



INDIGENOUS KNOWLEDGE OF BEN TRE PROVINCE COASTAL RESIDENTS IN WEATHER FORECAST AND RESPONDING TO CLIMATE CHANGE

Chung Le Khang

Ho Chi Minh City University of Education, Vietnam

Hoang Hong Anh

Hong Duc University, Vietnam.

*Corresponding author: *Hoang Hong Anh*

Tel.: +84914243265 Email : hoanghonganh@hdu.edu.vn

ABSTRACT

Indigenous knowledge is an important cultural element in the coastal community, which is constantly created, fostered, and transmitted between generations through production, application, and application. Dealing with nature and social relations in the community. This article analyzes the correlation between Ben Tre marine knowledge and Central sea knowledge, presents knowledge related to weather forecasting and response to climate changes in the community of residents and fishermen in the coastal province of Ben Tre. The research results are the collected documents to prove the origin and characteristics of the indigenous knowledge in the coastal areas of Ben Tre province in adapting to the natural environment, contributing to the completion of studies on anthropology. sea in Ben Tre province.

KEYWORDS

indigenous knowledge, Ben Tre sea area, weather forecast, climate change.

1. INTRODUCTION

Ben Tre is one of 7 coastal provinces of the Mekong Delta. The coastline of Ben Tre province is 65km long, the sea area has a diverse ecosystem, abundant seafood resources. Therefore, the sea plays a very important role in the livelihood of the people of Ben Tre. Ben Tre beach is outside the affected area of storms, but every year, fishermen and coastal residents are also affected by weather, especially climate change. To cope with these impacts of nature, fishermen in coastal areas have observed and memorized special weather phenomena, thereby helping them to recognize the differences to have different activities. Suitable fishing and living activities. The accumulated experience of local coastal communities over many generations and widely inherited is called indigenous knowledge. Today, in addition to the impact of science and technology, people in the coastal area of Ben Tre also use indigenous knowledge to adapt to changes in weather and the natural environment. Indigenous knowledge in the waters of Ben Tre is reflected in the way people live and respond to changes in weather and climate every year for aquaculture and fishing, and stabilizing their livelihoods.

There have been many studies on indigenous knowledge related to the natural environment such as the study "Indigenous knowledge of seasonal weather forecasting: A case study in six regions of Uganda" by Joshua Sikhu Okonya by author Joshua Sikhu Okonya. and Jurgen Kroschel [1], "Indigenous Knowledge Systems and Modern Weather Forecasting: Exploring the Links" by C. Makwara Enock [2], in the National Strategy for Change climate change 2011 mentioned, "Promoting the use of indigenous knowledge in responding to climate change, especially in building new low-carbon livelihoods" [3], The role of indigenous knowledge. In adaptation to climate change author Vu Van Cuong, Tran Thuc [4], Authors group Pham Xuan Phu, Nguyen Ngoc De published studies "Farmers use indigenous knowledge to adapt to climate change". With floods in An Giang province" [5]. There is also a study by Assoc. Prof. Dr. Phan Thi Yen Tuyet on indigenous knowledge in the Southern seas printed in the book Social-economic and cultural life of fishermen and residents of the Southern sea [6]. Although there are many studies on indigenous knowledge related to weather and climate, there is still no research on this issue in the waters of Ben Tre province.

This article analyzes the correlation between Ben Tre marine knowledge and Central sea knowledge, presents knowledge related to weather and the response to climate changes of Ben Tre residents and fishermen. This is the southeastern sea of the East Sea, where sea migrations and long-standing fishing communities took place, so local knowledge in general and knowledge of the weather, climate change is abundant and abundant. This knowledge of nature is an experience passed down from generation to generation through oral tradition. Therefore, it is necessary to investigate, how traditional knowledge systems can be integrated into living and fishing activities to minimize damage caused by climate and extreme weather. The purpose of this article is to identify and analyze the knowledge used in weather forecasting and climate change response in the coastal area of Ben Tre province. The collected materials contribute to the completion of studies on marine anthropology in Ben Tre province.

