14.2.2. Sharing Knowledge for Resilient Coastal Livelihoods

Building resilience in coastal communities requires more than one-time interventions—it depends on equipping local partners with the knowledge, skills, and networks they need to carry work forward after outside specialists leave. The following stories from DOrSU's partnerships in Davao Oriental show how this happens in practice: hands-on reef-building training in Pujada Bay with DOrSU, CCEF, and Sawom; a regional marine and freshwater science convention that connected researchers and stakeholders; fisheries research made accessible for education and planning; and aquaculture studies testing locally available feed ingredients for milkfish. Together, these examples illustrate a broader approach to coastal resilience—one that combines practical training, scientific exchange, and locally relevant evidence so that communities, educators, and managers can make more informed decisions about aquatic resources and livelihoods.

Giving Local Partners the Skills to Build Reefs

Restoration becomes more durable when local partners can carry the work forward. In Pujada Bay, rrreefs worked with DOrSU, the Coastal Conservation and Education Foundation (CCEF), and the freediving group Sawom on reef-building skills. Training began in August 2024, combining reef ecology with practical workshops.

CCEF also documented an Artificial Clay Reef Building Workshop in Pujada Bay on October 19, 2024. The activities connected scientific knowledge with hands-on preparation, strengthening the local capacity needed to assemble, assess, and maintain restoration structures.

The training also addressed a practical challenge in restoration: local continuity after visiting specialists leave. Familiarity with reef ecology, construction procedures, and assessment can help partner organisations participate more confidently in future work. The documented workshops establish that learning opportunities were provided. They do not, by themselves, demonstrate independent certification, deployment of additional reefs, or long-term ecological success (rrreefs, 2025; Coastal Conservation and Education Foundation, 2025).



Figure 1. Participants in the Pujada Bay Artificial Clay Reef Building Workshop, October 19, 2024. Photo credit: rrreefs / DOrSU project partners.

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rrreefs. (2025, June). Reef impact report: February 2024–February 2025, Pujada Bay, Philippines. Retrieved from https://www.rrreefs.com/wp-content/uploads/2025/06/2025_PUJ_impact_report.pdf

Coastal Conservation and Education Foundation. (2025). 2024 annual report (p. 33). Retrieved from https://www.coast.ph/wp-content/uploads/2025/03/CCEF_Annual_Report_2024_web.pdf

Bringing Aquatic Science Into a Shared Conversation

DOrSU, through the Regional Integrated Coastal Resource Management Center XI (RIC-XI), hosted the 56th convention of the Federation of Institutions of Marine and Freshwater Sciences in Mati on October 22–24, 2024. Researchers and stakeholders exchanged knowledge on fisheries, artificial reefs, plastic pollution, and blue carbon.

Adelina C. Santos-Borja's discussion of integrated lake-basin management also connected the gathering with freshwater stewardship. The convention gave participants access to expertise and contacts that can inform education and aquatic resource management.

The mix of subjects helped place aquatic conservation within a wider management conversation. Fisheries depend on habitats, pollution affects organisms and resource users, and lake-basin decisions can influence waters beyond a single administrative boundary. By bringing these themes together, RIC-XI created an opportunity for participants to compare approaches and identify possible collaborators. Subsequent projects or participant uptake need their own records (DOrSU PIO, 2024; Coastal Conservation and Education Foundation, 2025).



Figure 2. Opening activities at DOrSU's FIMFS convention in Mati, October 22–24, 2024. Photo credit: DOrSU–Public Information Office.

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Community Fisheries Education Through Research

Changing environmental conditions affect the choices available to fishers and fish farmers. Research involving DOrSU fisheries faculty reviewed climate vulnerability, adaptation, and ecosystem services across Asian fisheries and aquaculture, with findings published in Marine and Fishery Sciences in 2025.

Together with studies of small-scale fishing and closed-season management, the review makes scientific knowledge available for education and planning. Educators and managers can draw on this accessible evidence when discussing resilience and sustainable resource use.

