SPORT, LEISURE & TOURISM | RESEARCH ARTICLE

Using choice experiments to inform management of black-faced spoonbill reserve in Taiwan

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Abstract: The evaluation of wildlife tourism benefits is one of the key considerations in planning proper management measures and promoting mutually beneficial coexistence of wildlife tourism and wildlife resources. This key consideration is also important for Black-Faced Spoonbills (Platalea minor), which are at risk of extinction. To understand the value of Black-Faced Spoonbill wildlife tourism, this study adopted choice experiments to investigate tourists’ preferences and willingness to pay (WTP) for recreational environmental resources in the Black-Faced Spoonbill Reserve in Taiwan. The total WTP price indicates that the promotion of tourism activities in the Black Faced Spoonbill Reserve and the proper maintenance of tourist and recreation facilities will increase the WTP value for tourists, increases the opportunity costs of using the Reserve’s land for other purposes, and reduces the possibility of developing the Reserve. Keywords: Biodiversity; recreational quality; development; bird-watching.

Subjects: Tourism Planning and Policy; Economics of Tourism; Sustainability

Keywords: Biodiversity; recreation and development; bird-watching; wildlife tourism; conservation

1. Introduction
Wildlife tourism refers to watching animals from afar or interacting with animals from a short distance in natural or man-made environments (Ballantyne, Packer, & Falk, 2011) as well as tourism activities such as photographing wild animals, searching for and following wild animal tracks, and learning about animals and their habitats through interpretive presentations (Russell & Hodson, 2002). This type of tourism satisfies people’s desire to interact with nature, and positive interactions

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PUBLIC INTEREST STATEMENT

This study selected choice experiments to investigate the tourism benefits of the Black-Faced Spoonbill Reserve. The data indicate that an improvement in the conservation effects for Black-Faced Spoonbills would increase local tourism activities. The results also show that the tourism benefits of the Reserve can be increased by increasing the number of species of local resident birds. The average WTP price of tourists is 52.4 NT dollars. If an average of 10,000 people visits the Black-Faced Spoonbill Reserve each month, the monthly tourism benefit is approximately 500,000 NT dollars.
can change tourists’ attitude regarding the protection of natural resources (Jenner & Smith, 1992; Reynolds & Braithwaite, 2001). Wildlife tourism can not only educate tourists using knowledge about conservation and appropriate behaviors (Ballantyne & Packer, 2005) but can also marshal the financial resources to maintain the sustainability of wildlife habitats (Higginbottom, 2004).

In practice, however, wildlife tourism also brings about negative effects (Liu & Leung, 2019; Liu & Lu, 2014). For example, in Komodo National Park in Indonesia, Komodo Dragons have come to rely on human feeding and have therefore changed their original habitat behavior, thus affecting the ecological balance (Walpole, 2001). The basic recreational facilities in Marine Protected Areas (MPAs) in the Mediterranean have affected the spawning grounds of sea turtles. As a result, the turtles have become endangered (Davenport & Davenport, 2006). Rarely seen wild animals or ecological landscapes can attract tourists, but noises from car engines increase and waste and pollution are left afterwards. In addition, tourists may introduce infectious diseases and exotic species that affect the development of individual animals in the short term and entire populations or ecosystems in the long term (Ballantyne, Packer, & Hughes, 2009; Higginbottom, 2004). These negative phenomena demonstrate that wildlife tourism itself is not sufficient to ensure the continuous existence of wildlife resources. Proper operation and management are still necessary to promote a mutually beneficial coexistence.

Studies by Ruschkowski and Mayer (2011) and Floyd, Jang, and Noe (1997) showed that the attitudes and opinions of tourists are important factors affecting the management of wildlife tourism resources. Therefore, the methods of wildlife resource management must consider the influence of the tourism market. Reynolds and Braithwaite (2001) and Hearne and Salinas (2002) further explained that to effectively manage wild animals, it is first necessary to understand the benefits people will obtain from tourism surrounding the animals. Therefore, to effectively manage the utilization of wildlife resources, reserve management staff must evaluate the benefits of wildlife tourism. Willingness to pay (WTP) is an indicator that uses monetary value to measure the benefits from tourism. WTP can be estimated using the contingent value method (CVM), the travel cost method, or the hedonic price method, which have limitations in the application of valuations for complex management scenarios.

