

# Ethno-ecological significance and conservation implications of marine and coastal species in Misamis Oriental, Philippines

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**Abstract.** This study documents the ethnocultural knowledge of coastal communities in Misamis Oriental, Northern Mindanao, Philippines, focusing on the traditional use of marine and coastal species. The purpose was to describe how this local knowledge contributes to cultural ecosystem services (CES) and to identify its implications for conservation and education. Using a qualitative ethnographic approach, fifty key informants, including fishers, community elders, and traditional healers, were interviewed through semi-structured discussions in the local language. Thematic analysis revealed five domains of resource utilization: (1) ethnomedicinal applications, (2) spiritual and protective rituals, (3) food and sustenance, (4) utilitarian and material uses, and (5) traditional ecological knowledge (TEK) in fishing and coastal management. Species frequently mentioned include seaweeds (*Hydropuntia eucheumatoides*, *Sargassum* spp.), seagrass (*Enhalus acoroides*), and mangrove associates (*Barringtonia asiatica*, *Ipomoea pes-caprae*), highlighting their multiple functions in health, livelihood, and belief systems. The findings demonstrate that these practices sustain both cultural identity and environmental stewardship. Integrating this knowledge into conservation initiatives and Ethno-STEM education can strengthen community participation in the sustainable use and protection of marine resources.

**Key Words:** coastal practices, cultural ecosystem services, ethnocultural knowledge, Ethno-STEM, marine resource management.

**Introduction.** Culture has always been central to how people live and relate to one another. When cultural practices address basic needs such as food, health, and livelihood, they strengthen identity and resilience in changing times (Hosagrahar 2017; Throsby 2019). These cultural dimensions are captured in the concept of cultural ecosystem services (CES), the non-material benefits people gain from ecosystems, including knowledge systems, spiritual enrichment, learning, recreation, and aesthetic values (Chan et al 2012; Milcu et al 2013; Raymond et al 2013; McElwee et al 2025). In coastal settings, CES is closely linked with traditional ecological knowledge (TEK), which integrates long-term observation of nature, spiritual beliefs, and cultural values into everyday resource use (Yiu 2022; Maharja et al 2023).

Across the world, TEK plays a critical role in sustaining livelihoods and guiding marine resource management and conservation (Chakraborty & Gasparatos 2019; Diatta et al 2020; Fajardo et al 2021; Arzaman et al 2023; Hiwasaki et al 2024; World Oceans Day 2023). International studies document how traditional marine knowledge supports food security, health, and cultural identity in diverse regions, including Malaysia, Brazil, the Unani system, and the Moluccas (Begossi & Ramires 2013; Anas et al 2021; Tuaputty et al 2024).

The Philippines, with its 36,000 km of coastline and over 7,000 islands, is a hotspot for marine biodiversity, including seagrasses, seaweeds, molluscs, echinoderms, and various fish species (PEMSEA n.d.; Lastimoso & Santiañez 2021; Wang et al 2021; Rondevaldova et al 2023). Coastal communities continue to depend heavily on these resources and possess extensive traditional knowledge related to food, medicine, rituals, and environmental stewardship (Cabali & Cuevas 2016; Wagey & Bucol 2016; Gerada & Parreño 2019; Marquez & Olavides 2024). Ethnocultural fishing practices across the country demonstrate the diversity and cultural significance of marine resource use (Asia et al 2015; Balisco et al 2019; Bastillada 2019; Besmonte & Miña 2021; Contreras et al 2025).

Ethnomarine traditions in the Philippines are reflected in the culinary and medicinal use of seaweeds in Sorsogon and Ilocos Norte (Dumilag et al 2022; Dumilag & Javier 2022), the unique consumption practices of marine invertebrates in Mactan Island (Tsuji 2019), early archaeological evidence of toxic fish utilization in Mindoro (Boulanger et al 2023), and belief-based resource management in Capul, Northern Samar (Cabali & Cuevas 2016). These examples collectively illustrate how CES and TEK shape food systems, health practices, and environmental ethics in Philippine coastal communities.

Within this national context, Misamis Oriental in Northern Mindanao represents a culturally and ecologically significant coastal zone where marine resources remain central to subsistence, healing, and local identity (Neri et al 2009; Neri 2011; Lubos 2019; Zalsos et al 2021; Arriesgado et al 2022; Baños 2023; Rondevaldova et al 2023). Coastal families have long utilized sea cucumbers, bivalves, gastropods, and reef-associated species for food, crafts, and trade, as supported by archaeological and ethnographic evidence (Neri et al 2009; Neri 2011). Seagrass meadows and coral reefs continue to function as major foraging and livelihood grounds (Zalsos et al 2021), reflecting a living form of CES where culture, ecology, and community well-being are closely linked.