For education, the review offers a way to explain why fisheries management must consider both environmental change and the people who depend on aquatic resources. Its discussion can support learning materials and planning conversations. This is a contribution through accessible research; publication alone does not establish that a particular community received training, changed its practices, or became more resilient (Habib et al., 2025).

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REVIEW

Climate change vulnerability, adaptation and ecosystem services in different fisheries and aquaculture in Asia: a review

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Marine and Fishery Sciences MAFIS

ABSTRACT. This review aimed to discuss the vulnerability and climate change impacts on tropical fisheries in Asia using a systematic literature review. The study applied the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) to evaluate literature from 1990-2020. The results showed clustering of texts, keywords, and titles based on search terms like climate change, fisheries, and adaptation. High-scoring links revealed clusters: 1) climate change and food security, 2) biodiversity and environment protection, 3) conservation of resource, 4) climate change impacts in Asia, 5) fisheries. Abstracts and titles produced clusters on: 1) livelihood and food security, 2) fisheries catch, 3) stakeholder approaches, 4) Ecosystem services. While climate change dominated vulnerability and adaptation studies, it is only one of many stressors affecting fisheries and aquaculture. Adaptation is suggested as a solution for reducing vulnerability and increasing resilience in fishing communities. However, our findings indicate that the social and economic factors contributing to climate-induced vulnerability are still relatively neglected. Enhancing biodiversity and environmental protection can lead to a more productive and food-secure environment for farmers and fishers. It is crucial that interventions focus on adaptation and establishing science-based 'adaptive fisheries co-management' to engage fishing communities and address their broader vulnerabilities and aspirations.

Key words: Systematic literature review, PRISMA, fisheries management, food security.

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Vulnerabilidad al cambio climático, adaptación y servicios ecosistémicos en diferentes pesquerías y acuiculturas en Asia: una revisión

Figure 3. Front page of the review article "Climate Change Vulnerability, Adaptation and Ecosystem Services in Different Fisheries and Aquaculture in Asia," published in Marine and Fishery Sciences (2025).

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Habib, A., Borazon, E. Q., Nallos, I. M., & Macusi, E. D. (2025). Climate change vulnerability, adaptation and ecosystem services in different fisheries and aquaculture in Asia: A review. *Marine and Fishery Sciences (MAFIS), 38*(2), 311–330. https://doi.org/10.47193/mafis.3822025010101

For education, this validation matters twice over: it confirms which threats deserve the most attention in training and extension work, and it documents expert consensus that MPAs and livelihood diversification, the very instruments the university discusses in its conventions and workshops, are ranked among the effective responses.

