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Research on the engineering design and aesthetic value evaluation of coastal wetlands - a case study of the mangrove wetland of Zhanjiang City's Sea Watch Promenade

Jun Yao*, Danhong Chen

School of Life Science &Technology, Lingnan Normal University, Zhanjiang, Guangdong, 524048, China
5911369504@qq.com
**Corresponding author*

Abstract: *Zhanjiang is rich in mangrove resources, and mangroves themselves have unique landscape and protective values, as well as ecological, environmental, educational and economic functions.This paper takes the mangrove forest in Zhanjiang City as the research object, through the aesthetic value and natural landscape aesthetic questionnaire survey of the photos taken on site of the mangrove wetland landscape of the sea-viewing promenade, and on this basis the characteristics of the law of natural formal beauty of the mangrove landscape are analyzed with the hierarchical analysis method, and the superiority of the ecological design of the coastal mangrove landscape and the aesthetic value of the landscape design are explored from the ornamental mode of the mangrove landscape, tidal influence, endangered plant protection, and landscape culture derivation.*

Keywords: *mangroves, aesthetic value, wetland landscape*

1. Introduction

This study starts from the aesthetic value of mangrove wetland landscape and uses the hierarchical analysis method to investigate the questionnaire and analyze the field landscape photos of Zhanjiang Sea View Promenade, and then discusses and summarizes the characteristics of the mangrove landscape aesthetic value elements to explore the superiority of coastal mangrove landscape design.

2. Objectives and methods of the study

2.1. Research Subjects

Zhanjiang City is located in the southernmost part of mainland China, Leizhou Peninsula and southwestern Guangdong Province, with longitude 110°24′E and latitude 21°12′N. It has a tropical and subtropical monsoon climate. The annual average temperature is 22.8~23.4℃, the annual average sunshine time is 1,817.7~2,106h, the annual average rainfall is 1,400~1,700mm, the dry and wet seasons are distinct, and the rainfall is mostly concentrated in April-October. The Zhanjiang Sea Viewing Promenade project starts from Haidian Road in the south to Ocean Road in the north, with a total length of about 1.7 km, and is divided into three zones (860m in the south, 150m in the middle and 690m in the north) according to its topographic status, with a total area of 156 ha (6.38 ha in the south, 3.5 ha in the middle and 5.12 ha in the north).

2.2. Research Methodology

This study takes several aspects of mangrove landscape structure, landscape elements and tidal influence, and plant protection in the tropical coastal city of Zhanjiang Observatory Promenade as research objects, and uses questionnaires and hierarchical analysis to make scientific and effective quantitative evaluation and analysis, and gives the corresponding transformation design scheme to provide reference for the construction of tropical coastal ecological mangrove wetland landscape.

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3. Research results

Based on the AHP method combined with questionnaires, the project team conducted in-depth research and analysis on five aspects: the formal beauty of the mangrove landscape structure of the promenade, landscape elements and human landscape elements, tidal influence, and protection of endangered organisms and plants, and established the weights of 10 factor layers and their 4 indicator layers, It covers various aspects such as intuitive feeling, inner cultural connotation and deeper spiritual feeling and aesthetic value, and builds a comprehensive evaluation index system with a set of integrated scientific and practical mangrove landscape structure. From the weighting of the 4 major project layer indicators, it can be seen that ornamental value 43.83%, practical value 29.43%, cultural value 26.74% can be seen in the evaluation or construction of the mangrove landscape structure, its ornamental value should be the main consideration, mangrove landscape structure planning and design should firstly start from the ornamental, create the beauty and attractiveness of the stacks to appreciate the realm. Therefore, in the mangrove landscape structure design should take into account the harmonious coexistence of people's natural ecological landscape, and focus on the overall feeling of appreciation experience, the evaluation of the ornamental value of the mangrove landscape structure should also be integrated and comprehensive.

