



# A transition beyond traditional fisheries: Taiwan's experience with developing fishing tourism

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## ABSTRACT

Transforming fisheries into tourism has become a global trend. It arises mostly due to a decline in income generated by traditional fisheries, and fishers thus turn to seek alternatives by engaging in marine tourism activities. Taiwan has practiced this transformation policy for more than two decades, and fishing tourism has developed as a major outcome. This paper aims to investigate Taiwan's experience with developing this activity, with an emphasis on the emerging concerns it faces and anglers' perception of trip quality and potential management measures. The results show that anglers had a general satisfaction with the service delivered by operators. However, concerns regarding sustainable development of this activity were identified, mostly involving ineffective enforcement of regulations against illegal fishing, conflicts of interest between commercial fishing and recreational fishing, lack of statistics on harvest, improper angler behavior, and competition from yachts. Lastly, management implications for sustainable fishing tourism were discussed, highlighting suggestions to alleviate the concerns, including strengthening management of the harvest, encouraging dialogue between commercial and recreational sectors, enhancing marine environmental stewardship among anglers, and improving coordination of management to create a fair and balanced environment for recreational fishing vessels and yachts.

## 1. Introduction

It has been a trend worldwide that traditional fisheries have needed to diversify into developing tourism in response to its decreasing ability to generate income as a result of declining fisheries resources and the rise in operating costs (fuel, personnel, etc.). In Ecuador, fishers are seeking alternatives in the more profitable tourism industry by taking tourists out on their boats to experience an authentic day at sea [1]. In Scotland, fishing vessels take tourists out to sea to watch whales in order to bring in income from outside the community when fishing is proving to be unprofitable [2]. In Mexico, fishers are becoming local service providers and are engaged in whale shark ecotourism in Bahia de los Angeles [3]. At Jeju Island, South Korea, fishers open their fishing grounds to tourists, take them fishing and diving, and convert their homes into home stays because of decreased income arising from declining fishing resources and consequent out-migrating of residents [4,5]. In Italy, along a coastal area of the Strait of Sicily, fishing tourism transformed from ancient bottom longline fishing, which potentially produce several positive impacts, including alternative sources of income for artisanal fishers, enhancement of underexploited species

in the perspective of environmental sustainability, and the recovery of a disappearing mode of fishing [6]. In Taiwan, traditional fisheries have transformed, as well, by allowing fishing vessels to take tourists out to sea to have fun. These cases vividly demonstrate that traditional fisheries have embraced tourism as a way of generating alternative income, which has become a part of the socioeconomic fabric of fishing villages. This phenomenon is going in the right direction as outdoor activity, including nature-based tourism, is growing in popularity worldwide [7].

Taiwan's traditional fisheries are conducted for commercial purposes. Since 1980s, fisheries have suffered from overcapacity and overfishing in its nearshore waters, leading to decreased incomes from local fishing activity, a shrinkage of the fishery industry, and consequent out-migrating of young adults from fishing villages [8]. The policy of transforming fisheries into tourism was therefore initiated by the authority with three mandates: (1) alleviating socioeconomic problems as a result of overcapacity and overfishing of the coastal resources by providing alternative income for fishers, (2) reducing fishing pressure by diverting part of fishing vessels away from engaging in commercial fishing, (3) creating recreational opportunities in

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response to the booming tourism market [9].

While the policy of transforming fisheries into tourism has been in place, it is noted that when alternative job opportunities are not related to fishing, they can easily alienate fishers from their roots and culture [10]. It is also noted that fishers engaging in alternative jobs is not a new idea, but many of these job offerings have failed worldwide, because fishers generally wish to remain as fishers [1]. In line with this, this policy has proceeded in a way that has fishers who engage in recreational activities remain as fishers and their vessels retain the status of fishing vessels, even though the vessels seldom go out for fishing. To put this policy into practice, the most important and fundamental initiative was to revise the Fishery Act in 1992, which provides a legal basis for fishing vessels to engage in marine recreational activities.

After more than two decades since the fisheries transformation policy was established, fisheries have successfully embraced tourism as demonstrated by the fact that as of January 2016, there were 311 fishing vessels engaged in recreational activities, offering major recreational opportunities in Taiwan's marine tourism market, including fishing, boating, whale watching, diving and lagoon cruising. The largest portion of these vessels offered fishing activities [11].