Ethnographic documentation of TEK provides a foundation for both cultural preservation and conservation (Adams et al 2014; Chakraborty & Gasparatos 2019). While ethnobotanical studies are abundant in the highlands of Mindanao (Meñiza et al 2024), the ethnocultural dimensions of marine resources in Northern Mindanao remain underexplored. At the same time, recent studies demonstrate that integrating local ecological knowledge into science education enhances student engagement, cultural relevance, and sustainability awareness (Ladson-Billings 2002; Herrera & Palomo 2022; Idul & Fajardo 2023; Jaudinez & Joaquin 2024; Miole 2024).

Thus, this study aimed to document the marine species, their cultural uses, and common coastal practices observed among selected coastal communities of Misamis Oriental, Northern Mindanao, Philippines. The findings serve as a baseline knowledge foundation for developing place-based ethno-STEM learning materials for secondary science education. Beyond cultural documentation, the study also emphasizes the conservation and sustainable harvesting of ecologically threatened or traditionally used marine species, thereby promoting long-term environmental stewardship and the safeguarding of CES for future generations.

## Material and Method

**Research design.** This study employed a qualitative ethnographic research design to document local knowledge and coastal practices related to culturally significant marine resources in selected coastal communities in Misamis Oriental, Northern Mindanao, Philippines. The ethnographic approach captured the depth of community knowledge rooted in daily life and provided a contextual understanding of how marine practices reflect local livelihoods, beliefs, and conservation values.

**Study site.** The research was conducted in Misamis Oriental, a northern province on Mindanao Island in the Philippines (Figure 1). With 23 municipalities, 22 of which have coastal communities, these coastal areas are recognized for their rich marine biodiversity and diverse ethnocultural practices associated with marine resource utilization, making them an ideal setting for this study. The study sites were selected based on the presence

of active fisherfolk associations and significant community engagement with marine resources in the areas.

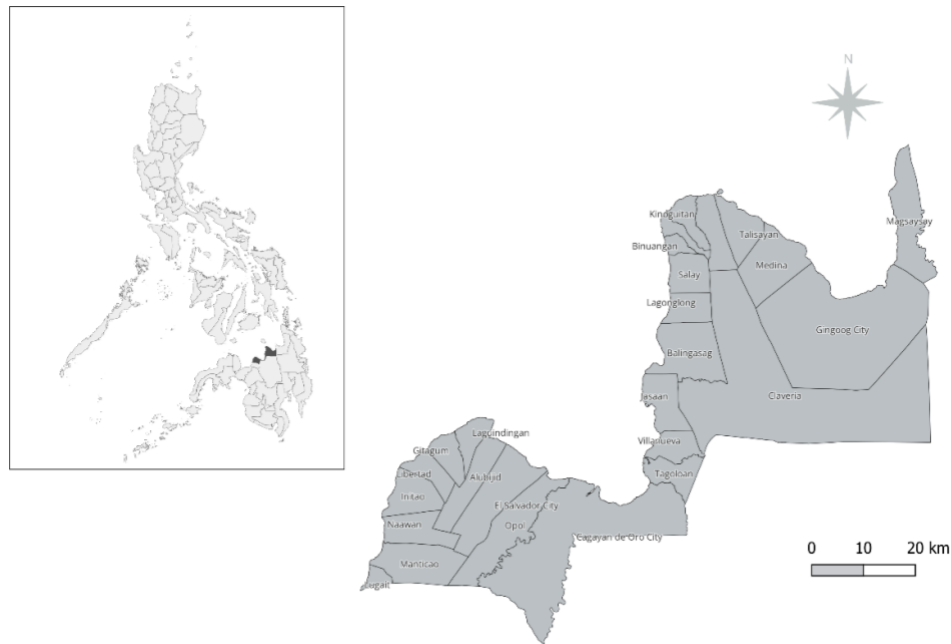


Figure 1. Map of Misamis Oriental showing the locations where key informant interviews were conducted.

**Participants and sampling.** Key informants were purposively selected based on their extensive knowledge of local marine biodiversity and associated cultural practices. These included leaders of Fisherfolk Associations, local fishers, coastal stakeholders, traditional healers, and experienced community elders. Key Informant Interviews (KII) were initiated by first engaging the president of the Fisherfolk Association in each municipality. The snowball sampling technique was employed to identify additional informants with relevant knowledge, as recommended by the initial informants. The initial list of Fisherfolk Association presidents was obtained with permission from the Bureau of Fisheries and Aquatic Resources in Region 10. In total, 50 informants from 20 coastal municipalities of Misamis Oriental participated in the study.

