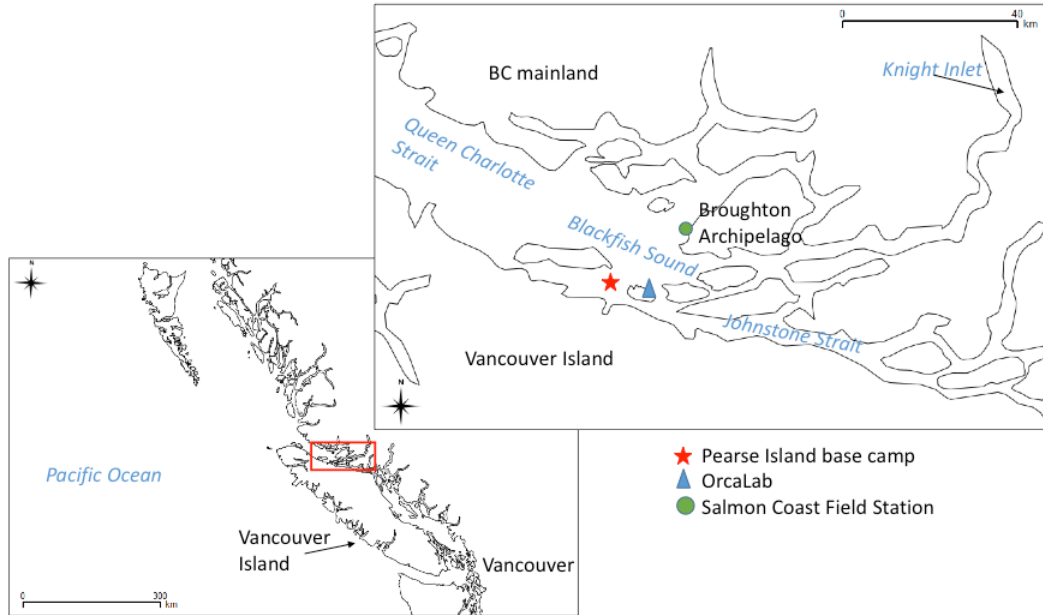


Figure 1. Study area along Canada's Pacific coast.

New population parameters were estimated from photo-ID data for the first time in this species. Abundance was highly variable from year to year: ranging from 2,889 (95% CI: 1,424-5,863) to 546 (95% CI: 293-1,018), after accounting for the proportion (0.57; 95% CI: 0.55 - 0.60) of marked dolphins. The study found support for philopatry and there was statistically significant support for a high degree of sociality (i.e., social differentiation in pairs of dolphins) in Pacific white-sided dolphins. Some individual dolphins were resighted over 19-year periods, and several associated pairs were seen together more than a decade apart. The mean proportion of calves was estimated as 0.0597 (SE=0.0083, 95% CI: 0.045-0.079) *per capita*, translating to an average probability of pregnancy in adult females of 0.238 (95% CI: 0.180-0.316) and an average inter-birth interval of 4.2 years.

Usage of the area by mammal-eating killer whales (in days; tallied from land-based monitors using consistent effort) was used as a candidate covariate in a Cormack-Jolly-Seber mark-recapture analysis of dolphin survival. A negative relationship was found between killer whale presence and apparent dolphin survival rate. Recently, mammal-

eating killer whales were present often enough to account (theoretically) for all of the estimated dolphin mortality, using bioenergetics models. Approximately 3.9% of dolphins bore injuries from killer whales, whereas only 0.5% showed evidence of interactions with fishing gear or propellers.

Both sociality and acoustic evidence was found for population structure in the form of one core and one peripheral group, but this requires additional, targeted research. Population viability analysis predicts an annual decline of -0.127 (95% CI: -0.14689 to -0.10701) over the next 50 years, but this predicted decline is driven by two key factors that require additional research. First, the trajectories assume a very long average interbirth interval, but photo-ID data in very large schools could easily underestimate the number of calves. Secondly, the estimates of non-calf survival may be pessimistic, because although robust design models were used to account for temporary emigration, the photo-ID evidence suggests that dolphins may go missing or undetected for periods (~19 years) that blur the line between temporary and permanent emigration. Consequently, the predictions of trend based on a small fraction of the dolphins' range may not apply to stock as a whole. Nevertheless, these findings advance our knowledge of the biology of this poorly studied species and contribute to our best available science to inform future conservation status assessments.