In addition to the aforementioned methods, some studies have adopted choice experiments to evaluate the tourism benefits of ecological resources. Naidoo and Adamowicz (2005) and Kolstoe and Cameron (2017) surveyed tourists regarding biodiversity in protected areas and found that when numbers of species are more abundant, the WTP price of tourists is higher. Reserve management staff can design measures based on this result to obtain the maximum benefits (Rathnayake, 2016). Lee, Lee, Kim, and Mjelde (2010) used choice experiments to evaluate the preferences and WTP price of tourists for an interpretive service of a bird-watching tour; the results showed that when managers invest more in interpretative services and other related resources, tourists’ satisfaction levels and the WTP price increase. Kelly, Haider, Williams, and Englund (2007) particularly emphasized that choice experiments are different from traditional survey methods because the research results from choice experiments can be practically applied to management practices (Serenari, Shaw, Myers, & Cobb, 2019). Hearne and Salinas (2002) and Paltriguera, Ferrini, Luisetti, and Turner (2018) also considered that choice experiments can be used to better understand the preferences of tourists and can assist managers in effectively increasing the quality of recreational and environmental resources in protected areas.

In view of the fact that choice experiments produce better results for policy applications than other research methods, the main objective of the study is to use choice experiments to evaluate wildlife tourism in Taiwan to improve its recreational quality. The study used the Black-Faced Spoonbill (Platalea minor) as the target species for wildlife tourism and the Black-Faced Spoonbill Reserve in Taijiang National Park as the research site.

2. Black-faced spoonbill reserve
There are approximately 2,700 Black-Faced Spoonbills in the world (Yu, Chan, Fong, & W.L. Tse, 2014). They are listed as an endangered species by the International Union for Conservation of Nature (IUCN), and their habitat is restricted to eastern Asia (BirdLife International, 2017). Their
summer habitat is mainly in Japan and North and South Korea. Their wintering period runs from October to March, and the major wintering areas are Taiwan, Hong Kong, the southeast coast of China, and Vietnam. Black-Faced Spoonbills show strong loyalty to their habitats, and they return to live in the same areas every year. The Qigu area (a coastal wetland) in Tainan is the Black-Faced Spoonbills’ largest wintering area, and more than half of the worldwide population spends its winter in Taiwan (BirdLife International, 2017).

The Hong Kong Bird Watching Society published the first official Black-Faced Spoonbill statistics in 1989. The report stated that there were only 288 Black-Faced Spoonbills in the world, and 150 of them were in Taiwan. Because of their extremely small population, Black-Faced Spoonbills have attracted much attention from international and Taiwanese media, and many people have come to the Qigu area to see them. The Black-Faced Spoonbill Refuge was established in Qigu to protect the birds. The Refuge was merged into the newly established Taijiang National Park in 2009 and renamed the Black-Faced Spoonbill Reserve. The Reserve contains the Black-Faced Spoonbill Ecology Exhibition Hall, bird-watching pavilions, and photography equipment for real-time Black-Faced Spoonbill images. There are also many sets of high magnification binoculars on site and volunteer interpreters in the station to serve the tourists. These facilities are designed to attract tourists to the Reserve so they can understand the dangers faced by the Black-Faced Spoonbills and the importance of their conservation. The development of Black-Faced Spoonbill wildlife tourism can help convey this information to the public.

Taijiang National Park hosts many Black-Faced Spoonbill-related tourism and recreational activities, such as a lottery for the prediction of the number of Black-Faced Spoonbills, a series of National Park-related activities, and craft DIY activities to increase people’s understanding of Black-Faced Spoonbills. These activities demonstrate that the managers of Taijiang National Park regard Black-Faced Spoonbills as an important tourism resource. However, Black-Faced Spoonbill wildlife tourism also produces significant negative impacts, including decreased water quality in the Zengwun River caused by the flow of tourists’ pollution emissions, Black-Faced Spoonbills that are frightened by the noise from cars, motorcycles, and approaching tourists, and littering (Taiwan Black-Faced Spoonbill Conservation Association, 2012). To promote the sustainable development of Black-Faced Spoonbill wildlife tourism and conservation of resources of the coastal wetland, these problems must be effectively resolved (Liu, 2017).

