



A Perfect Storm of Pathogens: Investigating Multi-Disease Outbreaks in Cage-Farmed Asian Seabass (*Lates calcarifer*)

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Asian seabass (*Lates calcarifer*) can be cultured in a variety of aquaculture systems, including open sea cages, semi-closed systems, and closed recirculating aquaculture systems (RAS), under low-salinity and marine environments. Each of these production systems presents distinct disease challenges. In the present study, multiple diseases associated with chronic mortality were recorded in *L. calcarifer* (n = 50) reared in marine cage culture facilities at Karwar. Affected fish exhibited poor body condition and a slight increase in surface mucus during the initial stages of infection. External examination revealed darkened body coloration, fin and tail rot, scale loss, and peeled skin on the body surface. In severe cases, ulcers with pus formation were observed, predominantly on the anterior region of the dorsal fin. The gills appeared disintegrated, pale in colour, and showed excessive mucus secretion. Post-mortem examination revealed enlargement of the liver, kidney, and spleen, while the brain exhibited haemorrhagic appearance. Some fish showed fatty degeneration of the liver with a pale coloration. The gastrointestinal tract was mostly empty, containing only a small amount of liquid.

Histopathological examination revealed marked pathological alterations in vital organs, including the kidney, liver, spleen, brain, gills, and other infected tissues. Molecular diagnosis using polymerase chain reaction (PCR) detected the presence of *Vibrio* spp. (from gills), *Staphylococcus haemolyticus* (from liver), and *Staphylococcus arlettae* (from kidney). These results were further confirmed through sequencing and analysis of PCR amplicons. Additionally, *Dactylogyrus* spp. were identified through wet mount microscopic examination. The occurrence of this multi-disease outbreak was recorded during March 2022. With the increasing intensification of Asian seabass aquaculture, the emergence of previously unknown or undescribed diseases is likely. Nevertheless, most disease-related losses caused by pathogens and parasites in Asian seabass culture can be effectively minimized through the adoption of Better Management Practices (BMPs) and robust biosecurity protocols.

Keywords:

Asian seabass, cage culture, multi-disease outbreak, bacterial pathogens; parasitic infection; histopathology, PCR-based diagnosis, biosecurity

