

14.3.3. Batangas State University – The National Engineering University works directly (research and/or engagement with industries) to maintain and extend existing ecosystems and their biodiversity, of both plants and animals, especially ecosystems under threat.

The marine environment in the Philippines is facing threats from increasing industrialization, human activities/tourism, and climate change. This leads to a vulnerable status resulting in pollution, the decline of 90% of marine habitats (Licuanan et al. 2017), and a decrease of 29% in fish catch (earth.org).

Continuous biodiversity assessment and monitoring, including an extensive database, would play a key role in measuring and understanding the changes happening to the marine environment. This understanding is crucial for policy formation that would prevent further negative effects on the marine environment. Monitoring bioindicator species would be a practical approach to biosurveillance, which gives a heads-up regarding possible threats facing a specific marine environment.

Issues like food security and livelihood need to be addressed in response to the threats facing the marine environment through the development of culture technology of economically important marine resources, implementation of aquaculture, and management schemes from wild harvest/catch.

The Batangas State University - the National Engineering University through its marine research center - the Verde Island Passage Center for Oceanographic Research and Aquatic Life Sciences or VIP CORALS addresses these pressing concerns of our marine environment. The marine biodiversity assessment^{1,2,3} in selected sites in Verde Island Passage showed that our marine environment is still in good condition based on good coral cover and biodiversity among the sites, some of which can be endorsed as Marine Protected Areas (MPA). The biodiversity mapping of MPAs in Papaya, Nasugbu showed that Santelmo MPA has the highest coral cover and biodiversity (50.28%, 22 OTUs), followed by Etayo MPA (13.41%, 18 OTUs) and Pico de Loro MPA (18.65%, 7 OTUs).

Although in good condition, the marine environment is still vulnerable as highlighted by decreases in seagrass cover in some sites and the proliferation of some green-tide blooming species⁴. This green-tide blooming species such as *Ulva* spp. has the potential used for biosurveillance⁵. These species were shown to tolerate a wide range of temperatures and light intensities prompting their proliferation year-round. These biomonitoring data are stored in a database for use in forecasting and documentation^{1,5,6}.

To address food security and livelihood in coastal areas, economically important marine organisms were identified for culture technology development (*i.e.*, seaweeds⁷, sea cucumbers⁸). In addition, training of the culture of economically important freshwater organisms (*i.e.*, tilapia) was done for local communities in Batangas province⁹.

There are still many gaps in understanding today's threats to the marine environment, and collaborations with other universities and institutions are essential to conduct studies that focus on these threats with success.

Another example is the remoteness of many sites with good coral reefs, which makes it difficult for scientists to access frequently for assessment studies. The INSPIRE project, which is a collaboration between VIP CORALS, ABS-CBN Foundation, SEA-VIP, and DLSU Bro. Alfred Shields FSC, aims to capacitate citizen scientists and locals in the assessment of their coral reefs.

¹DOST-GIA Marine Biodiversity Assessment in Selected Areas along the Verde Island Passage (MBioAssess-VIP)

²BatStateU Survey of vulnerable, threatened, endangered, and economically important marine organisms in Verde Island, Batangas City

³BatStateU Biodiversity Mapping of Marine Protected Areas of Brgy. Papaya, Nasugbu

⁴NAGAO Biodiversity of seaweeds and associated flora in Verde Island, Batangas City, Batangas Philippines

⁵DOST-PCAARRD Understanding Physiological Vulnerability of *Ulva* spp.: Implication to Green Tide Blooms

⁶BatStateU VIP CORALS Marine Repository Hub

⁷DOST-PCAARRD Biological and ecological studies on *Asparagopsis taxiformis* for culture technology development (BEAT)

⁸BatStateU Upscaling the Sea Cucumber Aquafarming Sustainability: Phase 1: Optimization of sea cucumber aquaculture and post-harvest processing method

⁹DOST-PCAARRD Backyard Tilapia Farming in Nasugbu, Batangas in Response to the COVID-19 Pandemic