4. Discussion and recommendations

4.1. Multi-angle viewing approach, landscape aesthetics of contrast and reconciliation

The sea view promenade uses plants (mangroves) to construct the function of space to produce spatial contrast and harmony, the integrity of the mangrove landscape ecosystem, the space is divided into open, semi-open and closed three forms. The coordination of the distribution of its landscape elements in three-dimensional space constitutes the beauty of its pattern, which is the main aspect of the formal beauty of the mangrove forest in the sea view promenade.

Due to the hot weather in Zhanjiang in summer, the discomfort caused by the high temperature and heat in the existing stacks and get no good solution, proper shade has become a major focus of the transformation.

Through the Zhanjiang coastal sea view promenade program transformation to present the design thinking and conclusions, the overall design of the axis of interpretation with the coiled mangrove forest and the typical migratory birds represented by the red-billed gull as the main clue. On the west side of the axis is a large street garden, and on the east side is Zhanjiang Bay. The overall style of the modern waterfront landscape is simple and bright, with natural elements: stones, wood, water and mangroves as the background, on which are superimposed stainless steel, aluminum and reinforced concrete corridors, pavilions, railings and small objects. The space of sea, land and air is transformed, and the sea view promenade coastal wetland landscape with different atmosphere is created through the change of view forms and perspectives, using mangrove contrast to achieve the purpose of reconciliation. The use of psychological perception and the law of optical illusion to solve the actual design encountered in the space scale, light, space transition and other problems. The mangrove wetland landscape of the Zhanjiang Sea View Promenade is a full embodiment of this. Forest Canopy line changes obviously increase the beauty of mangrove community landscape, walking on the corridor to observe that groups of mangroves form closed space and sparse mangroves form semi-closed space. The city's buildings become the backdrop on the mangrove landscape, and as the corridor route changes, the design takes advantage of the 3 m height difference between the high and low trestles to build public viewing platforms and ecological corridors. Set up public spaces of different heights, such as sky corridors and sunken trestles, as well as viewing platforms of the same height as the shore road, to create an all-round viewing sanctuary from three perspectives: overhead, upward and parallel (Figure 1), to further play the functional role of the trestles and play a contrast and tone with the mangroves. [1]

By raising or lowering the height of the trestle, thus enriching a variety of viewing angles, allocating some plants with strong purification function on the mudflat, and at the same time, by setting up shading corridors and other facilities, we can achieve the dual effect of function and landscape, material and spiritual. To create a "one-step-one view" effect, it is conducive to visitors to view the mangrove ecological communities in all directions, whether it is the marine life on the mudflats, the low breathing roots or mangrove stems and branches, can meet the diversified needs of visitors to view. (Figure 2)

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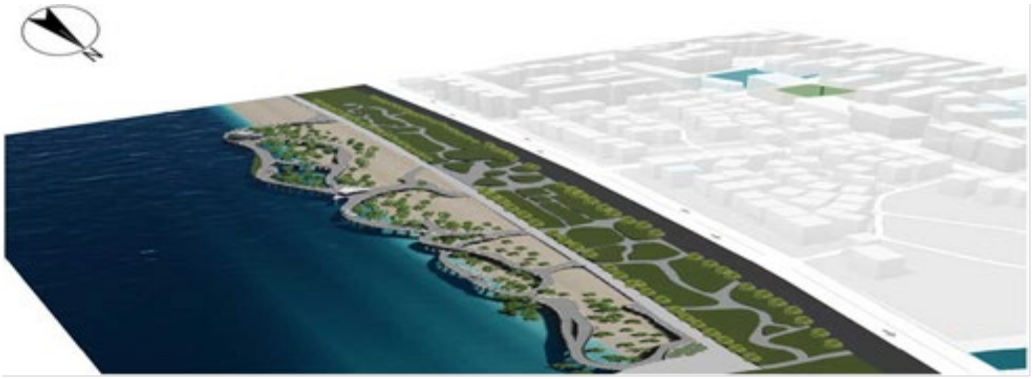

Figure 1: Aerial view of the mangroves of the Zhanjiang Sea View Promenade after renovation

Figure 2: Functional analysis of mangroves in the Zhanjiang Observatory Promenade after renovation

