

# 2025 Spent Wash Spill Incident in Bais Bay: Rapid Field Assessment and Implications for the Tañon Strait Protected Seascape, Central Philippines

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## ABSTRACT

A rapid environmental assessment was conducted by the Silliman University - Institute of Environmental and Marine Sciences (SU-IEMS) Emergency Response Team (ERT), in coordination with the Department of Environment and Natural Resources - Tañon Strait Protected Seascape (DENR-TSPS), Philippine Coast Guard (PCG), Manjuyod Bantay Dagat, and representatives from the Universal Robina Corporation (URC), to evaluate the spatial extent, ecological impacts, and socioeconomic consequences of the October 26, 2025 Universal Robina Corporation (URC) spent wash spill in Bais Bay, Negros Oriental, Philippines. Drone-based GIS mapping and field surveys estimated an affected area of approximately 4,494 ha. Localized fish kills were documented up to 7 km from the spill source, with benthic species such as *Cryptocentrus* spp. (Gobiidae), *Gymnothorax* spp. and *Echidna* spp. (Muraenidae), and species of dragonets (Callionymidae), including the mandarinfish (*Synchiropus splendidus*), most affected, indicating severe dissolved oxygen (DO) depletion. Interviews with fish corral operators revealed daily income losses of PhP 1,000 - 6,000 and cumulative stock losses estimated at PhP 1.8 million for a single operator. Approximately 100 operators and nearby seaweed farms were impacted. The findings provide an initial scientific basis for emergency intervention, coordinated response, short- and long-term ecological recovery planning. Ongoing monitoring is underway to track system recovery and inform management decisions.

**Keywords:** *Spent wash spill, fish kill, Bais Bay, ecological impacts, socioeconomic assessment, rapid environmental assessment*

## INTRODUCTION

On October 31, 2025, the Department of Environment and Natural Resources - Tañon Strait Protected Seascape (DENR-TSPS) formally requested assistance from Silliman University Institute of Environmental and Marine Sciences (SU-IEMS) to

conduct a rapid scientific assessment of a spent wash spill originating from the Universal Robina Corporation (URC) ethanol distillery facility in Negros Oriental. The spill, which discharged untreated effluent into Bais Bay, raised urgent concerns regarding water quality deterioration, potential fish and shellfish mortality, and risks to coastal ecosystems and local livelihoods dependent on marine resources.

Spent wash, a by-product of distillery operations characterized by high biochemical oxygen demand (BOD), can rapidly deplete dissolved oxygen (DO) in receiving waters when inadequately treated, thereby inducing acute ecological stress and mortality among aquatic organisms (Tiwari & Prakash, 2021). Understanding the immediate spatial and ecological impacts is critical for informing emergency response measures and preventing further environmental degradation.

This report summarizes the preliminary findings from the rapid field assessment conducted by SU-IEMS ERT on November 2, 2025, in collaboration with DENR-TSPS, the Philippine Coast Guard (PCG), Manjuyod Bantay Dagat, and URC representatives.

## **METHODS AND MATERIALS**

### **Site Description**

North Bais Bay (9.63058° N, 123.12594° E) spans between Manjuyod Municipality and Bais City, located in Negros Oriental, Philippines. Both northern and southern Bais Bay are part of Tañon Strait Protected Seascape (Fig. 1). It is an important shallow coastal bay with mangrove forests, coral reefs, seagrass meadows, and intertidal areas that support local fisheries and communities (Calumpong & Luchavez, 1997; Luchavez & Abrenica, 1997). The bay is a major source of food and livelihood for over 1,000 fishing families and 150 fishermen in nearby coastal barangays, with about 100 operators of fish pens and fish corrals (Luchavez & Abrenica, 1997; Pal, 2025).

### **Field Team and Coordination**

The Emergency Response Team (ERT) was led by Dr. Aileen Maypa (SU-IEMS) and

included faculty researchers, research assistants, student volunteers, and DENR-TSPS personnel. Coordination with the Philippine Coast Guard, Manjuyod Bantay Dagat, and URC facilitated access to the affected areas and provided background information.

### **Spatial Assessment**

Drone-based photogrammetric mapping and on-site coastal surveys were conducted on November 2, 2025. A DJI Mavic Pro drone was deployed to capture high-resolution aerial imagery of the affected coastal area, and a supplementary field survey was done by tracing the edge of the discolored water and marking waypoints using a handheld GPS Device (Garmin GPSMap 64). The imagery and coordinates acquired were georeferenced and integrated into a GIS platform to accurately delineate zones of discolored water and identify turbidity plumes associated with the spill. This approach enabled precise spatial analysis of the spill extent and supported subsequent environmental impact assessments.

### **Ecological Assessment**

To document fish-kill events, information from Manjuyod Bantay Dagat members operating patrol vessels was used to identify suspected fish-kill locations. Upon arrival at each site, floating dead fish were collected from the water column using a scoop net. Each specimen was measured, photographed, and identified to the lowest possible taxonomic level, contingent on the condition of the specimen.

