Inland Fisheries Service

Little Swanport River

Fish Mortality Event



Investigation Report – September 2026

Inland Fisheries Service

Little Swanport River Fish Mortality Event

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Executive summary

A fish mortality event in the upper estuary of the Little Swanport River was reported to the Department of Natural Resources and Environment Tasmania (NRE Tas) on 3 September 2026. The mortality event involved predominantly southern black bream (*Acanthopagrus butcheri*). The exact timing of the event is uncertain given the advanced decomposition of fish when examined indicating that mortality may have occurred one or more days before it was reported. Approximately, 31 August to 2 September is, therefore, considered the potential mortality window for this event.

Investigations by the Inland Fisheries Service (IFS), Environment Protection Authority (EPA), Parks and Wildlife Service (PWS), Animal Health Laboratory (AHL), Analytical Services Tasmania (AST), Biosecurity Tasmania (BT) and Marine Resources (MR) did not identify a contaminant, harmful algal bloom or disease sufficient to explain the mortality. The strongest direct environmental evidence for the cause of the fish kill was very low dissolved oxygen measured by the EPA on 5 September in the vicinity of the dead fish (3.49-4.7 mg/L and 43.1-55 per cent saturation).

The combined evidence is most consistent with a short-term, localised low-oxygen (hypoxic) event as the principal working explanation. Potential contributing conditions include prolonged dry weather and very low river flow (i.e. freshwater inflows to the estuary), local isolation of spawning fish in upstream reaches at low tide, high biological activity and overnight respiration by benthic periphyton, upper-estuary stratification or halocline conditions, and weather capable of altering circulation or redistributing oxygen-depleted water.

The mortality was strongly biased toward large, mature black bream, many of which were females in an advanced stage of gonadal development. An acoustic-tagged fish that was found amongst the dead fish was confirmed as having been tagged in 2005, demonstrating longevity of at least approximately 20 years and supporting high residency within the system. Despite the observation of many live bream in the area in the weeks following the mortality, this event appears to have removed a substantial component of the older spawning population which could have consequences for spawning biomass (the amount of mature breeding fish in the population) and future recruitment (the number of young fish entering the fishery) in the black bream population in this estuary.

Glossary of Terms

Term	Definition
Autolysis	Natural breakdown of fish tissues after death, which can make laboratory diagnosis difficult.
Biomass	The total weight of fish present in an area or population.
Chemical Oxygen Demand (COD)	A measure of the amount of oxygen that could be consumed as organic material decomposes in the water.
Dissolved Oxygen (DO)	Oxygen dissolved in water that fish need to survive.
Estuary	The area where freshwater from a river mixes with seawater.
Gonadal Development	Development of eggs or sperm before spawning.
Halocline	A boundary between fresher surface water and saltier deeper water.
Histopathology	Microscopic examination of tissues to look for signs of disease or injury.
Hypoxia	A condition where oxygen levels in the water become too low for fish.
Oxygen Saturation	How much oxygen the water contains relative to the maximum it can hold.
Periphyton	Algae and microorganisms attached to rocks, logs and other surfaces.
Recruitment	The addition of young fish into the population or fishery.
Spawning Biomass	The total mass of mature fish capable of reproducing.
Stratification	Separation of water into layers that do not mix readily.
Toxicology	The study and testing of poisons and contaminants.

Incident chronology and field observations

The incident was reported to NRE Tas on 3 September 2026. PWS attended the site on 4 September 2026 and collected fish samples which were frozen for analysis. Follow-up investigations were undertaken by EPA, MR, BT and IFS, with laboratory testing subsequently undertaken through AST and AHL.

Initial investigation

On 5 September, EPA and IFS observed significant numbers of dead black bream in the upper Little Swanport River estuary, with many appearing to have died at approximately the same time (**Figure 1**). Dissolved oxygen measured approx. 200 m upstream of the bridge on the northern bank was low at 3.49–4.7 mg/L (43.1–55 per cent saturation), providing direct evidence of oxygen stress contributing to the mortality. Water and fish samples were collected for laboratory analysis, with fish also retained for potential toxicological testing.

Schools of apparently healthy black bream and toad fish (*Tetractenos glaber*) were observed in the same area, with no moribund or distressed fish present, suggesting the mortality was episodic and conditions had changed by the time of inspection.

