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## Essential fatty acids influence metabolic rate and tolerance of hypoxia in Dover sole (Solea solea) larvae and juveniles

D. J. McKenzie<sup>1,2</sup>, I. Lund<sup>1</sup>, P. B. Pedersen<sup>1</sup>

## Abstract:

Dover sole (Solea solea, Linneaus 1758) were raised from first feeding on brine shrimp (Artemia sp.) with different contents and compositions of the essential fatty acids (EFA) arachidonic acid [ARA, 20:4n - 6]; eicosapentaenoic acid [EPA, 20:5n - 3], and docosahexaenoic acid [DHA, 22:6n - 3], and their metabolic rate and tolerance to hypoxia measured prior to and following metamorphosis and settlement. Four dietary Artemia preparations were compared: [1] un-enriched; [2] enriched with a commercial EFA mixture (Easy DHA SELCO Emulsion); (3) enriched with a marine fish oil combination (VEVODAR and Incromega DHA) to provide a high ratio of ARA to DHA, and (4) enriched with these fish oils to provide a low ratio of ARA to DHA. Sole fed un-enriched Artemia were significantly less tolerant to hypoxia than the other dietary groups. Larvae from this group had significantly higher routine metabolic rate (RMR) in normoxia, and significantly higher  $O_2$  partial pressure ( $PO_2$ ) thresholds in progressive hypoxia for their regulation of RMR (Pcrit) and for the onset of agitation, respiratory distress and loss of equilibrium. Metamorphosis was associated with an overall decline in RMR and increase in Pcrit, but juveniles fed on un-enriched Artemia still exhibited higher P<sub>crit</sub> and agitation thresholds than the other groups. Sole fed unenriched Artemia had significantly lower contents of EFA in their tissues, both before and after settlement. Thus, enriching live feeds with EFA has significant effects on the respiratory physiology of sole early life stages and improves their in vivo tolerance to hypoxia. We found no evidence, however, for any effect of the ratio of ARA to DHA.

<sup>&</sup>lt;sup>1</sup>Danish Institute for Fisheries Research (DIFRES), Danish Technical University, The North Sea Centre, 9850 Hirtshals, Denmark; email: david.mckenzie@univ-montp2.fr

<sup>&</sup>lt;sup>2</sup>Institut des Sciences de l'Evolution de Montpellier (UMR 5554 CNRS-Université de Montpellier 2), Station Méditerranéenne de l'Environnement Littoral, 1, quai de la Daurade, 34200 Sète, France