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Research Article

Ethnobotany of Three Sea Grass Species from Port Blair, A Step Towards Its Conservation in Andaman Islands

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ABSTRACT

Ethno-phycology is the study of the relationships of human society to flora and its ecosystem. In the marine world, ethno-biology is a thriving research area, which has yielded valuable ethno-biological knowledge. The main goal of the present study was to understand the effect of abiotic factors and the natural and anthropogenic disturbances that shape the sea-grass community in Andaman Island and reveal the local people's knowledge about the significance of sea-grass habitat and its conservation. The qualitative study on the distribution of sea-grasses in Chidiyatapu (11° 29' 30" to 11° 30' 34" N and 92° 35' 10" to 92° 42' 30" E) was carried out during December 2012 to February 2013. A total of three sea-grass species such as *Thalassia hempirichi* (*Ehrenberg*) Ascherson, 1871, *Halodule uninervis* (*R.Brown*) J.D.*Hooker* 1858, *Halophila ovalis* (*Forsskål*) Ascherson 1882, where identified. Among them, *T. hempirichi*, and *H. ovalis* found in this study was reported to have the ethno-medicinal value from west coast of India. As a part of the study, the semi-structured survey was carried out among the local coastal people to analyse the Traditional Ecological Knowledge (TEK). The survey has revealed the unawareness of coastal residents about the medicinal, nutritional, and conservational values of sea-grasses. A practical implementation has to be taken to make them aware that sea-grasses are fundamental components of healthy marine ecosystems and the local livelihoods that rely on them. The present findings provide the first report on the ethno-phycology of sea-grasses from South Andaman Island.

Keywords: Seagrass, Ethno-phycology, Intertidal, Thalassia hempirichi, South Andaman

Introduction

Sea-grasses are exclusive marine angiosperms comprising < 0.02% of the angiosperm flora represented by sixty-odd species [1] that occur in all the coastal areas of the intertidal and subtidal marine environment. They cover extensive areas by forming dense beds [2]. Sea-grasses offer the basis of a detrital food chain, nutrient cycling, sediment stabilization, and a refuge from predation for macroinvertebrates and small fishes [3]. Sea-grass patches in tropical regions are an example of a complex, variable, and diverse ecosystem that supports a large variety of associated fauna and flora with several ecological characteristics. Sea-grass biomass is used as human food, especially by coastal populations [4]. Sea-grasses such as *Thalassia* sp. and *Sirygodium* sp. constitute primary habitat for economically important fish in many tropical, subtropical, and temperate coastal ecosystems and thus are a central component of the ethnoecology of many tropical fishing peoples. In folk medicine, sea-grasses have been used for a variety of remedial purposes [5]. In India, sea-grasses were used as a medicine, nutritious seeds, fertilizer, and livestock feed [6]. Ethno-biological studies are of crucial intellectual transcendence as human use of living nature is not limited to obtaining food, garments, and tools [7], as they are also extremely important for theory building in the fields of biodiversity conservation [8], evolutionary medicine [9]. Traditional Ecological Knowledge (TEK) and Local Ecological Knowledge (LEK) are closely related to key

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concepts in ethno-biology, which are presently also used in anthropology and ecology. TEK is largely dependent on social and cultural practices, often shaped by traditional customs and institutions and incorporated in a worldview [10].

Nonetheless, islander societies and coastal communities living in arid environments derive as much as 90% of their protein intake from marine sources [11]. Marine ethno-biological knowledge has had a tremendous impact in terms of resource management, more specifically in the practical aspects of fisheries [12] and conservation of fisheries resources [13]. Sea-grass ecosystems are being destroyed rapidly even though they support high biodiversity and sustain many cultures as a vital source of their livelihood [13, 14).

Several studies in which sea-grasses were included in floristic surveys in India, and across these studies, a total of only 12 sea-grass species were reported [7]. Studies on the Seagrass ecosystem are poorly known in India [15] and from coastal waters of south Andaman is meager [16]. Similarly, there are scores of ethno-biological publications on resource utilisation, and sustainability [17]. However, ethno-biological surveys in current and reflective assessment and monitoring of natural resource status and ecosystem change in tropical Island ecosystems, though very promising, are novel [12, 18]. This study's purpose is research based on quantitative, qualitative data, on the distribution of sea-grasses and to assemble the awareness about its associated use for livelihood among the local people along the Coast of South Andaman Island conservation of marine ecosystems.