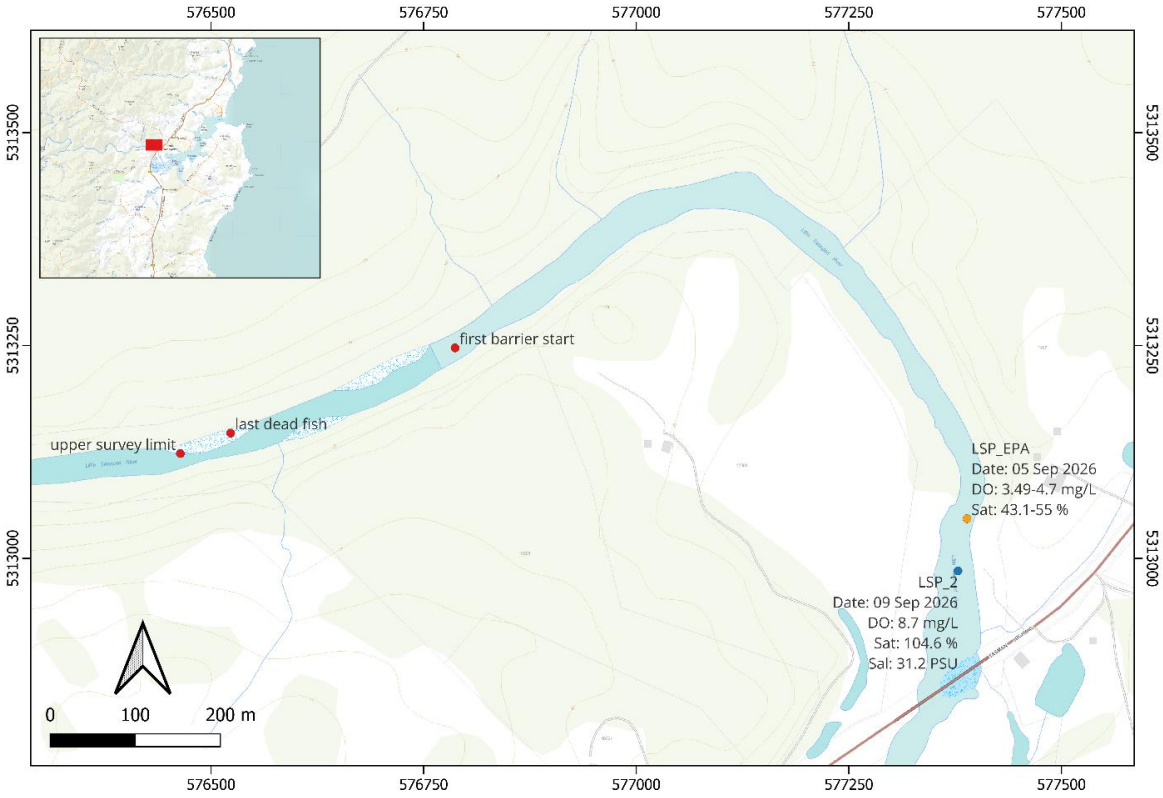


Figure 1. *Little Swanport River study area showing the location of the fish mortality event and water quality parameters recorded during follow-up investigations on 5 and 9 September 2026, after the initial report on 3 September 2026. The map also shows the upper extent of the field survey, the first main rock barrier, and the location of the last recorded dead fish within the upper reaches of the estuary.*

Fish clean-up and extent of biological and environmental surveys

IFS undertook fish clean-up and removal operations on 9, 10 and 14 September, with approximately 3,800 dead black bream (approximately 4 t) removed across these three days (**Figure 2**). A small number of dead toadfish (fewer than 20 individuals) were also recovered. Follow-up water quality measurements collected on 9 September indicated that conditions had returned to levels more typical of the estuary, with dissolved oxygen of 8.7 mg/L (104.6 per cent saturation) and salinity of 31.2 PSU. These measurements suggest that the low dissolved oxygen conditions recorded immediately following the mortality event were no longer present at the monitored location by 9 September, further supporting the possibility that the event was transient and episodic.

An aerial survey was undertaken on 12 September with the assistance of the PWS to assess the downstream extent of the fish kill (Figure 3). No mass mortality was identified below the Little Swanport River bridge (Tasman Highway), supporting the observation that the mortality event was concentrated in the upper estuary.

On each clean-up occasion, multiple large schools of live black bream were observed, particularly upstream of the bridge. These fish appeared to represent a smaller group of fish of similar size and age than the dead fish and may have included a higher proportion of males, although sex was not confirmed. At least three schools of black bream that were observed were estimated to contain approximately 400 individuals each. The repeated presence of substantial schools of apparently healthy smaller bream indicates that the mortality event did not affect all black bream present in the upper estuary equally and further supports a potentially selective or episodic event.



***Figure 2**. Dead black bream in the upper estuary of the Little Swanport River immediately upstream of the bridge and the associated physical barrier to fish movement. The image shows accumulated fish mortalities within the shallow channel immediately above the bridge. Image provided by a member of public on 6 September 2026.*