Fishing tourism refers to the recreational activity that fishers take tourists<sup>1</sup> on board fishing vessels out to sea to go fishing. By this definition, it is also called recreational fishing in this paper due to its non-commercial fishing and fun-seeking nature, as indicated in the definitions used to characterize recreational fishing [12]. Recreational fishing similarly involves taking of fisheries resources as commercial fishing; however, it has a much lower inherent ecological impact than the latter do [13]. Given its significant and growing importance in Taiwan's marine recreation industry and its relevance to fisheries management, there has, however, been relatively limited research pertaining to this activity.

This paper aims to examine Taiwan's experience with developing fishing tourism, with an emphasis on the emerging concerns it faces and anglers' views towards trip quality and potential management measures. It is noted that identifying anglers' perceptions of regulations can assist in determining fishers' behavior and improving the management of coastal fisheries [14]. It is also noted that trip quality has been shown to be good indicators of future behavioral intentions<sup>2</sup> [15,16]; consequently, it is important in sustaining fishing tourism.

The paper first presents an overview of Taiwan's fishing tourism and then a description of the qualitative interview and the questionnaire survey methods. The results of anglers' perceptions and areas of concerns are presented, followed by a discussion of the management implications for sustainable fishing tourism. Finally, concluding remarks are offered. It is envisioned that the insights offered in this paper will inform theory and practice for those fisheries in other parts of the world, which similarly face socioeconomic problems arising from traditional fisheries and have to seek a way to alleviate these problems by transforming fisheries into tourism.

## 2. Overview of Taiwan's fishing tourism<sup>3</sup>

A total of 154 fishing vessels were engaged in fishing tourism. These vessels, stationing at 48 fishing harbors,<sup>4</sup> are scattered around Taiwan and its outlying islets, with a high concentration on the northern coast (Fig. 1) [11]. The reasons for this geographical concentration are twofold. One is that the north coast features a natural rocky seascape and

<sup>1</sup> In this paper, tourists participating in this activity were also called anglers since only angling gear can be used as required by regulation. The use of certain types of gear will be mentioned in the later section.

<sup>2</sup> Future behavioral intentions include such as the likeliness to revisit the same destination, the willingness to recommend the destination to others.

<sup>3</sup> Much information of this section is excerpted from [17].

<sup>4</sup> There are a total of 224 fishing harbors in Taiwan.

abundant fisheries resources due to the Kuroshio and its branch current meeting here.<sup>5</sup> The other is the proximity to the Taipei metropolitan area, where the population is huge. By contrast, the central coast features tidal flats and is highly influenced by tide-generated processes, where fishing harbors suffer from big tidal differences [18]. Therefore, fishing vessels have to wait for suitable tidal conditions to enter or exit the harbors, which is unfavorable for the development of recreational fishing. In the south, east coast and outlying islets (e.g., Penhu archipelagos, Green Island), favorable fishing grounds exist, and the prospect for developing recreational fishing is good.

Operators generally have fisheries background. This facilitates them venturing into tourism business, since they know more about maritime conditions (e.g., wave, tides and currents), seasonal catch and the areas where fish potentially aggregate, compared to those who have no fishery background. With this background, they are able to find specific fishing grounds, catering to their customers. Most of fishing grounds are the places surrounding rocks, reefs (natural or artificial), ship wreckages, or are within several miles of the coast. Fish species are diverse, depending on seasons and fishing areas. Beltfish, grouper, seabream, snapper, mackerel, greater amberjack, tuna, red big eye, porgy, bass, squid, and dolphin fish are commonly caught fishes.

Anglers are roughly divided into two types: professional and experiential. The former are characterized by having higher levels of angling skills, having their own fishing gear, and regularly participating in recreational fishing. In other words, they have high involvement in fishing (i.e., specialization) [19]. Professional anglers can be further divided into two subgroups based on motivations: leisure and profit. The former enjoy fun brought by the activity itself and keep fish for home consumption or give it away to relatives or friends. On the other hand, the latter care profit more than fun and thus catch as much fish as they can. The fish is mainly for sale and profit. It is worth noting that in Taiwan, there are no such anglers that fish purely for 'recreation' and release fish, presenting a marked contrast to a high proportion of anglers who fish solely for recreational purposes instead of for food or income in the Northeastern US [20].

