


Article

Research on the Key Success Factors for the Transformation of the Traditional Fishery to Recreational Fishery in Taiwan's Outlying Islands

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Abstract: Outlying islands are affected by the environment and economy, and fishery resources are the first to experience these impacts. Therefore, it is necessary to actively and effectively transform traditional fisheries in outlying islands. This is the case in Penghu County (Penghu Islands), located on the outlying islands of Taiwan. The transformation to recreational fishery can increase the additional income of traditional fisheries during the fishing moratorium through the development of recreational fishery boats by fishermen. Recreational fishery means the fishery using fishing vessels for recreational purposes or for passengers to harvest aquatic organisms on the reef or to engage in sightseeing on the islets. Therefore, this study will explore the key factors for the successful route planning of fishermen who switch to recreational fishery boats to assist the fishermen in successfully transitioning and enabling recreational fishery to flourish. In the research, using the method of the Analytic Hierarchy Process (AHP) expert questionnaire, it was found that the key factors affecting the route planning of recreational fishery boats are “boat conditions”, “berthing conditions”, “operating environment”, and “sightseeing potential”. After the expert questionnaire, a weight comparison of each level was performed, and it was found that “operating environment” was the most important factor, followed by “tourism potential”. However, the key factors of the “natural environment” and “cultural environment” are more important under the influence of the “operating environment”. Under the influence of “tourism potential”, “attractiveness” is a key factor, as is the “accessibility” factor. In this study, the four main fishing ports in Penghu County were also used for empirical discussion. The study results showed that Magong Fishing Port was the first choice for transformation, followed by Chikan Fishing Port. The results of this study can be used as a reference for fishermen and officials in developing a subsidy scheme for fishing boat operation, and they can be used as a reference for transforming traditional fisheries in outlying islands into recreational fishing to develop recreational fishery boats and leisure tourism industries. This research can help fishermen to attach importance to the development of recreational fishing activities and promote the stable growth of the fishery industry environment.

Keywords: outlying islands; recreational fishing; recreational fishing boats; analytic hierarchy process (AHP)



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1. Introduction

In recent years, the rapid transformation of the social and economic structure and the lack of marine resources have resulted in a gradual decline in fishery development [1]. There is a significant development issue regarding how to revitalize the fishery economy. Approximately 60% of the world's population is concentrated in coastal areas, but most of them are concentrated in large cities, while small-scale coastal fishing villages relying on traditional fishery and aquaculture are facing the phenomena of fishery economic

decline and population exodus [2]. In addition, the impact of climate change on natural fishing grounds and unfavorable factors such as industrial pollution of the coastal fishery environment causes traditional fishery operators to experience operational difficulties [3,4]. Therefore, it is very important to actively guide the transformation of fishermen, fishing ports, and fishing villages and revitalize the declining fishery economy.

The traditional fishery is mainly to maximize the benefits of fishing, but the recreational fishery is primarily based on experience and sightseeing. Based on the necessity of fishery transformation and the development trend of leisure life, the development of traditional fishing can be transformed into recreational fishery with high added value to enhance the economic capacity of fishing villages, improve the living environments of fishing villages and increase the income of fishermen, so that the fishery can move towards sustainable development [5,6]. The definition of recreational fishery mainly refers to the planning and utilization of fishery-related natural and human resources and the provision of services so that the participating individuals can achieve the purpose of sightseeing, recreation, and leisure [7,8]. In North America, Europe and Oceania, it is estimated that approximately 10.52% of these individuals are engaged in recreational fishery activities, which is equivalent to 118 million of the recreational fishery population [9]. Recreational fishery seems to have gradually attracted the attention of many countries and regions, and it has gradually expanded and accelerated the development of fisheries [10]. Furthermore, recreational fisheries are increasingly recognized as having certain economic, socio-cultural, and ecological importance in many countries [11,12].

Because the scope of recreational fishery activities is very broad, all people and entities related to freshwater and marine environments and fishing are included [13,14]. Recreational fishery means the fishery using fishing vessels for recreational purposes or for passengers to harvest aquatic organisms on the reef or to engage in sightseeing on the islets. Penghu County, an outlying island in Taiwan, is also facing the problem of the gradual decline of traditional fisheries. Therefore, if the traditional fishery in Penghu County, an outlying island of Taiwan, can be transformed into a recreational fishery, it may be possible to create vitality for the declining traditional fishery. However, how to transform and what the influencing factors are in the process of transformation are the questions that this research wants to understand. Therefore, this study will explore the key factors affecting the transformation of recreational fishery boats in the recreational fishery to understand how future recreational fishery boats can integrate waypoints and form sailing routes with sightseeing benefits. Let us suppose fishing boats can be transformed into recreational fishery boats, providing tourists with more recreational options. In that case, this could also increase fishermen's income, change the industrial structure and upgrade the original primary industry to the secondary and tertiary industries. In addition, if there is a complete sightseeing route for recreational fishery boats in outlying islands, this will not only attract large numbers of tourists but also promote the development of the local tourism industry, promote outlying island tourism, boost the economic development of outlying islands and increase the job opportunities for fishermen.