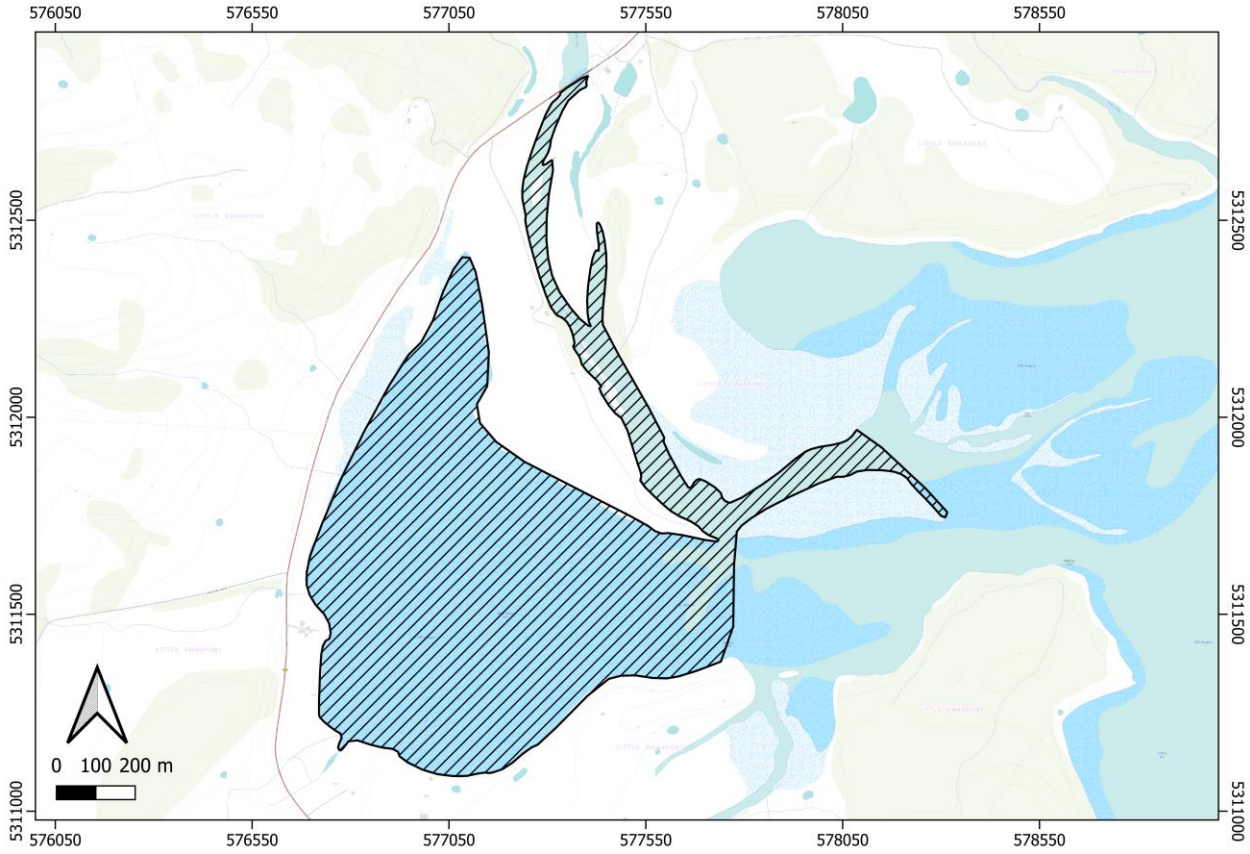


Figure 3. *Aerial drone survey coverage of the lower Swanport Estuary undertaken jointly by IFS and PWS on 12 September 2026 to assess the extent of the fish kill event. Survey coverage focused on the lower estuary and adjacent shoreline habitats where fish mortality was considered most likely to occur. No major fish mortality was observed within the areas surveyed, indicating that significant fish kill impacts were largely confined to upper sections of the estuary.*

Fish pathology and disease testing

Fish were in an advanced state of decomposition and autolysis when examined, which substantially limited the diagnostic value of histopathological tests. AHL advised that no cause of mortality was apparent histologically in the tissues examined, but advanced autolysis made useful histological assessment nearly impossible (**Table 1**).

The significance of the isolated low-level Pilchard orthomyxovirus (POMV) detection is unclear; however, based on the available results there is no evidence that disease was responsible for the mortality.

Table 1. *Summary of fish pathology and disease testing results from black bream that were collected following the Little Swanport River fish mortality event.*

Test	Outcome
Histopathology	Significant autolysis: no apparent cause identified in assessable tissues.
Microbiology	Not undertaken because of the age and condition of samples.
Molecular testing	One fish returned a low-level positive result for Pilchard orthomyxovirus (POMV); remaining samples were negative.

Water chemistry, contaminants and toxicology testing

Water chemistry investigations did not identify a contaminant cause. A comprehensive analytical program was undertaken, with 23 separate laboratory tests targeting a wide range of potential contaminants applied across the submitted samples. No pesticides were detected, while hydrocarbons, glyphosate and most metals were absent or present in low concentrations. An elevated chemical oxygen demand (COD) result was identified but was considered subject to analytical uncertainty because of the high chloride concentration. COD is a measure of how much oxygen is consumed as organic material breaks down in the water, and elevated levels may also have been influenced by the decomposition of fish and other organic matter associated with the mortality event.

AST advised that, based on the available information, there was no specific toxicological target of concern warranting further fish-flesh testing. Potential additional analyses included metals, pesticides and marine biotoxins, but further testing was not considered warranted.

Nearby oyster growers in the estuary of the Little Swanport River had not reported an increase in oyster mortalities before, during or after the fish mortality event. While this does not exclude a localised or fish-specific toxic event, the absence of a broader reported mortality signal was considered somewhat reassuring in relation to a widespread environmental toxin.

Algae testing

No harmful algal blooms or concerning phytoplankton concentrations were identified in water samples submitted for laboratory analysis. While AST interpreted the phytoplankton community in the upper estuary as indicative of a halocline associated with freshwater input, the assemblages observed throughout the estuary are also consistent with a more mixed freshwater-marine environment. In particular, counts from the lower estuary were more typical of regular observations and suggest substantial mixing between freshwater and marine waters, rather than a strongly stratified system characterised by a well-defined halocline (a layer where fresh water sits above salt water). The upper-estuary assemblage was considered potentially consistent with conditions that could support low dissolved oxygen upstream. This interpretation does not by itself demonstrate that a hypoxic event occurred, but it provides additional evidence of different water-mass and mixing conditions between the upper and lower estuary.

Environmental conditions preceding the event

As water chemistry, pathology and disease testing did not identify a clear cause of the mortality, additional investigative work focused on examining the preceding environmental conditions and physical characteristics of the upper estuary that could contribute to low dissolved oxygen events. This assessment was supported by subsequent field surveys by IFS of water quality, tidal connectivity and physical barriers to fish movement within the affected reaches.

The upper Little Swanport River contains a series of natural and artificial physical features that may restrict tidal exchange and fish movement, particularly at low tide (**Figure 4**4). Immediately downstream of the bridge, the main river channel becomes extremely shallow at low water levels, potentially limiting both fish passage and the volume of tidal water exchanged with the upper estuary. Immediately upstream of the bridge, a historical concrete apron and apparent artificial arrangement and tiering of rocks may further restrict water and fish movement.

Further upstream, a natural rock bar forms a distinct barrier between the lower channel and upstream pools at low tide. Field observations indicate that this feature is generally inundated when the predicted tide reaches a height of approximately 1.2 m. Significant fish mortality was observed in the pools upstream of this feature and below the main freshwater confluence. Collectively, these physical constraints may contribute to periods of reduced tidal replacement of water by incoming tides, restrict fish movement and increase the length of time water remains in the upper estuary before being replaced, particularly during periods of low river flow and tides below the approximate inundation threshold of tidal heights of 1.2 m.

High periphyton growth was observed in upper sections downstream of the freshwater confluence. Strong daytime photosynthetic activity can produce elevated dissolved oxygen and oxygen supersaturation (how close the water is to holding the maximum amount of oxygen possible), while respiration continues at night when photosynthesis ceases. In poorly exchanged upstream reaches, this could contribute to large daily fluctuations between day and night and substantially lower dissolved oxygen before dawn potentially exposing fish to levels insufficient to sustain their population and increasing the risk of mortality.