Two questions must be considered together to improve the recreational environment of the Black-Faced Spoonbill Reserve. The first concerns the amount of recreational facilities. Because the Reserve is an ecologically sensitive area, providing too many facilities will excessively interfere with the environment, but insufficient facilities will not improve the ecological impact of tourism. Therefore, the optimal amount of facilities should be determined. The second question concerns whether the investment funds in the facilities meet the benefits. Because the Reserve’s operation and management resources and its funds are limited, the optimal allocation of funds for each facility must be achieved. Therefore, in addition to understanding the costs of each facility, it is also necessary to understand the benefits each facility provides for tourists. These questions can both be answered through an evaluation of the environmental requirements and the WTP price of tourists for viewing the Black-Faced Spoonbills (Liu, 2017).

3. Methods

3.1. Choice experiments

The selection of the environmental characteristics at tourism sites reflects the preferences of tourists. If a tourism location has many types of environmental characteristics (natural or man-made), the environmental characteristics can be represented by the vector \( X \), and the degree of the tourists’ satisfaction with these environmental characteristics is \( U(X) \) (McFadden, 1981). If these environmental characteristics are changed through management strategy, the changes may produce many different combinations of environmental characteristics; the utility of the number \( i \)
combination \((X_i)\) for tourists is \(U(X_i)\), and so on. Theoretically, each environmental characteristic \((X_i)\) will produce a utility value \(U(X_i)\). In practice, we do not know \(U(\cdot)\), and we can only observe whether \(X_i\) is chosen. Therefore, the observation results should be used to estimate the preferences of tourists. The influence of \(X_i\) on tourist utility can come not only from the \(X_i\) itself but also from other unobservable characteristics; if the observable characteristics are represented by \(V(X_i)\) and the unobservable characteristics are is represented by, then \(U(X_i)\) can be represented by the following equation (Ryan, Gerard, & Amaya-Amaya, 2007; Train, 2009): 

\[
U(X_i) = V(X_i) + \varepsilon_i
\]  
(1)

Let \(C\) represent the combination of environmental characteristics that may be selected by a tourist; if a tourist chooses the group \(i\) of environmental characteristics from the combination, it can be inferred that the utility of this group of characteristics for the tourist is higher than the utility produced by other possible environmental combinations. The relationship can be presented as the following equation: 

\[
(V(X_i) + \varepsilon_i) > (V(X_j) + \varepsilon_j), \quad \forall j \neq i \in C
\]  
(2)

After rearranging the variables, Equation (3) can be obtained: 

\[
(V(X_i) - V(X_j)) > (\varepsilon_i - \varepsilon_j), \quad \forall j \neq i \in C
\]  
(3)

where \(\varepsilon_i - \varepsilon_j\) is a random variable and the possibility that tourists prefer \(X_i\) is 

\[
F(V(X_i) - V(X_j)) = P(\varepsilon_i - \varepsilon_j < V(X_i) - V(X_j))
\]

We assume that \(F(\cdot)\) follows the Weibull distribution (Cerda, Ponce, & Zappi, 2013; Koundouri et al., 2012), and thus the probability of tourists choosing the alternative scheme \(i\) can be represented by Equation (4): 

\[
P_i = \frac{\exp(V_i)}{\sum_{j \in C} \exp(V_j)}
\]  
(4)

The maximum estimated value of the modified equation chosen by all tourists is 

\[
L = \prod_{n=1}^{N} \prod_{i \in C_n} (P_i)^{y_{ni}}
\]  
(5)

where \(y_{ni}\) is the indicator variable. When tourist \(n\) chooses the group \(i\) environmental characteristics, \(y_{ni}\) is 1; otherwise, \(y_{ni}\) is 0. When Equation 5 is solved, the estimated value of each parameter can be obtained.

Before performing the regression analysis, we must understand the function form of \(V(X_i)\). This study hypothesizes that \(V(X_i)\) is a linear function of \(X_i\), as shown in Equation (6): 

\[
V(X_i) = X_i\beta = \beta_1 x_{i1} + \ldots + \beta_k x_{ik}
\]  
(6)

Under the hypothesis of this function, the trade-off relationship between any two environmental characteristics (such as \(x_{i5}\) and \(x_{i6}\)) is shown in Equation (7): 

\[
MRS_{x5x6} = -\left(\frac{\beta_5}{\beta_6}\right)
\]  
(7)

