{rokbox title=|Modelled marginal means of relative changes in standard length (SL; cm), weight (W; g), and Fulton's condition factor (K) across habitat treatment groups :: Image: Authors| thumb=|images/stories/ieo/imagenespublicaciones/centro-oceanografico-baleares-ieo-csic-influence-algae-habitat-moranta-2026-thumb-et-al.jpg|}images/stories/ieo/imagenespublicaciones/centro-oceanografico-baleares-ieo-csic-influence-algae-habitat-moranta-2026-et-al.jpg{/rokbox}

Hilmar Hinz, Maria del Mar Gil, Paula Anglada, José Maria Disdier, **Olga Reñones**, Gaetano Catanese, Julia Castro-Fernández, Antoni Sureda , Amalia Grau,
Adam Gouraguine
,
Joan Moranta
, 2026.
The influence of algae habitat refuge complexity on juvenile fish growth, condition, and survival under the presence or absence of predators
. Marine Environmental Research. Volume 215. March 2026. 107844.
10.1016/j.marenvres.2026.107844

Abstract:Macrophyte habitats are key for juvenile fish survival in coastal littoral zones, yet they are increasingly degraded by human activities. While macrophytes offer both shelter and food, their protective function may be context-dependent, particularly in relation to predator abundance, which varies with fishing pressure and protection. In protected areas, where predator densities are higher, juvenile fish may face increased risk and rely more on complex habitats for refuge. Despite the potential benefits of structural complexity, studies on its effects on juvenile fish growth, condition, stress, and mortality remain limited.This study tested the influence of macrophyte complexity on two Mediterranean fish, Symphodus ocellatus and Diplodus vulgaris, selected for their contrasting habitat preferences, under laboratory conditions. We hypothesized that juveniles would show improved growth, condition, and survival in complex habitats, especially under predator presence.Results revealed species-specific responses. S. ocellatus, contrary to expectations, exhibited a slight reduction in body size, likely due to stress-induced physiological changes. However, this size loss was mitigated in structurally complex habitats. Mortality was also lowest in the highest complexity treatment. In contrast, D. vulgaris showed consistent fast growth across treatments, with only tentative effects of habitat complexity. For this species predator presence had a significant negative effect on weight gain in the unvegetated control treatment compared to the high complexity habitat treatment. Biochemical stress indicators supported these patterns. Elevated catalase activity in structurally complex habitats under predator presence, observed in both species, suggests a habitat-mediated physiological stress response. In contrast, the absence of significant differences in superoxide dismutase activity or RNA:DNA ratios across simpler habitats may indicate that stress levels exceeded physiological response limits, resulting in dampened or

exhausted enzymatic responses. Circumstantial evidence for this interpretation is provided by the elevated mortality observed in S. ocellatus in no-habitat control treatments and the reduced weight gain in D. vulgaris under predator presence in the same habitat.

Keywords: Habitat complexity, Juvenile fish, Macrophytes, Predation risk, Stress physiology