Rainfall and river flow

Rainfall data used in this report were obtained from the Swansea Bureau of Meteorology station (092148), while Little Swanport River discharge data were obtained from Little Swanport River 800 m downstream Eastern Marshes Rivulet hydrology station (2212-1) that is managed by NRE Tas. August 2026 was particularly dry at Swansea, with only 7.6 mm of rainfall, approximately 21 per cent of

the long-term August average. Correspondingly, river discharge declined through August and was very low immediately preceding and during the suspected mortality period (**Figure 5**5). There was no substantial rainfall immediately before the mortality event to provide significant freshwater flushing of the upper estuary. These prolonged dry conditions and low river flows likely resulted in limited freshwater inflows and increased water residence time within the upper estuary, potentially increasing its susceptibility to declining dissolved oxygen where tidal exchange was also restricted.

The mortality event followed an extended period of dry weather and very low river flows. A Tasmanian Government (NRE Tas) water restriction was introduced for the Little Swanport River on 28 August 2026 in response to ongoing low-flow conditions, providing independent evidence of reduced freshwater discharge immediately before the event.

Tidal conditions, atmospheric pressure and potential fish entrapment

Spring Bay tide predictions were used as a proxy for tidal conditions in Little Swanport River estuary. Field observations indicate that the upper extent of the Little Swanport estuary is typically inundated by tidal water when the predicted tide reaches approximately 1.2 m. Many tidal cycles preceding the mortality did not reach this threshold, suggesting intermittent tidal replenishment of the upper estuary (**Figure 5**5).

A prolonged period of reduced tidal exchange occurred in the upper estuary following a series of higher tides around August 10. This period of lower water levels persisted for an extended duration, reducing connectivity between the main estuary and upstream reaches. Under these conditions, fish that had moved upstream during the earlier high-water period may have become isolated within poorly flushed sections of the estuary.

This mechanism is consistent with observations that fish can migrate into upper estuarine habitats during favourable conditions but subsequently become trapped when water levels recede and connectivity is reduced. Sakabe and Lyle (2010) noted that physical barriers and low-flow conditions can prevent fish from returning to the Little Swanport estuary, resulting in their entrapment in upstream habitats. They further referenced a previous fish kill involving adult black bream in the upper estuary, which was attributed to the development of hypoxic conditions associated with a lack of freshwater inflows.

It is therefore plausible that fish entered the affected reach during the higher water levels and low-pressure event of approximately 10 August, before becoming confined within the upper estuary as tidal exchange decreased over the following days. Prolonged residence in poorly flushed habitats may have increased their exposure to deteriorating water quality conditions, including low dissolved oxygen concentrations, ultimately contributing to the observed fish mortality event.

The return of higher tides around 1 September, coinciding with another deep low-pressure system, may have re-inundated these isolated areas and transported dead fish downstream, where they became visible to the public. Strong north-westerly winds during this period may have further assisted their downstream movement.

The advanced state of decomposition observed in many fish is consistent with mortality occurring before the first reports on 3 September. This supports the possibility that fish died during the preceding period of restricted tidal exchange and were subsequently redistributed by the return of higher tides.

Collectively, these observations suggest a plausible sequence of upstream migration, tidal isolation, declining dissolved oxygen, mortality and subsequent downstream transport. However, the precise timing of mortality and the proposed entrapment mechanism remain unconfirmed.