If \(\theta_i\) is the parameter of price, Equation (7) shows the price of the marginal WTP of tourists for other environmental characteristics (such as \(x_{is}\)). In addition, if the change in environmental characteristics is not limited to a single variable but instead there are many characteristics changing together, then \(V_0\) before the change and \(V_1\) after the change can be calculated separately. When these variables are introduced into Equation (8), the welfare impact produced by the environmental changes can be obtained (Liu, 2017).

\[
WTP = -\frac{1}{\theta_1} (V_0 - V_1)
\]  
(8)
3.2. Questionnaire design for choice experiments

When designing the questionnaire for choice experiments, the key items that affect policy and the systematic and random items should be identified first. Next, the demographic variables that may affect the preferences of respondents should be clarified. When developing the key items and their levels, one can refer to the results of other studies and use other qualitative research methods (such as the literature review method, the focus group method, and the participant observation method) to determine the items and levels that are the most suitable for this study (Ryan, Gerard, & Amaya-Amaya, 2008). The present study used the focus group method (field interviews with the administrative staff at the Black-Faced Spoonbill Ecology Exhibition Hall and policemen from the Taijiang National Park police tram), the participant observation method (participation in a tourist trip to the Black-Faced Spoonbill Ecology Exhibition Hall and the 1st, 2nd, and 3rd bird-watching pavilions), and the literature review method (understanding key items, the rationale of compiling item levels, and the methods to present research items and levels chosen by other studies) to prepare the questionnaires. The key items selected by this study include the number of Black-Faced Spoonbills, crowdedness, transportation convenience, admission fee, biodiversity, necessary facilities, non-necessary facilities, and interpretation quality (Table 1).

3.2.1. The number of black-faced spoonbills

Richardson and Loomis (2004) showed that changes in natural resources affect recreational demands. The major recreational resource of the Black-Faced Spoonbill Reserve is the Black-Faced Spoonbill. The number of Black-Faced Spoonbills observed by tourists will affect the degree of satisfaction for this recreational activity and the WTP price. This variable is measured by actual photos, and the number of birds that can be observed in the photos is indicated under each one to help the respondents understand the content of the questionnaire.

3.2.2. Species diversity of birds

Increasing the biodiversity of national parks can significantly increase the recreational value for tourists (Juutinen et al., 2011a). For example, when tourists observe more bird species, their recreational utility value is higher (Lee et al., 2010), and if different species can be observed at the same time, an area’s appeal to tourists is also higher (Naidoo & Adamowicz, 2005). These results show that tourists prefer areas with high biodiversity; therefore, this study includes biodiversity in the choice experiments. The Black-Faced Spoonbill Reserve is in the coastal wetland; in addition to Black-Faced Spoonbills, other birds, both migratory and resident, can be found in this area. Therefore, the species diversity of the birds represents the status of biodiversity in the area. This item is divided into four levels, and photos of other bird species are presented in the questionnaire.

3.2.3. Crowdedness

The major bird-watching sites in the Black-Faced Spoonbill Reserve are the bird-watching pavilions. However, the space in each bird-watching pavilion is limited. If too many tourists appear at the same time, bird-watching activities will be curtailed, and such a situation may affect the degree of the tourists’ recreational utility satisfaction (Manning, Valliere, Wang, Lawson, & Newman, 2002). Therefore, crowdedness is another variable that must be considered when studying the recreational demands of the Black-Faced Spoonbill Reserve. Manning et al. (2002) studied the social capacity of Yosemite National Park in the USA and showed that crowdedness and noise caused by too many tourists reduce recreational quality. In their study, photos were used to allow the respondents to easily understand the differences in quality; six photos were designed to express six different levels of crowdedness. This method allowed the respondents to clearly understand the actual situation represented by the amount of crowdedness, making it easier to evaluate the impact of crowdedness on tourist’s utility satisfaction. Therefore, this study references the method used by Manning et al. (2002) and presents actual photos in the questionnaire to represent crowdedness.