2. Research content

2.1 Indigenous knowledge and the value of indigenous knowledge

Through adaptation to the natural environment, people have survived by the indigenous knowledge that they have been taught, experienced and accumulated in the process of survival to pass on from generation to generation. Currently, there are many concepts of indigenous knowledge, in which, UNESCO considers that indigenous knowledge is local knowledge belonging to a particular

culture or society. This knowledge is passed down from generation to generation by word of mouth or cultural rituals. Indigenous knowledge is the basis for agricultural production, food processing, health care, education, conservation and a host of other activities to maintain social sustainability.

Indigenous knowledge is important in all aspects of life, but in the past, indigenous knowledge was only considered as shallow, unscientific, unverifiable and somewhat colorful knowledge. Spirituality. Therefore, the applicability of indigenous knowledge in scientific fields is often limited. However, at present, indigenous knowledge is increasingly recognized for its right role and is no longer considered completely as knowledge without a scientific basis. Many parts of the world have been conducting indigenous knowledge research to support scientific research.

Indigenous knowledge is associated with the life of a specific community in the natural environment in which that community has lived for a long time, understands and adapts. Historical development shows that the majority of ethnic minority communities in mountainous areas or coastal residents take indigenous knowledge as a tool and means of environmental and social awareness and the sole basis for survival. In. To this day, they still use and teach it to their descendants, a testament to the value and importance of indigenous knowledge to human life.

2.2. Overview of the coastal area of Ben Tre province

Ben Tre is a province in the Mekong Delta, with a natural area of: 2,360.2 km², formed by An Hoa islet, Bao islet, Minh island and alluvial deposits of four branches of the Mekong River. Long accreted that citadel (including Tien river (My Tho river), Ba Lai River, Ham Luong river, Co Chien river). Ben Tre is adjacent to the East Sea, with a coastline of 65 km.

Three districts bordering the sea of Ben Tre province include Ba Tri, Binh Dai, and Thanh Phu.

+ Ba Tri district is located at the end of Bao island, has an area of 354.80 km², has geographical location: the Northeast borders Binh Dai district, the natural boundary is Ba Lai river, the northwest borders Going district. Trom, the southwest borders Thanh Phu district, has a natural boundary of Ham Luong river, the southeast borders the East Sea with a coastline of nearly 10 km.

+ Binh Dai district is located on An Hoa island, compared to other districts in Ben Tre province, Binh Dai is somewhat isolated, lying alone on a series of islands, geographically located: to the northwest, it borders Chau Thanh district. It borders My Tho river in the northeast, separated from Cho Gao, Tan Phu Dong, Go Cong Dong districts, Tien Giang province, the southwest borders with Ba Lai river, separated from Giong Trom and Ba Tri districts, and the east. The South borders the East Sea with a coastline of about 30km.

+ Thanh Phu district is located in the south of Ben Tre province, at the end of Minh island, with geographical location: the West borders Mo Cay Nam district, the northeast borders Giong Trom and Ba Tri districts with the natural boundary of Ham river. Luong, the southwest borders Tra Vinh province with the natural boundary of Co Chien River, the southeast borders the East Sea with a coastline of about 25km.

Ben Tre is a delta province located close to the sea, with relatively flat terrain, the average altitude is from 1 -2m. Four tributaries of rivers: My Tho River, Ba Lai River, Ham Luong River, and Co Chien River divide the land of Ben Tre into 3 ranges of islands, which pour into the sea, forming a

long coastline with a large alluvium content in seawater, suitable for alluvial waters helps to develop dunes and mangroves in the coastal area of Ben Tre province.