Material and Methods

Collection of Sea-grass

Chidiyatapu is located in the southernmost tip of South Andaman (11° 29' 30" to 11° 30' 34" N and 92° 35' 10" to 92° 42' 30" E). It is a rocky coastal area with medium to coarse sand. Patches of ethnomedicinal sea-grasses *Thalassia hempirichi, Halodule uninervis,* and *Halophila ovalis* are distributed in some selected sites of Mundapahar, Chidiyatapu (Figure 1). Leaf-blades of *Thalassia hemprichii, Halophila ovalis* and *Halodule uninervis* were collected during December 2012- February 2013, by snorkeling through the water column when the tidal mark was low. A quadrate of 32 × 32 cm was placed over the sea grass patch. 10-15 leaf blades inside the frame were clipped at the sheath base and transferred immediately into a plastic bag. Leaf

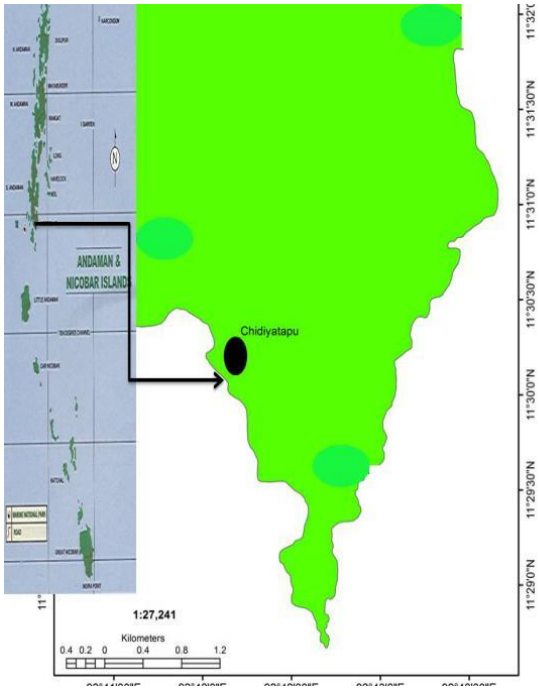

Figure 1. Map showing the location of study area Chidiyatapu in south Andaman.

blade samples were stained with Rose Bengal and preserved with 5% formalin.

Surveying

During the ethno-botanical explorations the informants were selected following standard interview protocols using Bernard's [19] methodology. From a total of 50 possible participants, we selected 30 informants, including 10 men, 10 women, and 5 of each male and female child. Ages of informants ranged from 12 to 75, and informants' occupations included fishing, sales, driving, construction works, and business. All interviews were conducted using Hindi and Malayalam language. To avoid recurrent information, only one person per house was questioned. The preference was given to older people living in the site for more than a generation and could relate changes in concepts and society. Local inhabitants were also asked questions about any observed benefits disturbances in the sea-grass ecosystem.

Selected key interview questions (using the 'Kadal pullu' ethnotaxa as an example):

1. Do you know about 'Kadal pullu' sea-grass?
2. Do you know this name?
3. Do you ever use this plant?
4. How important is 'Kadal pullu' sea-grass to you?
5. Do you sell 'Kadal pullu' sea-grass?