There are three tour routes in this node, and the cross routes meet the diversified viewing needs of visitors. Among them: the sunken trestle, the trestle sinks 1.5 meters, and a small viewing platform is set up at the lowest. You can observe the growth of mangrove stems and roots from a close distance and play the unique scientific function of the mangrove walkway; the elevated walkway is raised by 1.5 meters and a small observation deck is set up at the highest point, where you can look down on the walkway and mangrove leaves from the air and enjoy the best sea view. (Figure 3)

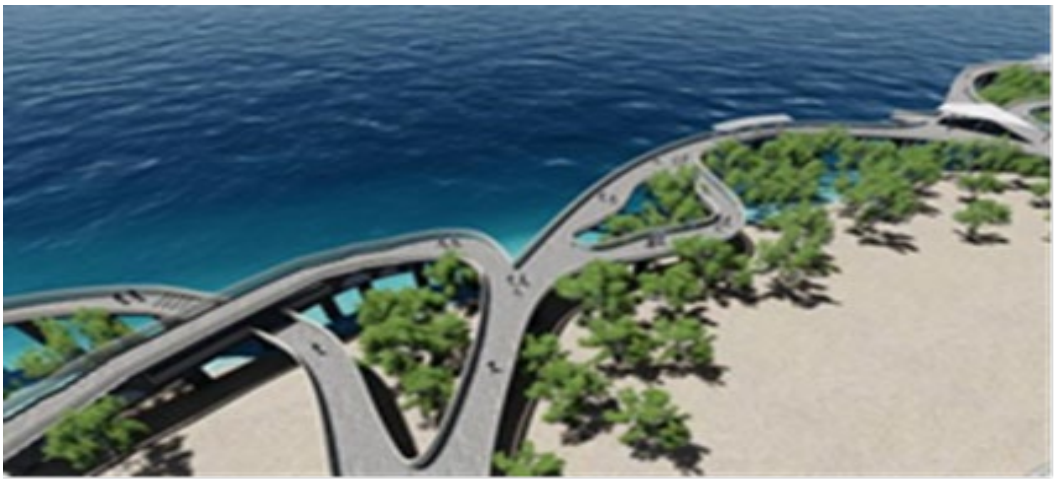

Figure 3: Mangrove nodes of the Zhanjiang Sea View Promenade after renovation

4.2. Spatial restructuring, rhythm and rhythm of landscape aesthetics

The clever use of landscaping, originally used in garden art to express the character and style of a landscape space, is just as relevant in mangrove ecological landscape design. In the plane, the trestle adopts the design form of larger curves, and the direction is roughly consistent with the distribution of

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mangrove plant communities. The design sense curve of the trestle mirrors the canopy curve of the mangrove community, sparse and dense, ensuring that the viewer gets a certain sense of rhythm and rhythm visually. At the same time, the design forms of both the trestle and the shore are in the form of natural curves, combining sea and land in a spatial and functional organic way, breaking the defect of single function. [2]

In the elevation, the difference in height between the highest and lowest part of the trestle has both a raised air corridor and a sunken observation deck. The combination of structural settings with different heights and the natural growth of the mangrove forest's height curve gives the overall landscape a rich sense of hierarchy, giving the picture both depth and breadth. (Figure 4)

Figure 4: Relationship between the trestle and the sea surface after high tide

The relationship between the trestle and the sea surface after low tide and high tide.The water phase characteristics of waterfront wetlands are the most important aesthetic features of urban wetlands. Water, as the most dynamic element of the landscape elements, is often the highlight in the landscape. The sea has the beauty of the water itself, and adds a bit of mystery because of its depth and boundlessness. The sea water is both dynamic and static characteristics for its beauty to present a lot of color. Mangrove forests are mostly planted in order to ensure the survival rate, and they are planted in monopolies, forming a unique scene of interval distribution between forest and water zones. [3] The ebb and flow of the tide and the mangrove forest correspondingly out of the scenery stimulates the perception and feeling of beauty, forming a unique rhythm and rhythm. [Figure 5]

