

Tailoring your feeds

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Acknowledgments:

This work is part of project E!1575 HATCHTOOLS_3539, supported by EUROSTARS-3 programme, and by Portugal and the European Union through ERDF, Algarve 2030, and COMPETE 2030, in the framework of Portugal 2030.

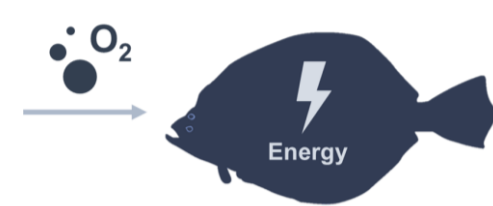


References:

- [1] Castanheira, M. F., Martins, C. I., Engrola, S., & Conceição, L. E. (2011). Daily oxygen consumption rhythms of Senegalese sole *Solea senegalensis* (Kaup, 1858) juveniles. *Journal of Experimental Marine Biology and Ecology*, 407(1), 1-5.
- [2] Salas-Leiton, E., Anguis, V., Manchado, M., & Canavate, J. P. (2008). Growth, feeding and oxygen consumption of Senegalese sole (*Solea senegalensis*) juveniles stocked at different densities. *Aquaculture*, 285(1-4), 84-89.

Oxygen consumption in Senegalese Sole *Solea senegalensis* post-larvae in fed and fasted state

INTRODUCTION



Fish uses O₂ to produce energy

In fish metabolic rate is proportional to the rate of oxygen consumption and varies with the physiological state of fish (e.g., fed or fasted).



Reference to support diet design

Characterizing oxygen consumption in different physiological states can help design more efficient diets and feeding strategies.

- This study** was carried out with Senegalese sole post-larvae aiming to:
- characterize the oxygen consumption in fasted and fed state
 - assess the impact of diet and feeding level on the oxygen consumption rates

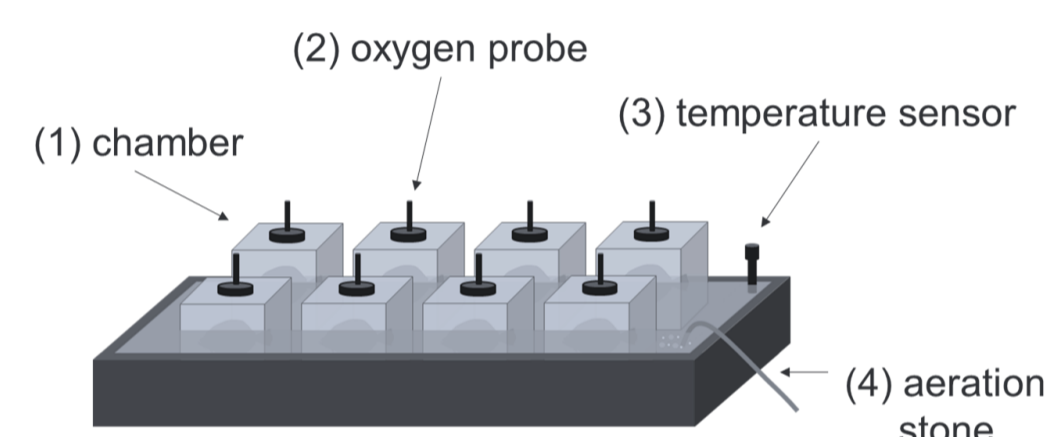
CONCLUSIONS

- Senegalese sole post-larvae in **fed state consume 14% more O₂** than in **fasted state** (5h feed deprived).
- Diet and feeding level did not impact** the oxygen consumption of fish in either the fed or fasted state.

METHODS

The analysis was conducted in the context of a trial where fish (age at start: 16 days after hatching, DAH) were fed three diets with different protein, fat and energy contents, at two feeding levels (100% and 80%), for 100 days (age at the end: 115 DAH).

- Respirometry measurements** were carried out with fish aged 41, 48, 62 and 90 DAH, both in the fed (fed up to half an hour before) and fasted (5h feed deprived) state. Measurements were made with fish placed in individual chambers containing an oxygen probe, by closed respirometry.



Tank with 8 individual chambers in water bath at 20°C

- Data cleaning, transformation and filtering** was carried out aiming to ensure data reliability and representativeness. Out of 575 datasets, approximately 50% passed the quality assessment.