3.2.4. Transportation convenience

The Black-Faced Spoonbill Reserve is in a remote area. Only one route of the Taiwan Tourist Shuttle service serves the bird-watching pavilion area, and there is no other public transportation.
Table 1. Attributes and levels of the choice experiment

| Attributes                              | Levels                        |
|-----------------------------------------|-------------------------------|
| 1. The number of Black-Faced Spoonbill individuals seen | 1. 50 individuals 2. 100 individuals 3. 200 individuals 4. 400 individuals |
| 2. Degree of crowdedness                | 1. 90% 2. 50% 3. 10%         |
| 3. Waiting time                         | 1. 90min 2. 70min 3. 50min 4. 30min |
| 4. Admission Fee                        | 1. 100NTD 2. 75NTD 3. 50NTD 4. 25NTD |
| 5. The number of other bird species seen| 1. 0 2. 3 3. 7 4. 12         |

(Continued)
| Attributes          | Levels | |
|---------------------|--------|---|
| 6. Necessary facilities | 1. Low level | 2. Medium level | 3. High level |
|                     | ![Image] | ![Image] | ![Image] | ![Image] | ![Image] | ![Image] | ![Image] | ![Image] | ![Image] | |
| 7. Non-necessary facilities | 1. Low level | 2. Medium level | 3. High level |
|                     | ![Image] | ![Image] | ![Image] | ![Image] | ![Image] | ![Image] | ![Image] | |
| 8. Interpretation quality | 1. Low quality | 2. Medium quality | 3. High quality |
|                     | ![Image] | ![Image] | ![Image] | ![Image] | ![Image] | ![Image] |
However, schedules are limited and seasonal which makes the transportation service quite inconvenient. Other studies have found that the convenience of transportation significantly influences the recreational benefits to tourists. For example, Kelly et al. (2007) included a “transportation preference” item in their choice experiments on ecological benefits to evaluate the preferences of tourists. This study uses the waiting time interval for shuttle buses to measure the convenience of transportation. The item is divided into four levels.

3.2.5. Admission fee
This item is used to evaluate the WTP price of tourists for the Black-Faced Spoonbill Reserve. The admission fee (in New Taiwan Dollar, NTD) is used as a payment item, and it is divided into four levels.

3.2.6. Necessary facilities
Even in an ecological reserve, recreational facilities must be provided. Such facilities should not only increase recreational quality but could also reduce the impact of tourists on the Reserve. For example, trash cans, restrooms, bird-watching pavilions, and trails can be considered necessary facilities. Trash cans and restrooms are used to keep the area clean. Although bird-watching pavilions and trails are man-made facilities and may cause interference with the environment, bird-watching pavilions can mask some tourist behavior and reduce their interference with the birds’ habitat. Trails can allow tourist activities within a planned scope, preventing the destruction of vegetation and soil erosion. Christie, Hanley, and Hynes (2007) proposed that in recreational areas for viewing wild animals and plants, parking lots, restrooms, interpretive centres, viewing pavilions, trails, and facilities for increasing viewing opportunities (binoculars) should be installed. If such facilities can be properly configured, tourists’ degree of satisfaction can be increased, and managers can make the most efficient use of its funds. These necessary facilities exist at the Black-Faced Spoonbill Reserve. However, if there are too many tourists, they must wait in line to use the facilities, which indicates that the facilities are currently insufficient. Therefore, tourists’ demand for these facilities must be assessed. The classification levels for this item are based on increases or decreases of each facility, including restrooms, binoculars, interpretive signs, chairs, parking lots, and trash cans. The item is divided into three levels, and it is presented in the questionnaire as the number of signs for each facility.

3.2.7. Non-necessary facilities
In addition to necessary facilities, non-necessary facilities such as cafes, gift shops, and detailed information centres can also increase the attraction of areas of the Reserve and the satisfaction of tourists (Christie et al., 2007). Currently, the Black-Faced Spoonbill Reserve has “gift shops” and “multimedia animation interpretation facilities”. In accordance with the research of Christie et al. (2007), “cafes” and “drinking fountains” are also added to the classification. The classification levels for this item are based on the presence or absence of each facility; the item is presented as the signs for each facility in the questionnaire and is divided into three levels.

3.2.8. Interpretation quality
Interpretation quality affects tourist satisfaction (Lee et al., 2010). For wildlife tourism, the interpretation quality is important. Through interpretation, tourists can gain the relevant knowledge about wild animals’ habits and achieve the purposes of their visit. This item is measured in the questionnaire as high, medium, and low quality.

3.3. Orthogonal fractional factorial design
This study includes eight groups of items, and each item has three to four levels. If a full factorial design was used, there would be more than 20,000 possible combinations in the questionnaire, and its implementation would be difficult. In addition, if there were too many possible combinations, it would be difficult for the respondents to make their decisions, and the statistical results from the questionnaire would lose reliability and validity. Therefore, the number of possible combinations had to be reduced. The orthogonal fractional factorial design can determine a representative recombination (Hearne & Salinas, 2002; Juutinen et al., 2011b; Kelly et al., 2007; Lee et al., 2010). Therefore, we use the design to produce 32 groups of items. Furthermore, these
32 items are randomly divided into eight question sets, and each set contains four items. Each questionnaire contains two question sets. An example of a question set is shown Table 2.