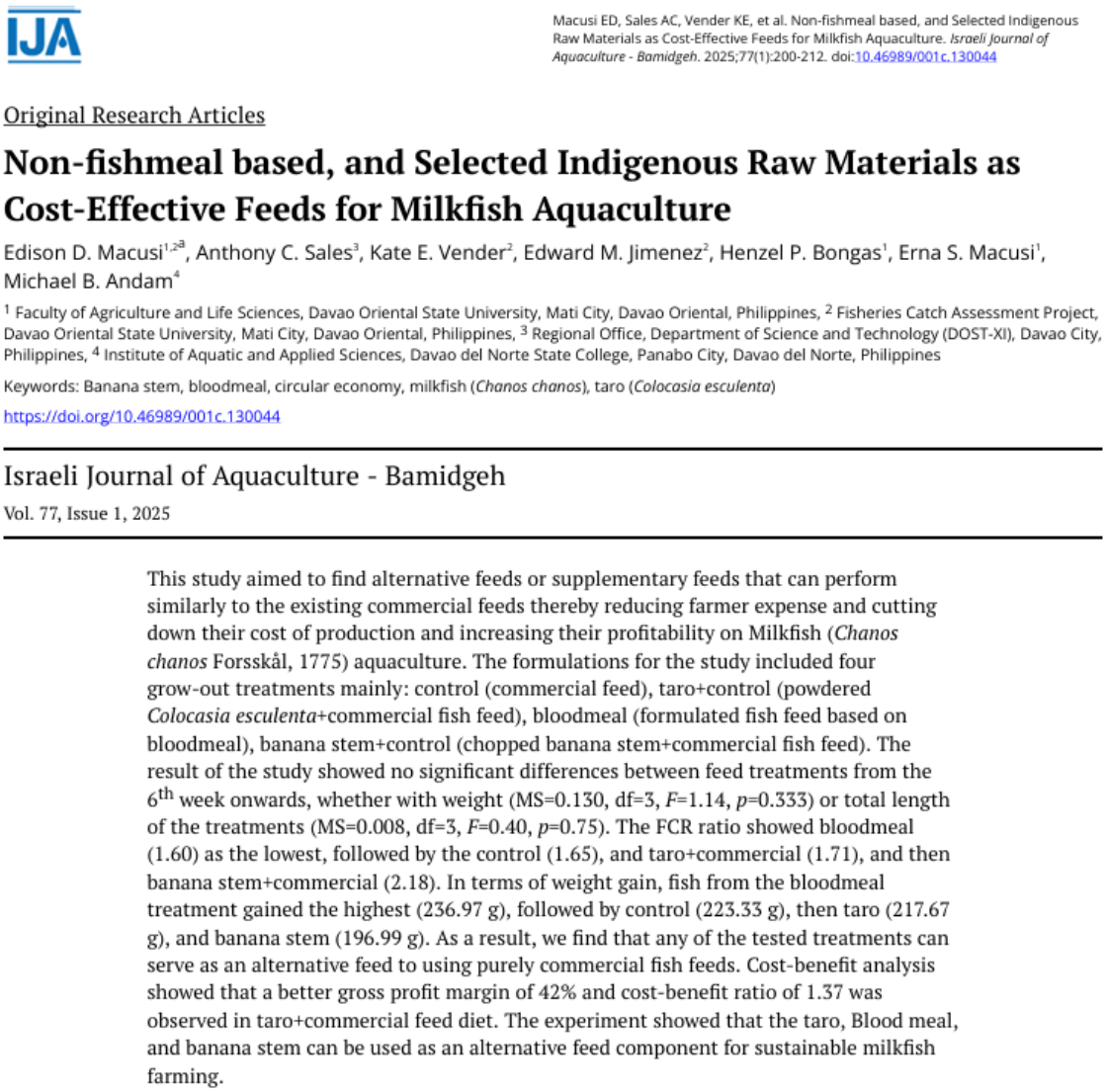
Knowledge shared with fishers and farmers is only as good as the science beneath it. A 2025 study in The Philippine Journal of Fisheries, with DOrSU researchers among its authors, surveyed 22 experts from the academe, government, and non-government sectors to validate the climate and non-climate exposure factors affecting small pelagic fisheries and milkfish aquaculture in the Philippines. For small pelagic fisheries, the experts ranked coastal development, water quality, temperature changes, typhoons, and declining catch as the top threats; for milkfish aquaculture, water quality, fry source, temperature changes, typhoons, and salinity. The experts also ranked adaptation measures, endorsing alternative livelihoods and marine protected areas for capture fisheries, and hatchery development, feed research, and marketing support for aquaculture.

Validating What Threatens Fisheries and Aquaculture

Research Based Guidance for Sustainable Aquaculture

For milkfish farmers, feed choices affect the cost of production and the resources used to raise fish. DOrSU's Faculty of Agriculture and Life Sciences and Fisheries Catch Assessment Project worked with DOST–Region XI and Davao del Norte State College on research into locally available feed ingredients. Two 2025 studies provide a stronger basis for discussing alternatives to exclusive reliance on commercial feeds.

One study compared commercial feed with diets incorporating taro, bloodmeal, or banana stem. Another evaluated indigenous ingredients in juvenile milkfish, including copra meal and Azolla. These experiments connect the search for affordable inputs with direct assessment of fish growth and feed use. Their results identify options for further testing under the conditions relevant to particular farms.



