




11th Symposium on Morphometrics and Evolution of Shape

30th juin-2nd July 2021
Online

*Programme, abstracts and
instructions for participants and panelists*

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3D analysis of vertebral morphology in Dall's porpoise (*Phocoenoides dalli*): an example of habitat driven morphology-functional adaptation

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Particular vertebral morphologies have been reported for coastal and oceanic cetaceans. Dall's porpoise (*Phocoenoides dalli*) vertebral column is considered one of the most derived among cetaceans. Total vertebral count exceeds greatly that of any other porpoise species, having strongly compressed vertebrae with exceptionally long processes. We employed 3D geometric morphometrics techniques and multivariate statistics to analyze particular vertebral morphology of Dall's porpoise when compared to other four porpoise species (*N. phocoenoides*, *P. phocoena*, *P. dioptrica*, *P. spinippinnis*), and a pelagic dolphin (*Lagenorhynchus cruciger*) known to show vertebral morphologies associated with fast swimming in an oceanic environment. Principal component analyses (PCA) showed great differentiation of Dall's porpoise with regards to the other species studied here, except when comparing the mid-torso with the oceanic dolphin. PCA results were supported by statistically significant Mahalanobis distances calculated between species. In these small odontocetes, vertebral morphology is distinctive and varies with the differential foraging strategies and habitat of each species. In the oceanic Dall's porpoise, an extremely high vertebral count in conjunction with vertebrae morphological features (*i.e.*, disk-shaped centra and long strongly bent processes) reveal a vertebral column structure that would be associated with greater stability, particularly adapted for fast swimming in pelagic waters. These findings reveal morphological plasticity among porpoise species and a possible convergence between Dall's porpoise and an oceanic dolphin in the mid-colum, one of the main areas for force production by swimming muscles. Our result highlight the importance of habitat use and behavioral complexity in the evolutionary development of morphological adaptations.

Keywords: 3D geometric morphometrics, vertebral morphology, column stability, Dall's porpoise

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