capture composition was 95.8 % porpoises and 4.2 % dusky dolphin and with a 95.75 % recovered dead and 4.3% alive from the nets. Small cetacean meat was used for fisher's consumption or trade; the meat was sold US$0.60 – US$1.5 /kg and is consumed fresh or processed as *muchame*, a dried local dish.

Different approaches were identified for monitoring and reducing cetacean bycatch: 1) socioeconomic and market studies, 2) incorporate devices to avoid incidental captures, 3) sensitize and develop campaigns for reducing demand for small cetacean meat and 4) enforcement of the law.

Movements of common bottlenose dolphins (Tursiops truncatus) within the Pelagos Sanctuary (North-Western Mediterranean Sea).

De Santis, Valentina[1]; Azzellino, Arianna[2]; Lanfredi, Caterina[3]; Airoldi, Sabina[4]; Bellingeri, Michela[5]; Gnone, Guido[5]; Nuti, Silvio[6]; Labach, Helene[7]; Notarbartolo di Sciara, Giuseppe; Gonzalvo, Joan[8]
(1) Tethys Research Institute, Politecnico di Milano, Italy
(2) Politecnico di Milano, Milano, Italy
(3) Tethys Research Insitute, Milano, Italy
(4) Tethys Research Institute, Bordighera, Italy
(5) Acquario di Genova, Costa Edutainment S.p.A.,, Genova, Italy
(6) CE.TU.S. Cetacean Research Center, Viareggio, Italy
(7) GIS3M, Sausset-les-pins, France
(8) Tethys Research Institute, Milano, Italy
Corresponding Author: vale.desa@tiscali.it

Common bottlenose dolphin (*Tursiops truncatus*) research and conservation actions were implemented in the Pelagos Sanctuary, the largest marine protected area (87,500 km^2) for Mediterranean marine mammals, within the framework of project "Dolphins Without Borders", Studies were conducted in three areas with a water surface, respectively (west to east), of 11,000, 2,200 and 8,150 km^2, between Nice and Elba Island. During 203 visual surveys, totaling about 8700 km of research effort under positive conditions (sea state < 4 on the Douglas scale), bottlenose dolphins were sighted 101 times. The unified photo-identification catalogue resulted in a total of 185 well-marked individuals.Of these, 53 (28%) matched with at least one of the other two catalogues. Only 2 dolphins (1%), both mother/newborn pairs, sighted between July and September 2018, were included in all the three catalogues. The maximum displacement distance was measured for each dolphin sighted at least twice (n=143): mean and median displacements were respectively 105, and 81 km, with 20% of the dolphins showing a displacement higher than 188 km, while the maximum displacement recorded was 272 km. These movements are longer than those reported in a similar study carried out in the same area, suggesting a possible extension of the dolphins' home range over time. The photo-ID data collected within this project were also matched with those collected along the French Mediterranean coast and Corsica within the GDEGeM project (2014, 381 individuals), resulting in only 4 matches, all involving individuals moving between Liguria and the eastern portion of the French coast. This result seems to confirm that there are quite stable discontinuities in the connectivity of the Pelagos bottlenose dolphin network, in agreement with previous studies.

The unprecedented sensitivity of the external ear canal of odontocetes, evolutionary adaptation, functional morphology, and histopathology

De Vreese, Steffen[1]; Andre, Michel[2]; Mazzariol, Sandro[3]
(1) Dipartimento di Biomedicina Comparata e Alimentazione (BCA) - Università degli Studi di Padova (It) Laboratori d'Aplicacions Bioacústiques (LAB) - Universitat Politécnica de Catalunya (Es), Legnaro, Italy
(2) Technical University of Catalonia, Vilanova i la Geltru, Spain
(3) Department Comparative Biomedicine and Food Science - University of Padova, Legnaro, Italy
Corresponding Author:
steffendevreese@gmail.com

