

INFORMATION ON DIFFERENT CAUSES OF FISH DEATHS

Fish deaths occur due to one or more natural causes, human impacts or sometimes an interaction of both. A summary of some different causes of fish deaths is provided below:

Cause	Signs	Contributing Factors	Other Information
Lack of dissolved oxygen	Gasping at the surface	<ul style="list-style-type: none"> ✓ Input of large amounts of plant matter into waterways (eg: following significant rains after periods of drought) ✓ Input of nutrients resulting in algal blooms or growth of aquatic plants (most critical at night or in overcast weather) ✓ Interference in the natural flow of a waterway resulting in stagnant conditions ✓ Inputs of dissolved metals (eg: Fe) from acid sulphate drainage which flocculate in water (a process which uses up oxygen) 	Death by suffocation Critical minimum DO concentration varies between species
Water temperature changes	-	<ul style="list-style-type: none"> ✓ Overturning (stratification) – indicated by temperature profile of water column uniform from surface to bottom and dissolved oxygen levels low and uniform throughout water column ✓ Extreme weather events ✓ Inputs of low (eg: bottom off-takes in storages) or high temperature water into waterway 	Particularly apparent in small water bodies
Salinity changes	-	<ul style="list-style-type: none"> ✓ Rapid drop in salinity levels following a major storm event (more evident in estuarine environments) ✓ Rapid increase in salinity due to breach of sand barriers at river mouths and sudden incursion of saline water ✓ Rapid increase in salinity due to evaporation of water in confined water bodies 	-
pH stress	Gill and skin damage Body lesions associated with "red spot disease"	<ul style="list-style-type: none"> ✓ Chemical spills or other contaminated runoff ✓ Industrial effluents ✓ Acid sulphate drainage 	Fish have a limited tolerance to abnormal pH concentrations
Toxic algae	-	<ul style="list-style-type: none"> ✓ Presence of toxin producing BGA and dinoflagellate's 	-
Excessive plant growth	Refer lack of dissolved oxygen	<ul style="list-style-type: none"> ✓ Through the processes of photosynthesis and respiration, there can be a supersaturation of dissolved oxygen levels in water during the day (excess oxygen is toxic to fish) or oxygen depletion at night. ✓ Reduced DO levels due to decomposition of large amounts of plant matter 	Excessive plant growth is often a result of excessive nutrient concentrations in waterways and is more likely to occur in warmer weather.

Cause	Signs	Contributing Factors	Other Information
Sediment disturbance / excessive turbidity	Gasping at the surface (lack of dissolved oxygen, or suffocation from clogging of gills)	<ul style="list-style-type: none"> ✓ Disturbance (eg: due to increased flows, direct disturbance, etc) of nutrient rich organic matter present in bottom sediments, and subsequent issues associated with decomposition of this matter in the water column ✓ Gills clogged with particulate matter or injured by abrasive particles 	-
Contamination by Chemicals	Refer pH stress, Acid Sulphate Drainage	<ul style="list-style-type: none"> ✓ Inputs of pesticides, herbicides, heavy metals, etc 	Adjacent landuse is important if contamination, chemical or otherwise, is considered a possible cause
Ammonia	-	<ul style="list-style-type: none"> ✓ Fertilisers ✓ Organic pollution ✓ Collapsing algal blooms ✓ Overcrowding of fish ✓ Industrial effluents 	NH ₃ is potentially toxic to fish and its proportion relative to NH ₄ ⁺ increases with pH.
Sunburn	White lesions on top of head, accompanied by cloudless weather and very clear water	<ul style="list-style-type: none"> ✓ High temperatures ✓ Limited shade / protection 	-
Parasites and disease	Sometimes lesions or haemorrhages but these may not always be present	<ul style="list-style-type: none"> ✓ Fish are subject to a variety of bacterial and viral infections and parasitic infestations. These are often a secondary cause of fish kills in fish already stressed by other factors 	-
Acid sulphate drainage	Gill and skin damage Body lesions associated with "red spot disease" Suffocation (gasping at the surface)	<ul style="list-style-type: none"> ✓ Acidic runoff / drainage from disturbed acid sulphate soils ✓ Inputs of dissolved metals from acid sulphate drainage resulting in fish deaths from metal toxicity, or flocculated (precipitated) metal causing low DO levels and clogging of gills 	Acid sulphate soils occur in estuarine and coastal areas only, typically where surface elevation is <5m
Gas bubble disease (bubbles of gas in the blood vessels)	Bubbles visible in the fins and on the head, also present in the gills and behind the eyes	<ul style="list-style-type: none"> ✓ Supersaturation of dissolved gases in the water, usually as a result of high energy inputs (eg: flow over a spillway, heated water discharges from power station operations) 	Death by blockage of blood supply to vital organs
Hydrogen sulfide (H ₂ S)	Smell (rotten eggs) Larger fish affected first Dark brown gill filaments	<ul style="list-style-type: none"> ✓ Release of H₂S is usually the result of collapsing algal blooms, or disturbance of anoxic sediments or thermal stratification (eg: due to releases from dams or changing weather conditions). 	-
Lifecycle related	-	<ul style="list-style-type: none"> ✓ Some fish make seasonal migrations for breeding and sometimes die after spawning or their journeys can expose them to stressful environmental conditions. 	Fish kills confined to single species only

Source: EPA Fish Kill Reporting and Investigation Manual, November 1998. Further information:

http://www.epa.qld.gov.au/publications/p00366aa.pdf/Fish_kill_reporting_and_investigation_manual_for_use_in_investigation_of_possible_breaches_of_the_Environmental_Protection_Act_1994_and_Fisheries_Act_1994.pdf