Geographic positions of all fish-kill observations were recorded in situ using a handheld GPS device (Garmin GPSMap 64). These coordinates were subsequently mapped to determine each site's distance from the origin of the spent-wash spill. Mapped locations included both fish-kill events directly observed on November 2, 2025, and additional sites previously reported by Manjuyod Bantay Dagat personnel between October 27 and November 1, 2025. Water depth at each fish-kill location was measured using a handheld sonar system (Hawkeye H22PX).

## Socioeconomic Assessment

A rapid assessment was conducted using an open-ended interview format with fish pen and corral operators in Manjuyod who were available and willing to participate ( $n = 6$ ), including Bantay Dagat personnel engaged in fish corral and fishing operations. The interviews were carried out on November 2, 2025, with the objective of collecting information on income losses, stock mortality, and the broader impacts on aquaculture and seaweed farming activities.

## RESULTS AND DISCUSSION

### Extent of Affected Area

GIS-based spatial analysis estimated that approximately 4,494 hectares of coastal waters were affected by the spill on November 2, 2025, including areas immediately adjacent to the URC facility (Fig. 1) and extending up to 10 km from the source. Spatial mapping indicated that the molasses-based ethanol spent wash plume exhibited a distinct color gradient, ranging from dark reddish-brown near the source to lighter brown and yellow with increasing distance, extending from the mouth of North Bais Bay eastward toward the Tañon Strait. This color variation likely reflects spatial differences in suspended solids concentration, dilution, and sedimentation along the dispersal pathway (Campos et al., 2022).

Comparison with a more recent dataset, a drone-GIS-generated map produced by DENR-TSPS on October 31, 2025, indicated a larger spatial extent, with the plume covering approximately 6,000 hectares (C. Fabre, NIR-RED, pers. comm.). The apparent differences in plume coverage over time can be attributed to temporal variability in hydrodynamic conditions, including tidal fluxes, ocean currents, and wind-driven surface transport, as well as episodic events such as rainfall or storm-induced mixing (FernándezNóvoa et al., 2017; Mamidisetti & Vijay, 2023). These variations highlight the dynamic nature of coastal effluent dispersal and emphasize the importance of repeated, high-resolution spatial monitoring using remote sensing and GIS-based tools

for accurate assessment of environmental impacts (Klemas, 2013).

The area affected by the spent-wash spill encompasses key marine ecosystems, including mangrove forests, seagrass meadows, and coral reef assemblages, within the Tañon Strait Protected Seascape - the largest marine protected area in the Philippines, covering more than 5,000 ha. Due to zero to low water visibility on 2 November 2025, direct assessment of these habitats was not feasible. However, potential adverse effects should be anticipated, particularly the inhibition of seagrass photosynthesis and impacts on zooxanthellae, the symbiotic algae of corals, given their high sensitivity to turbidity, light attenuation, and increased sedimentation.

### Ecological Impacts

Localized fish kills were observed up to 7 km from the point of origin, with the highest mortality recorded at 3 m depth (Fig. 1). Benthic species, including gobies (*Cryptocentrus* spp.), dragonets (Callionymidae) such as mandarinfish (*Synchiropus splendidus*), and moray eels (*Gymnothorax* sp. and *Echidna* sp.), were disproportionately affected, indicating severe dissolved oxygen (DO) depletion near the substrate. Additional mortalities involved species from Tetraodontidae (Pufferfish), Cirrhitidae (Hawkfish), Apogonidae (Cardinalfish), Pomacentridae (Damselfish), Monacanthidae (Filefish), and various crabs, reflecting the broad ecological impact of the spill. The predominance of benthic organism mortality aligns with measured DO concentrations below the 5.0 ppm safety threshold for fisheries class III waters during the Silliman University – Angelo King Center for Research and Environmental Management rapid assessment team's sampling on November 1, 2025 (Guino-o 2025; DENR AO 08-2016; DENR AO 34-1990). Dissolved Oxygen is a critical parameter for marine life, as oxygen is essential for cellular respiration and energy metabolism; concentrations below 5 - 6 ppm can cause stress, impair growth, reduce reproductive success, and ultimately result in mortality, particularly for less mobile benthic organisms (Diaz & Rosenberg, 2008; Roa et al., 2017). The observed hypoxia near the substrate likely created a lethal environment, disproportionately affecting bottom-dwelling fauna and highlighting their sensitivity to acute oxygen

depletion. These results emphasize the importance of continuous monitoring of DO and complementary water quality parameters, including biological oxygen demand (BOD), pH, temperature, salinity, and total suspended solids, to prevent and mitigate similar localized die-offs in marine ecosystems.

### **Socioeconomic Impacts**

Interviews with fish pen and corral operators in Manjuyod revealed that daily income losses ranged from PhP 1,000 to PhP 6,000 for operators managing six to ten corrals. One operator reported losses of approximately PhP 1.8 million in grouper stocks during the peak fish kill event on October 27, 2025. According to Manjuyod Bantay Dagat, an estimated 100 operators were affected, and seaweed farms in the vicinity also experienced partial to total damage.