Over the course of evolution, the odontocete hearing apparatus has undergone major adaptations with the development of alternative hearing pathways. As such, the external ear canal lost its function as sound conductor but still constitutes active components such as glands, muscles, an intense vascularization, and sensory nerve formations[1]. Although the function of the ear canal was subject to debate in early cetacean research, it got neglected as focus was put on other structures, and its significance remains a conundrum heretofore. In this study, we analysed the ear canals of various odontocetes (incl. striped dolphin, bottlenose dolphin, common dolphin, harbour porpoise, long-finned pilot whale, and Cuvier´s beaked whale) using macro- and microscopic techniques to study morphology and pathology. Results indicate that the ear canal has acquired an unprecedented sensitivity that could function as an extero- and proprioceptive pressure sensor. We describe mechanoreceptors, identified as simple lamellar corpuscles in all of the odontocetes, while absent in terrestrial mammals, which show

morphological resemblance to the inner core of Pacinian corpuscles as shown by immunohistochemistry, transmission electron microscopy, and immunofluorescence and confocal microscopy. The receptors form part of a complex nervous network that surrounds the ear canal in its superficial half, while it is concentrated into a ´sensory ridge´ in the medial half, associated with cartilage, vascular lacunae, and the tympanic membrane. We provide a preliminary hypothesis that the ear canal has an essential role in the correct functioning of the hearing apparatus. And finally, we describe various pathologies, including purulent otititis externa and granulomatous dermatitis with hyperplastic pigment-laden macrophages, which could negatively affect those functions, and/or could serve as indicators for infectious diseases and other causes of death. These results provide essential information for a better understanding of the sensory system of cetaceans, functional morphology of the hearing apparatus, and associated pathologies.

Feeding of humpback whales (Megaptera novaeangliae) in Nicaragua, Central American Breeding ground.

De Weerdt, Joëlle[1]; Ramos, Eric Angel[2]
(1) Association ELI-S, Gujan-Mestras, France
(2) The Graduate Center, City University of New York, BROOKLYN, NY
Corresponding Author: eliscientific@gmail.com

We report evidence of feeding by humpback whales in the Central American subpopulation of this species along the Pacific coast of Nicaragua during their winter breeding seasons in 2017 and 2018. Boat-based surveys were conducted to collect data on whales as part of ongoing studies at two field sites: Northern and Southern Nicaragua. We documented 18 events with either direct or indirect evidence of whale feeding activity, exclusively in Southern Nicaragua. Lunge feeding was observed on 6 occasions and in 12 sightings there was indirect evidence of feeding including the erratic surface movements, the presence of feces, and close associations with feeding aggregations of seabirds and dolphins. Photo-identification analysis revealed that at least one whale was documented feeding in both years, indicating some whales may regularly feed in this location to account for the energetic demands of migration. These findings provide important insights into the importance of Nicaragua for migrating humpback whales.

Numerical modeling tools investigating marine mammal lung and melon response to underwater explosion impulse

DeAngelis, Monica[1]; Fetherston, Thomas[2]; Guzas, Emily[3]; Turner, Stephen[3]; Mitchell, Glenn[4]; Hesse, Rachel[3]; Perez, Daniel[3]
(1) NUWC-Naval Undersea Warfare Center, Portsmouth, RI
(2) U.S. Navy, Newport, Rhode Island
(3) NUWC-Naval Undersea Warfare Center, Newport, Rhode Island
(4) NUWC-Naval Undersea Warfare Center-Retired, Newport, Rhode Island
Corresponding Author: monicade@aol.com

Marine mammals could be exposed to underwater explosions (UNDEX) in various settings, including coastal construction, underwater demolition, and military operations. Primary blast injury (PBI), the gross blast-related trauma or traces of injury in air-filled tissues or tissues adjacent to air-filled regions (e.g. lungs, GI tract), has been documented in a number of marine mammal species after blast exposure. The melon, an important component of echolocation, if damaged, may compromise an animal's ability to navigate, communicate, hunt, and ultimately survive. Little is known about marine mammal susceptibility to PBI, and even less about potential UNDEX damage to the melon. As a result, traditional analysis relies on methods developed almost 40 years ago using terrestrial mammals as surrogates for marine mammals in experimental protocols, ignoring species-specific physiological adaptations to the marine environment. Currently available numerical modeling tools (finite element modeling and computational fluid dynamics) could better inform zones of influence estimates for UNDEX by simulating the response of morphologically accurate proxies with material properties representative of marine mammal tissues. We developed a computational model of a surrogate air-filled spherical membrane structure subjected to directional shock loading to represent the full complexity of *in vivo* marine mammal lung and melon response to UNDEX. This approach incrementally improves the assumptions used by the US Navy, which employs a surrogate of a one-dimensional spherical air bubble of equivalent lung volume for a given marine mammal species, with the bubble oscillating in response to an initial velocity and omnidirectional pressure loading. For the melon, we are developing similar surrogate models to determine potential damage to melons at UNDEX impulse/peak pressures below what would cause severe lung hemorrhage (e.g., death). Verification and validation testing were conducted for the various surrogate models investigating marine mammal lung and melon dynamics.