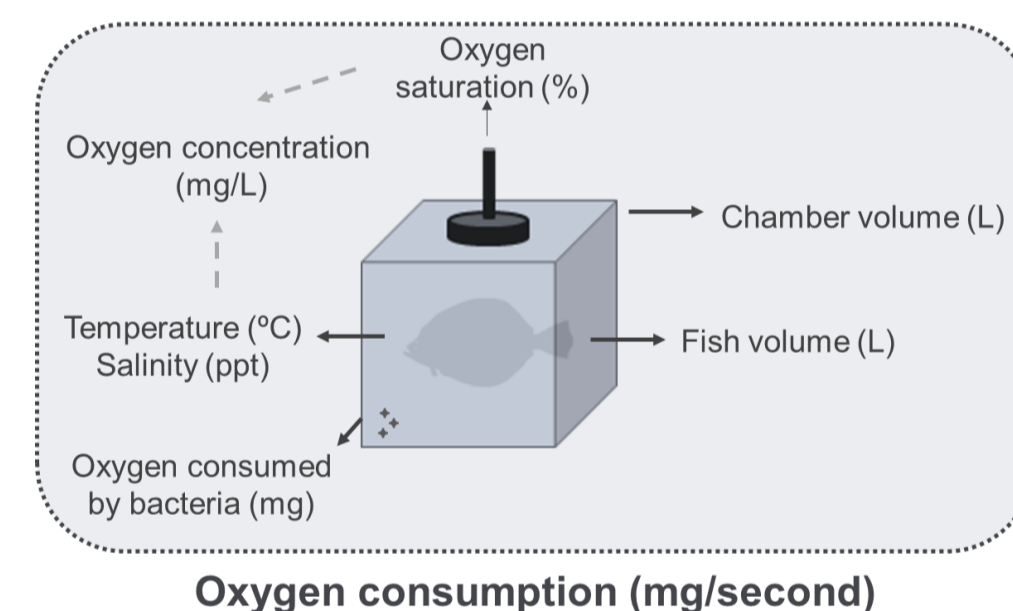


Fig. 1: Conceptual diagram of experimental setup and variables considered to estimate oxygen consumption.

- Allometric models**, characterizing the average oxygen consumption of Senegalese sole post-larvae as a function of weight, in fed and fasted state, were obtained by regression.

- The impact of diet and feeding level on oxygen consumption were assessed based on a two-way approach:** (a) comparison by sampling point, considering as variable of interest the relative oxygen consumption (mgO₂/g fish/day); (b) comparison of all measurements, considering as variable of interest the normalized relative oxygen consumption (mgO₂/g^{bw-exp} fish/day). For both, differences between groups were assessed by ANOVA ($\alpha = 0.05$).

