
Swimming speeds of Mediterranean settlement-stage fish larvae nuance Hjort's aberrant drift hypothesis

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Abstract

Historically, the mortality of early-life stages of marine fishes was supposed to be mostly caused by poor feeding during a critical period and aberrant drifting away from favourable recruitment areas. While fish larvae may display remarkable swimming abilities, those have rarely been evaluated as counteracting factors for this aberrant drift. In this study, we measured critical swimming speed (U_{crit}) of settlement-stage larvae of six coastal Mediterranean fish species, for which no data was previously available (Sparidae: *Boops boops*, *Diplodus annularis*, *Spicara smaris*, *Spondyllosoma cantharus*; Pomacentridae: *Chromis chromis*; Mugilidae: Mugilidae sp.). Their swimming speeds were comparable with those of other temperate species, but also with the speeds of tropical species, which are considered as very fast swimmers. Mugilidae were the fastest (29.2 cm s⁻¹), followed by Pomacentridae (22.8 cm s⁻¹) and Sparidae (11.6 cm s⁻¹). Most larvae swam in an inertial regime (Reynolds number > 1000). Those swimming speeds were then implemented in a Lagrangian dispersal model and virtual larvae were tracked over their competency period (4 days). In the model, directional swimming strongly increased the proportion of successful settlers, independently of mesoscale hydrological structures. Fish larvae could settle on the coast from as far as tens of kilometres offshore, in just four days. These findings mitigate the importance of aberrant drift for strong swimming temperate larvae and show that larval behaviour should be considered on equal footing with ocean currents when assessing larval fish dispersal.

Keywords: Larval fish behaviour, Swimming speed, Dispersal, Mediterranean Sea, Aberrant drift hypothesis

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