By contrast, experiential anglers usually do not have angling skills nor have their own fishing gear. They do not participate in this activity on a regular basis either. Anglers of this type are mostly driven by curiosity about angling at sea. Some of them may gradually develop an interest, if they participate in recreational fishing more times, and thus would eventually become professional ones.

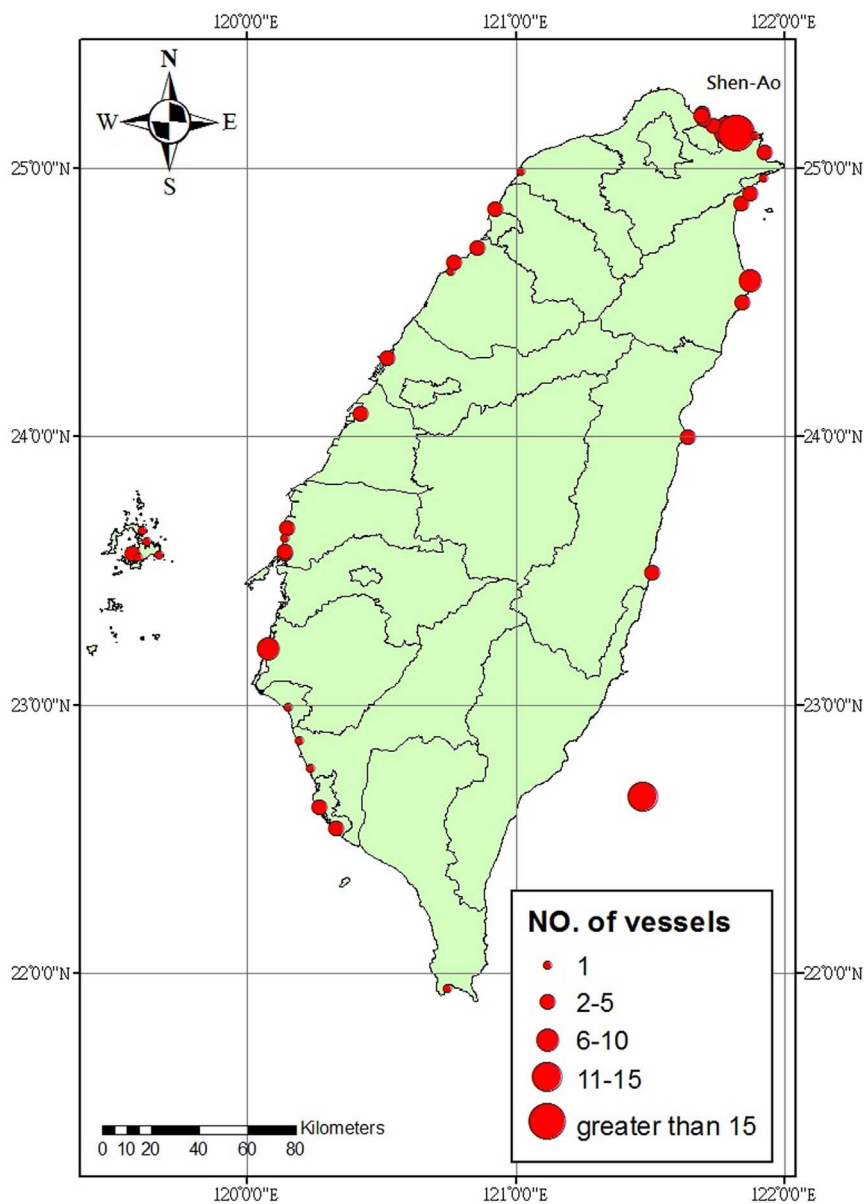
Electronic communication tools (i.e., Facebook, webpages) are often used to advertise recreational fishing trips by operators. The information mostly cover the time and date of the trip, fishing grounds, target species, fares etc. The trips for experiential anglers are comparatively shorter in time (2–6 h), have lower fares (NTD 800–1000<sup>6</sup>), and have regular sea routes. By contrast, the trips for professional anglers are longer in time (12–48 h), have higher fares (NTD 2000–5000), and have various sea routes, depending on seasonal catch. In addition, operators can diversify their business by also offering chartered service where anglers pay a lump sum fee for the service as a group.

