

Table S1. Economic Impact of Common Fish Diseases in Mariculture (2015–2023).

Disease	Reported Loss Range (\$M)	Midpoint Value (\$M)	Primary Pathogen Type	Most Affected Species	High-Risk Regions	Sources
Sea Lice	500–1,000	750	Parasitic	Salmon, Trout	Norway, Chile, Scotland, Canada	[1]
Infectious Salmon Anemia (ISA)	200–400	300	Viral	Atlantic Salmon	Norway, Chile, Canada, Faroe Islands	[2]
Amoebic Gill Disease (AGD)	80–150	115	Parasitic	Salmon, Turbot	Tasmania, Ireland, Chile, Australia	[2]
Viral Nervous Necrosis (VNN)	50–100	75	Viral	Grouper, Seabass, Barramundi	Mediterranean, Southeast Asia, Japan	[3]
Streptococcosis	30–70	50	Bacterial	Tilapia, Barramundi, Bass	Southeast Asia, Brazil, Gulf of Mexico	[4]
Vibriosis	60–120	90	Bacterial	Salmon, Seabass, Seabream	Norway, Chile, Japan, Mediterranean	[5]
Furunculosis	40–100	70	Bacterial	Atlantic Salmon, Trout	North Atlantic, Canada, UK	[6]

Table S2: Bacterial Disease Impact in Open Sea Cage Aquaculture

Disease	Pathogen	Min–Max Mortality (%)	Key Affected Species	Transmission Mode	Seasonal Prevalence	Common Control Measures	Primary Regions (%)	Source
Pasteurellosis	<i>Photobacterium damsela</i>	70–100	Sea Bass, Sea Bream	Waterborne, Direct Contact	Summer–Autumn	Vaccination, Antibiotics	Mediterranean (13%), AP (25%)	[7]
Streptococcosis	<i>Streptococcus iniae</i>	60–90	Tilapia, Barramundi	Vertical, Fomites	Year-round (peaks in warm)	Probiotics, Improved Sanitation	Americas (31%), AP (25%)	[8]
Vibriosis	<i>Vibrio anguillarum</i>	40–80	Salmon, Shrimp	Waterborne, Oral	Summer	UV Sterilization, Biosecurity	Mediterranean (13%), AP (25%)	[9]
Nocardiosis	<i>Nocardia seriolae</i>	20–50	Yellowtail, Amberjack	Vertical, Skin Lesions	Winter–Spring	Culling, Tank Disinfection	Northern Europe (31%)	[10]
Furunculosis	<i>Aeromonas salmonicida</i>	50–70	Atlantic Salmon, Trout	Waterborne, Stress-Induced	Spring	Vaccines, Oxytetracycline	NE (31%), Americas (31%)	[11]
Bacterial Kidney Disease	<i>Renibacterium salmoninarum</i>	10–40	Pacific Salmon, Char	Vertical, Egg-associated	Year-round	Egg Disinfection, Brood Screening	NE (31%), Americas (31%)	[11]
Enteric Redmouth Disease	<i>Yersinia ruckeri</i>	30–70	Rainbow Trout, Catfish	Oral, Contaminated Feed	Spring–Autumn	Formalin Baths, Quarantine	Americas (31%), NE (31%)	[12]
Pseudomonas Infections	<i>Pseudomonas fluorescens</i>	25–60	Multiple Marine Species	Opportunistic, Wound Entry	Year-round	Ozone Treatment, Antibiotic Baths	All regions	[13]

Table S3: Multivariate Analysis of Disease Impact in Open Sea Cage Aquaculture

Disease	Mortality Rate (%)	Species-Specific Mortality (%)	Most Affected Species	High-Risk Regions	Economic Impact (USD per ton loss)	Treatment Efficacy (% Reduction)	Sources
Vibriosis	40-60	Salmon: 55%	Salmon, Seabass, Seabream	Norway, Chile, Mediterranean	8000	60 (vaccination)	[14]
		Seabass: 45%	-	-	-	-	
		Seabream: 50%	-	-	-	-	
Parasitic Infections	15-30	European Seabass: 25%	European Seabass	Mediterranean, North Africa	3500	40 (chemical baths)	[15]
Trypanosomiasis	25-50	Barramundi: 40%	Barramundi	Southeast Asia, Australia	5200	30 (antiparasitic drugs)	[16]
Parasitic Copepods (Sea Lice)	10-20	Atlantic Salmon: 18%	Atlantic Salmon, Trout	Norway, Canada, Scotland	6,000 (cost of mechanical removal)	70 (thermal delousing)	[17]
		Trout: 12%					
Tenacibaculosis	30-70	Salmon: 65%	Salmon, Sea Bream	Japan, Korea, Southern Europe	10500	45 (antibiotics)	[18]
		Sea Bream: 50%	-	-	-	-	

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