4.3. Influence of tides, unity and change of landscape aesthetics

According to the relationship between tidal water level and growth zone of mangroves, according to the location of mangrove community distribution on the tidal flats, it can be divided into mangrove high, medium and low tidal flats. When the tidal level is low, you can enjoy the landscape presented by the root growth of mangrove plants, odd-shaped breathing roots, strut roots and plate roots, and leaves with salt secretion. The evaluation of the close-up landscape beauty degree reveals people's preference for plant community characteristics such as plant life type composition, forest canopy line and patch boundary line, as well as individual plant characteristics landscape element types such as branch arrangement, crown shape and branch density. At mid-tide, the roots of mangroves are submerged in seawater or a small part of them is exposed. At this time, the plant structure of mangroves is mainly viewed. It is generally believed that the higher the degree of hybridization, the higher the degree of species isolation, and the more stable the structure of the forest stand. The mangrove trees in the promenade are not highly mixed, simple in species, and have a single community appearance. [4] Exotic species should be introduced appropriately, so as to increase the degree of mixing in the forest, change the spatial level of change, and accelerate the benign succession of the forest. Further optimize the environment and landscape. [Figure 5]

According to the law and influence of tide, the level of tide will directly affect the degree of mangrove flooding, so the design must focus on the effect of different water levels when viewing. After the actual investigation, the highest tide water level will be slightly higher than the shore road, and the height of the road road tooth is similar, close to the shore and the height of 4m above the mangroves only to reveal the crown part, near the trestle part of the low mangroves will be completely submerged. At this time, [5]we can see the branches and leaves of the mangrove; when the tide level is the lowest,

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the tide will exit the shore nearly 100 meters, and the mudflat part will be exposed in a large area. (Figure 5)

Figure 5: Post tidal influence plan

The sunken trestle will be exposed at mid-tide for visitors to walk through, plus the mangrove ecological community has a functional role in bringing people close to nature, so the trestle can meet the viewers to a greater extent of hydrophilic.

Through the natural growth of mangroves formed by the height of the match, to create a wild jungle wilderness. However, it is necessary to consider the selection of materials and safety of the trestle.As the sunken trestle will be flooded by the tide at high tide, it needs to have strong anti-corrosion performance, and regular maintenance and reinforcement of the facility. At the same time, at the high tide level, visitors are reminded to leave the sunken stacks in time through the relevant intelligent system. The design of this case sets up through-forest stacks and sunken stacks, so that visitors can view and experience the root landscape and branch, leaf, flower and fruit landscape of mangrove plants at close range, increasing the fun of touring experience and the effect of science popularization. (Figure 6)

Figure 6: Effect after tidal influence

The air corridor ensures that visitors can view the scenery from afar at any time of the day, regardless of the high or low tide. The height of the corridor must take into account the security and secrecy of the military base across the harbor, and therefore should not be higher than 3m. It should also have certain safety performance against typhoons. The height of the viewing platform is slightly higher than the highest level of the tide, and it is arranged in a location between the forests. Under the subtropical monsoon climate conditions of Zhanjiang, the viewing platform must have some shade and shelter from rain. The viewing points are arranged in different locations to create the best bird watching view for visitors [6].

The scenery is made in a specific geographical environment under special meteorological conditions and relying on certain astronomical conditions. They are either related to the morning and evening, or with the wind and rain, smoke and clouds. An important element of natural beauty, it and

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landscape poetry and painting each other, has become a distinctive feature of landscape beauty, mangroves and tidal changes reflecting the sun's rise and fall formed a landscape aesthetics of unity and change in the characteristics.