## 3. Management of fishing tourism

A regulation dedicated to manage recreational fishing vessels was stipulated in 1993. It has later gone through several revisions over time. This regulation requires a permit for any fishing vessel engaging in recreational activities. The granting of permits comes with restrictions or conditions. First of all, a number of requirements were made for the sake of passenger safety. Specifically, vessels need to be

<sup>5</sup> The Kuroshio is a north-flowing current on the west side of the North Pacific Ocean. It flows up from the east coast of Taiwan and its branch current instead flows up from the west coast.

<sup>6</sup> NTD: New Taiwan Dollar. USD 1=NTD 31.



**Fig. 1.** Distribution of recreational fishing vessels around Taiwan. (Each red spot represents the location of fishing harbor and its size indicates the relative number of vessels). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

equipped with designated communication devices (e.g., VMS, DSB, EPIRB) and covered with liability insurance and personal accident insurance, each with a minimum coverage at NTD two million. The minimum crew number, the maximum passenger number and the maximum trip duration (up to 48 h) are set. In addition, it is also required that fishing grounds should be within a certain distance (mostly up to 30 miles) from the coastline, and vessels should carry back the same group of passengers to the same fishing harbor when the fishing trip is over. While these two measures are to ensure passengers' safety, it consequently restricts their freedom in moving around different harbors and fishing further afield.

Second, in order to reduce the impact on traditional fisheries, there is a maximum number of permits at each fishing harbor. Along with this, fishers who have vessels registered at the designated fishing harbors have the priority to apply for permits. Third, only angling gear is allowed, which is restricted to three types: rod and reel, pole and line, and trolling. These fishing methods are deemed environmentally-friendly, compared to other fishing methods commonly used in commercial fisheries, such as gillnet and trawling.

Despite the above restrictions, there are no rules on harvesting, such as the minimum size of fish, or keep limits per trip. In addition, it was found that while a measure requires operators to submit catch records monthly, they either ignore it or know nothing about it. In other words, this measure has not been put into practice, leading to a serious lack of monitoring and compiling of harvest statistics. The measures mentioned above are summarized in [Table 1](#).

#### 4. Methods

Data collection was based on a qualitative approach using in-depth interviews with operators and a quantitative approach using questionnaires. The qualitative approach was mainly used to assist identify areas of concerns. The quantitative approach was employed to explore anglers' views toward service and potential management options.

##### 4.1. Qualitative approach

A semi-structured interview method was adopted, in which a set of

**Table 1**  
Management of fishing tourism.  
Source: Fisheries Agency.

Management measures	Details
Permit requirements	Permits are required for fishing vessels to engage in recreational fishing.
Number of permits	The number of permits is fixed at each fishing harbor.
Priority for permits	Fishers having vessels registered at the fishing harbor have the priority to apply for permits.
Insurance coverage	Liability insurance and personal accident insurance are required, each with a minimum coverage at NTD two million.
Communication devices	Vessels need to be equipped with designated communication devices, such as VMS, DSB, and EPIRB.
Trip duration	Trip duration is no more than 48 h.
Fishing gear	Only rod and reel, pole and line, and trolling are allowed.
Distance between fishing areas and coasts	The distance of no more than 30 miles from the coastlines around Taiwan and Penhu islands is required.
Number of crew members and passengers	The number depends on vessel tonnage and space and other concerns.

questions centering on the operational, ecological and managerial aspects of the activity were presented to interviewees. The operational aspect focuses on how operators run the business. The ecological aspect deals with their environmental behaviors during the fishing trip, including the ways to deal with garbage on board, and instruction of marine conservation. The managerial aspect focuses on the problems faced and the management issues that need to be addressed. A total of 38 operators participated in the interviews. These participants were geographically distributed in the north, south, east, west and outlying islets of Taiwan. The interviews were conducted in a conversational manner to maintain openness and flexibility, allowing interviewees to express their opinion freely [21]. Each interview typically lasted about 2 h. In addition, field observations (i.e., onboard and fishing harbor observations) were carried out to supplement the interview method.

Data from interviews were coded with thematic analysis [22]. Codes and major themes were developed to reflect insights of interviewees and were updated throughout the data analysis process as codes were added, edited, or reorganized. All analysis was undertaken using NVivo 10 [23].

#### 4.2. Quantitative approach

The questionnaire includes three parts. The first part deals with anglers' demographic information. The second part focuses on their perceived trip quality. Eight items were developed to examine the performance of service delivered during fishing trip. The gap between perceived importance and satisfaction of each item is indicative of its performance. In other words, when greater scores are given to importance, and lower scores are given to satisfaction of an item in question, its performance is deemed to be worse, and it should be given priority for improvement.

