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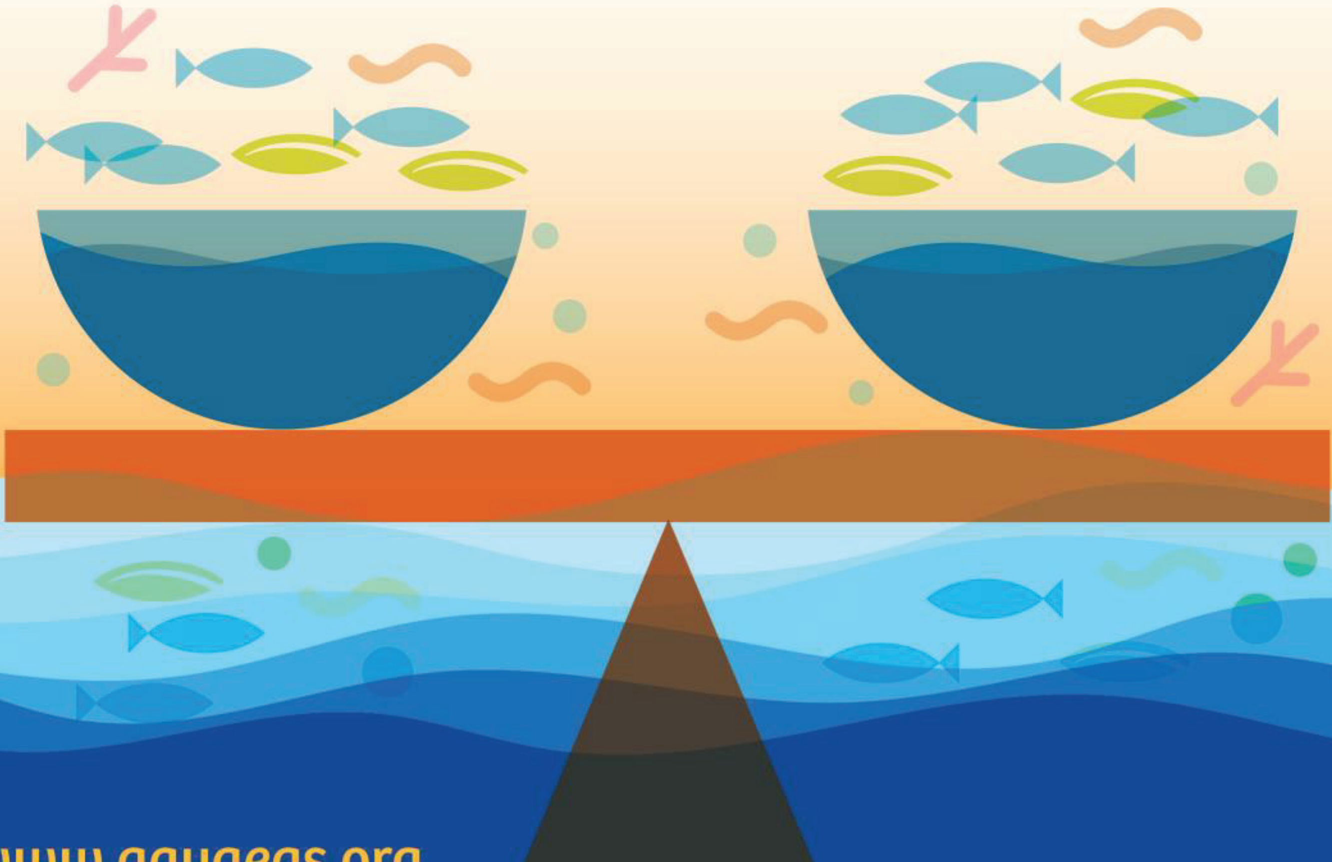

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ABSTRACTS

OXYGEN CONSUMPTION AND LOCOMOTORY BEHAVIOUR DURING A SWIM FITNESS TEST OF EUROPEAN SEABASS (*Dicentrarchus labrax*): RELATION WITH ORIGIN AND EARLY LIFE EXERCISE TRAINING

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Introduction

Swimming capacity plays a crucial role in the fitness of fish, crucial for their survival and reproductive success. Origin and early life experiences may have important consequences for swimming capacity later in life (Zambonino-Infante *et al.,* 2017; Vandeputte *et al.,* 2019). In this study, we investigated the influence of origin and early life exercise training on the swimming economy and locomotory behaviour during later life in the European seabass (*Dicentrarchus labrax*).

