Effect of morphological development on the locomotion function of Nile tilapia, *Oreochromis niluticus* during early ontogeny

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Abstract
This study was conducted to investigate the hydrodynamic parameters and how morphological changes affect them in *Oreochromis niloticus* at the National Museum of Natural History-Paris in the winter of 2020. To record fish movement, a high-speed camera (1000 fps) with a macro lens was used. The fish trajectory was taken by calculating coordinate*s* of a center point between the two eyes and kinematic variables were measured by trajr package in R software. To describe the body shape and its changes from the dorsal and lateral view of fish were photographed using a digital camera. According to the results, fingerlings are wider and longer than larvae and therefore have a greater 3D surface area, which contributes significantly to the production of drag force.

The streamlined shape of the body at the last stages of growth of fish has an inertia drag coefficient about 2 to 3 times smaller than the small larvae. In addition, the decrease rate of drag coefficient before the inflection point was higher than that of fry and fingerling, which may be related to more body shape changes in the larval stage than in larger fish in Nile tilapia. The larvae due to large size transfer in the inertial regime, while the larvae have not yet adapted to this type of regime in terms of form. It has an undesirable effect on the drag force produced by the larvae which are compensated by the deformation of the fish during growth, these changes of are well reflected in the three-dimensional shape of the body, the positive allometry of body mass and volume.

Keywords: Hydrodynamic, Nile tilapia, Drag coefficient, Reynolds number.