With the above geographical conditions, Ben Tre will be heavily affected by the impacts of climate change such as high tide, sea-level rise, saline intrusion, etc., affecting and causing damage to production and life. community life. According to forecasts of experts studying climate change, if the sea level rises by 0.75-1m, about 60-70% of the province's natural area will be flooded, some coastal areas are being eroded. strong, encroaching into the mainland from 20-30m/year. According to the statistics of the functional sector, Ben Tre coastline currently has 8 landslide points, on a total length of 19km of coastline. Landslides penetrate deep inland on average about 10-15 m annually, losing over 120ha of land and 54ha of coastal protection forests, serious areas needing the most urgent treatment today such as Con Loi area, Thanh Phu district; Con Nhan, Ba Tri district; area of Thua Duc commune, Binh Dai district.... Saltwater intrusion and drought, the salinity of 4‰ has penetrated inland over 60km from the estuaries in recent years, drought and saltwater intrusion have caused a shortage of freshwater for daily life and affected production.

2.3. Correlation between Ben Tre sea knowledge and Central sea knowledge

If counting from 1757 to now, the land of Ben Tre (in the old Tra Vang) has belonged to Vietnam for more than 260 years. Experiencing the ups and downs of history, from the "opening of plantations and setting up hamlets", it can be said that the people living in the land of Ben Tre in particular and the Mekong Delta, in general, are mostly from Ngu Quang: Quang. Binh, Quang Tri, Quang Duc (modern-day Thua Thien Hue), Quang Nam and Quang Ngai. They moved to this new land in 2 ways: land and sea, but because of the rugged mountains, remote roads, wild animals, robbers and robbers, the number of migrants traveling by road was only a small number. Most of them follow the coastal road by boat in several waves. They moved in groups with villages and clans with rice pots, salt pots, water, and plowing tools to settle down in big rivers such as Tieu, Dai, Ham Luong, and Co Chien, gradually. gradually moved inland. At first, they formed villages and lived mainly by traditional farming or trade, gradually, people lived by fishing on deserted rivers, in remote beaches that were separated and formed. Forming tens of thousands of fishing boats on the banks of rivers and coastal areas, mainly in Thanh Phu, Ba Tri, and Binh Dai districts today. In Le Quy Don's Phu Bien Tap Luc, the Nguyen court: "Recruiting people with material resources in Quang Nam, the palaces of Dien Ban, Quang Ngai, Quy Nhon let them move here, cut down and expand..." [7].

In 1984, researcher Vu Van Kinh surveyed 261 genealogies of several Ben Tre families, it was found that 85/261 genealogies have people who entered the 18th century, 176/261 genealogies have people. Founded in the 19th century... When surveying 98 genealogies of some families in Ben Tre, it was found that 38/98 genealogies have Quang Ngai origin, 14/98 genealogies are of Quang Nam origin, 7/98 genealogy has origins in Thua Thien Hue, 7/98 genealogies have origins in Binh Dinh,...[8]

Migrants moving to Ben Tre province in general, most of them travel by sea. However, Ben Tre is not the destination right from the start, they move step by step, to any land where it is easy to establish a village, establish a hamlet, can open a business, they will settle down. The reclamation picture of Ben Tre at that time was also a method of exploration in the South, the localities bordering the sea showed even more clearly the relationship with the Central region in many aspects: "The land

was good and the coastal area, Expatriates can go to the village by boat from the Central region to set up a business, in addition to reaping the benefits of upland fields, they also benefit from fish and shrimp. Fishing in the sea is the forte of the Vietnamese people, spoiled for choice of good land. Thanks to the sea, the communication to the homeland in the Central region is convenient” [9].

The people of Ben Tre originate from the Central region, where there is a strong influence of the sea in daily life and culture. It was also thanks to the sea route that they reached the land of Ben Tre. It can be said that indigenous knowledge in general and indigenous knowledge in the sea area of Ben Tre province, in particular, cannot be separated from the marine knowledge of the Central region. Weather forecasting, seafaring and fishing experiences continue to be developed and popularized in the waters of Ben Tre province.