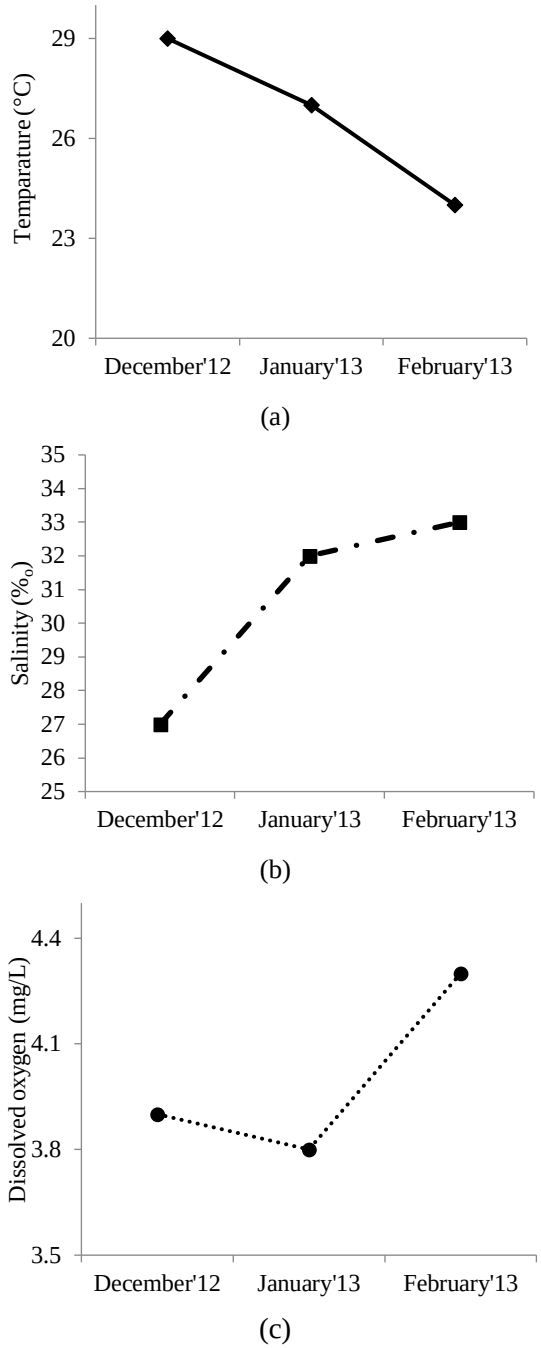

Figure 2. Graph showing the environmental parameters of the study area: temperature (a), salinity (b), and dissolved oxygen (c)

6. What is 'Kadal pullu' sea-grass used for?
7. From whom did you learn the uses of 'Kadal pullu' sea-grass?
8. How is the sea-grass habitat important to you?
9. How is this ecosystem important to you?
10. What is good about being at this site?
11. What is the name of this area?
12. Why is this important to you?
13. Do you think that 'Kadal Pullu' is vanishing by years?
14. If yes what might be the reason?
15. What is your opinion about the conservation of sea-grasses?

Results and Discussions

Environmental parameters

Salinity varied from 27-33 (psu), and dissolved oxygen ranged from 3.8-4.3 (mg/L), showing an increase from December to February. PH varied from 7.4-7.9. While temperature showed a reverse trend, it was comparatively low during February, whereas higher in December (Figure 2).

Sea-grasses

Sea grasses such as *T. hempirichii*, *H. ovalis*, and *H. uninervis* were collected from the study area's intertidal waters varied in shapes and sizes. Distinctive features were studied based on the standard key [20] (Figure 3). The leaf blade's length ranged from 2.13 ± 0.3 cm in *H. ovalis* to 6.6 ± 0.2 in *T. hempirichii* (Table 1).

Ethno-phycology of sea-grass

There was exceptional cultural diversity in our study site, where the Andaman Sea and the Bengal Sea meet. The villagers surveyed contained a number of different religious groups, including Hindu, Islam, and Christian. The indigenous people were mixed settlers who represent southeastern and southwest India. Many people within these groups speak Hindi, Malayalam, and Tamil, as well as Bengali. As per the interview conducted among the local people of the east coast of South Andaman, they are not using the sea-grass for any purpose and even cattle feeding. Some of them are not at all bothering about the presence of sea-grasses. They are leaving it in the sea, as it may be the food of marine creatures.