2. Literature Review

2.1. Fisheries Policy

Taiwan's coastal fish catches once reached 400,000 metric tons, with an average output of about 180,000 metric tons in the past five years, with an output value of about 15.9 billion yuan. The main types of fisheries are pick nets, trawl nets, stick nets, gill nets, and longline fishing. The main reasons for affecting fish catches are overfishing, marine pollution, and global climate change. The formulation of Taiwan's fishery policy is based on the goal of implementing the vision of sustainable development. The aquaculture industry is an important traditional economic industry in Taiwan, and grouper is an important target financial fish species [15]. Over the last five years, the average aquaculture fisheries output has been 290,000 metric tons, with 36.6 billion New Taiwan Dollars. There are more than 50 cultured species; the bulk comprises tilapia, milkfish, clams, oysters, sea bass,

grouper, larvae, and white shrimp, accounting for 92% of the total output of aquaculture fisheries. The Fisheries Agency [16] mentioned the following: “In the coastal waters, in order to maintain the coastal habitat environment and fishery resources, guide the transformation of fisheries, and promote the revitalization and development of fishing village industries through the overall development strategy of the local creation. Through the experience of fishing village production, life, and ecology, as well as the promotion of fishing village industry, celebration culture and tourism fish market visits and consumption, and planning fishing village tourism routes, promoting fishing village tourism, culture, and attractions, hoping to promote the concept of fishery sustainability and assist the industry Transformation, effective, rational and sustainable use of marine resources”.

2.2. Recreational Fishery Boats

Traditional fishing is a very important primary industry in island countries [17]. However, the excessive development of Taiwan’s early fishery has led to the decline of fishery resources in the coastal waters. Therefore, the Council of Agriculture of the Executive Yuan has strengthened the management of fishing boats for the sustainable use of marine resources and guided fishermen to transition towards recreational fisheries so that the marine ecological resources in the coastal waters can be recuperated. The income and transformation willingness of fishermen is maintained when traditional fishing is suspended while, at the same time, providing the general public with more diverse marine leisure activities [6].

It is precisely because the government has promoted the fishery transformation policy, the citizens’ economic level is being gradually improved, the fishery resources in the coastal waters are progressively decreasing, and the public now attaches great importance to the sustainable development of marine resources, etc., that the recreational fishery trend has arisen [8]. The recreational fishery is a recreational activity that combines fishing and ecological tourism [18] and is regulated by the Fisheries Law of the Council of Agriculture of the Executive Yuan, the Regulations for Recreational Fishery and the Law of Ships of the Maritime Port Bureau, MOTC.

Article 41 of Chapter 4 of the Fisheries Act of Taiwan states the following: For this Act, the term “recreational fishery” means the fishery using fishing vessels for recreational purposes or passengers to harvest aquatic organisms on the reef or to engage in sightseeing on the islets. Article 2 of the Regulations for Recreational Fishery of the Council of Agriculture of the Executive Yuan defines recreational fishery as follows: the activities of recreational fishery stipulated in these Regulations mean the following activities that a recreational fishing vessel carries passengers on board or to islands or reefs to engage in: (1) Harvesting aquatic animals or plants; (2) Watching fishing operations; (3) Watching natural environment and wildlife; and (4) Whale watching. Article 4 also states, “A recreational fishing vessel referred in these Regulations means an existing fishing vessel that engages in part-time recreational fishery, or is modified or built as a replacement to engage in the recreational fishery”. Due to the unique positioning of recreational fishery boats, they can carry out fishing operations under specific conditions, allowing tourists to watch the marine ecology and fishing boat operations. Therefore, the recreational fishery boats discussed in this study also belong to the outlying island sightseeing boats, one type of sightseeing boat.

2.3. Sailing Route Planning

The sailing route is an important factor in determining the market value of the product [19]. However, in order to achieve a ship with sightseeing benefits, various suitable travel routes and shore sightseeing itineraries must be arranged according to the needs of tourists in different regions [20]. Therefore, when choosing a port of call, more consideration should be given to the location advantage, tourism economy, and tourism resources of the port city, so as to achieve the joint development of land and sea. The key factors of sailing route planning are listed as follows.

2.3.1. Ship Conditions

Different ship types, sizes, and styles will affect the planning of sailing routes, the number of passengers, and the attributes of passengers. Whether the sailing route is on the main route will also affect the passenger capacity. The shipping company designs the sailing route according to logistical factors (such as fuel and sailing time). It then adjusts the ship's sailing time according to tourists' needs for shore excursions to form a route plan that balances marine sailing and shore excursions to achieve effective economic efficiency [21,22].

2.3.2. Berthing Conditions

Port facilities are required to operate ships [23]. Well-developed port facilities attract more sailing routes [24]. The development potential determines whether the port's location is in the core circle [25]. The length of the distance from each port will affect the design of the nodes of the sailing route [26]. The size of the ship, shoreline, berth and water depth, etc., will also affect the size of the ship that can be berthed and indirectly affect the sailing route, channel, and water depth of the ship's seats [27]. The berthing facilities can facilitate the approach of ships and whether it is convenient for passengers to embark or disembark, and logistics support capabilities are also very important. Supplementary ship fuel, freshwater supply facilities, food, maintenance, and rescue systems provide marine rescue services for ships and tourists to ensure personal and property safety [28]. However, in a competitive market, inappropriate charging strategies can lead to the suspension of sailing routes. Thus, port charges are also important for ship services. Port charges include terminal fees, port taxes, berthing fees, and fuel consumption [29]. Therefore, the berthing conditions are divided into port conditions, port location, port spacing, wharf length, berth conditions, the port logistics support capability, and the charging strategy. Operating costs include crew wages, repairs and maintenance, insurance premiums, and administrative expenses. Voyage costs include fuel consumption, a freshwater supply, port charges, and pilot fees.