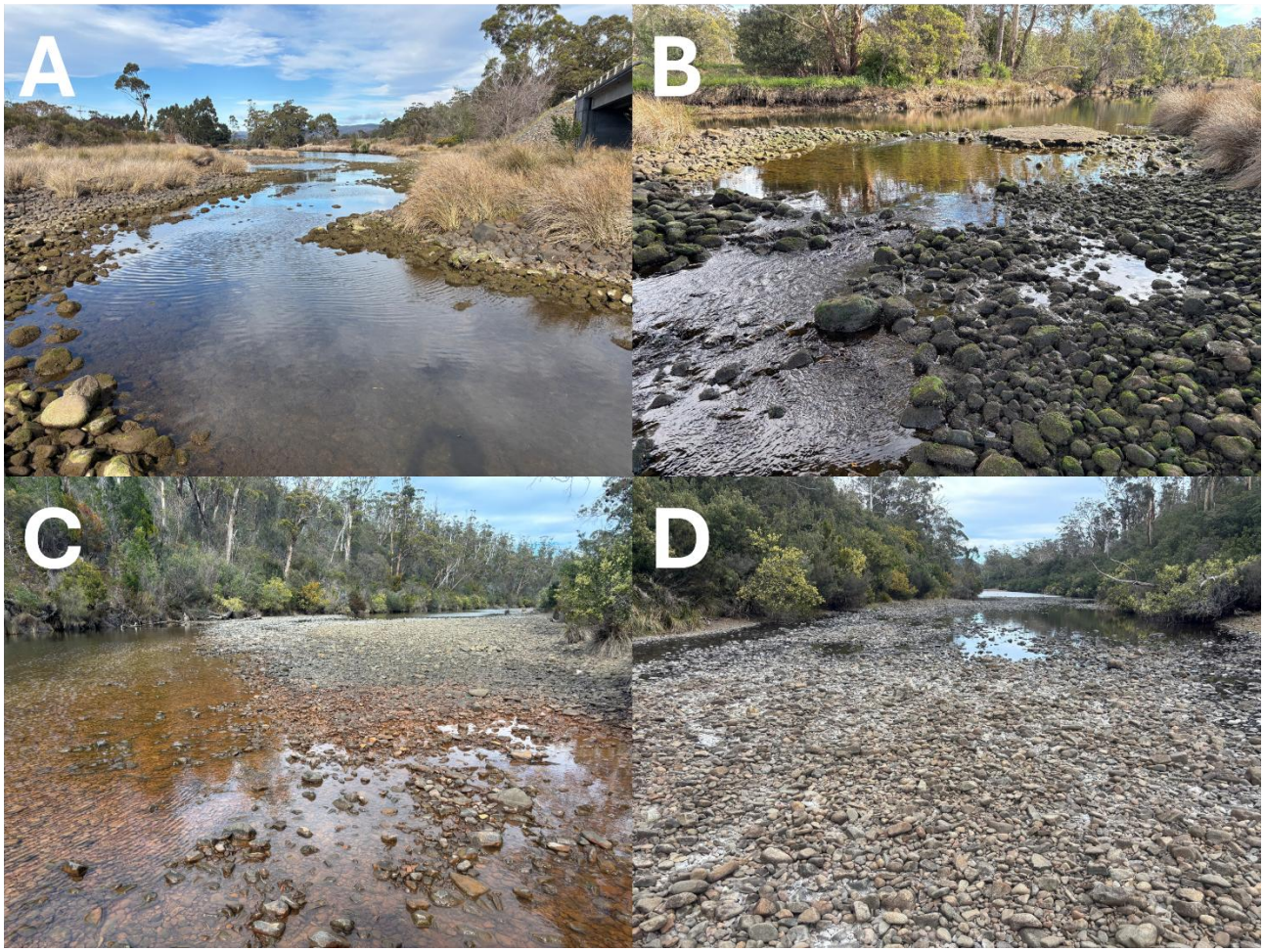


***Figure 4**. Natural and artificial features influencing tidal exchange and fish movement in the upper estuary of the Little Swanport River, photographed at low tide (approx. 0.93 m) on 17 September 2026. (A) Main river channel immediately downstream of the bridge, showing extremely shallow habitats and restricted connectivity at low tide. (B) Historical concrete apron and apparent artificial arrangement and tiering of rocks immediately upstream of the bridge, potentially restricting tidal exchange and fish passage. (C) First upstream natural rock bar at low tide, forming a barrier to the upstream pools where significant fish mortality was observed; field observations indicate that this feature is generally inundated when the predicted Spring Bay tide reaches approximately 1.2 m. (D) Upper extent of the field survey at the main freshwater confluence.*

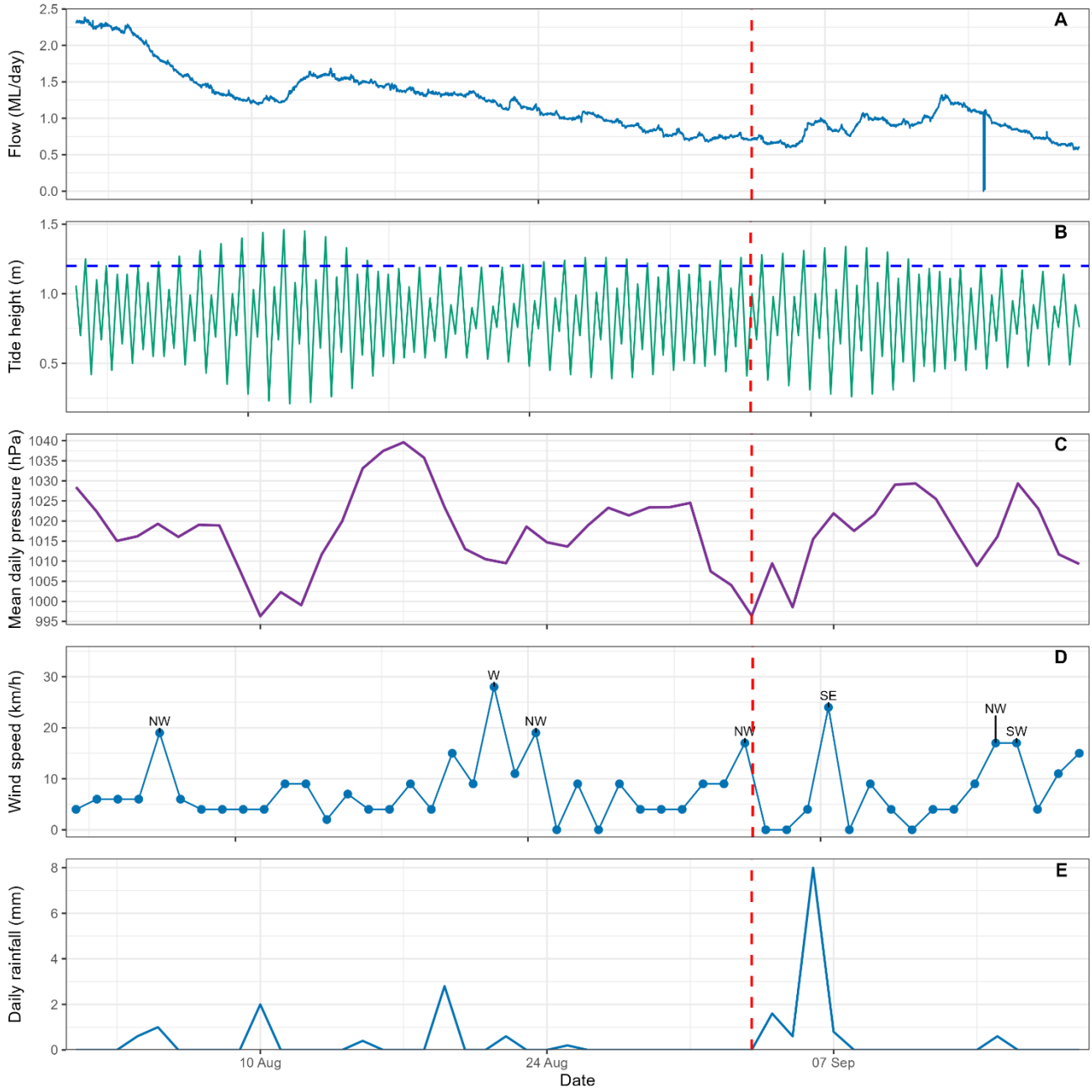


Figure 5. *Environmental conditions preceding and following the fish mortality event in the upper estuary of the Little Swanport River. Little Swanport River discharge (A), predicted tide height (B), mean daily atmospheric pressure (C), average daily wind speed and direction (D) and daily rainfall (E) during August-September 2026. The red dashed line indicates the date the fish mortality event was reported (3 September 2026). The blue dashed line (1.2 m) represents the approximate predicted tide height at which tidal water typically inundates the upper extent of the estuary, based on field observations. The figure demonstrates declining river discharge during August, intermittent tidal inundation of the upper estuary, a marked low-pressure system and higher winds around the incident period, and limited rainfall prior to the event. Environmental conditions experienced by fish may, therefore, have reflected prolonged low freshwater inflow and periods of restricted tidal replenishment before the fish mortality event was detected.*