During the conversation, no traditional medicinal practitioner was encountered. Ecological knowledge, such as knowledge of microhabitat and site conditions, is a key factor used by the locals to distinguish sea-grasses. The majority of the informer could not determine the sea-grass species name, and some of them cannot distinguish between the sea-grass and seaweeds. None of the informants know the traditional utility of the sea-grass. However, about 80 % of the men are using the sea-grass for other utility such as

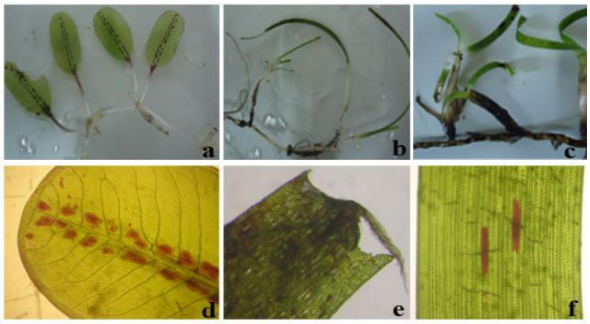

Figure 3. Sea grass species collected from the study area. (a) Leaf blade of *Halophila ovalis*, (b) Leaf blade of *Halodule uninenrvis*, (c) Leaf blade of *Thalassia hemprichii*, (d) Leaf tip of *H. ovalis* (e) Leaf tip of *H. uninenrvis*, (f) Leaf blade of *T. hemprichii*

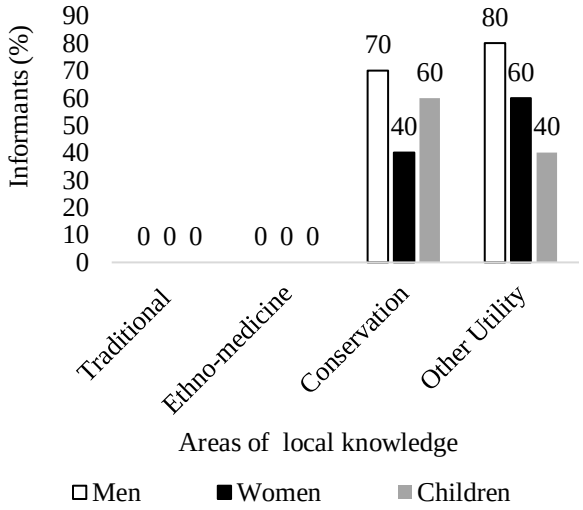

Figure 4. Showing the knowledge of local people on sea-grass in various aspects

scrubbers for washing the boat and nets (Figure 4). A notable anthropogenic factor observed in the study site, which was not stated by the informants, was the clear-destruction and crushing of sea-grass where they anchor the fishing boats. However, the informants shared a good opinion towards the need of conservation of the sea-grass after we provided a brief description on its importance.

A large portion of South Andaman Islands are surrounded by coral rubble, coral reefs, sandstone, sand and mud, providing ideal habitat for the luxurious growth of many sea-grasses such as species of *T. hemprichii*, *H. uninervis*, and *H. ovalis*. These sea-grasses provide a critical habitat for diverse marine fauna such as cuttlefish, dugongs, sea horses, eels, rays and scorpion fish, sea cucumbers and sea snakes others. The three sea-grasses *T. hemprichii*, *H. ovalis*, and *H. uninervis* were distributed in plenty throughout the study sites. However, a mixed growth of the three species was very rare. *T. hemprichii* and *H. uninervis* was distributed almost uniformly along with the three tidal marks, high tide, mid-tide and low tide. However, the *H. ovalis* was growing more in the mid-tide and high tide mark. Among the three sea-grasses studied, *T. hemprichii* and *H. ovalis* were reported as ethnomedicinal sea-grass among the tribal community of the Tamil Nadu coast [6]. For mental illnesses, those people use the dried rhizome powder of ethnotaxa *T. hemprichii*. Various skin diseases, burns and boils are treated with the leaves of *H. ovalis* with a paste made from turmeric. Nevertheless, in south Andaman Island's coastal community, the local community was unaware of sea-grasses' ethnomedicinal values in their nearby sea. The people of different ages were interviewed, but none has any traditional beneficiary information about the sea-grasses. Still, they have little knowledge about some of the marine animals that use the sea-grass leaf blades as food; hence its ecological role is essential, and conservation measures have to be taken. They are more concerned about their food and livelihood rather than the conservation of biodiversity.

