

by enrichment of energy-metabolism and immune-regulation pathways. Overall, salinity-induced health responses in yellowfin seabream are regulated through three interacting molecular layers: osmoregulatory gene expression, metabolic and oxidative stress control, and immune-microbial regulation. The evidence indicates that health outcomes depend less on salinity tolerance in the narrow survival sense than on how effectively these regulatory systems remain coordinated under fluctuating environmental conditions.

6 Case Studies of Yellowfin Seabream Culture under Different Salinity Conditions

6.1 Case background: effects of salinity gradients on culture performance of yellowfin seabream

Case studies of yellowfin seabream culture under different salinity conditions consistently show that this species is broadly euryhaline, but culture performance varies markedly within that tolerance range. In a 56-day salinity-gradient trial, juveniles reared at 6‰, 12‰, 24‰, 35‰, and 48‰ showed improved growth when salinity increased from 6‰ to 12‰, whereas salinity above 24‰ suppressed growth, indicating that moderate brackish conditions were more favorable than full-strength or hypersaline seawater (Mozanzadeh et al., 2021). A separate acclimation study using 0.5, 3, 7, 15, 23, and 30 g/L reached a similar conclusion, with the highest growth rate and best feed conversion observed at 7 and 15 g/L and poorer performance at 23 and 30 g/L. Together, these studies provide a practical culture background for yellowfin seabream: the species survives over a wide salinity span, but production efficiency peaks within an intermediate salinity window rather than at salinity extremes.

This case background is strengthened by evidence that yellowfin seabream can withstand acute transfer across large salinity ranges, which helps explain its culture potential in estuarine and variable coastal systems. Juveniles transferred from 20 ppt to 34, 12, and 5 ppt acclimated within 48 h, and the main short-term changes were metabolic rather than ionic, showing that salinity stress was rapidly buffered at the whole-animal level. More generally, euryhaline fish maintain homeostasis under changing salinity through coordinated responses of the gill, intestine, and kidney, but rapid shifts beyond the optimal range still cause physiological stress even when survival is maintained (Mkulo et al., 2025). This means that field and farm salinity gradients should be evaluated not only by whether fish remain alive, but by whether salinity stays within the narrower range that supports efficient growth and stable health.

6.2 Case analysis: responses of growth performance and health status

The main growth-response pattern across case studies is that intermediate salinity improves production traits, whereas higher salinity reduces weight gain and feed efficiency. In juvenile yellowfin seabream, growth depression above 24‰ was accompanied by reduced feed utilization, showing that poorer performance at elevated salinity reflects both slower growth and weaker conversion of feed into biomass (Mozanzadeh et al., 2021). Another culture study found that fish reared at 23 and 30 g/L had lower body protein, fat, and moisture together with higher ash content than fish reared at lower salinity, indicating that salinity effects extend beyond growth rate to carcass composition and nutrient deposition. These findings show that salinity gradients shape not only how fast yellowfin seabream grows, but also how efficiently it uses feed and how body tissues are formed during culture.

Health responses in these case studies are similarly salinity-dependent and often precede visible mortality. Acute challenge experiments showed that cortisol, glucose, and lactate rose shortly after transfer and then returned toward basal levels within 24-48 h, indicating a transient but real physiological stress cost during acclimation. Longer-term salinity comparison in juvenile yellowfin seabream further showed that 10 ppt and 30 ppt conditions produced distinct gut microbial and transcriptomic states: brackish water enriched *Cetobacterium* and metabolism-related genes, whereas seawater enriched *Vibrio* and immune/redox pathways (Peng et al., 2025). In case-analysis terms, this suggests that a salinity regime can appear acceptable from a survival perspective while still shifting the fish toward higher immune activation and a less favorable intestinal microbial profile.

6.3 Case implications: optimal salinity regulation and aquaculture management strategies

The main management implication from these case studies is that yellowfin seabream culture should target a moderate brackish salinity range, especially during juvenile grow-out. Across direct growth trials, the best performance clustered around 7-15 g/L or near 12‰, while higher salinity consistently reduced growth or feed