RESULTS AND DISCUSSION

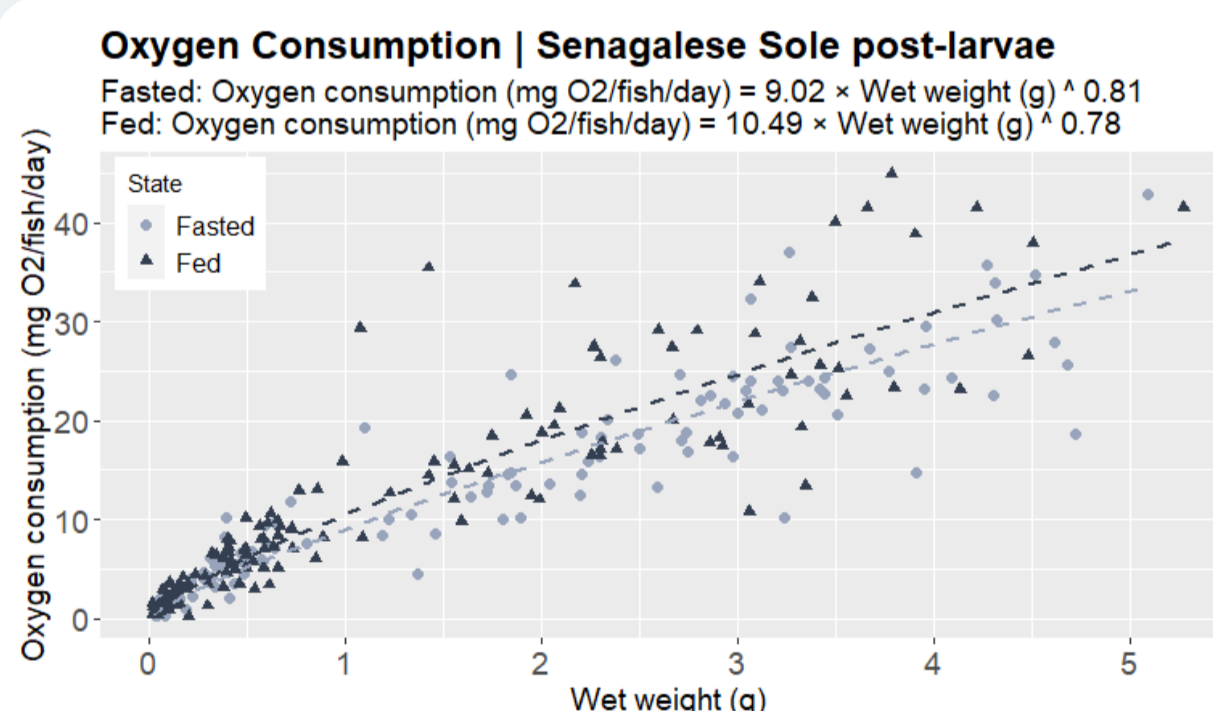


Fig. 2: Oxygen consumption as a function of weight, for Senegalese sole post-larvae in the fed and fasted state.

Fish in the fed state consume, on average, **14%** more oxygen than in the fasted state. This difference is lower than reported for juveniles, where differences between c.a. 35-45% were found between fish in the fed and fasted state [1-2]. This may be related to the size of fish, but also to the fact that in our study the fish were deprived of feed for 5h (due to their small size), whereas in juvenile studies, they were for 24 and 72h.

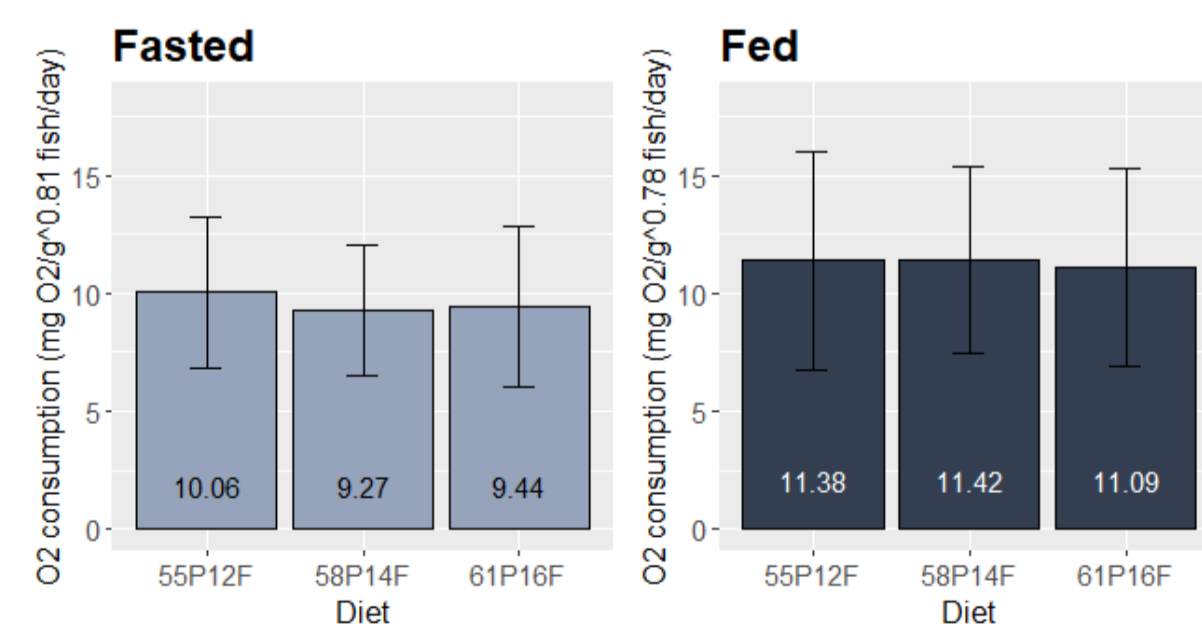


Fig. 3: Comparison of oxygen consumption of fasted and fed fish by diet, considering as variable of interest the normalized relative oxygen consumption.

Based on a two-approach analysis, neither diet nor feeding level (the latter not shown in the chart) clearly affect the oxygen consumption of fish in both fasted and fed states. However, these results apply only to the diets and feeding levels tested and may differ for others not considered in this study.

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