4.4. Distribution of plant communities, balance and stability of landscape aesthetics

The distribution pattern of the mangroves in the promenade will be adjusted by prioritizing some trees with angular scales of 0~0.25 and 0.75~1.00 as interfering trees for interplanting or replanting, so as to change the distribution pattern from the original uniform or group distribution to random distribution, and to optimize the stand structure gradually through spatial turning and spatial releasing. [6]

The water surface should be used as the base of the plant landscape to avoid bare mudflats; through the collocation of different heights of tree species to enrich the forest canopy line changes; focus on creating semi-open plant space to avoid space depression; plant collocation should be hierarchical, to avoid high and low, cluttered. The place near the tour route and the place where the visitors stay more

Landscape nodes, especially pay attention to the selection of tree species, giving priority to plants with curved trunks, cable-like breathing roots, branches and leaves, and avoiding plants with no trunk, sparse leaves, dark green color and knee-like breathing roots. In the mangrove plant community, the landscape structure is composed of patches of different sizes, numbers, shapes and locations, which have different structures and functions. The substrate of mangrove landscape is mudflat, which is called "intertidal zone" in geomorphology.is sometimes submerged and sometimes exposed due to tidal action. The mudflats are very extensive and consist of plant communities with their own characteristics, which are the most extensive and connected important landscape elements that largely determine the nature of the plant. In the design process, different plants, aquatic animals are matched according to the principles of color, size, texture and shape, which, although asymmetrical, achieve a good and stable effect, and are more refreshing because of their irregular characteristics. Different categories of mangrove plants, growing in tidal habitats, therefore form unique ecological characteristics: with placental phenomenon, odd-shaped breathing roots, strut roots and plate roots, leaves with the phenomenon of salt secretion, etc. There are also a large number of birds and fish, shrimp, crabs and shellfish inhabiting under the mangroves to interact and depend on each other. The ideal mangrove landscape structure not only includes reasonable forest cover, reasonable vegetation type structure, reasonable tree species structure, reasonable age structure, but also has to consider whether the spatial distribution pattern of mangroves in the region is balanced and stable. Due to the influence of temperature, currents, waves, shore slope, salinity, tide, substrate and other factors, the spatial distribution of mangroves is different from other terrestrial forests, mostly growing in the coastal tidal zone with gentle slope topography, forming a belt distribution almost parallel to the coastline, forming a unique balanced and stable landscape in the coastal intertidal zone.

In the marine culture, mangrove culture is one of its important components. The implantation of mangrove culture elements make visitors subconsciously be inculcated by the culture of protecting mangroves, with a strong theme. When the tide is high, the cultural pillar can also act as a large scale to measure the depth of seawater, so that visitors know the ebb and flow of the tide. In aesthetically pleasing while also ensuring the safety of the trestle to a certain extent.

On the plane, the trestle adopts the design form of large curves, and the direction is roughly consistent with the distribution of mangrove plant communities. The design curve of the trestle and the canopy curve of the mangrove community reflect each other, sparse and dense, to ensure that the viewer gets a certain sense of harmony and balance visually.

The landscape node is located at the central entrance of the trestle and has an exact axis to create a glance effect. The node is mainly equipped with a beak pavilion and a beak platform. The "beak" is the beak of a bird, and the beak is visualized as a pavilion and given a vivid connotation. The pavilion and platform combine the open space of the sea and the closed space of the walkway, so that they can better perform the functions of sightseeing, viewing and resting. (Figure 7)

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Figure 7: Mangrove entrance effect

5. Conclusion

In the evaluation study or construction of the aesthetic value of wetlands, its ornamental value and ecological value should be the main consideration, coastal wetland planning and design should first start from the ecological and ornamental, creating a landscape stack of beauty and attractiveness to appreciate the realm. And people's ornamental experience is not a single, but includes many factors such as plant configuration, as well as distant scenery, near scenery and the diversity of organisms and tidal influence in the appreciation experience. Therefore, in the landscape planning and design should take into account people's appreciation experience of coastal wetlands and focus on the overall feeling, and the evaluation of the ornamental value of coastal wetlands should be comprehensive and comprehensive. In addition, the contrast and harmony of landscape aesthetics, spatial structure adjustment, the rhythm and rhythm of landscape aesthetics, the influence of tides, the unity and change of landscape aesthetics, the distribution of plant communities, the balance and stability of landscape aesthetics, cultural value and practical value should not be ignored. This paper takes ecological protection as the core, analyzes and summarizes the characteristics of the landscape aesthetics of mangrove wetlands in Zhanjiang, and carries out the design of the case. Effective suggestions are made for the construction methods of Zhanjiang coastal wetlands.

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