Although originating in the Central region, however, marine knowledge in Ben Tre also has differences compared to Central sea knowledge. This difference mainly comes from natural conditions, topography. The central coastal area is a barren land, mountainous terrain spreads close to the sea or desertification, and resources are limited, so agricultural activities are underdeveloped, often affected by storms, so most people in the Central Coast will have a sea-oriented mindset, conquering and exploiting marine resources to serve socio-economic life. In contrast, in the land of Ben Tre, inland is a rich plain, abundant resources, good living conditions. Therefore, people in Ben Tre often do not have the mindset to conquer the sea, instead, they often live in harmony with nature, thinking of protecting the resources inland from the influence of the sea to ensure to settle down.

2.4. Indigenous knowledge in the waters of Ben Tre province in weather forecasting

In ancient times, there were no modern means to forecast the weather, fishermen often relied on observations, personal experiences or folk experiences handed down from previous generations. These conclusions are increasing and become the basic lessons of the sea.

The signs that can be observed while at sea are the sky (clouds, moon, stars, thunder, wind, birds), the sea (waves, watercolor, fish) specifically as follows:

Numerical order	Phenomena	Weather
1	The sky is red turning purple	Foreshadowing of heavy storms and rough seas
2	In the windy season, looking at the direction of the wind, you can see the night stars flashing continuously.	Foreshadowing strong seas
	When seen in the center of the moon there is an opaque halo.	
	As the sun rises, below the horizon, the clouds are broom-shaped.	
3	When the sun goes down, the sun turns red	If the time turns red for a long time, then there will be storms in the next 2 to 3 days, and the sunset will turn red a little and then a storm will come.
	At night, the stars flash a lot.	That night or early in the morning, there will be a strong wind
4	From February to June, the night sky is starless	The next day there will be no sun
5	From January to March, the sky is starless at night.	Strong winds, ships should not go to sea
6	Count the number of stars in the sky	If the sky is full of stars, the weather is clear, if there are 3 stars out of 10 in the sky, the sea can be rough. If you can't see any stars, it's

		cloudy, then there's going to be a storm.
7	Lightning	If lightning is high above, there is no storm, red lightning is normal, lightning below is low or passing quickly, it is dangerous.
8	Clouds shaped like fish scales storm	Dangerous, it will rain heavily, strong winds are about to
9	The wind from the shore blows towards the sea.	There is a storm coming out of the sea
10	When the wind blows and then stops, the sea is calm, it's hot	There's going to be a storm
11	November - December is a month with strong waves, strong waves, the water changes from blue to purple	The sea is very dangerous
12	On a normal day, diving to the bottom of the sea meets many solid objects such as tree trunks, coconuts, etc.	It is about to have a strong wind, very big waves, prepare to avoid storms.
13	When the sea is calm, seeing the birth, sea snake lying around	The sky is about to get stormy, the wind is blowing strongly
14	The clear sea water turns turbid	The sea is rough
15	There are very long waves in the sea	If these waves do not coincide with the forecast wind direction at sea, there will be storms operating hundreds of kilometers away from the shore. If these waves come fast and strong, the direction of the waves coincides with the direction of the storm.
16	Look in the direction the birds fly	If the bird is flying to eat fish but the bird rushes back to the mainland, it is a sign of strong wind coming
17	The sea makes strange sounds, it even smells or glows	Prepare for a storm

The above experiences are summarized into a treasure of extremely rich and diverse folk knowledge of the inhabitants of the sea.

2.5. Indigenous knowledge in coastal areas of Ben Tre province in response to climate change

The impacts of climate change have been directly affecting the socio-economic life of all countries, including Vietnam. In the waters of Ben Tre province, climate change causes coastal erosion, saltwater intrusion, seriously affecting crops and livestock. To find a responsible solution, besides the scientific basis, it is necessary to research and combine with the indigenous knowledge of the local people.

