3D REPRESENTATION OF THE AMPULLAE OF LORENZINI

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KEY WORDS: 3D-representation, ampullae of Lorenzini, elasmobranch, ImageJ.

The ampullae of Lorenzini are specialised electroreceptors, that enables sharks, skates and rays to locate and attack the prey, being stimulated by very low frequency electric fields. They are constituted by a canal filled with a high conductive jelly, opening to the external environment by a electrosensitive pore and ending in one blind sac, the ampulla. The ampulla consists of cluster of alveoli, those number can vary according to the species considered. Recently it has been suggested that an increase of the alveoli number can reflects an increase of the number of sensory cells harbored in the sensory surface epithelium, and, finally, an increase of electro sensitivity [1]. In this way the morphology of the ampullae can reflect the ecological features of the different species. The knowledge of their 3D morphology is fundamental to support this suggestion. Specific programs for 3D representation (3D-r) are already available [2], but they are generally expensive, or difficult to use. Recently the free software for image analysis and 3D-r, ImageJ/SurfaceJ, was available on-line [3, 4]. We have set up an operative protocol to use it with histological serial sections. We applied this protocol for the 3D-reconstruction of the serially sectioned ampullae of Lorenzini of the shark \textit{Etmopterus spinax}. Images were obtained by a CCD camera equipped BH2 Olympus microscope, and the Data Translation software GlobalLab. Contour lines of images were traced by selection of threshold, and roto-traslated using internal fiduciary markers. These contour lines were overlapped, stacked by ImageJ and 3D rendered with SurfaceJ. We obtained two kind of 3D-r: 1) an alignment on z-axis of various series of segmented transparent sections to observe the ampullary cavity; 2) a volume render to show the internal epithelial surface from an external (Fig. 1) or internal point of view. For a correct depth we maintained the same micron/pixel ratio on x-, y- and z-axis. In this way, the 3D structure of internal epithelial surface, covering the alveoli, can be easily observed and studied. The public domain software ImageJ/SurfaceJ requires a fast CPU and good quantity of RAM. It is quite fast and easy to use for the 3D-r of organs from histological serial sections.

REFERENCES