**Data collection instrument.** The study employed a semi-structured questionnaire written in the local language, Cebuano (Bisaya). The instrument was pilot-tested, reviewed, and validated by subject-matter experts to ensure content relevance, clarity, and cultural appropriateness. It included items on participants' demographic information, traditional coastal practices, and marine resource utilization. Data were collected through in-person interviews using the participants' native language to facilitate open-ended and accurate responses. The names of marine flora and fauna, as well as descriptions of coastal practices and belief systems, were documented in Bisaya and translated into English, when possible, for analysis and reporting.

**Taxonomic identification.** Species identification of the most frequently cited marine flora and fauna during the interviews was cross-referenced with the existing literature and further validated through consultations with experts. Only the five most-cited flora and fauna species were formally identified by expert botanists and marine biologists from Caraga State University and Mindanao State University at Naawan, ensuring alignment with accepted scientific nomenclature.

**Ethical considerations.** Before the interviews, participants were presented with the study’s objectives, and informed consent was secured, with participants signing a consent form to confirm their voluntary participation. Confidentiality was maintained by anonymizing the participants and securing all data. Care was taken to conduct the research respectfully and in a culturally sensitive way.

**Data analysis.** Interview transcripts were manually analyzed using a thematic analysis approach following Braun and Clarke’s guidelines (2006). An inductive process was used to identify recurring patterns, which were grouped into themes related to marine species knowledge and cultural practices of the participants. The analysis was grounded in the participants’ experiences, allowing local meanings and uses to emerge naturally from data.

**Results and Discussion.** The demographic profiles of the informants reflected their roles as knowledge holders in the community.

Table 1

Socio-demographic characteristics of key informants in the study

<i>Profile variable</i>	<i>Number (N = 50)</i>	<i>Percentage (%)</i>
<i>Age</i>		
18-35 years	2	4.0
36-55 years	22	44.0
56 years and above	26	52.0
<i>Sex</i>		
Male	42	84.0
Female	8	16.0
<i>Occupation</i>		
Fishermen	38	76.0
Trader	1	2.0
Driver	2	4.0
Carpenter	1	2.0
Barangay worker	5	10.0
Traditional healer	3	6.0
<i>Education level</i>		
No formal education	1	2.0
Elementary	13	26.0
High School	20	40.0
College	16	32.0
<i>Length of residency</i>		
1-10 years	1	2.0
11-21 years	2	4.0
21 years and above	27	94.0
<i>Role in community</i>		
Elder	16	32.0
Community leader	31	62.0
Traditional healer	3	6.0

As shown in Table 1, the majority comprised older adults, with almost all having lived in their coastal community for over 20 years (94%), indicating their deep-rooted familiarity with the local marine environment. Most (52%) were above 56 years of age, and another 44% were middle-aged (36-55 years), indicating that the older generation largely holds traditional knowledge. These patterns underscore the crucial role of older, long-term residents in preserving and transmitting TEK (Galang et al 2020). A large proportion (84%) of the participants were male, which is expected given that fishing in this region is a male-dominated occupation; however, several female participants (16%) also contributed valuable insights. In terms of occupation, over three-quarters (76%) identified themselves primarily as fishermen, while others were engaged in related livelihoods or community

roles (including fish trading, boat work, or serving as local officials). A few participants (6%) were “*mananambal*” or traditional healers who incorporated marine materials into their healing practices, and many community leaders (62%) held positions such as association officers or barangay officials, often having dual roles as active fishers or as resource managers. Education levels varied: while a minority had no formal education, most had at least some schooling (26% elementary-level, 40% high school, and 32% college-level).

**Emerging ethno-cultural themes.** The inductive thematic analysis of the KII yielded five major ethno-cultural themes describing how coastal communities in Misamis Oriental interact with marine resources. These themes were organized into two broad clusters: (1) medicinal and spiritual uses of marine resources and (2) food, material applications, and traditional ecological knowledge (TEK) practices, as summarized in Tables 2 and 3. Sub-themes, codes, and sub-codes were also generated to categorize the various flora and fauna, as well as the traditional coastal practices mentioned during the interviews. These themes show the connection between marine biodiversity, cultural identity, livelihood, and health in the coastal communities of Misamis Oriental. The findings reveal the diverse ways in which marine resources are utilized, encompassing ethnomedicinal applications, spiritual and ritualistic practices, sustenance, material uses, and the embodiment of traditional ecological knowledge. These local practices reflect broader patterns observed in other coastal communities across the Philippines, as documented in existing literature (Cabil & Cuevas 2016; Gerada & Parreño 2019; Dumilag et al 2022; Dumilag & Javier 2022; Boulanger et al 2023).