In the process of land opening of the Southern people in general and the Ben Tre people in particular, people have openly cleared and purified the land, turned it into the property, and created material and spiritual wealth. Today's affluence of this land, in terms of nature, is the contribution of many generations: "mam tree, mangrove tree, melaleuca tree". Based on the process of observation, grandparents have realized in the process of alluvial accretion, encroaching on the mam tree as a pioneer tree. The characteristics of the mam tree are ground roots and lung roots. Lung roots, in addition to the task of absorbing oxygen, are a lifeline when the mangrove soil is also an adaptive way to protect the alluvial soil. Mam has fruit before falling, has sprouted seedlings. Therefore, when the fruit falls off in a short time, it can cling to the ground and grow. It is these two characteristics of fish sauce: the roots of fish sauce and its fruit that make it possible for the fish tree to quickly reproduce, grow and develop well in the border area between land and water. The fish sauce grows as soon as the fruit falls into the water and clings to the place between the soil and the water, which is

a condition to keep the land, help the land be accreted and gradually encroach into the sea to become a fish forest in the long run.

The characteristic of this species is that it is resistant to waves, wind and saltwater all year round. The group of mangroves is trees that grow adjacent to the sea fish tree population. Mangrove leaves are very hard, waxy and glossy with a reflective effect to retain water. Some people call mangroves "water purifiers", with the function of turning saltwater into freshwater. The unique feature of mangroves is the roots and fruit. Mangroves have 2 types of roots: taproots and accessory roots. The stake roots are small but deeply rooted in the ground, while the secondary roots (chang mangroves) are very large, like the legs of a bow, sprouting around the base, clinging to the soft ground, that's why the one-sided mangrove tree always stands firm. On marshy land, not afraid to shake the wind and storm. Mangroves germinate and give rise to seedlings from the time they are still hanging from trees, when they fall, they can be plugged into the ground or pushed by the waves and drifted everywhere, then meet in muddy places, the mangroves stay and the young roots cling to them. Alluvial. Melaleuca tree belongs to the third generation in the group of forest encroaching trees, the root system of the Melaleuca tree grows strongly, to get more nutrients and make a solid foundation for the Melaleuca tree that does not fall, the roots of the tree have grown wide and deep. , dig deep into the ground, thereby helping Melaleuca healthy and stable, not easily knocked down by the wind.

Such knowledge was taught by the previous generation through the folk song "Mam first, mangrove later, melaleuca follow closely, behind the row of coconut trees on whose roof", as a summary of the process of people coming to settle down and explore the land. new. There must be "mam, mangrove, melaleuca" first. Then there are "nuoc tree rows" so that people can have "house" leaves, a trunk to gather, and fruits to eat, then people can initially settle down. Europe is also a long, arduous process, with the contribution and support of nature, and the persistent efforts of humans. It can be seen from the indigenous knowledge about the characteristics of the coastal flora that today, many projects have chosen to plant fish, mangrove, melaleuca and cork trees to build a mangrove forest system. , protection forest to prevent landslides in coastal areas and estuaries of Ben Tre province. Typically, the People's Committee of Ben Tre province, to encourage people to participate in forest planting, management and protection in association with product development, the province has contracted out to 520 organizations, individuals and households to manage and protect. forest according to the Government's Decree No. 168/2016/ND-CP, with a total area of 3,364 ha, the trees selected for planting are mostly mam, mangrove, melaleuca and cork.

Previously, in the process of overexploiting the coastal land of Ben Tre, residents used forest trees to build embankments and prevent landslides. Today, in the face of increasing sea erosion, Ben Tre province offers many solutions to build embankments. Besides the construction of concrete rafts, which costs a lot of money, the locality also uses the option of soft embankments, which is to use forest tree trunks that are eroded by waves, uprooted, or fallen as protective breakwaters. effective forest area inside.

The life of coastal residents is often affected by storms and tornadoes. To protect their homes, coastal residents of Ben Tre province for many generations have used sand sacks on the roof to keep the roof from the effects of storms and high winds. These sand sacks are also used to effectively protect the coast in the current encroachment scenario.