The third part examines anglers' attitudes towards potential management options, which are not yet imposed, but are quite relevant to sustainable utilization of fisheries resources. Four options were designed, including: limit on fish species which are experiencing serious declines or challenges in rebuilding, keep limits per trip, minimum size of fish, and catch reporting. They were presented in the following format: 'according to your angling experience, how much you agree with the proposed management options?'. The items in the second and the third parts were gauged with a five-point Likert-type scale.

The questionnaire was revised and finalized based on feedback from six anglers who have participated in recreational fishing regularly. They were chosen to evaluate the appropriateness of questions and the length of the questionnaire, the clarity of language, the smoothness of flow of the questions, and the time taken to answer the questions.

The survey was conducted at Shen-Ao fishing harbor, which is located in the northern Taiwan (Fig. 1). The rationale for selecting this harbor is that it hosts the greatest number of recreational fishing vessels. Professional anglers at this harbor are the target sample for this survey, since they had participated multiple times in recreational

fishing and were assumed to have a deeper perception and understanding of recreational fishing, as opposed to experiential anglers.

It is noted that the time that vessels returned to harbors way highly varied, sometimes in the very early morning or late night, making it hard for researchers to conduct face-to-face questionnaire surveys. Therefore, by using the convenience sampling method [24], researchers turned to operators for help in distributing questionnaires to anglers who were willing to perform self-administered surveys when they returned to the harbor. A total of 294 participants completed the questionnaire survey.

## 5. Results

### 5.1. Anglers' perceptions

#### 5.1.1. Respondents' profiles

The summary of their profiles was compiled in Table 2. Male respondents (79%) overwhelmingly outnumbered female. Anglers aged 31–40 (23%) and 41–50 (20%) constituted the major part, closely followed by those aged 51–60 (19%), 25–30 (18%) and 19–24 (17%). Summer was unsurprisingly the most popular season for recreational fishing, with 92% of anglers participating in this season. This is due to the agreeable maritime conditions (less wind and warmer weather). Most anglers went fishing 2–3 times (50%) or one time (41%) per month. The major motivation for recreational fishing was leisure/pleasure (55%), followed by making friends (25%), and making profit (20%). Over 70% reported to have fish for home consumption or be given away to relatives or friends, while approximately 20% for sale. The information sources for the activity are internet (57%), anglers (43%) and angling shops (26%).

#### 5.1.2. Anglers' views towards service delivery

Anglers had a general satisfaction with the service items except for two, which are 'convenient and safe access to get on board from docks' and 'trip duration'. Both items had a mean of importance greater than that of satisfaction (Table 3). A *t*-test showed that the difference of the two means of each item was statistically significant ( $p < 0.05$ ), indicating the two items are the priorities for improvement from anglers' viewpoint. It is noted that the latter is the rule that operators cannot change at their discretion in order to fulfill customers' needs. The remaining six items had a mean of satisfaction greater than that of importance, suggesting anglers had a general satisfaction with these items.

#### 5.1.3. Anglers' attitudes toward potential management options

Anglers generally had a neutral attitude toward the four management options (Table 4). However, it is noted that the standard deviation of all items tend to be large, greater than one. This indicates that greater difference among anglers exists regarding their attitudes toward management options.

**Table 2**  
Respondents' profiles (n=294).

Items	Number	%
Gender		
Male	232	79
Female	62	21
Age		
12–18	1	0
19–24	49	17
25–30	53	18
31–40	66	23
41–50	60	20
51–60	57	19
> 60	8	3
Seasons of fishing (multiple choices)		
Spring	40	14
Summer	271	92
Fall	84	29
Winter	58	20
Frequency (per month)		
1	119	40
2–3	147	50
4–5	23	8
> 5	5	2
Major motivation		
Leisure/pleasure	161	55
Making friends	73	25
Making profit	60	20
Information sources for recreational fishing		
(multiple choices)		
Internet	169	57
Anglers	126	43
Angling shops	77	26
Others	11	4
Disposition of catch (multiple choices)		
Home consumption	223	76
Being given to relatives or friends	210	71
Sale	61	21

## 5.2. Areas of concerns pertaining to fishing tourism

Given fishing tourism has become one of major marine recreational activities in Taiwan, it is worth going into details to understand the concerns that have emerged, with the goal of pursuing a sustainable management. The perspectives of interviewees in relation to the concerns pertaining to fishing tourism were explored. Most of the participants demonstrated a substantial understanding of the general fishing tourism problems. They were presented as follows:

### 5.2.1. Ineffective enforcement against illegal fishing

Illegal fishing, particularly trawling within three nautical miles and electrifying fishing, are not only destructive to the marine environment but also detrimental to the sustainable development of recreational fishing. Such illegal fishing events have been occasionally spotted by operators during fishing trips, but laws seem not to be effectively enforced.