The first theme, Ethno-medicinal Applications of Marine Resources, revealed that marine species, both flora and fauna, are traditionally used for treating external and internal ailments, managing pain, and promoting general health and vitality. The occurrence and use of this species are linked to the municipality’s large coastal area, which is rich in coral reefs and seagrass beds (Neri 2011; Rondevaldova et al 2023).

The second theme, Spiritual, Ritual, and Protective Uses, shows the symbolic and ritualistic roles of marine resources. Items such as seahorses, stingray tails, and *Bana-og* (black coral) are believed to protect from negative forces and are incorporated into cleansing, blessing, and purification rituals, including Palina (smoke rituals). Similar to observations in the Pacific and Southeast Asia, these practices highlight the relational values of marine resources, not merely as utilitarian commodities but as agents that shape spiritual, social, and emotional lives (Neri et al 2009; Neri 2011; Lau et al 2019).

The third theme, Marine Resources as Food and Sustenance, confirmed the essential role of species such as wild *Ambalang*, *Sisi* (rock oysters), and sea turtles in local diets, providing both nutritional and cultural value. This echoes Lau et al’s (2019) findings that provisioning ecosystem services, those directly tied to food security, are often prioritized in coastal communities as they are crucial for livelihoods, identity, and daily survival. Similarly, Rondevaldová et al (2023) found that certain seaweeds and seagrasses from Misamis Oriental are rich in essential minerals, making them valuable sources of nutrition.

The fourth theme, Utilitarian and Material Applications, and the fifth theme, TEK in Coastal Practices, demonstrate the creative and practical use of marine resources. Some marine plants and animals are utilized as fertilizers, natural pesticides, or fish poison, illustrating how people use the resources available in their environment. These practices are part of their TEK, which helps them manage resources wisely and sustainably. The fifth theme also includes local fishing methods, such as *payao*, *bobo*, and spear fishing, as well as special ways to combat seasickness, including eating *Lusay* seeds and flowers and treating marine animal stings. Similar examples can be found in Malaysia and Papua New Guinea, where communities use marine resources for farming and rely on traditional systems to manage fishing and protect coral reefs (Lau et al 2019; Arzaman et al 2023).

Table 2

Summary of themes regarding medicinal and spiritual uses of marine resources in the coastal community of Misamis Oriental

<i>Theme</i>	<i>Sub-theme</i>	<i>Code/description</i>	<i>Flora cited/Parts used</i>	<i>Fauna cited/Parts used</i>
Theme 1: Ethno- medicinal applications of marine resources	Treatment of external ailments	Boils, swellings, wounds, stings, burns, skin and eye conditions	Seaweeds (sea grapes <i>Latu</i> ), tape seagrass seeds ( <i>Lusay</i> ), beach morning glory stem/leaf sap ( <i>Lambayong</i> ), mangrove leaves ( <i>Alipata</i> ), mangrove bark sap ( <i>Bakhaw</i> ) Spanish needle leaf sap ( <i>Dagom-dagom</i> ), mangrove bark sap ( <i>Tabige</i> ), Pipturus bark scrapes ( <i>Handamay</i> )	Shells ( <i>Siyok; Talaba; Sa-ang</i> ), Dogfish shark ( <i>Lahoy</i> ) liver oil, Cuttlefish (backbone), Sea urchin ( <i>Tuyom</i> ), Black coral ( <i>Bana-og</i> )
	Treatment of internal & systemic conditions	Goiter, stomach and respiratory ailments; diabetes, hypertension, cancer, kidney disease, LBM	Seaweeds ( <i>Latu; Ambalang</i> ), tape seagrass seeds ( <i>Lusay</i> ) seeds & flowers, fish poison tree seeds ( <i>Bitoon</i> ), gulfweed ( <i>Samo</i> ), beach morning glory flowers/seeds/roots ( <i>Lambayong</i> ), mangrove bark ( <i>Bakhaw</i> ), mangrove bark ( <i>Tabige</i> )	Seahorse, Sea cucumber, Oyster meat, shells ( <i>Umang susu-an; Balakan; Kapinan</i> ), Cuttlefish ( <i>Kubotan</i> ) backbone, rock oyster ( <i>sis</i> ), dogfish shark ( <i>Lahoy</i> ) liver oil, shark dorsal fin ( <i>silik</i> )
	Pain and discomfort management	Pain relief for arthritis, headache, trapped wind	tape seagrass seeds ( <i>Lusay</i> ) seeds & flowers, beach morning glory ( <i>Lambayong</i> ) flowers & leaves, fish poison tree ( <i>Bitoon</i> ) leaves, mangrove associates ( <i>Talisay &amp; Abgaw</i> ) leaves	Black coral ( <i>Bana-og</i> )
	General health, vitality & life stages	General health, infant care, aphrodisiac, fertility, energy/strength	tape seagrass seeds ( <i>Lusay</i> ) seeds	Sea cucumber, Seahorse, Dogfish shark ( <i>Lahoy</i> ) liver oil, Sting ray tail powder, Octopus tentacles, Eel blood
Theme 2: Spiritual, ritual, and protective uses	Protection from negative forces	Protection from witchcraft ( <i>balbal</i> ), curses ( <i>barang</i> ), or "buyag"	tape seagrass, beach morning glory	Seahorse, Sting ray tail, thorny shells ( <i>Tirik-tirik</i> ), sea cucumber ( <i>Bahag-bahag</i> ), Black coral ( <i>Bana- og</i> ), Crown of thorns
	Blessings, cleansing & purification	Rituals ( <i>palina</i> , offerings) for protection, safe voyages, good fishing, pregnancy protection	tape seagrass, gulfweed, beach morning glory, Seaweeds ( <i>Ambalang</i> )	Shells, seahorse, thorny shells ( <i>Tirik-tirik</i> )

