

salinity moves beyond the optimal acclimation range. Overall, seawater salinity variation affects the physiological health of yellowfin seabream through rapid blood stress responses, tissue-specific oxidative and immune regulation, and remodeling of gill and intestinal function. In yellowfin seabream, physiological resilience is evident, but health costs rise when salinity departs too far from the acclimation range or changes too abruptly.

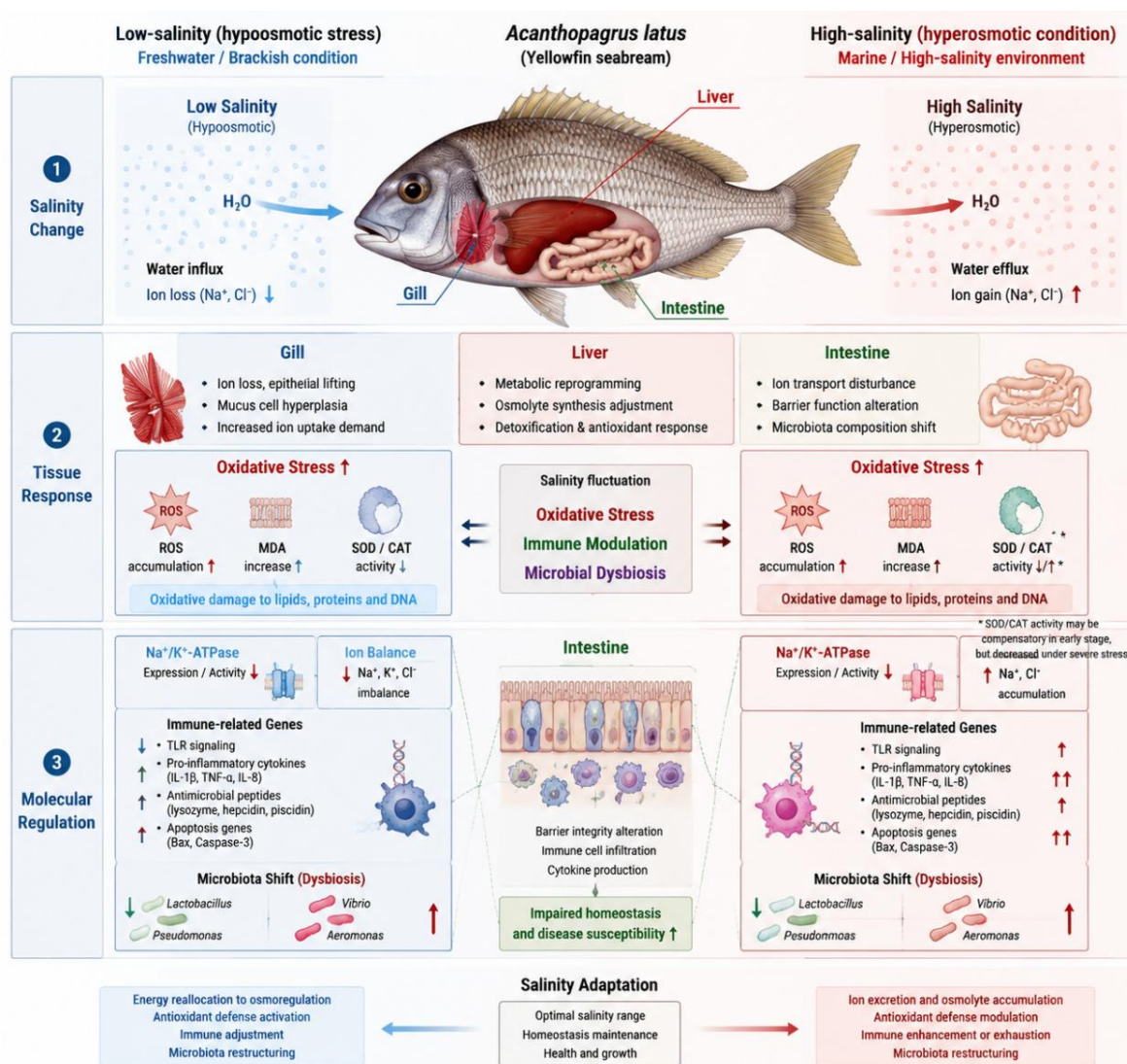


Figure 2 Mechanistic overview of salinity-induced oxidative stress, immune modulation, and microbiota alteration in yellowfin seabream

5 Molecular Regulatory Mechanisms of Salinity-Induced Health Responses in Yellowfin Seabream

5.1 Expression responses of osmoregulation-related genes

In yellowfin seabream, salinity-induced health responses begin with rapid remodeling of osmoregulatory gene expression in key epithelial tissues. Under hypoosmotic challenge, transcriptomic analysis showed that genes related to osmoregulation were strongly altered across gill, liver, and muscle, with the gill being the most sensitive tissue and showing enhanced Na^+/K^+ -ATPase activity to reduce ion loss. More broadly across euryhaline fishes, salinity acclimation consistently involves ion-transport and water-channel genes, and transcriptomic studies repeatedly identify transporters, osmoregulatory effectors, and stress-response genes as core components of adaptation (Mkulo et al., 2025). This general pattern is directly relevant to *Acanthopagrus latus*, because health maintenance under changing salinity depends on preserving hydromineral balance before secondary oxidative or immune damage develops.