### 5.2.2. Conflict between recreational fishing and commercial fishing

The main areas of conflict include: competition for resources, competition for space and gear interactions, and incongruent claims over the conservation needs of fish stocks<sup>7</sup> [12]. For example, in March

<sup>7</sup> The incongruent claims were manifest when recreational fishing prefers large fish, whereas commercial fishing requires high rates of marketable fish. Both sectors tend to

**Table 3**  
Anglers' perceived levels of importance and satisfaction about service (n=294).

Items	Importance Mean (A) (SD)	Satisfaction Mean (B) (SD)	Difference (B-A)
Staff attitude	3.76 (0.79)	3.98 (0.83)	0.22*
Assistance in angling skill instruction	3.59 (0.97)	3.85 (0.83)	0.26*
Instruction on environmental protection	3.72 (0.85)	3.85 (0.84)	0.13
Instruction on safety	3.82 (0.81)	3.88 (0.84)	0.06
Physical comfort on board	3.78 (0.90)	4.10 (0.74)	0.32*
Convenient and safe access to get on board from docks	3.99 (0.78)	3.65 (0.81)	-0.34*
Trip duration	4.12 (0.77)	3.74 (0.94)	-0.28*
Trip cost	4.21 (0.75)	4.01 (0.88)	-0.14

Note: The scale to gauge the importance and satisfaction of items is a five-point Likert-type scale.

\*  $p < 0.05$ .

**Table 4**  
Anglers' attitudes towards proposed management options (n=294).

Management options	Mean	SD
Limit on fish species	3.18	1.28
Keep limits per trip	2.97	1.32
Minimum size of fish	3.30	1.27
Catch reporting	3.46	1.28

Note: The scale to gauge the agreement of management options is a five-point Likert-type scale.

2009, a conflict occurred in the northeast coastal waters where trawling vessels came to interfere with the angling activity. This action was regarded as provocative, angering operators to call other recreational vessels to join them at sea to circle trawlers. This conflict was not resolved until coast guard personnel headed to the scene [25]. This conflict is a vivid illustration of physical competition for fish and space, and gear interference.

The conflict would intensify if resource allocation were made. Specifically, both the commercial sector and recreational sector, commonly known as resource users, would argue its own claim for priority access to resources and managers would face a dilemma that no principles have been established for allocation [26]. In Taiwan, this type of conflict has not yet taken shape since resource allocation has not been in place, except at a very limited number of fisheries that the recreational sector is evidently not involved (e.g., Total Allowable Catch on larval fish and flying fish roe). Nevertheless, some recreational fishing vessels have been criticized for catching too much fish and for sale and profit, impacting the resources available to their commercial counterparts. Fig. 2 shows a big number of fish on the deck of a recreational fishing vessel.

(footnote continued)

have differing requirements either in terms of fish availability or size structure [18].





Fig. 2. A big number of fish on the deck of a recreational fishing vessel.

### 5.2.3. Inadequate facilities at fishing harbors

At some fishing harbors, there is not an area specifically designated for recreational fishing vessels to anchor nor floating piers stationed to line docks and vessels. This poses inconvenience and danger to tourists when they get on/off vessels. The previous result also showed that anglers perceived the item, 'safe access to get on board from docks', a priority for action, due to its perceived importance level being significantly less than the perceived satisfaction level.

### 5.2.4. Absence of integrated information of recreational fishing

While operators have their own channels (i.e., Facebook or websites) to promote their own business, there is not yet an integrated network established to cater to the public. The absence of this kind of network may make it hard for operators to attract potential customers as well as for the public to get the information on various recreational fishing trips, safety, rules, marine environmental protection, etc.