2.3.3. Operating Environment

The natural and human environments are the landscape features presented in the port environment [30]. The management mechanism established and the environmental characteristics created by the port management unit or the operator are the resources and information provided to the users [31]. Funding and policy are considered crucial first steps in sustaining the development of recreational fisheries [32]. The development of recreational fisheries in various regions is closely related to local development—that is, recreational fisheries will promote regional economic development and become a global localized industry [33]. However, the success of its marketing strategy will also affect local development. The cooperation between ship operators and the tourism sector can increase passenger occupancy and economic benefits [34].

2.3.4. Tourism Potential

The term “tourist attraction” is very broad and usually refers to the collection of all attractions that attract tourists to a destination [35]. Gee et al. suggest that attractions can be divided into six categories: natural resources, human resources, recreational facilities, events, innovative activities, and psychological attractions [36]. Cooper et al. pointed out that tourism development is an inter-departmental and inter-disciplinary industry, combining diversified activities such as central and local government departments, private enterprises, non-profit organizations, and communities, and it is also a gathering of a comprehensive industry, where related industries gather and develop together [37]. A successful tourist destination must have six components: attractions, accessibility, amenities, available packages, activities, and ancillary services [38]. Therefore, an island recreational fishery boat with sightseeing benefits also needs to have a tourist attraction.

3. Materials and Methods

3.1. Study Areas

The study discussed the key factors of outlying islands' recreational fishery boats. Therefore, using the literature mentioned above review of the sailing route planning content, Penghu County (Penghu Islands), an outlying island in Taiwan, was selected as the study area. Figure 1 shows that Penghu County (Penghu Islands) is an outlying island located in the western sea of Taiwan. It is approximately 60 km long from north to south and about 40 km wide from east to west, and it has a total land area of roughly 128 square kilometers. The four major fishing ports in Penghu County are Jibei Fishing Port, Chikan Fishing Port, Magong Fishing Port, and Tanmen Fishing Port (as shown in Figure 1). These ports were initially designed as fishing ports. Still, due to the development of tourism in Penghu County, they have provided multi-functional berthing for transportation boats, yachts, and fishing boats.

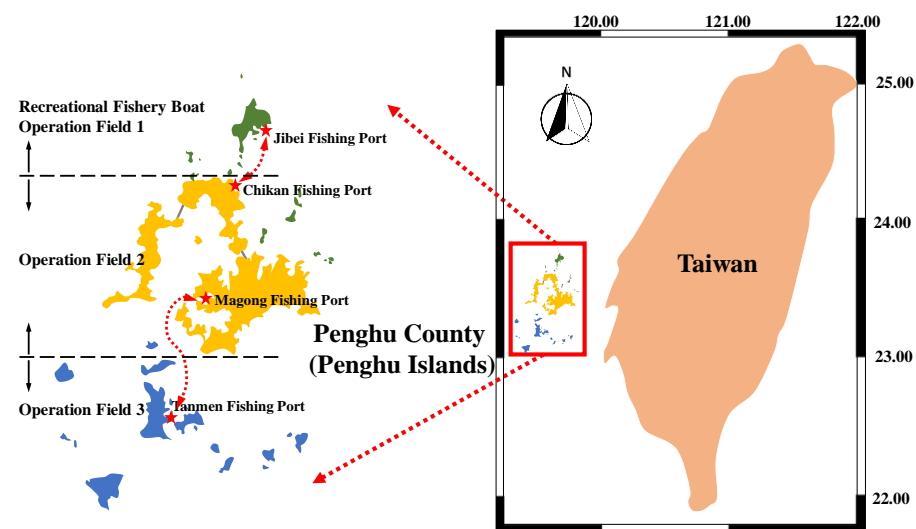


Figure 1. Distribution map of Penghu County (Penghu Islands).

Table 1 shows the current number of fishing households, number of fishing boats, operating fishing grounds, main fish species, hardware facilities, operating environment, and tourism potential in each fishing port. Magong Fishing Port and Chikan Fishing Port are the largest and second largest. Jibei Fishing Port and Tanmen Fishing Port are crowded due to a lack of fishing port space during the peak tourist season. In addition, it can be seen from Table 1 that Magong Fishing Port can accommodate the most significant number of fishing boats and fishing households. Jibei Fishing Port and Chikan Fishing Port mainly focus on shallow sea aquaculture. Chikan Fishing Port is rich in clove fish. Every year, Chikan Fishing Port hosts clove fish season activities. Jibei and Chikan Fishing Ports were developed earlier and are suitable for water activities, so there are also more packaged itineraries and water activities. In addition, the island and fishing village atmosphere of recreational fishery boat operation field 1 is attractive. In recreational fishery boat operation fields 2 and 3, in the past, fishermen mainly focused on coastal fisheries, and they frequently led fishing and hunting activities. Magong Fishing Port is located in operation field 2, which is rich in cultural relics, military relics, natural landscapes, and coastal beach water activities. Therefore, Penghu fishermen have a strong opportunity to transform traditional fishery into recreational fishery through the conditions and resources mentioned above.