A proposed Lagenorhynchus workshop for Society of Marine Mammalogy

Research and management efforts in marine mammal conservation often hinge on a definition of the biological unit to conserve, whether that is a population, subspecies, or species. For some groups, such as the diverse genus, *Lagenorhynchus*, information on demography, general biology, and intra-/inter-specific relationships is often lacking, and the statistical power to detect declines in these cases is generally poor (Taylor et al. 2007). A wide degree of morphological variation exists within the genus. Independent lines of evidence suggest that a reclassification of some of these species within the genus is warranted (Perrin et al. 2013). Both acoustic (Kyhn et al. 2010) and genetic (Cipriano 1997; Harlin-Cognato and Honeycutt 2006; LeDuc et al. 1999) lines of evidence point to reclassification, and that some *Lagenorhynchus*, including Pacific

white-sided dolphins, belong in the genus *Sagmatias* (Perrin et al. 2013). Additionally, the relationships among *Lagenorhynchus*, *Cephalorhynchus* and *Lissodelphis* remain unclear. To better understand the current state of the field regarding the complex classification of species within these groups, as well as the status of stocks within species, there is a need to bring together researchers investigating taxonomy, genetics, acoustics, morphology, and conservation status of *Lagenorhynchus* and closely-related species. The Society for Marine Mammalogy Biennial Meeting in San Francisco provides an invaluable opportunity for a workshop focused on integrating *Lagenorhynchus* researchers for this purpose. Several of us (including Frank Cipriano, Bill Perrin, Randall Reeves, Barb Taylor, and Nikki Vollmer, among others) proposed a workshop to connect scientists working on this genus around the world, picking up where the 1996 IWC meeting on *Lagenorhynchus* left off. This workshop will provide a platform for researchers to compare lessons learned and to build new collaborations with international colleagues who have experience studying *Lagenorhynchus* (and potentially unpublished data). Our target audience includes researchers working at all academic levels (e.g., principle investigators, postdocs, graduate students) on *Lagenorhynchus*, *Cephalorhynchus*, and *Lissodelphis*, and specifically scientists with expertise in taxonomy, molecular genetics, conservation, demography, and acoustics. The main goals of this endeavor are to identify partnerships and expertise, where genetic samples are held, and potential funding sources to conduct analyses where needed. We also aim to submit a review paper formulated from workshop discussions to a peer-reviewed journal that will summarize the current knowledge of *Lagenorhynchus* species and suggest avenues for future funding and research. This workshop will initiate and promote correspondence among people working on these species, build productive collaborations at a global scale, and combine resources and lessons learned to allow us to study, collectively, these dolphins at ecologically meaningful spatial scales. Finally, if consensus is reached through workshop activities, the workshop chairs will make a taxonomic recommendation to the SMM Taxonomy Committee for reclassification of the species currently within the genus *Lagenorhynchus*.

We seek assistance from individual members the Scientific Committee to disseminate

information about this new initiative among their professional networks. We are certain that we are missing information on this genus that has been published in languages other than English, or introductions to early-career researchers who have not yet had a chance to publish their findings at all. We are in the process of raising funds for SMM2015, and would welcome introductions to researchers, especially students and early-career researchers, who work on *Lagenorhynchus* in the southern hemisphere, and who may not be able to attend the workshop without travel funding.

References

Cipriano F. (1997) Antitropical distributions and speciation in dolphins of the genus *Lagenorhynchus*: a preliminary analysis. *Molecular Genetics of Marine Mammals Volume Special Publication 3*.

Harlin-Cognato A.D., Honeycutt R.L. (2006) Multi-locus phylogeny of dolphins in the subfamily Lissodelphininae: character synergy improves phylogenetic resolution. *BMC evolutionary biology* **6**, 87.

Heise K. (1996a) Diet and feeding behaviour of Pacific white-sided dolphins (*Lagenorhynchus obliquidens*) as revealed through the collection of prey fragments and stomach contents. Paper presented to the Scientific Committee of the International Whaling Commission, Small Cetaceans Sub-Committee.

Heise K. (1996b) Life history and population parameters of Pacific white-sided dolphins (*Lagenorhynchus obliquidens*). Paper presented to the Scientific Committee of the International Whaling Commission, Small Cetaceans Sub-Committee.

Kyhn L.A., Jensen F.H., Beedholm K., Tougaard J., Hansen M., Madsen P.T. (2010) Echolocation in sympatric Peale's dolphins (*Lagenorhynchus australis*) and Commerson's dolphins (*Cephalorhynchus commersonii*) producing narrow-band high-frequency clicks. *The Journal of Experimental Biology* **213**, 1940-1949.

Leatherwood S., Reeves R., Bowles A., Stewart B., Goodrich K. (1984) Distribution, seasonal movements, and abundance of Pacific white-sided dolphins in the eastern North Pacific. *Scientific Reports of the Whales Research Institute* **35**, 129-157.

LeDuc R., Perrin W., Dizon A. (1999) Phylogenetic relationships among the delphinid cetaceans based on full cytochrome b sequences. *Marine Mammal Science* **15**, 619-648.

Morton A. (2000) Occurrence, photo-identification and prey of Pacific white-sided dolphins (*Lagenorhynchus obliquidens*) in the Broughton Archipelago, Canada 1984-1998. *Marine Mammal Science* **16**, 80-93.

Perrin W.F., Rosel P.E., Cipriano F. (2013) How to contend with paraphyly in the taxonomy of the delphinine cetaceans? *Marine Mammal Science* **29**, 567-588.

Taylor B.L., Martinez M., Gerrodette T., Barlow J., Hrovat Y.N. (2007) Lessons from monitoring trends in abundance of marine mammals. *Marine Mammal Science* **23**, 157-175.