

analysis are viewed as essential steps for accelerating molecular breeding (Yue et al., 2023). New genomic-selection work in spotted sea bass further shows that combining marker types can substantially improve prediction accuracy for tolerance traits, reaching an accuracy of 0.71 in the best-performing integrated model (Zhang et al., 2025). Yellowfin seabream breeding programs should therefore prioritize reference-genome quality, high-throughput salinity challenge phenotyping, and genomic prediction pipelines that can be updated with omics-derived biomarkers of osmoregulation and stress resilience, while also preserving growth and health traits needed for commercial culture. Overall, future research on yellowfin seabream should connect pan-omics biology, climate-resilient risk assessment, and genomic breeding into one framework. That integrated approach is the clearest path to defining optimal salinity management and improving health and productivity under increasingly variable culture conditions.

9 Conclusions

Salinity variation is one of the most important environmental factors influencing the growth performance of yellowfin seabream. As a euryhaline marine fish, this species has a certain capacity to tolerate a relatively wide salinity range, but its growth response is not uniform under all conditions. When salinity remains within an appropriate physiological range, yellowfin seabream can maintain stable feeding activity, efficient nutrient assimilation, and normal metabolic function, thereby supporting satisfactory growth rate and body weight gain. In contrast, exposure to excessively low, high, or rapidly fluctuating salinity often increases the energetic cost of osmoregulation, causing more metabolic resources to be diverted from somatic growth toward physiological adjustment and survival maintenance. Overall, the growth performance of yellowfin seabream tends to depend not only on the absolute salinity level but also on the duration, amplitude, and frequency of salinity change. Moderate and relatively stable salinity conditions are generally more favorable for feed utilization efficiency, protein deposition, and body composition balance, whereas persistent salinity stress can suppress appetite, reduce feed conversion efficiency, and impair normal growth trajectories. Therefore, salinity should be recognized as a central regulator of production performance in yellowfin seabream aquaculture, and growth optimization requires maintaining environmental salinity within a biologically suitable and dynamically manageable range.

Beyond growth, salinity variation has comprehensive effects on the physiological health of yellowfin seabream. Changes in salinity can alter hematological characteristics, ionic balance, endocrine responses, antioxidant capacity, and immune status, reflecting the broad systemic nature of salinity adaptation. Under manageable salinity conditions, yellowfin seabream can activate osmoregulatory and metabolic adjustment mechanisms that help preserve internal homeostasis. However, when salinity stress exceeds the adaptive threshold of the fish, disturbances begin to appear in blood biochemical indicators, oxidative stress regulation, tissue integrity, and cellular function, indicating that health impairment often accompanies environmental instability. The health consequences of salinity stress are also closely linked to the intensity and duration of exposure. Short-term salinity shifts may trigger compensatory responses that are initially protective, but long-term or repeated stress can weaken antioxidant defenses, increase susceptibility to inflammation or infection, and damage key organs such as the gills, liver, kidney, and intestine. At the molecular level, these outcomes are associated with changes in the expression of genes related to ion transport, energy metabolism, stress signaling, and immune regulation. Taken together, the available evidence indicates that salinity variation affects yellowfin seabream health through integrated physiological, biochemical, histological, and molecular pathways, making health assessment essential when evaluating the biological effects of salinity in culture systems.

From an aquaculture perspective, effective salinity management is essential for improving both productivity and animal welfare in yellowfin seabream farming. Maintaining salinity within an appropriate range, avoiding abrupt fluctuations, and adjusting culture conditions according to developmental stage and environmental context can help reduce physiological stress and support stable growth and health outcomes. In practice, salinity regulation should be combined with water quality monitoring, nutritional support, and health management strategies so that fish can better cope with environmental variation. This integrated approach is particularly important in coastal and estuarine farming areas, where rainfall, evaporation, tidal exchange, and freshwater input can cause pronounced salinity