Table 3

Summary of themes regarding food, material use, and TEK practices in the coastal community of Misamis Oriental

<i>Theme</i>	<i>Sub-theme</i>	<i>Code/description</i>	<i>Flora cited</i>	<i>Fauna cited</i>
Theme 1: Marine resources as food and sustenance	Direct consumption & culinary use	Food source, laxative, nutritional use (salad, soup, cooked/raw)	Seaweeds ( <i>Latu; Ambalang</i> ), tape seagrass seed pods ( <i>Lusay</i> ), Spoon seagrass	Rock oyster ( <i>Sisi</i> ), oilfish ( <i>Pinyahon</i> ), Sea turtle
Theme 2: Utilitarian and material applications	Agricultural & resource processing Fishing aids	Fertilizer, animal feed, natural pesticide  Fish poison	tape seagrass, gulfweed  fish <i>berry</i> ( <i>Lagtang</i> ) seeds, poison vine ( <i>Tubli</i> ) roots	Starfish excretions  N/A
<i>Practices/Resources cited</i>				
Theme 3: Traditional ecological knowledge (TEK) in coastal practices	Resource harvesting techniques Navigational & travel adaptations Management of occupational hazards	Local fishing and gleaning practices  Coping with sea sickness  Local remedies for stings/thorns	Fish aggregating device ( <i>payao</i> ); bamboo trap ( <i>bobo</i> ); spear fishing ( <i>pana</i> ); net fishing ( <i>pang laya</i> ); blinker (light fishing); Gleaning ( <i>panginhas</i> )  tape seagrass ( <i>Lusay</i> ) seeds/flowers; drinking seawater from boat; eating fish stomach contents; stones in pocket; Rattan belt  mangrove bark sap ( <i>Bakhaw</i> ); beach morning glory ( <i>Lambayong</i> ) sap; starfish slime; fish liver oil; urine on sting, hot water; coconut milk; sand rubbing; starfish mouth; stonefish liver	

This finding aligns with studies in Malaysia and the Philippines, which highlight how traditional knowledge about marine resources serves not only as a means of healing but also as a cultural repository passed down across generations (Arzaman et al 2023; Boulanger et al 2023). Similar patterns have been documented among the Bajo people of Indonesia, where sea cucumbers and other marine organisms play an integral role in local healing practices (Fachruddin et al 2021). Integrating this knowledge into community healthcare reflects a holistic worldview in which ecosystems and human well-being are closely linked. Importantly, the recognition of these themes suggests that any conservation or educational intervention in Misamis Oriental must be culturally grounded. Studies emphasize that when local knowledge is integrated into formal education and management policies, communities are more likely to engage in sustainable practices and biodiversity conservation (Berkström et al 2019; Herrera & Palomo 2022; Jaudinez & Joaquin 2024).