Materials and methods

Experimental fish, originating from the Atlantic, Eastern Mediterranean, and Western Mediterranean, had been subjected to an early life exercise training consisting of swimming against an increased flow of 0.3 $m.s^{-1}$ from 92 to 162 dph at the facilities of Ifremer (Palavas-les-Flots, France) by M-L Bégout and colleagues. The controls had been reared at regular flow conditions of 0 - 0.1 $m.s^{-1}$ during this period. After training and PIT tagging, fish were reared in common garden until an average weight of about 20 g was reached. Fish were then transported to Wageningen University and Research experimental facilities (CARUS, Wageningen, The Netherlands). The fish (N= 36, with 3 origins x 2 training conditions is N= 6 fish per group) were grown until approximately 60 g in weight, when the swimming experiments were executed using a 30-L Loligo swim tunnel (Loligo systems, Viborg, Denmark) (Fig.1).

The flow in the swim-tunnel was set at five different speeds during the experiment, starting at the lowest speed of 0.1 $m.s^{-1}$ and then increasing stepwise with 0.1 ms^{-1} per hour up to a maximum speed of 0.5 $m.s^{-1}$. Oxygen consumption and locomotory behaviour were assessed at each interval using a galvanic oxygen probe and a Basler 2040-90um NIR USB3 high-speed camera, respectively (see also Arechavala-Lopez *et al.,* 2021). From the experiment we obtained the following data thus far: oxygen consumption rates at each of the swimming speeds (MO_2 in $mg.kg^{-1}.h^{-1}$), optimal swimming speed (U_{opt} in $m.s^{-1}$), Cost of Transport at the optimal speed (COT in $mg.kg^{-1}.km^{-1}$) and critical swimming speed (U_{crit} in $m.s^{-1}$). Locomotory behaviour parameters tail beat amplitude and frequency, and head width amplitude and frequency, are still being analysed.

Results and discussion

Our results provide valuable insights into the swimming economy of juvenile seabass. Group averages of MO_2 ranged from 206 to 231 $mg.kg^{-1}.h^{-1}$ when swimming at 0.1 $m.s^{-1}$; 174 to 218 $mg.kg^{-1}.h^{-1}$ at 0.2 $m.s^{-1}$; 190 to 232 $mg.kg^{-1}.h^{-1}$ at 0.3 $m.s^{-1}$ and 260 to 459 $mg.kg^{-1}.h^{-1}$ at 0.4 $m.s^{-1}$. Fish then started to fatigue at U_{crit} values of 0.38 up to 0.43 $m.s^{-1}$ or 2.01 up to 2.48 $BL.s^{-1}$. Average U_{opt} was calculated at 53-67% of U_{crit} as 0.30-0.33 $m.s^{-1}$ or 1.57-1.73 $BL.s^{-1}$. At U_{opt}, COT values were ~200 $mg.kg^{-1}.km^{-1}$. U_{opt} values were significantly lower than the 0.69 $m.s^{-1}$ reported for similar sized seabass swimming in Blazka-type swim-tunnels (Graziano *et al.,* 2018) which may well be due to the longer swimming compartment in those tunnels allowing for burst-and-glide swimming behaviour. COT values at U_{opt} were similar.

Surprisingly, our results revealed no significant differences between fish from the three different origins, nor between trained fish and their controls. These findings suggest that origin and early life training do not have any relation with the swimming performance during later life. As we did observe that Atlantic fish were generally more active than fish from the Mediterranean sites, we expect to find differences in locomotory parameters between fish from different origin.

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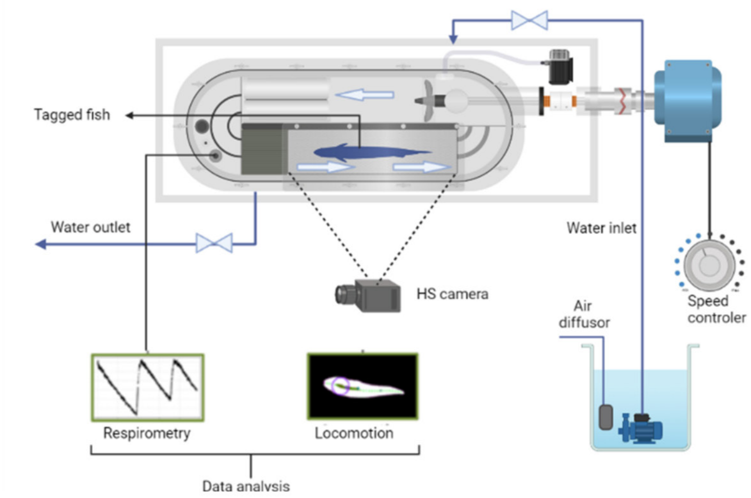

Figure 1. Schematic drawing of a Loligo swim-tunnel with the experimental setting for *Dicentrarchus labrax* swimming performance and locomotion at different speeds.

Understanding the swimming economy of seabass has important implications for both scientific research and practical applications in aquaculture (McKenzie *et al.,* 2020). By gaining a deeper understanding of the swimming economy, we can determine climate change impacts and optimize breeding programs, and develop more effective strategies for the cultivation and management of this economically significant fish species.

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