IJA

Macusi ED, Sales AC, Vender KE, et al. Non-fishmeal based, and Selected Indigenous Raw Materials as Cost-Effective Feeds for Milkfish Aquaculture. *Israeli Journal of Aquaculture - Bamidgeh*. 2025;77(1):200-212. doi:10.46989/001c.130044

Original Research Articles

Non-fishmeal based, and Selected Indigenous Raw Materials as Cost-Effective Feeds for Milkfish Aquaculture

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Keywords: Banana stem, bloodmeal, circular economy, milkfish (*Chanos chanos*), taro (*Colocasia esculenta*)

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Israeli Journal of Aquaculture - Bamidgeh

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This study aimed to find alternative feeds or supplementary feeds that can perform similarly to the existing commercial feeds thereby reducing farmer expense and cutting down their cost of production and increasing their profitability on Milkfish (*Chanos chanos* Forsskål, 1775) aquaculture. The formulations for the study included four grow-out treatments mainly: control (commercial feed), taro+control (powdered *Colocasia esculenta*+commercial fish feed), bloodmeal (formulated fish feed based on bloodmeal), banana stem+control (chopped banana stem+commercial fish feed). The result of the study showed no significant differences between feed treatments from the 6th week onwards, whether with weight (MS=0.130, df=3, F=1.14, p=0.333) or total length of the treatments (MS=0.008, df=3, F=0.40, p=0.75). The FCR ratio showed bloodmeal (1.60) as the lowest, followed by the control (1.65), and taro+commercial (1.71), and then banana stem+commercial (2.18). In terms of weight gain, fish from the bloodmeal treatment gained the highest (236.97 g), followed by control (223.33 g), then taro (217.67 g), and banana stem (196.99 g). As a result, we find that any of the tested treatments can serve as an alternative feed to using purely commercial fish feeds. Cost-benefit analysis showed that a better gross profit margin of 42% and cost-benefit ratio of 1.37 was observed in taro+commercial feed diet. The experiment showed that the taro, Blood meal, and banana stem can be used as an alternative feed component for sustainable milkfish farming.

Figure 4. Source article on climate change vulnerability, adaptation, and ecosystem services in fisheries and aquaculture in Asia.

The value for farmer education is a concrete set of comparisons to discuss: an ingredient must be assessed as part of a suitable formulation and production system. An encouraging trial does not mean that untested mixtures are interchangeable or that every farm will obtain the same savings. Research-based technical guidance can help farmers and extension workers ask better questions before adopting alternatives.

The contribution is locally relevant evidence for sustainable aquaculture learning. It supports decisions about feed resources and production efficiency while keeping farm-scale validation central to assessing economic and environmental benefits (Macusi, Sales, Vender, et al., 2025; Macusi, Sales, Jimenez, et al., 2025).

Macusi, E. D., Nallos, I. M., Santos, M. D., & Geronimo, R. C. (2025). Climate and non-climate related hazards in small pelagic fisheries and milkfish aquaculture: Expert opinion survey in the Philippines. The Philippine Journal of Fisheries, 32(1).

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Macusi, E. D., Sales, A. C., Jimenez, J. E. M., Vender, E. K. E., Bongas, H. P., Macusi, E. S., & Andam, M. B. (2025). Assessment of indigenous feed ingredients on growth and feed utilization efficiency in juvenile milkfish (Chanos chanos Forsskål, 1775). *Israeli Journal of Aquaculture - Bamidgeh, 77*(2), 231–244. https://doi.org/10.46989/001c.138435

Conclusion

Across reef restoration training, scientific conventions, fisheries education, and aquaculture research, DOrSU's work under Indicator 14.2.2 demonstrates a consistent commitment to sharing knowledge that local partners can use and build upon. By investing in local reef-building capability, fostering dialogue among researchers and stakeholders, and making research accessible for education and planning, these efforts create a stronger foundation for informed decision-making and community-led resilience. At the same time, the sources document training, knowledge exchange, and research sharing rather than measured changes in household income or long-term ecological success; those outcomes require continued tracking. DOrSU's impact lies in expanding access to skills, scientific knowledge, and working partnerships relevant to coastal livelihoods. Local reef-building capability gives restoration a stronger base, while fisheries learning supports informed choices. The sources establish training and research sharing, without measuring changes in household income.