The thematic map (Figure 2) illustrates the central concept of Ethno-Cultural Uses of Marine Resources and Coastal Practices, an outcome synthesized from five interrelated thematic domains. The general pattern shows that marine resources are utilized in ways that span health (ethnomedicine), spirituality (ritual and protective practices), daily sustenance (food and nutrition), livelihood and innovation (material applications), and environmental adaptation (traditional ecological knowledge). These domains are interconnected through shared values, practices, and meanings, all of which are deeply rooted in the community's lived experiences. The arrows pointing toward the central theme indicate that these domains collectively define the broader cultural framework by which marine resources are valued, utilized, and understood within the community.

Beyond their individual contributions, the themes also reveal significant overlaps, as illustrated by the dotted arrows in the diagram, reflecting their multifunctionality. For example, certain marine species used in food preparation are also employed in ritual healing or as protective charms, emphasizing the inseparability of material use from its symbolic and spiritual meanings. This interconnectedness exemplifies the principles of CES, particularly in the domains of health, identity, spiritual fulfillment, and traditional knowledge transmission (Chan et al 2012; Milcu et al 2013; Raymond et al 2013). While these belief systems and forms of knowledge are also found in other parts of the Philippines, ethnocultural practices and beliefs are not static; rather, they are continually shaped by lived experiences, seasonal changes, and evolving community contexts.

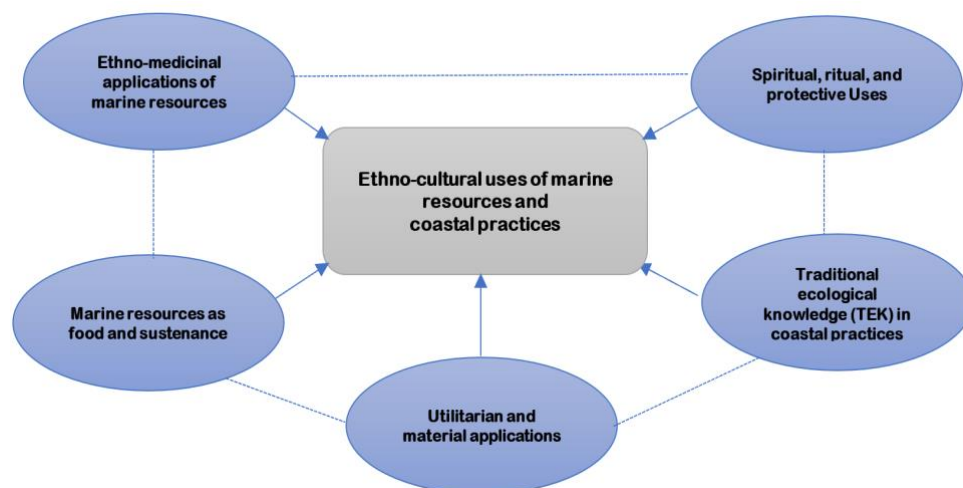


Figure 2. *Thematic map of ethno-cultural uses of marine resources and coastal practices in coastal communities of Misamis Oriental.*

**Traditional practices and ecological knowledge.** Among the various marine flora and fauna mentioned during the KII's, the most frequently cited are summarized in Table 4, along with their common and local names, scientific identifications, uses, ethnocultural significance, and preparation methods. The results include various species of seaweeds, a seagrass, mangrove associates, fish, a mollusk, and a coral. The most prevalent use was

for ethnomedicinal purposes and nutraceuticals, with key species including *Hydropuntia eucheumatoides* (wild seaweed), *Enhalus acoroides* (tape seagrass), and *Ipomoea pes-caprae* (beach morning glory). For food sustenance, these marine species are prepared as raw seafood salad or grilled. As an ethnomedicine, it is primarily prepared as a dried extract and applied topically. There were also very prominently mentioned species, such as those used as folkloric protective charms, like *Dasyatidae* and *Mobulidae* (stingrays' tails), *Gorgoniidae* and *Plexauridae* (black corals), and *Troschel's murex* (*thorny*) shells. Notably, most of these species are incorporated into the local smoke ritual known as *palina*. The embedded use of dogfish shark liver oil (*Lahoy*) and oilfish (*Pinyahon*) in these coastal communities is rooted in the abundance of these fish species in the surrounding waters (Catoto 2014; Gomez 2019; Baños 2023).

