14.4.1. Investigating Pressures on Coastal Water Quality

Introduction

Protecting coastal receiving waters requires a clear understanding of where contamination may originate, how it moves through human-managed systems, and what institutions and communities can do to reduce risk. Aquaculture discharges, gaps in household solid-waste practices, and limitations in environmental testing can each complicate efforts to safeguard nearshore ecosystems. Evidence-based responses therefore need both local research and dependable analytical capacity.

During Academic Year 2024–2025, Davao Oriental State University (DOrSU) contributed to this knowledge base through a published assessment of water quality around Pacific whiteleg shrimp ponds in Dahican, City of Mati; the strengthening of its soil and water laboratory facilities; and a household survey documenting solid-waste management practices in coastal communities. An earlier peer-reviewed review of shrimp farming provides a wider context for interpreting local pollution concerns.

The accounts below distinguish measured water-quality findings from institutional capacity-building and community survey evidence. They show how these contributions can inform management decisions without implying that DOrSU issued new discharge regulations, completed a campus compliance audit, or demonstrated a measurable reduction in pollution during the reporting period.

Monitoring Effluent Water Quality from Aquaculture

Water entering and leaving shrimp ponds is relevant not only to the health of cultured animals but also to the environmental condition of canals and coastal receiving waters. In a study published in the Philippine Journal of Science in February 2025, DOrSU researchers France Guillian B. Rapiz, Ricksterlie C. Verzosa, Phoebe Nemenzo-Calica, and Misael B. Clapano examined physico-chemical water quality in Pacific whiteleg shrimp (Litopenaeus vannamei) pond areas in Barangay Dahican, City of Mati.

The study considered three sites and established inlet, canal, and outlet sampling stations to compare conditions along the pathway used to supply water to the ponds and convey discharge toward receiving waters. The researchers examined temperature, pH, salinity, dissolved oxygen, chemical oxygen demand (COD), total suspended solids, ammonia, nitrite, nitrate, phosphorus, and alkalinity. This design provided local information on parameters relevant to aquaculture operations and effluent quality (Rapiz et al., 2025).

Most reported parameters fell within the recommended or optimal ranges cited by the authors. Chemical oxygen demand was the notable exception: reported values of 1,383–1,805 mg/L substantially exceeded the 300 mg/L effluent threshold referenced in the article. Elevated COD indicates a considerable oxygen demand associated with oxidizable material in water and warrants particular attention when evaluating potential discharge impacts. The authors recommended improved water management, treatment of effluents before discharge, and continued water-quality monitoring.

The research offers a location-specific scientific foundation for conversations with farm operators, local government personnel, and resource managers about discharge pathways and treatment practices. It should not be treated as evidence that every shrimp farm has the same water quality, nor as a DOrSU institutional discharge permit or proof of compliance or noncompliance by the university itself. The

documented AY output is the peer-reviewed research publication and the environmental management recommendations it supports (Rapiz et al., 2025).

References

Rapiz, F. G. B., Verzosa, R. C., Nemenzo-Calica, P., & Clapano, M. B. (2025). Physico-chemical analysis of water in Litopenaeus vannamei ponds in Dahican, City of Mati, Davao Oriental, the Philippines. Philippine Journal of Science, 154(1), 135–147. https://doi.org/10.56899/154.01.14

Scopus publication record (supplied citation register): https://www.scopus.com/pages/publications/86000306622?origin=resultslist

A Stronger Laboratory for Local Environmental Questions

A dependable water-quality evidence base requires laboratories equipped to analyze samples and personnel trained to use suitable methods. During the reporting period, DOrSU strengthened this foundation through participation in the Philippine National Soil Laboratory Network (PhilNASOLAN), training in soil and water testing, and equipment support provided by the Department of Agriculture–Bureau of Soils and Water Management (DA–BSWM).

DOrSU was recognized as a PhilNASOLAN member in November 2024, connecting its laboratory work with a national network concerned with the quality and comparability of soil and water analysis. Earlier in October 2024, Dr. Janeth C. Tayone and Geralph Sam P. Villarubia participated in DA–BSWM laboratory training, including sessions on water chemistry, soil physics, and rapid soil testing. These activities strengthened the personnel and institutional foundation needed for subsequent technical services (DOrSU PIO, 2024a, 2024b).

On March 26, 2025, DA–BSWM delivered an incubator, oven, nitrogen distiller, and hot plate to DOrSU's University Research Complex (UResCom). The equipment transfer, reported by the university in May 2025, expanded the analytical resources available to the Institute for Soil and Water. Such support can help improve the consistency and scope of future investigations relevant to environmental conditions, agricultural management, and water-resource questions (DOrSU PIO, 2025).



Figure 1. Actual photographs of equipment delivery and UResCom on March 26, 2025 (cropped from DOrSU's official photo collage). The photos document the facility and equipment turnover, not results of pond-water sampling. Photo credit: DOrSU–Public Information Office.

The value of the upgrades depends on the combined use of calibrated equipment, suitable methods, quality assurance, and trained laboratory staff. PhilNASOLAN membership and participation in laboratory

training provide an institutional setting for developing these practices, while new equipment increases potential analytical capability. The photo evidence verifies the equipment delivery and the network engagement but does not document completed testing of a particular coastal water sample.