The successful and sustainable utilization of the sea-grass with traditional knowledge can be a good initiative for the island's economic upliftment, which will spend only limited machinery and expenditure. This angiosperm's medicinal and nutritional value can open a wide door for the mariculture and associated small-scale industries in the island with the join involvement of local people and various concerned agencies. But without incorporating or sufficiently knowing the elements and issues of local people (food, housing, religion), we expect conservation and management strategies of sea-grass and another marine ecosystem to unsuccessful. More precisely, the policy should be at the heart of the ecologic, economic, and socio-cultural reality of the communities involved. Both scientific and societal elements should form the basis of an efficient conservation and management scheme of a locality. Such elements include biological monitoring from remote sensing [21], ethno-biological traditions and perceptions (this study), and even eco-religious approaches. In this study, some of the more sincere concerns about sea-grass habitat degradation at the community level were discharge of household wastes and use of mechanized boats. Hence understanding the full

Table. 1 Morphology of sea grasses blades collected from the study area.

Sea Grass	Distinctive Features	Length of a blade (Average)	Width of a blade (Average)
Thalassia hempirichi (*Ehrenberg*) Ascherson, 1871	Curved leaves with clearly visible red or black cells arranged in bars running along the blade (Plate I).	6.66 cm	0.4 cm
Halophila ovalis (*R.Brown*) J.D.*Hooker* 1858	Ten to twenty-eight branched cross veins ascending at 45-60 degrees on both sides of the mid vein (Plate I).	2.13 cm	1.26 cm
Halodule uninervis (*Forsskål*) Ascherson 1882	Three leaf tips with a blunt central "tooth" (Plate I).	6.03 cm	0.2 cm

assortment of factors, which drive and shape sea-grass communities, is essential for developing integrated conservation strategies that support the complex sea-grass food web and their associated faunal relationships. The rigorous experimental design and consensus analysis of traditional knowledge among informants provide quantitative support for local knowledge that may affect society-at-large [22]. Although conservation measures for sea-grass ecosystems have been established in marine biodiversity hotspots worldwide, such as in North America and Australia, there are no adaptive management strategies, public education plans, or conservation measures for sea-grass ecosystems Andaman. As a step towards a management strategy for sea-grass ecosystems, it is already well understood that any integrated science-based systems' success requires effective conservation management in the field at the local level [7], especially in a remote Island territory like Andaman. In the Andaman Islands, indigenous coastal populations suffer from anthropogenic factors such as pollution, overfishing, ocean acidification, sea-level rise, and climate change exacerbated soon. The study of their adaptive capacities in the face of these changes should be an essential area of research for marine ethno-phycology.

Besides, detailed scientific research is needed to document and understand coastal systems' changes on the islands after the Tsunami. Then, create a useful and strong awareness module for tourists in films, booklets, and pamphlets. It is necessary to include traditional knowledge in management practice. Scientific training to increase traditional knowledge, especially tribal communities for biodiversity research and management and conservation initiatives, is highly recommended. The present study also came across the importance of sea-grass ecosystems to traditional cultures, which has been neglected and deserves stronger recognition and respect. A practical implementation has to be taken to make them aware that sea-grasses are fundamental components of healthy marine ecosystems and the local livelihoods that rely on them.

Conclusion

The significance of sea-grass ecosystems to traditional cultures has been neglected and deserves significant attention from this area. Unlike other marine biodiversity hotspots worldwide, such as in Australia and North America, there are no public education plans, adaptive management strategies, or conservation measures prevailing in India, especially from Andaman for sea-grass ecosystem. A good base level conservation management will be the success of all integrated science-based programs. As an additional step, an adaptive management policy would smooth the progress of the assembling of public education, multiple knowledge systems (LEK and TEK), and the beginning of effective utilization and conservation policy, which will help learn how to preserve this fragile ecosystem. It could be implemented by bringing government officials, local communities, scientists, resource managers collectively to the study site to propose an action plan for the conservation of sea-grass.

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