### 5.2.5. Improper angler behavior

It is noted that except for the restriction on the use of certain types of fishing gear, there are no rules or codes of conduct governing angler behavior. In this sense, recreational fishing is no more than an unmanaged activity. Field observations spotted improper angler behavior, including taking fish of small size, catching as much fish as possible, and intentionally or unintentionally throwing garbage overboard. This reflects a lack of personal conservation ethics among anglers, leading to potential damage to the long-term viability of the ecosystems.

### 5.2.6. Lack of statistics on recreational fishing harvest

As noted previously, there is a serious lack of statistics on harvest from fishing tourism. This missing information has retarded the ability to understand the magnitude of the recreational fishing sector and its contribution to fish mortality relative to commercial fisheries, and to take precautionary measures to avoid unsustainable fishing. Furthermore, lack of statistics makes it impossible to evaluate whether, or to what extent, the objective of the fisheries transformation policy (i.e., reducing fishing pressure by diverting part of fishing vessels away from commercial fisheries) has been realized.

### 5.2.7. Intense competition from yachts

As noted previously, recreational fishing vessels face intense competition from yachts due to the different levels of stringency or leniency in rules. In fact, in Taiwan, recreational fishing vessels and yachts are two major channels for the public to participate in marine recreational activities. Both share the same tourism market by offering similar recreational opportunities such as fishing and boating. However, they are under two different management sectors: fisheries and transportation. Specifically, as opposed to recreational fishing vessels, yachts are manifestly subject to less stringent rules, including less bureaucratic procedures in taking people out to sea, no limit in the trip duration, no need to bring back the same group of passengers to

the same harbor, and no limit in the distance between the coast and the vessel at sea. This lenient management mode gives yachts a market advantage. A related result from this study showed that anglers had a low satisfaction about the trip duration limited to 48 h, while yachting is free from this restriction.

## 6. Management implications for sustainable fishing tourism

The findings of the present study have important implications for sustainable fishing tourism. First, regulation against illegal fishing should be effectively enforced. It is important in the protection of the marine environment as well as in the reduction of conflicts between commercial fishing and recreational fishing. Enforcement authorities should put more efforts into curbing illegal activities either through effective enforcement, serious punishments, or the combination of both.

Second, Taiwan's fishing tourism currently faces two areas of conflict: competition for resources and competition for space and gear interactions. They arise mainly from the overlapping of fishing grounds. Given fishing grounds are huge, compared to the operation area of vessels, it is therefore likely that both commercial and recreational activities can coexist without interfering with each other if both are separated from each other. To this end, dialogue on the use of ocean space between both sides is encouraged. Additionally, given that the nature of conflicts varies locally because of social, geographical, and historical factors in each fishing ground, finding local solutions to local problems is a laudable approach [27]. Therefore, the dialogue should be based on local context and center on the solutions of potential problems arising from the use of ocean space. Recreational fishing areas, for example, have been used as solutions to the conflict between commercial and recreational fishing in the state of Queensland, Australia, despite that whether they are warranted from environmental and social perspectives are yet to be decided [28]. In practical terms, the creation of a forum for dialogue between managers, commercial and recreational sectors, and local fishermen associations might help contribute to better solutions to the conflict.

Third, facilities necessary to enhance safety and facilitate people's understanding of fishing tourism are encouraged. Specifically, a safe boarding area is secured at fishing harbor. In addition, as noted in the anglers' survey result, the internet is a major information source for fishing tourism. Establishing a network to integrate information relevant to recreational fishing is of great help in facilitating people's participation and understanding of this activity. This network serves as a major portal and a platform to link customers, operators, and concerned authorities. It particularly covers the information of operators, fishing trips, maritime conditions, policy and management measures, safety tips, and knowledge of fish species and marine environmental protection.

Fourth, monitoring programs are key processes for science and research as well as for management [29]. In this regard, monitoring and compiling of harvest from fishing tourism should be conducted in order to understand the magnitude of this fishing. In particular, while commercial fishing has been repeatedly blamed for the declines in fish populations, the recreational fishing sector also has the potential to negatively affect fish and fisheries [13,28]. Therefore, to become legitimate fishery stakeholders alongside government and commercial fishing, recreational fishing must operate in accordance with rules such as catch reporting and stock assessment, control of fishing effort or harvest, and allocation of the harvest amongst stakeholders [30]. Given this, there has been an increasing demand for integrated management of commercial and recreational fishing [13,28,31,32].