Table 4

Foremost marine and coastal species with ethno-cultural importance based on key informant data from Misamis Oriental

Common name & Local name	Scientific name	Category	Uses & parts used	Ethno-cultural significance & preparation
Wild seaweed ( <i>Ambalang</i> ; <i>wild guso</i> )	<i>Hydropuntia eucheumatoides</i>	Seaweed (macroalgae)	Functional food (thallus), remedy for goiter, smoke bath ( <i>palina</i> )	Salad; dried and rubbed for goiter; used in purification rituals
Tape seagrass ( <i>Lusay</i> )	<i>Enhalus acoroides</i>	Seagrass	Seed pods (nutraceutical), flowers (anti-seasickness), whole plant (fertilizer, <i>palina</i> )	Raw seeds eaten; flowers chewed; dried plant added to animal feed; burned in rituals
Fish poison tree ( <i>Bitoon</i> )	<i>Barringtonia asiatica</i>	Tree (angrove associate)	Seeds (remedy for goiter, boils, cancer)	Scraped/boiled and applied or drunk
Beach morning glory ( <i>Lambayong</i> )	<i>Ipomoea pes-caprae</i>	Vine (Beach creeper)	Leaves (arthritis, flatulence, asthma), used in smoke bath ( <i>palina</i> )	Heated and applied; soaked for infusion; burned in rituals
Gulfweed ( <i>Samo</i> )	<i>Sargassum</i> spp.	Seaweed	Thallus (stress, heart ailments, goiter, <i>Palina</i> , pesticide)	Boiled as drink; powdered and mixed with wine; burned for purification; Placed near crops or fruit trees.
Stingray ( <i>Pagi</i> )	Family: <i>Dasyatidae</i> & <i>Mobulidae</i>	Fish (cartilaginous)	Tail (protective charm, whip), fins	Mixed with coconut oil ( <i>lana</i> ); carried as protective charm; tail used as whip ( <i>bunal</i> )
Dogfish shark ( <i>Lahoy</i> )	Family: <i>Squalidae</i>	Fish	Liver oil (wounds, lung disease, cancer)	Liver cooked for oil; taken orally or applied
Black corals ( <i>Bana-og</i> )	Family: <i>Gorgoniidae</i> & <i>Plexauridae</i>	Coral	Protective charm; treatment for arthritis, bone pain, skin rashes	Hung in houses; soaked in alcohol for liniment
Thorny shells ( <i>Tirik-tirik</i> )	<i>Murex troscheli</i>	Shell	Protective charm	Hung in homes or carried
Oilfish ( <i>Pinyahon</i> )	Family: <i>Gempylidae</i>	Fish	Meat (nutraceutical, laxative)	Grilled and eaten

Table 5

## Traditional marine practices and beliefs for livelihood and community well-being in Misamis Oriental

<i>Practices</i>	<i>Organism or material used</i>	<i>Details</i>	<i>Folkloric belief / healing or protective properties</i>	<i>Preparation and application</i>
Purification and blessing ritual	Tape seagrass ( <i>Lusay</i> ), Gulfweed ( <i>Samo</i> ), Seaweed ( <i>Ambalang</i> ), Beach Morning Glory ( <i>Lambayong</i> )	Smoke ritual ( <i>palina</i> ) on new boats and fishing gears for protection and luck, using coastal herbs and marine organisms; sometime white duck's blood is sprinkled.	Blessing new boats or fishing gear; Ensuring good catch for fisherfolk; Breaking curses or removing bad luck; Warding off evil spirits	A small wood or charcoal fire is used to produce smoke from marine materials, which is wafted over the new boat or gear to bless and protect it.
Fishing methods	Bamboo traps ( <i>Bobo</i> )	Traditionally made from bamboo this is fish pots used in trapping fishes especially for reef and benthic fishes ( <i>isda sa bato</i> ), and/or pelagic fishes.	N/A	Fishermen place weighted bamboo traps or pots in fish-rich sea areas, mark them with poles or buoys, and return after a few days to collect the catch.
	Fish aggregating device ( <i>payao</i> )	Traditionally made of floating rafts of bamboo anchored to the seafloor, with submerged weighted palm fronds beneath.	N/A	Man-made structures purposely deployed in fishing grounds to attract/lure pelagic fish species.
Counteract sea sickness	Sea water inside boat	Traditional beliefs mostly by fisherfolks to counteract seasickness.	Remove the curse of sea sickness	Drink a handful of water from inside the boat to reverse sea sickness.
	Undigested food inside caught fish Tape seagrass seeds (inside pods) and flowers		Remedy for Sea sickness	cooked and eat the undigested food of inside freshly caught fish. Eat raw one piece of the green seed inside the pod; Eat about pieces of white floating part of the flowers as needed.
Protective charm	sting ray tail ( <i>Binsol sa Pagi</i> )	Folkloric protective charm	Tail (whip-like tail) (dorsal and caudal fin) ( <i>binsol sa Pagi</i> )	Mixed with coconut oil ( <i>lana</i> ), carried as a protective charm, or used as a whip ( <i>bunal</i> ) for defense.