Dissolved oxygen requirements of black bream

Black bream are adapted to variable estuarine conditions but remain susceptible to low dissolved oxygen. They generally favour dissolved oxygen concentrations above 4 mg/L (Hoeksema et al., 2006), while experimental studies have demonstrated adverse effects of hypoxia, including reduced embryo hatching success at 45–55 per cent oxygen saturation and substantially reduced survival at 30 per cent saturation (Hassell et al., 2008).

The dissolved oxygen measured in the upper estuary of the Little Swanport River shortly after the mortality (3.49–4.7 mg/L; 43.1–55 per cent saturation) was, therefore, at or below the lower end of conditions considered favourable for black bream and indicative of oxygen stress. As these measurements were taken after the mortality event, they may not accurately represent the lowest dissolved oxygen concentrations that fish potentially experienced during the event.

Seasonal spawning behaviour and susceptibility

The timing of the mortality coincided with the seasonal upstream movement of black bream associated with spawning. Sakabe and Lyle (2010) found that adult black bream in the estuary of the Little Swanport River migrate upstream from approximately August and aggregate in the upper estuary, with spawning occurring over a protracted period during spring and early summer and peaking in November-December (Sakabe and Lyle 2010; Sakabe et al. 2011).

The predominance of large adult females in the mortality event is consistent with fish congregating in the upper estuary in preparation for spawning. During this period, females undergo substantial gonadal development and associated energetic demands (Haddy and Pankhurst, 1998). While there is insufficient evidence to conclude that reproductive condition directly increases adult sensitivity to hypoxia, it is plausible that these physiological demands reduced resilience to additional environmental stress.

More importantly, the concentration of large adult fish would have substantially increased local biomass and oxygen demand in isolated reaches. Therefore, this seasonal aggregation may have increased the susceptibility of the population to a rapid decline in dissolved oxygen, potentially contributing to the scale of the mortality event.

Fish size, maturity and population implications

The mortality was strongly biased toward large black bream, with an estimated 80 per cent of affected fish exceeding 40 cm in length. Many deceased fish were females showing clear signs of early-stage gonadal development and appeared to be mature fish preparing for spawning.

One affected black bream, measuring approximately 34 cm (fork length), contained an acoustic tag (**Figure 6**6). Follow-up with Ryuji Sakabe confirmed that the fish was one of those tagged between July and September 2005 during his research on black bream spawning and movement in Little Swanport estuary (Sakabe and Lyle 2010). The fish measured 32.7 mm when tagged and was last detected on 1 February 2006, indicating it reached a minimum age of approximately 20 years.

This tagged fish provides direct evidence of considerable longevity and supports the view that black bream in estuary of the Little Swanport River can be remain within the estuary for most of their lives. Given the majority of the deceased fish were relatively large (and hence old) individuals, a substantial component of older cohorts in this black bream population may have been impacted by this mortality event. Because many affected fish were mature females approaching spawning, the event may have reduced spawning biomass and could create a gap in the age structure of the population and thereby impact future recruitment.



Figure 6. *Acoustic tag recovered from a decomposed black bream collected following the fish mortality event in the upper estuary of the Little Swanport River. (A) Decomposed black bream with the body cavity exposed. (B) Close-up of the body cavity showing the acoustic tag in situ. (C) Acoustic tag following recovery from the fish.*

Subsequent water quality investigation

Detailed field measurements by IFS on 17 September demonstrated substantial spatial variability in water quality (physicochemical variables) across the upper estuary of the Little Swanport River. Dissolved oxygen ranged from approximately 6.5 mg/L at some sites to more than 13 mg/L, with oxygen saturation ranging from approximately 70 per cent to more than 130 per cent (**Figure 7**7). Salinity also varied strongly between locations.

Several upstream locations exhibited high daytime oxygen saturation, consistent with substantial photosynthetic activity in benthic periphyton. This survey occurred approximately two weeks after the suspected period of fish mortality, allowing considerable opportunity for tidal exchange, biological activity and changes in estuarine circulation.

