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

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### Abstract:

Dover sole (*Solea solea*, Linnaeus 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<sub>2</sub> partial pressure (PO<sub>2</sub>) thresholds in progressive hypoxia for their regulation of RMR (P<sub>crit</sub>) and for the onset of agitation, respiratory distress and loss of equilibrium. Metamorphosis was associated with an overall decline in RMR and increase in P<sub>crit</sub>, 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.