Black corals ( <i>Bana-og; balite sa dagat</i> )	Folkloric protective charm	Folkloric protective charm against witchcraft, especially for pregnant women	Hung by the window or anywhere in the house; carried as a protective charm.
Thorny shells ( <i>Tirik-tirik</i> )	Folkloric protective charm	Folkloric protective charm against witchcraft, especially for pregnant women	Hung by the window or anywhere in the house.

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The documented ethnomedicinal uses, in particular, point to the marine environment as a valuable source for bioprospecting, which should be guided by the ethics of TEK and ensure equitable benefit-sharing with the community. This TEK, which governs harvesting practices, represents a form of sustainable resource management that has fostered long-term co-existence (Anas et al 2021; Fachruddin et al 2021; Arzaman et al 2023; Sanchez et al 2023).

The common coastal practices and beliefs gathered from the interviews are summarized in Table 5. The prevalence of spiritual and ritualistic practices, such as the Palina and the use of protective charms from black coral and stingray tails, shows a worldview in which the sea is both a source of livelihood and a domain of spiritual forces. The Palina ritual is a form of risk management, believed to protect new fishing gear and ensure safety and good fortune at sea. This practice reinforces both spiritual and ecological harmony, a concept that has also been documented in Siquijor, where rituals serve to sustain both marine resources and cultural identity (Wagey & Bucol 2016).

Folk remedies using marine resources, such as lusay seeds and flowers for seasickness and the symbolic use of sting ray tails (*binsol sa pagi*), black corals (*bana-og*), and thorny shells (*tirik-tirik*) as charms, provide psychological comfort and a sense of agency over unseen threats, a crucial aspect of community well-being. Comparable beliefs have been recorded among the Bajo and Ilocano peoples, where sea-based ethnomedicine remains integral to community well-being (Anas et al 2021; Fachruddin et al 2021; Dumilag & Javier 2022).

Traditional fishing methods, such as bamboo traps (*bobo*) and a fish aggregating device known as *payao*, demonstrate ingenuity and ecological mindfulness. These practices are sustainable, aligning with seasonal patterns and species behaviors, as observed in other coastal communities (Asia et al 2015; Arzaman et al 2023; Sanchez et al 2023).

**Educational and conservation implications of local knowledge.** These practices emphasize the interconnectedness of cultural traditions, marine conservation, and health. Documenting and integrating such traditional knowledge and practices into formal education and conservation efforts provides a pathway for culturally responsive and sustainable marine governance (Cabali & Cuevas 2016; Zalsos et al 2021). This approach honors place-based knowledge, fosters cultural identity, values intangible CES, such as heritage, and reinforces environmental stewardship, which is crucial for the well-being of coastal communities (Lau et al 2019).

The creation of an Ethno-STEM learning module is crucial for bridging academic science with TEK, particularly amid the global decline of traditional knowledge systems (Aswani et al 2018). Guided by the framework of Adams et al (2014), which promotes collaboration between academic institutions and local communities, the module will incorporate the documented species, beliefs, and coastal practices as concrete examples and case studies in lessons on marine biodiversity, biomolecules, and sustainable resource use. These localized examples will help students connect chemistry and environmental science concepts with real experiences from their own coastal environment.

**Conclusions.** This study achieved its aim of documenting and interpreting traditional marine knowledge and practices in Misamis Oriental, revealing a rich body of ethnocultural and ecological wisdom rooted in healing traditions, spiritual beliefs, food security, and sustainable fishing. Thematic analysis identified five key domains: ethnomedicinal applications, spiritual and protective rituals, sustenance, material use, and traditional ecological practices. These domains highlight the multidimensional role of marine resources in community well-being, cultural identity, and environmental stewardship.

Given these findings, future work should focus on the development and implementation of a contextualized Ethno-STEM learning module in high school science education as a strategy to bridge TEK with formal science learning. This intervention offers a direct application of documented community knowledge and has crucial conservation implications for the region.

Schools, local government units, and community stakeholders must collaborate to ensure the long-term sustainability of such educational and conservation initiatives. As an

immediate step, schools can partner with community elders, fisherfolk, and traditional healers to collect examples of local practices. Teachers may then adapt these materials into pilot lessons and experiential activities that connect scientific concepts with cultural heritage.

This initiative enhances science education while preserving intangible cultural heritage and promoting the sustainable use of marine resources. Future research may expand this documentation to other coastal provinces to compare patterns of Ethno-STEM integration and conservation practices.

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