Besides being affected by erosion and erosion, the coastal area of Ben Tre province is also seriously affected by salinity. Salinity events do not happen suddenly like landslides, they are often cyclical and can be predictable. Local people in Ben Tre province often look at Wind to predict the level of salinity. The wind is the local name for the northeast wind, which is believed to be the cause of rising water levels and salinity intrusion. Because during the period of strong wind resistance, the upper Mekong River is at its driest period, there is very little freshwater flow to the downstream, along with the wind direction blowing perpendicular to the cross-section of the estuaries, so the intrusion salinity deeper into rivers. Wind gusts usually start in October, peak in February and last until April of the following year.

Besides the irrigation works to prevent saltwater, the people of Ben Tre province also actively use traditional solutions such as storing water in the house with a jar made from the traditional craft village of Hoa Loi in Thanh Phu, Ben Tre province, which is very famous from ages ago. People in the coastal area use to store water from dug wells and rainwater to serve family activities during the year. Currently, although the life of residents in Ben Tre sea area has developed a lot, to overcome the problem of saltwater and increasingly severe saltwater intrusion, people in this area still have the habit of using water heaters. to store freshwater.

Agricultural production activities are severely affected by salinization, to deal with this natural phenomenon, people in the coastal area of Ben Tre have applied the experience of using deep plowing without overturning, plowing many times, cutting off. capillary to prevent salt from rising to the field surface. Improve the soil by rotating crop and livestock structure. Specifically: On the saline land closest to the sea, aquaculture will be carried out, followed by sedge and salt-tolerant plants, the innermost land will grow rice. Focus on developing crops in the direction of intensive farming and rotation on rice land. In which, identifying watermelon as an advantageous crop.

3. CONCLUSION

In the process of existence and development, coastal communities in Ben Tre province always use indigenous knowledge as tools and means in production, community management and dealing with the natural environment. In particular, the indigenous knowledge of the inhabitants of the coastal area of Ben Tre is always adjusted, supplemented and perfected compared to the original sea knowledge in the Central region, making indigenous knowledge of great value for weather forecasting. climate change adaptation and resilience, building resilience for communities. At the local level, one of the solutions to build a community that effectively adapts to the natural environment is to use the indigenous knowledge of the local community. Therefore, in the process of living, fishing activities at sea and developing climate change adaptation plans for the community, it is necessary to pay attention to the experiences of the community. Assess, select and use valuable indigenous knowledge in adapting to the natural environment as an endogenous resource of the community; combine indigenous knowledge with modern science to enhance the capacity of the community in socio-economic development.

References

- [1] Joshua Sikhu Okonya, Jurgen Kroschel (2013), Indigenous knowledge of seasonal weather forecasting: A case study in six regions of Uganda, *Agricultural Sciences* issue 4 (12), pp.:641-648.
- [2] C. Makwara Enock (2013), Indigenous Knowledge Systems and Modern Weather Forecasting: Exploring the Links, *Journal of Agriculture and Sustainability*.
- [3] Prime Minister (2011). National strategy on climate change. Section 7. page 12.
- [4] Vu Van Cuong, Tran Thuc. (2017). The role of indigenous knowledge in climate change adaptation. *Journal of Climate Change Science*. No. 02 pages 25 - 30.
- [5] Pham Xuan Phu, Nguyen Ngoc De. (2017). Farmers use indigenous knowledge to adapt to floods in An Giang province. *Journal of Science Can Tho University*. Number 50. 13-25.
- [6] Phan Thi Yen Tuyet. (2016). Social-economic and cultural life of fishermen and residents of the South Sea. Ho Chi Minh City National University Publishing House
- [7] Le Quy Don (1977). *Covering the magazine border*. Social Science Publishing House. Hanoi. P.381.
- [8] Le Minh Quoc. (2020). *People of Ben Tre*. Young Publishing House. Page 61
- [9] Son Nam. (2018). *History of Southern Emergencies*. Young Publishing House. Page 30.