This study found that about 20% of anglers fished for profit and had their catch for sale. This profit-seeking behavior deviates from the nature of recreational fishing, for which the primary reason for participation is leisure [12]. It also runs counter to the goal of fisheries transformation policy and has potential negative impacts on fisheries

resources. In parallel with the growth in visitor numbers, natural resource managers are increasingly required to demonstrate ecological sustainability [33]. In this regard, given the potential growth in angler numbers and consequently in harvest amount, policy makers need to consider taking active measures in order to pursue long-term fishery conservation and eliminate profit-seeking behavior. First of all, monitoring of catch should be implemented. The restrictions, such as the limit of fish size and the number of take-home fish per trip, are suggested for further consideration. However, it should be noted that this study result showed anglers' divergent views toward management options. It is also noted that opposition to these restrictions from anglers would be faced, as indicted in the case that restrictions to control the recreational harvest, first implemented in Portugal in 2006, were highly criticized by the angler community [34]. Given this, public participation in the making of restrictions should be guaranteed to alleviate concerns or resistance from anglers. It will also enhance rule compliance, since understanding correctly how a decision is made is the key to openness, trust and ultimately acceptance of the management structure [35]. In addition, while making restrictions, maximizing angler satisfaction should be taken into consideration as well [36].

Fifth, environmental education holds that behavior can be changed by making people more knowledge about the environment and its associated issues [37]. Knowledge about environmental issues is thought to be a precondition for meaningful pro-environmental behavior and its transmission a key component for successful implementation of environmental education programs [38]. Through education, people's behavioral adjustment occurs, as they understand more clearly that human societies are dependent on services and functions (i.e., the production of goods, the basic life-support processes and life-fulfilling conditions, such as serenity, beauty, cultural inspiration and recreation) provided by the earth's physical, chemical and biological systems [39]. In this respect, environmental stewardship should be enhanced among anglers to facilitate behavioral adjustment and environmental behavior. Codes of conduct, voluntary self-discipline practices, and education programs are examples of tools which can be used to fulfill this purpose.

In addition, it is worth noting that implementing environmental sustainable practice on board is generally a reflection of the ship operators' environmental commitment [40]. Therefore, environmental education programs for operators are encouraged as well. It is hoped that through their instruction on board, practice of environmental behavior will be fostered among anglers.

Lastly, given recreational fishing vessels and yachts share a similar marine recreational market, it is suggested that fisheries and transportation sectors are encouraged to communicate and coordinate with each other to work out rules with similar levels of 'stringency' or 'leniency' applied to their respective vessels. This can help establish a more fair competitive environment for both types of vessels. It is noted that this study found that anglers had a low satisfaction for the restriction of trip duration, while yachting is free from this restriction.

## 7. Conclusion

Taiwan's fisheries have experienced a diversification into tourism thanks to the fisheries transformation policy initiated in the early 1990s. This policy has long gained governmental support and has made Taiwan's fisheries undergo structural changes; consequently, they have expanded and diversified into marine tourism, leading to the development of fishing tourism and other types of marine recreational activities such as whalewatching.<sup>8</sup>

This paper presented a preliminary investigation into fishing tourism and identified concerns that might prevent its sustainable

development. The results showed that while anglers have had a general satisfaction with the service delivered during fishing trips, concerns regarding sustainable development of this activity were identified and mostly involved ineffective enforcement of regulations against illegal fishing, conflicts of interest between recreational fishing and commercial fishing, lack of statistics on harvest, improper angler behavior, and competition from yachts. The identification of concerns would facilitate the development of strategies to increase the sustainability of this activity. For this, this paper highlighted suggestions to alleviate these concerns, including strengthening management of the harvest, encouraging dialogue between commercial and recreational sectors, enhancing marine environmental stewardship among anglers, and improving coordination of management to create a fair and balanced environment for recreational fishing vessels and yachts.

Following this preliminary study, a number of future studies are proposed, including one that evaluates the magnitude of recreational fishing and compares it with that of commercial fishing, the size of angling population and the size of its two subgroups (experiential and professional anglers), the ecological and socioeconomic impacts of recreational fishing, the nature of conflicting claims for access to resources by the commercial and recreational sector in the Taiwan's socioeconomic context, and stakeholders' perceptions of management options. These studies would facilitate making more informed decisions in the pursuit of a sustainable management of recreational fishing.

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<sup>8</sup> For more information on the development of Taiwan's whalewatching tourism, please refer to [41].

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