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Marine mammal osteology – dolphin's adaptation to the aquatic life

Martina Đuras, Kim Korpes, Magdalen Kolenc

Abstract

Dolphins are members of the order Cetacea (whales) and represent marine mammals that are morphologically and functionally fully adapted to the aquatic environment. First whales developed from land mammals that entered the aquatic environment 55 million of years ago. Their body structure changed during evolution and the most prominent changes are the loss of pelvic limbs, development of flippers and the hydrodynamic body shape. The workshop will give you the opportunity to study a bottlenose dolphin (*Tursiops truncatus*) skeleton and to compare it to skeletons of domestic mammals. The participants will be divided in small groups (2-3 participants). Each group will work at a working station that will be equipped with one disjointed bottlenose dolphin skeleton. The aim of the workshop will be to put the bones in the right position and rebuild the skeleton. The main osteological characteristics of the dolphin skeleton will be highlighted. The morphology of the bones will be studied: bones of the skull will be identified, the main skull openings explained, the vertebrae and ribs divided into groups. The modifications of the limb bones will be discussed: bones of the flippers will be compared to thoracic limb bones of domestic animals and the remains of the pelvic limb will be explained. The characteristic morphology of certain bones will be discussed in their evolutionary and functional context.

The skeletons used in the workshop are part of the marine mammal collection of the Faculty of Veterinary Medicine University of Zagreb (FVMUZ). This collection hosts around 300 marine mammal skeletons with data on the circumstances, date, and location of discovery of the specimen, results of the *post mortem* analysis, archived samples and photo-documentation. All the specimens have been recovered within the mortality monitoring program conducted in the Croatian part of the Adriatic Sea from October 1990 until today by FVMUZ. This program has been run under the supervision of the national Institute for Environment and Nature Protection, with annual permits issued by the Ministry of nature protection and green transition Republic of Croatia. The results of the three decade of marine mammal research showed that the Adriatic Sea was inhabited by three marine mammals in the past: the Mediterranean monk seal (*Monachus monachus*), the common dolphin (*Delphinus delphis*) and the bottlenose dolphin. Our research has showed that the bottlenose dolphin is the only mammal in the Adriatic Sea and that the abundance of striped dolphins (*Stenella coeruleoalba*) has increased in southern areas of the Adriatic Sea. The bottlenose dolphin in the Adriatic Sea is of one and the same morphological type unlike ones in other bottlenose dolphin habitats. The unique morphological characteristics of the bottlenose dolphins in the Adriatic Sea indicate their same hunting and life habits. High genetic biodiversity has been established in the population of bottlenose dolphins in the Adriatic Sea, which in turn indicates they are not isolated from other Mediterranean populations. Intense anthropogenic influence has been recorded and frequent interactions with the fisheries have been observed. Some of those interactions have deadly consequences.

Archaeozoology

Tajana Trbojević Vukičević, Kim Korpes, Magdalena Kolenc

Archaeozoology is the study of animal remains from archaeological sites to explore historical human-animal relationships. Participants of the archaeozoology workshop will gain insights into the exploitation of animals, their morphology, and possible pathological changes from a veterinary medicine perspective. The hands-on workshop will use animal remains from Croatian archaeological sites.

The workshop will be divided into five thematic fields: species identification, bone identification, distinguishing bird species, age determination, and pathological changes. Participants will work in pairs and rotate through all five topics. This collaborative format will enhance learning and analytical skills.

Neuroscience

Organoids – model for development and neurodegenerative diseases

Ante Plećaš, Iva Šimunić, Ivan Alić

Brain development is complex process which involves cell migration, organisation and differentiation in 3D structure. Since 2014, few protocols for different types of iPSCs derived organoids were published. In our group, we routinely growing cerebral organoids, midbrain organoids as well as assembloids which were composed of cortical and striatal spheroids. Our previous data showed that cerebral organoids behave like human brain. The main idea of workshop is to introduce the organoids and go through the 150 days journey form single iPSC to the mature organoid.

Participants will be divided in two groups. The first group will be in Tissue Culture where we will show iPSCs and organoid technology including following steps: growing, genotyping, manipulation, differentiation, fixation, tissue preparation, and imaging. Second group will be on Image Analysis stations where we will show image analysis in 3D using different software's.

Anatomage presentation

Carlos Martinez