Table 1. Outline description of the four main fishing ports in Penghu County.

Fishing Port		Jibei Fishing Port	Chikan Fishing Port	Magong Fishing Port	Tanmen Fishing Port
Fishing Port Space	Port Length (m)	1877	1728	6204	1001
	Berth Area (hectare)	7.6	8.69	35	2.72
	Water Depth (m)	3	3	3.5~4	3
Number of fishing boats that can be accommodated		80	75	270	44
Number of existing power fishing boats		237	414	181	
Number of fishing households		1488	3993	746	
Fishing boat operation and fishing ground (fish species)		Shallow sea aquaculture is mainly used, and the yield of fish includes oysters and other marine fish. The Chikan Fishing Port is rich in clove fish.		Dominated by cage net culture and oyster production.	Dominated by gill nets; other marine fish production is the highest.
Fishing Port Facilities	Water	Yes	Yes	Yes	No
	Power	Yes	Yes	Yes	No
	Fuel	No	Yes	Yes	Yes
	Ice	No	Yes	Yes	No
Recreational fishery boat operation field (see Figure 1)		Operation field 1	Operation fields 1 and 2	Operation fields 2 and 3	Operation field 3
Type of berthed vessel		Fishing boats, transportation boats, yachts, sightseeing boats	Fishing boats, recreational fishing boats, transportation boats, recreational boats, sightseeing speedboats	Fishing boats, recreational fishing boats, transportation boats, yachts, sightseeing boats	Fishing boats, yachts
Recreational facilities		Visitor Center, Waiting Room	Visitor Center, Pavilion, Observation Deck, Parking Lot	Visitor Center, Ticket Booth, Transportation Boat Terminal, Waiting Room, Parking Lot, Convenience Store	Waiting Room, Pavilion, Parking Lot

3.2. Research Methods

With regard to the main fishing ports in the study area, local government officials, local ship operators, and scholars specializing in shipping and marine tourism were invited to participate in expert questionnaire surveys. Quantitative questionnaire analysis was carried out with the Analytical Hierarchy Process (AHP) to clarify the priorities of sailing route planning for future island recreational fishery boats.

An advantage of the AHP method is that it is easy to operate, it can comprehensively capture the opinions of experts or decision makers, and it has a quantitative theoretical basis [39]. The AHP method is tested for consistency, showing whether the consensus of expert groups or decision makers is biased. The disadvantage of the AHP method is that it will increase the complexity of the pairwise comparison between variables when there are many variables [40]. The operational procedure of the AHP method includes three steps, as detailed below [41].

Step 1: Establishing a pairwise comparison matrix. The main diagonal of the pairwise comparison matrix *A* is the comparison of the factors themselves, so they are all 1. The upper triangular of the pairwise comparison matrix is the comparison result measured by *n* factors. The value of the lower triangle is the reciprocal of the relative position of the upper triangle. The pairwise comparison matrix is generally given below.

$$A = \begin{bmatrix} 1 & a_{12} & a_{13} & \cdots & a_{1n} \\ a_{21} & 1 & a_{23} & \cdots & a_{2n} \\ a_{31} & a_{32} & 1 & \cdots & a_{3n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & a_{n3} & \cdots & 1 \end{bmatrix} = \begin{bmatrix} 1 & a_{12} & a_{13} & \cdots & a_{1n} \\ 1/a_{12} & 1 & a_{23} & \cdots & a_{2n} \\ 1/a_{13} & 1/a_{23} & 1 & \cdots & a_{3n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 1/a_{1n} & 1/a_{2n} & 1/a_{3n} & \cdots & 1 \end{bmatrix}$$

where a_{ij} represents the comparison value obtained by the decision maker after comparing the decision factors i and j in pairs, and $a_{ij} = 1/a_{ji}$.

Step 2: Obtaining the largest eigenvalue of the pairwise comparison matrix. After obtaining the pairwise comparison matrix, use the eigenvalue solution method in numerical analysis to obtain the eigenvector and obtain the largest eigenvalue according to the eigenvector. The row geometric mean method (RGMM) is a suitable eigenvector estimation method. The row geometric mean method is defined below.

$$p_i = \frac{[\prod_{j=1}^n a_{ij}]^{\frac{1}{n}}}{\sum_{i=1}^n [\prod_{j=1}^n a_{ij}]^{\frac{1}{n}}}, i, j = 1, 2, 3, \dots, n$$

Step 3: Performing a pairwise comparison matrix consistency test. Saaty suggested the use of the consistency index (C.I.) and consistency ratio (C.R.) to test the consistency of the matrix [42]. The C.I. and C.R. can be calculated as below:

$$C.I. = \frac{\lambda_{max} - n}{n - 1}$$

$$C.R. = \frac{C.I.}{R.I.}$$

where $R.I.$ is the random index ($R.I.$). The $R.I.$ value is related to the order of the matrix, and the corresponding value can be found according to the order of the matrix [42]. As Saaty (1980) suggested, higher consistency indicates that the value of the matrix is acceptable [42]. Generally, when $C.R.$ is less than or equal to 0.1 and $C.I.$ is less than or equal to 0.1, the model is considered to pass the consistency test.