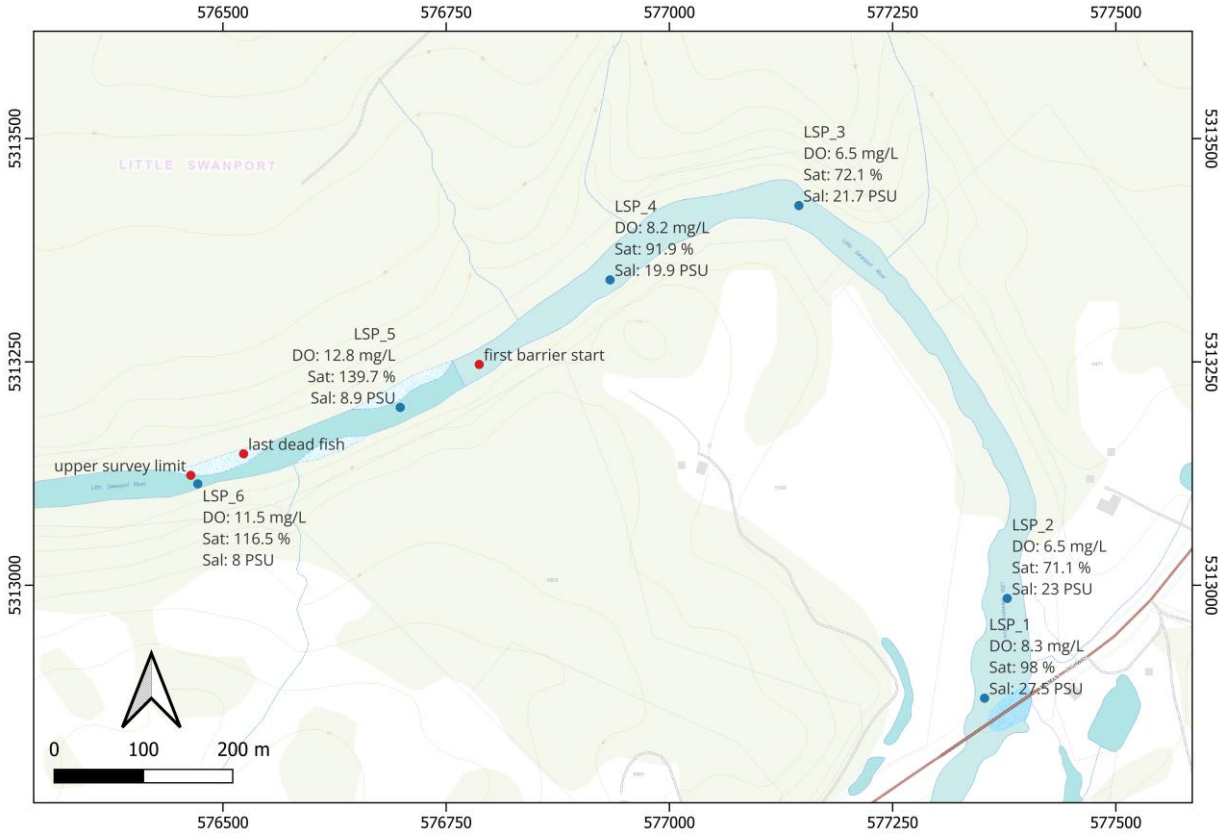


Figure 7. *Water quality survey locations in the upper estuary of the Little Swanport River on 17 September 2026, showing dissolved oxygen concentration, oxygen saturation and salinity. The locations of the upper survey limit, last observed dead fish and the first upstream barrier to fish movement are also shown. The pronounced spatial variation in salinity and dissolved oxygen demonstrates the heterogeneous nature of conditions within the upper estuary at the time of the survey. Conditions measured on 17 September should not be interpreted as representative of those occurring during the suspected mortality period of approximately 31 August – 2 September.*

Summary conceptual model

The summary conceptual model (**Figure 8**8) provides a summary of the hypothesised sequence of environmental conditions and processes contributing to this fish mortality event. Prolonged low river flows, intermittent tidal replenishment and physical constraints on tidal exchange may have increased water residence time within the upper estuary. Combined with biological oxygen demand, including overnight respiration, these conditions may have allowed dissolved oxygen to decline to critically low levels in largely isolated reaches or pools. The mortality is, therefore, hypothesised to have resulted from a localised and episodic hypoxic event in the upper estuary, potentially occurring during 31 August – 2 September 2026, with subsequent weather and tidal conditions altering water quality before later investigation and sampling.

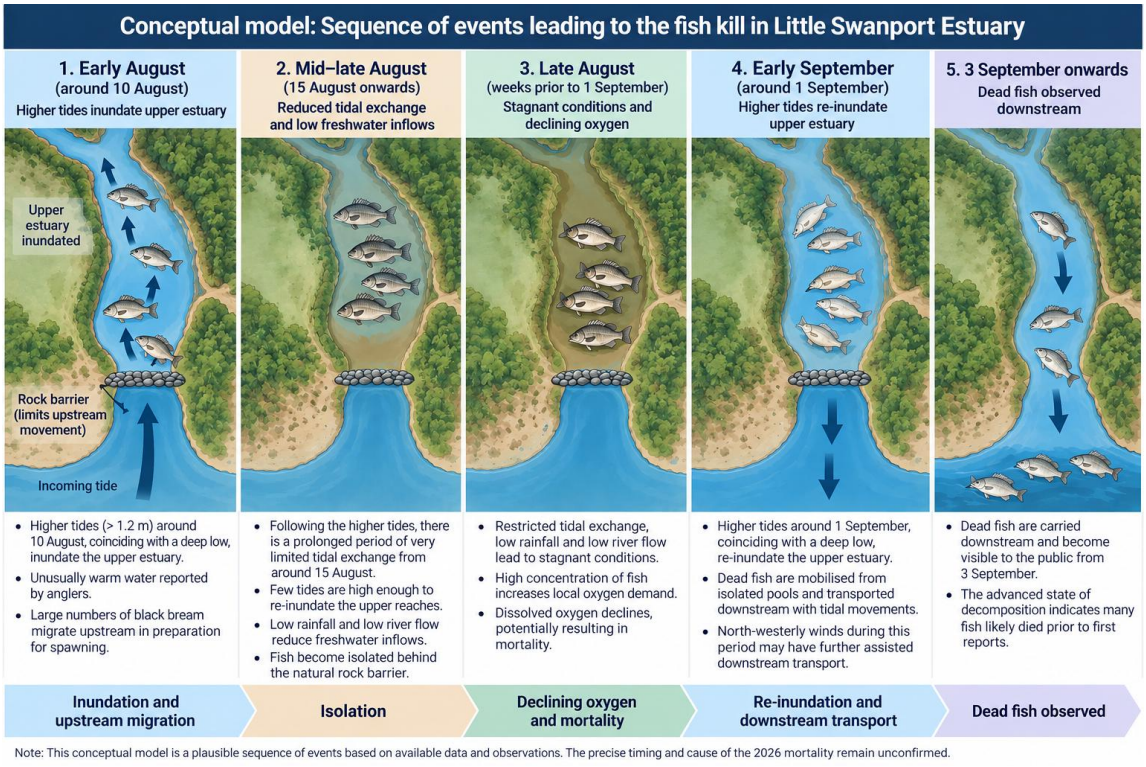


Figure 8. *Conceptual model of the Little Swanport River estuary fish mortality event, illustrating the environmental conditions and processes that may have contributed to a localised and episodic low dissolved oxygen event in the upper estuary during 31 August – 2 September 2026.*