Our preliminary results, based on a limited number of respondents due to the rapid nature of the assessment, indicated substantial economic impacts of the fish kills on both fish-pen and corral operations, as well as on associated aquaculture activities in the area. These data provide an initial quantitative basis for estimating the scale of losses and for prioritizing appropriate mitigation and rehabilitation measures.

The economic losses documented in Manjuyod are consistent with findings from other studies on the impacts of fish kill events in coastal aquaculture systems. For example, coastal fish farms in the Philippines have reported losses ranging from hundreds of thousands to millions of pesos during severe fish mortality events, particularly in grouper and milkfish cultures (San Diego-McGlone et al., 2008; Asian Development Bank, 2014). The wide range of daily income losses (PhP 1,000–6,000) reflects differences in farm size, the species being cultured, and the susceptibility of the stock to environmental stressors. In contrast, reports from Bantay Dagat in Bais Bay indicate that milkfish cultures were not affected by the fish kills.

The reported peak loss of PhP 1.8 million highlights the vulnerability of high-value species like grouper to acute environmental events. Fish kills can be triggered by factors such as hypoxia, harmful algal blooms, sudden temperature shifts, or contamination from land-based activities (FAO, 2020). Seaweed farms also

experienced damage, which aligns with prior reports indicating that multi-species aquaculture systems often suffer collateral effects when environmental perturbations occur (Rosenberg et al., 2009).

The findings emphasize the need for data-driven mitigation strategies, including early warning systems, improved water quality monitoring, and contingency plans for stock insurance and diversification. Moreover, systematic documentation of losses, such as this study provides, can guide local government units and community-based organizations in prioritizing support for affected operators (Primavera, 2006).

Overall, the results show the interconnected vulnerability of coastal aquaculture and the importance of integrated management approaches that consider both ecological and socioeconomic dimensions to benefit the restoration and recovery of negatively impacted ecosystems and resources.

## **RECOMMENDATIONS**

SU-IEMS emphasizes the importance of accountability, prompt action, and continuous monitoring. The following recommendations are proposed:

1. Immediate repair and stabilization of the containment pond to prevent further discharge, and cessation of its operation to avoid future incidents, in accordance with the E-NIPAS Act and PD No. 1586.
2. Regular and systematic monitoring of water quality and sediment conditions.
3. Enhanced inter-agency coordination for data sharing, response planning, and enforcement.
4. Strict adherence to environmental safety protocols by all industrial and regulatory stakeholders.
5. Provision of support and compensation for affected fishers, aquaculture operators, tour operators, and seaweed farmers.
6. Ensure continuous monitoring for possible algal blooms and red tide events.
7. Provision of an emergency mobilization fund for the SU Emergency Response Teams is essential to ensure the continuation of assessments and technical advisory activities.

8. Develop and implement comprehensive short- and long-term recovery and rehabilitation plans for Bais Bay that integrate ecological restoration with socio-economic support measures, promoting resilient ecosystems and sustainable community livelihoods in accordance with the TSPS mandate.

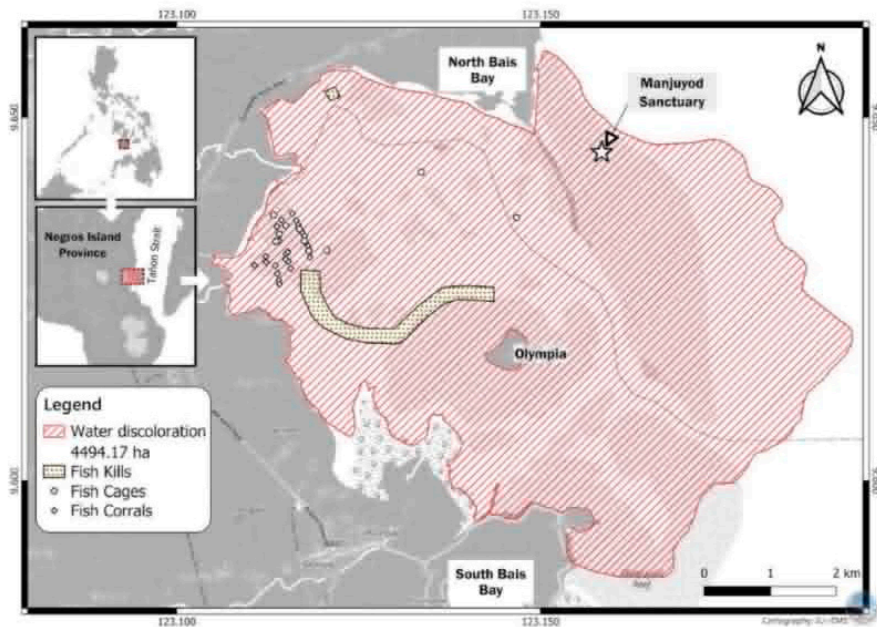


**Figure 1.** Extent of the URC molasses-based ethanol waste (spent wash) plume (red) and the recorded fish kill locations at Bais Bay, Negros Oriental, based on the SU-IEMS Rapid Assessment Field Survey conducted on November 2, 2025.

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