3.3. Research Variables

First, through in-depth interviews, the respondents were asked to express their opinions and thoughts on possible factors affecting the planning of the sailing route for the outlying islands' recreational fishery boats, and the suitability of each factor was evaluated. This method enables respondents to answer questions in-depth. It overcomes key information that cannot be obtained through closed questionnaires, thus enabling empirical results to identify specific problems and solutions [43]. In-depth interviews were conducted in this study from 16 September 2021, to 30 September 2021. A total of 6 representatives from industry, government, and academia were interviewed, as shown in Table 2. The key factors collated from the interview content and a literature review of the respondents included four influencing levels (ship conditions, berthing conditions, operating environment, and tourism potential) and 20 influencing factors, as shown in Table 3.

Table 2. Basic information of respondents in expert interviews.

Expert	Industry Category	Job Tenure
Expert 1	Travel Agency	10 years
Expert 2	Bed and Breakfast	7 years
Expert 3	Port Bureau	25 years
Expert 4	Penghu National Scenic Area Administration	10 years
Expert 5	National Penghu University of Science and Technology	30 years
Expert 6	National Taiwan Ocean University	8 years

Table 3. Important factors affecting the sailing route planning of outlying islands' recreational fishing boats.

Level	Factor	Description
Ship Conditions	On the Main Route	Take the shortest and most economical route between the two ends as the main route.
	Ship Facilities	Provide entertainment hardware.
	Ship Size	Affects the port of call on the route, including tonnage, number of passengers, etc.
	Ship Style	Ships with different features are suitable for different sailing routes.
	Sailing Time	Sailing time at sea.
Berthing Conditions	Port Conditions	Perfect port facilities need to match with operating ship facilities.
	Distance between Ports	Affects sailing route node design.
	Berth Conditions	Include berthing facilities, shoreline, berth and water depth, etc.
	Logistical Support	Port logistics support capabilities (such as fueling and water supply facilities, ship supplies, fresh water supply, rescue system).
	Charging Strategy	Includes terminal fees, port taxes, berthing fees, fuel consumption, etc.
Operating Environment	Natural Environment	Climate, scenery.
	Cultural Environment	Ancient relics, local culture.
	Policy Environment	Local government policy
	Social Environment	Resident attitudes, quality of employees, employment opportunities, labor price, population, consumption level, GDP, security.
	Marketing Environment	Sailing routes or business alliances, etc.
Tourism Potential	Attractive	Stronghold attraction.
	Accessibility	Shore excursions, accommodation and entertainment accessibility.
	Subsidized Services	Provide services to passengers (including food, internet, consultation, etc.).
	Package Itinerary	The characteristics of hinterland tourism (including tourism resources and connectivity, etc.).
	Activity	Water activities, nearshore activities, land activities, etc.

3.4. Expert Questionnaire Design

Through the above research, we investigated and discussed the four influencing levels and 20 influencing factors that affect the sailing route planning of the outlying islands. Then, a complete hierarchical structure was established. Next, the questionnaire design of the AHP method was carried out. The questionnaire mainly included six parts: research description, questionnaire answering description and example, importance intensity standard, and interpretation of influencing factors and items. The AHP method uses the scaling ratio to derive the principal eigenvectors of the paired ratio matrix to find the relative weights among the items at each level. The evaluation scale can be divided into five grades, namely, equal strength, slightly stronger, strong, extremely strong, and absolutely strong, which are assigned values of 1, 3, 5, 7, and 9, respectively, while intermediate values of 2, 4, 6 and 8 are assigned between the two scales. We then asked the expert group to select the appropriate value. A scale to the left indicates that the items in the left column are more

important than the items in the right column. Conversely, a scale to the right indicates that items in the right column are more important than those in the left column.

3.5. Expert Questionnaire Object

The AHP method relies on professional judgment, and this study selected 20 experts, including those from industry, government, and academia. This study conducted the expert questionnaire survey on 15 October 2021. A total of 20 questionnaires were sent out. After collection, five were returned by government officials, five by industry officials, and five by scholars, as shown in Table 4.

Table 4. Basic information of respondents in AHP expert questionnaire.