Conclusion

Overall, the investigation has not identified a toxicant, pathogen or harmful algal bloom capable of clearly explaining the mortality. The most notable direct environmental observation was the low dissolved oxygen measured by the EPA following the event (3.49-4.7 mg/L; 43.1-55 per cent saturation), combined with evidence of strong biological activity and limited or variable water mixing, and restrictions to fish movement.

The available evidence is, therefore, most consistent with a sudden, localised low oxygen event as the principal working explanation. The likely mechanism may have involved a combination of prolonged low river flow, tidal isolation, overnight respiration and altered circulation or mixing during the severe-weather event.

The evidence is not sufficient to determine exactly when the oxygen decline occurred, how long low dissolved oxygen persisted, or whether storm-driven mixing, a pulse of freshwater inflow, stagnant upstream water, diel respiration, or a combination of these factors provided the immediate trigger for fish mortality to occur.

The mortality event appears to have disproportionately affected large, old and reproductively mature black bream. Therefore, the ecological consequence may extend beyond the immediate number of fish killed through loss of a significant component of the local spawning biomass and potential effects on future recruitment.

Repeated observations of substantial schools of smaller, live black bream during clean-up operations, together with the absence of mass mortality below the bridge during the 12 September aerial survey, indicates a strongly localised event with differential effects across the population. The apparent size difference between surviving schools and the predominantly large mature fish recovered is noteworthy, but the suggestion that surviving schools contained a higher proportion of males remains observational and has not been confirmed by sampling.

Recommended management

- Continue to liaise with local anglers and community members regarding observations of fish numbers and movements into and out of the suspected area where the mortality event occurred and undertake follow up water testing where practical.
- Encourage anglers to consider limiting their take of black bream from the Little Swanport River and its estuary to reduce pressure onthe remaining spawning population.
- Maintain a rapid-response fish-kill protocol for fresh fish pathology, water chemistry, dissolved oxygen profiles and targeted toxicology before carcass autolysis substantially limits diagnostic value.

Key uncertainties and limitations

- The exact time of fish death is unknown; the 3 September report date may lag mortality by one or more days.
- No continuous dissolved oxygen record is available for the suspected mortality window.
- Fish were substantially decomposed and autolysed, limiting pathology and microbiology.
- Water samples were collected after the fish mortality event and may not accurately represent adverse environmental conditions that caused the fish kill.
- Spring Bay tide predictions are a proxy for coastal tidal forcing rather than direct Little Swanport River estuary water level measurements.
- The role of storm-driven mixing, freshwater input, stagnant upstream water or potentially low-oxygen water remains hypothetical without event-time measurements.
- The population-level effect on spawning biomass and recruitment is plausible but has not yet been quantified.

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Appendix 1 – Investigation record

Table 2. *Summary of key events and response actions associated with the Little Swanport fish mortality incident. This table is intended to provide an overview of major events and actions undertaken during the response and is not an exhaustive record of all activities, communications, observations, or reports that may have been received, documented, or undertaken by the various agencies involved.*

Date	Source / agency	Key information
3 Sep	NRE Tas	Initial report to NRE Tas that approximately 35 dead fish in the river; however, this was subsequently revised to three confirmed fish mortalities. As a result of the limited scale of the incident and the updated information received, no on-ground investigation was undertaken.
4 Sep	PWS	Report of significant numbers of dead fish in the estuary above the bridge. Fish samples collected late in the day.
5 Sep	EPA	Significant dead black bream; DO 3.49-4.7 mg/L and 43.1-55% saturation; water samples collected.
5 Sep	IFS	Hundreds of dead black bream upstream of bridge; fish appeared to have died at similar time; fish and water samples collected; healthy black bream and puffer fish also observed.
9 Sep	IFS	Fish clean-up/removal undertaken; additional water quality readings collected.
10 Sep	IFS	Fish clean-up/removal continued.
11 Sep	AHL/AST	No specific toxicology target recommended at that stage; EPA samples also under analysis.
12 Sep	IFS/PWS	Aerial survey undertaken to determine downstream extent of the mortality event; no mass mortality identified below the bridge.
14 Sep	IFS	Further fish clean-up/removal undertaken. Approximately 3,800 dead fish were removed across the 9, 10 and 14 September operations. At least three live schools of about 400 black bream each were observed across clean-up occasions; fish appeared to be smaller sized cohorts than the mortalities.
15 Sep	Investigation update	No clear contaminant cause; low-level POMV in one of three black bream; no harmful algal bloom; upper estuary phytoplankton interpreted as consistent with halocline/freshwater influence.
15 Sep	AST	Upper estuary taxa considered indicative of halocline associated with freshwater input; lower estuary indicated greater mixing.

16 Sep	AHL	Histopathology limited by autolysis; microbiology not undertaken; one POMV-positive fish, remaining samples negative.
16 Sep	EPA	EPA testing finalised; highlighted episodic nature of events and value of rapid/event-based sampling; suggested freshwater or low-oxygen/sulfidic upstream pulse as possible mechanism.
17 Sep	IFS	Follow-up field water quality survey documented strong spatial variation in DO, oxygen saturation and salinity.
18 Sep	AHL	No histological cause apparent in examined tissues; advanced autolysis made useful assessment nearly impossible.

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