This is an enabling contribution to aquatic environmental management: better tools and training can support future monitoring, but they do not independently establish a number of analyses completed, a specific improvement in laboratory accuracy, or compliance status for a receiving water body. Those claims require method-validation records, test reports, and external quality-assurance evidence (DOrSU PIO, 2024a, 2024b, 2025).



Figure 2. DOrSU representatives and partner institutions at the PhilNASOLAN 5th General Assembly, November 6–8, 2024, where DOrSU's membership was recognized. Actual event photograph. Photo credit: DOrSU–Public Information Office.

References

Davao Oriental State University, Public Information Office. (2024a, November 5). DOrSU advances expertise in soil physics, water chemistry, and rapid soil testing through BSWM training. https://dorsu.edu.ph/dorsu-advances-expertise-in-soil-physics-water-chemistry-and-rapid-soil-testing-through-bswm-training/

Davao Oriental State University, Public Information Office. (2024b, November 20). DOrSU joins the Philippines National Soil Laboratory Network. https://dorsu.edu.ph/dorsu-joins-the-philippines-national-soil-laboratory-network/

Davao Oriental State University, Public Information Office. (2025, May 6). DA–BSWM strengthens DOrSU's research lab with new soil, water analysis equipment. https://dorsu.edu.ph/?p=12359

Evidence for Community Waste and Water Interventions

Safeguarding nearshore waters also involves understanding the everyday handling of solid waste in coastal settlements. Household waste that is improperly stored, disposed of, or burned may create environmental and public-health concerns; effective responses depend on information about what residents know, what they do in practice, and what barriers may affect their choices.

In September 2024, DOrSU researchers Ricksterlie C. Verzosa, Francis Jay M. Katipunan, Jose Gabriel B. Lumangyao, and Emily S. Antonio published a study of solid-waste management awareness and practices among 399 households in selected coastal barangays of the City of Mati. Using a structured survey administered through KoboCollect, the researchers examined residents' awareness, practices, and selected demographic relationships (Verzosa et al., 2024).

The study reported moderate awareness (mean score 2.55) and practices (2.66), with comparatively low familiarity with regulatory requirements (1.97). It also identified gaps in waste segregation and avoidance of waste burning. These findings provide a more precise basis for discussing educational priorities and local support measures than broad assumptions about the behavior of all coastal households.

One important implication is that awareness alone is not the same as effective action. Educational messages must be considered alongside access to collection systems, local ordinances, feasible segregation arrangements, and opportunities for community participation. The study offers local baseline evidence that can help municipal offices, educators, and environmental advocates identify topics for targeted engagement. However, a household survey is not a measurement of waste entering the sea, and the publication does not establish a subsequent reduction in marine litter (Verzosa et al., 2024).

References

Verzosa, R. C., Katipunan, F. J. M., Lumangyao, J. G. B., & Antonio, E. S. (2024). Solid waste management awareness and practices in coastal communities. Davao Research Journal, 15(3), 60–77. https://doi.org/10.59120/drj.v15i3.247

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Research Context for Responsible Aquaculture Discharge

An earlier scholarly review involving DOrSU researchers helps place the 2025 Dahican water-quality findings within the wider issues faced by shrimp aquaculture in the Philippines. In 2022, Edison D. Macusi and colleagues published a critical review applying the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) approach to examine the environmental and socioeconomic implications of shrimp farming.

The review considered concerns involving pollution, disease, farm management, livelihoods, and the policy coordination needed to promote more sustainable practices. It highlighted the importance of environmental monitoring, good aquaculture practices, and cooperation among government agencies, research institutions, and local stakeholders (Macusi et al., 2022).

Read together, the earlier review and the Dahican water-quality research illustrate why productive aquaculture and receiving-water protection should not be treated as competing objectives. Evidence about pollution pathways can help inform practical farm-management improvements, while wider research identifies the institutional and socioeconomic conditions needed for uptake. Nevertheless, the 2022 review is background literature rather than a new 2024–2025 implementation, and neither paper substitutes for farm-specific permits, regulatory sampling, or independently verified remediation results.

References

Macusi, E. D., Estor, D. E. P., Borazon, E. Q., Clapano, M. B., & Santos, M. D. (2022). Environmental and socioeconomic impacts of shrimp farming in the Philippines: A critical analysis using PRISMA. Sustainability, 14(5), Article 2977. https://doi.org/10.3390/su14052977

Scopus publication record (supplied citation register): https://www.scopus.com/pages/publications/85126308841?origin=resultslist

Conclusion

DOrSU's work under Indicator 14.4.1 shows how local environmental research, laboratory development, and community-focused studies can support efforts to protect coastal waters. The 2025 shrimp-pond assessment identified elevated chemical oxygen demand and recommended stronger management and treatment of effluents. The 2024 coastal household survey identified gaps between awareness, regulations, and waste-handling practices that can guide more focused education and local planning.

The university's participation in PhilNASOLAN, specialized laboratory training, and receipt of DA–BSWM analytical equipment strengthened the institutional capability needed for future soil and water investigations. Earlier peer-reviewed research on shrimp farming offers context for connecting technical monitoring with the wider environmental and socioeconomic challenges of aquaculture.

Together, these contributions establish an evidence base and a stronger analytical foundation, not a verified reduction in pollution loads or new university-wide discharge requirements. Continued sampling, validated laboratory methods, stakeholder engagement, and transparent reporting will be needed to determine whether the knowledge and capabilities documented during Academic Year 2024–2025 translate into measurable improvements in the quality of coastal receiving waters.