Expert	Industry Category	Job Tenure
Scholar 1	Department of Marine Navigation, National Penghu Marine and Fishery Vocational High School	10 years
Scholar 2	Department of Marine Navigation, National Penghu Marine and Fishery Vocational High School	21 years
Scholar 3	Department of Hospitality Management, National Penghu University of Science and Technology	7 years
Scholar 4	Department of Marine Navigation, National Penghu Marine and Fishery Vocational High School	6 years
Scholar 5	Department of Tourism and Leisure, National Penghu University of Science and Technology	20 years
Official 1	Department of Recreation, Penghu National Scenic Area Administration	4 years
Official 2	Department of Recreation, Penghu National Scenic Area Administration	7 years
Official 3	Port Bureau	12 years
Official 4	Department of Recreation, Penghu National Scenic Area Administration	3 years
Official 5	Department of Management, Penghu National Scenic Area Administration	6 years
Industry 1	Travel Agency	6 years
Industry 2	Travel Agency	1.5 years
Industry 3	Travel Agency	1 years
Industry 4	Fisheries practitioners	8 years
Industry 5	Bed and Breakfast	4 years

4. Results and Discussion

A weighted analysis was performed based on the data from the AHP expert questionnaire. The research results show that the consistency index (*C.I.*) and consistency ratio (*C.R.*) of the four impact levels (ship condition, berthing condition, operating environment, and tourism potential) are *C.I.* = 0.0329 and *C.R.* = 0.0365, respectively. Both *C.I.* and *C.R.* are less than 0.1, indicating that they meet the requirements of the consistency test, and this also shows that the impact level of this study has passed the consistency test. The analysis results of the most important key factors affecting the planning of the sailing route of the outlying islands' recreational fishery boats are explained as follows and shown in Table 5.

4.1. Analysis Results at the Impact Level

The relative weight value of the impact level that affects the sailing route planning of outlying islands' recreational fishery boats is the highest in the order of operating environment (0.320), followed by tourism potential (0.256) and ship conditions (0.238),

and the lowest is obtained for berthing conditions (0.186). From this, it can be seen that the expert group believes that the operating environment is a necessary condition for the planning of the sailing route of the outlying islands' recreational fishery boats. Lekakou et al. obtained similar results, where the operational environment was an important income generator for tourist areas [44]. The operating environment includes factors such as nature, culture, policy, society, and marketing. The quality of the operating environment represents an important factor affecting the sailing route planning of recreational fishery boats on outlying islands. The environment includes not only the outlying islands being affected by the northeast monsoon, which may lead to concerns about the safety of ships but also the local government's policy promotion and implementation, as well as the attitudes of the public and industry, which all affect its weight value. However, if the government formulates relevant regulations in the future or the industry formulates activity plans, we can first investigate their environmental impact factors, and it is very important to prioritize adjustments and improvements to solve the related problems. This study also found that the operating environment has a higher index weight value regarding the impact level, so it has a joint impact on the overall weight value. Therefore, the influencing factors in the operating environment, including the natural environment, cultural environment, and social environment, are all given the highest priority in the overall ranking. In addition to the importance of the natural beauty and cultural connotations of outlying island tourism, it is also important to enhance the attractiveness of the base. Formica and Uysal also found that only attractive resources can attract recreational ships and tourists [45].

4.2. Determination of Key Factors at the Level of Ship Conditions

Among the key factors regarding ship conditions, the ship size (0.279) is the most important, and the ship style (0.140) is the least important. It can be seen that experts believe that the size of the ship is an important factor affecting whether the port can be berthed, so the size of the ship is the most important key factor under the conditions of the ship (Rodrigue and Notteboom [46] also mentioned this argument), followed by the ship facilities that provide related entertainment hardware facilities (0.263). In the case of the transformation of fishing boats, in addition to meeting the basic physiological and safety needs of passengers, comfortable and suitable equipment is also required so that passengers can be satisfied in the recreation process. The index weight value of ship style (0.140) is the lowest, indicating that ships with different characteristics are not valued. In addition, whether it is on the main route (0.166) and the time of sailing (0.151) are not the most important key factors.

4.3. Determination of Key Factors at the Level of Berthing Conditions

Among the key factors in berthing conditions, the most important are the port conditions (0.359), and the least important is the distance between ports (0.051). From this, it can be seen that experts believe that a perfect port can enable ships to berth smoothly and quickly. Hence, port conditions are the most important and necessary for berthing conditions, while the distance between ports is not a key factor.

4.4. Determination of Key Factors at the Level of Operating Environment

In terms of the key factors of the operating environment, there are two indicators with higher weights, namely, the natural environment (0.305) and the cultural environment (0.259), while the lowest is attributed to the marketing environment (0.115). From this, it can be seen that if there is no suitable climate, pleasant scenery, historical sites, or fascinating local culture on the sailing route of the island's recreational fishery boat, it is impossible to attract the island recreational fishery boat to berth (as shown in [33]). Although local government support, or whether the sailing route has a joint operation alliance with the industry, is the main concern of industry officials at present, the index weight results of the marketing environment (0.069) and the policy environment (0.053) show that their importance is relatively lower. It is worth noting that in terms of the social

environment (0.204), residents' attitudes, the quality of employees, and safety are also key factors.

