2016 SMALL GRANT IN AID OF RESEARCH – ANNUAL SUMMARY REPORT

DEVELOPMENT OF BIOSONAR-RELATED STRUCTURES OF DOLPHINS (Odontoceti: Delphinoidea)

Guilherme Frainer – gui.frainer@gmail.com

Universidade Federal do Rio Grande do Sul, Brazil

SUMMARY REPORT

Even 56 years after Norris and colleagues (1961) proved that dolphins does not use sounds only for communication but for hunting and navigation, the detailed functional anatomy of the sound production apparatus in dolphin head still remains uncertain. Investigations comparing the general anatomy of the epicranial complex (*i.e.* main sound source for echolocation and communication) in dolphins using classical (*e.g.* macroscopical dissection) and advanced techniques (*e.g.* computed tomography, 3D morphometric geometrics) might not only be useful in interpreting acoustic behavior data published elsewhere but provide insights into the evolution of the nasal tract in odontocetes. The research award provided by the Society for Marine Mammalogy was useful for travelling from Cologne (Germany) to Copenhagen (Denmark) and Port Elizabeth (South Africa) to visit the Zoological Museum - University of Copenhagen and Port Elizabeth Museum at Bayworld, respectively. The main goal of this PhD's sub-project was to start a comparative approach concerning the skull ontogeny of phylogenetic distant dolphin species, in which 157 skulls of three species (*i.e. Phocoena phocoena*, n=75; *Lagenorhynchus albirostris*, n=31; and *Sousa plumbea*, n=51) were analyzed using a Microscribe 3D digitizer. The mandible has been studied for the first time with this method in this work. Since the analysis of an ontogenetic skull series of *Pontoporia blainvillei* and *Tursiops gephyreus* are scheduled for the second semester (2017), the completion of this work needs further analysis - *i.e.* scheduled for 2018 - of *Cephalorhynchus commersonii* and *Phocoena dioptrica* (Museo Acantushún, Tierra del Fuego-ARG), *Sotalia guianensis* (Nacional - UFRJ, Rio de Janeiro-BRA) and *Inia geoffrensis* (Museu Paraense Emílio Goeldi, Pará-BRA) which depends on future financial investment. However, the stay in South Africa provided an unprecedented opportunity to perform dissections on *Sousa* specimens (including the analysis of CT-scans), for which biosonar-related anatomy remained largely unknown until now. In this way, a detailed description of the epicranial complex of the Indian Humpback dolphin, *Sousa plumbea*, was performed to compose the first result of my PhD: an original research article entitled "THE EPICRANIAL COMPLEX OF THE HUMPBACK DOLPHIN *Sousa plumbea* (CUVIER, 1929) AND SOUND PRODUCTION ASYMMETRY IN DOLPHINS". The macroscopic morphology of structures involved in sound generation in the Indian humpback dolphin (*Sousa plumbea*) are described for the first time using computed tomography imaging and gross dissection. Sousa spec. may represent a useful comparative model in comparison to the bottlenose dolphin (*Tursiops* spec.) to get insights into the functional anatomy of the sound production in dolphins since these coastal dolphins exhibit similar body size and share similarities in acoustic behavior. The presence of a small left posterior branch of the main acoustic fat body (melon) in *S. plumbea* might reflect an adaptation for communication sounds production as seen in some delphinids with high-frequency vocalizations. This finding addresses differences of the asymmetry of the sound production structures in dolphins and address previous findings in my ongoing PhD. I´m grateful to the Society for Marine Mammalogy for the confidence and interest in this investigation as well as for supporting such study.