4.5. Determination of Key Factors at the Level of Tourism Potential

Among the key factors of tourism potential, the most important is an attraction (0.306), and the least important is subsidized services (0.074). Recreational resources with tourism potential need to be relatively attractive. Indeed, whether it is sightseeing, leisure, or recreation, recreational resources depend on the participation of people and their desire to visit an attraction in order to achieve this behavioral pattern. Therefore, it can be seen that the attractiveness of the strongholds included in the sailing route planning of outlying islands' recreational fishery boats is necessary for route planning in this study. As Huertas et al. noted, a successful tourist destination must have tourist attractions [39]. In terms of subsidized services (0.074), whether services are provided to passengers (including food, internet, consultation, etc.) is not an important key factor. However, this study suggests that if the research object of this questionnaire is adjusted to consumers, different results may be obtained; our findings can also be used as a suggestion and reference for follow-up research. In addition, the index weight value of the accessibility (0.220) of the tourism potential is also high, so it is necessary to pay attention to the accessibility of shore excursions, accommodation, and entertainment at the waypoints where ships are docked. The package itinerary (0.163) and the activities (0.156) are not important factors affecting the planning of the sailing route, including the characteristics of hinterland tourism (including tourism resources and connections) and whether there are water activities, nearshore activities, land activities, etc.

Table 5. AHP weight analysis results.

Level	Factor	Index Weight	Individual Ranking	Overall Weight	Overall Ranking
Ship Conditions (0.238)	On the Main Route	0.166	3	0.039	12
	Ship Facilities	0.263	2	0.063	7
	Ship Size	0.279	1	0.066	5
	Ship Style	0.140	5	0.033	16
	Sailing Time	0.151	4	0.036	15
Berthing Conditions (0.186)	Port Conditions	0.379	1	0.070	4
	Distance between Ports	0.131	5	0.024	20
	Berth Conditions	0.155	4	0.029	19
	Logistical Support	0.173	2	0.032	17
	Charging Strategy	0.162	3	0.030	18
Operating Environment (0.320)	Natural Environment	0.305	1	0.098	1
	Cultural Environment	0.259	2	0.083	2
	Policy Environment	0.117	4	0.038	13
	Social Environment	0.204	3	0.065	6
	Marketing Environment	0.115	5	0.037	14

Table 5. Cont.

Level	Factor	Index Weight	Individual Ranking	Overall Weight	Overall Ranking
Tourism Potential (0.256)	Attractiveness	0.306	1	0.078	3
	Accessibility	0.220	2	0.056	8
	Subsidized Services	0.154	5	0.040	11
	Package Itinerary	0.163	3	0.042	9
	Activity	0.156	4	0.040	10

4.6. Discussion of Application Results

The fishing port is the production base of the marine fishery, while the recreational fishing port is the main body of the development of recreational fishery. By carefully assessing the transformation of traditional fishing ports into recreational fishing ports, one can combine fishery development and recreation into recreational fisheries, which is the main policy for the transformation of fishery management methods.

This study selected four major fishing ports in Penghu County (Jibei Fishing Port, Chikan Fishing Port, Magong Fishing Port, and Tanmen Fishing Port, as shown in Figure 1), as the object of the empirical case study. Based on the research results in Table 5 and the evaluation criteria of each key factor, after examining the existing conditions of the four major fishing ports, an evaluation of the transformation of traditional fisheries to recreational fisheries in the four major fishing ports was carried out. The evaluation value of each key factor ranged from 1 to 9. When the existing conditions of the evaluated object are more in line with its key factors, the evaluation value will be larger, and vice versa. After evaluating the four main fishing ports, the evaluation values of each key factor were as listed in Table 6.

It can be seen from Table 6 that the Magong Fishing Port has a higher overall weight value (6.509). Since Magong Fishing Port has strong tourism potential, it is a major fishing port to introduce recreational fishing to develop recreational fishery boat route planning. Magong Fishing Port can conduct island visits on the blue road at sea and create multiple industries and activities, such as box net visits, fishing village life experiences, fishing port construction tours, oyster festivals, and fishing for anglers. The overall weight value (4.615) of Chikan Fishing Port is the second highest. Table 6 shows that the operating environment of Chikan Fishing Port is high, the berthing conditions and ship conditions are acceptable, and the sightseeing potential is low. Therefore, if Chikan Fishing Port can take advantage of its natural environment planning and other conditions and increase its entertainment or package activities through tourism resources, it will also have the opportunity to transform and develop recreational fisheries.

The global fishery resources are depleted, and fishermen's catches are decreasing daily [1,47]. There are cases in many countries of the transformation of traditional fishing ports—for example, the Haedomari Fishing Port in Nagasaki Prefecture in Japan; the Tobishima Fishing Port in Yamagata Prefecture in Japan; the Tarumi Fishing Port in Kobe City in Japan, which combines yachts and exotic styles; and the Himi Fishing Port in Toyama Prefecture in Japan, which is famous for its fixed-net fisheries and fresh fish festivals [48]. The San Francisco Fisherman's Wharf and the historic Baltimore Inner Harbor in the United States are both successful cases of transformation [49]. Using fishery transformation, fishermen can increase their incomes, maintain their livelihoods and achieve sustainable fisheries [5]. In order to enable fishermen to develop various recreational fishing activities, it is also necessary to replace older fishing boats through government subsidies to introduce new styles to the fishing port. Therefore, through the research results of Table 5 and the practical application presented in Table 6 in this study, suggestions such as the possibility (feasible) of transforming traditional fishing ports into recreational fishing to develop recreational fishery boats can be effectively put forward.

Table 6. The weight analysis results of the application of AHP for each factor in the fishing port of Penghu County.

Level	Factor	Overall Weight	Jibei Fishing Port	Chikan Fishing Port	Magong Fishing Port	Tanmen Fishing Port
Ship Conditions (0.238)	On the Main Route (A1)	0.039	3	5	9	7
	Ship Facilities (A2)	0.063	1	5	7	3
	Ship Size (A3)	0.066	3	7	9	1
	Ship Style (A4)	0.033	3	5	7	1
	Sailing Time (A5)	0.036	5	3	5	1
Berthing Conditions (0.186)	Port Conditions (B1)	0.070	1	5	7	3
	Distance between Ports (B2)	0.024	5	3	7	5
	Berthing Conditions (B3)	0.029	3	7	9	1
	Logistical Support (B4)	0.032	3	7	7	1
	Charging Strategy (B5)	0.030	5	5	3	5
Operating Environment (0.320)	Natural Environment (C1)	0.098	7	5	3	1
	Cultural Environment (C2)	0.083	1	5	3	5
	Policy Environment (C3)	0.038	5	5	5	5
	Social Environment (C4)	0.065	3	5	9	3
	Marketing Environment (C5)	0.037	5	7	9	3
Tourism Potential (0.256)	Attractiveness (D1)	0.078	7	1	5	3
	Accessibility (D2)	0.056	5	3	9	1
	Subsidized Services (D3)	0.040	5	5	9	3
	Package Itinerary (D4)	0.042	5	3	7	1
	Activity (D5)	0.040	7	3	7	1
Sum of overall weight value (W)			4.035	4.615	6.509	2.639
Ranking			3	2	1	4

Note: Sum of overall weight value (W) = $0.039 \times (A1) + 0.063 \times (A2) + 0.066 \times (A3) + 0.033 \times (A4) + 0.036 \times (A5) + 0.070 \times (B1) + 0.024 \times (B2) + 0.029 \times (B3) + 0.032 \times (B4) + 0.030 \times (B5) + 0.098 \times (C1) + 0.083 \times (C2) + 0.038 \times (C3) + 0.065 \times (C4) + 0.037 \times (C5) + 0.078 \times (D1) + 0.056 \times (D2) + 0.040 \times (D3) + 0.042 \times (D4) + 0.040 \times (D5)$.

5. Conclusions

Although ship conditions are important factors that affect the market value of products, their influence is weaker than that of berthing conditions, operating environment, and tourism potential. However, it is worth noting that, under the conditions of the ship, the entertainment facilities provided and the size of the ship are the primary considerations. In addition, in the operational concept of shipping management on the main route, it is necessary to adopt the shortest and most economical route between the two ends as the main route. This study suggests that the sailing range of outlying islands' recreational fishery boats lies between adjacent islands in the same country. Therefore, whether the planned sailing route lies along the main route and how much time is required to sail are not the primary considerations in sailing route planning.

Outlying islands' attraction lies in their unique coastal scenery, geological environment, wildlife, and other landscapes. Attraction is a quality that tourists value in a tourist destination. This quality comes from specific characteristics or attributes within the tourist destination, which arouse tourists' interest and encourage them to visit. An attractive natural and cultural environment is more important than good port conditions. The results of this research show that the weight of attraction in tourism potential ranks second only to the natural and cultural environments in terms of total weight. Thus, some resources are not attractive, and their original natural and cultural resources must be effectively planned and their most important attributes identified so as to appeal to travelers and industry players alike.

The results of this study indicate that the operating environment and tourism potential are important for the planning of the sailing route of the outlying islands' recreational fishery boats. In the process of interviewing experts, some interviewers stated that the most important factor for sightseeing ships on outlying islands is to allow ships to berth. However, this study suggests that if only the construction of hardware facilities is needed, the benefits of recreational fishery boats that wish to develop recreational fishing cannot be achieved, because a unique environment combining nature and culture is needed to increase the attractiveness of the base and cooperate with a shore excursion, so that guests can easily access it, regardless of whether it is accommodation or entertainment. This argument can also be supported by the empirical case analysis results (that is, the Magong Fishing Port has great potential for tourism and is very suitable for a transition to recreational fishing so as to develop a major fishing port for recreational fishery boat route planning).

However, if the port and ship conditions are good, this is also advantageous for the development of outlying islands' tourism. In addition, perfect port facilities, berthing facilities, coastlines, berths and water depths, as well as ship size, recreational facilities, tonnage and passenger carrying capacity, are all aspects that need to be paid attention in developing outlying islands for recreational fishery boat tourism. Therefore, if traditional fishing boats are to be transformed into recreational fishery boats, it is necessary to consider the number of tourists that can be carried and whether the entertainment equipment provided is comprehensive. However, the distance between ports, berth conditions and even charging strategies are different from those considered in general cargo route planning, because these are relatively less important when it comes to tourist attractions and recreational activities such as entertainment.

Although this study has made relevant research results through the collection of a lot of literature, expert opinion surveys, and in-depth interviews, the conclusions mentioned above are all completed in a limited number of samples. Therefore, the conclusion proposed in this study is not an entirely closed argument conclusion but an indicative opinion conclusion.

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