3.4. Questionnaire survey method
There are only three major scenic spots with buildings in the Black-Faced Spoonbill Reserve. They are the Black-Faced Spoonbill Ecology Exhibition Hall and the 1st, 2nd, and 3rd Black-Faced Spoonbill bird-watching pavilions. Because the 1st and 2nd pavilions are connected, they are counted as one. There are only static and dynamic interpretation displays installed in the Ecology Exhibition Hall, and direct viewing of the Black-Faced Spoonbills from the hall using binoculars is impossible. The facilities in the 3rd bird-watching pavilion are more primitive and the location is remote and therefore, few tourists visit these facilities. The 1st and 2nd bird-watching pavilions have facilities such as parking lots, restrooms, several high magnification binoculars, real-time broadcast systems, narrators, and merchandise sales. Using the free binoculars provided by managers, tourists can view the Black-Faced Spoonbills and other birds from these facilities. These pavilions are the only places in the Reserve that provide free binoculars to the tourists to watch the wild animals. Therefore, this study chose the 1st and 2nd Black-Faced Spoonbill bird-watching pavilions to distribute the questionnaires.

We used systematic sampling to select interviewees. On the survey date, the tourist who passed the questionnaire distribution point in the order that matched the last digit of the date number would be the first respondent for the day. With this first interviewee as the starting point, every next third tourist was then interviewed. We approached interviewees with a brief explanation of the survey's purpose, which was for better managing the coastal wetland. The questionnaires were distributed in March and April 2013. A total of 440 questionnaires were distributed, 440 copies were recovered, and there were 434 effective questionnaires, for an effective response rate of 98.6%.

4. Results

4.1. Basic characteristics of respondents
The structural characteristics of the respondents are shown in Table 3. For the levels of education, more than half (58%) of the respondents had college or junior college degrees, followed by people at high school and vocational school educational levels, and then people with master's degrees. More than half of the respondents (58.2%) had an annual income below 500,000 NTD. Tourists who were visiting the Reserve for the first time accounted for 47.5% of the respondents, while 52.5% of the respondents had visited more than once.

4.2. Parameter estimation results
The results of the analysis show that the items that can increase the willingness of tourists to visit the Reserve include the number of Black-Faced Spoonbills, biodiversity, necessary facilities, non-necessary facilities, and interpretation quality. These results mean that increases in the quality of these items would be helpful in increasing the number of tourists. The items that could decrease the willingness of tourists to visit the Reserve include crowdedness and the admission fee; that is, an increase in these items would decrease the willingness of tourists to visit. Transportation convenience does not affect the willingness of tourists to visit the Reserve, meaning that convenience of public transportation does not affect the number of tourists (Table 4).

Black-Faced Spoonbills are the most important species for tourists to watch; their number will affect tourists' reviews of the Reserve. The estimated value of this item is 0.003, indicating that when the number of Black-Faced Spoonbills increases by one, the probability that tourists will visit increases by 0.3%. Equation (7) shows that when other conditions remain unchanged and the number of Black-Faced Spoonbills increases by one, tourists are willing to pay 0.3 NTD more for admission (Table 5). The estimated value of species diversity is 0.064, indicating that the species
| Attributes                                      | Alternative 1 | Alternative 2 | Alternative 3 | Alternative 4 | Alternative 5 |
|------------------------------------------------|---------------|---------------|---------------|---------------|---------------|
| The number of Black-Faced Spoonbill individuals seen | 400 individuals | 200 individuals | 200 individuals | 50 individuals | None of these |
| Degree of crowdedness                           | 10%           | 90%           | 10%           | 90%           |                |
| The number of other bird species seen           | 3             | 12            | 3             | 12            |                |
| Necessary facilities                            |               |               |               |               |                |
| Non-necessary facilities                        |               |               |               |               |                |
| Interpretation quality                          | Medium        | High          | Medium        | Medium        |                |
| Waiting time                                    | 50min         | 50min         | 70min         | 30min         |                |
| Admission Fee                                   | 25NTD         | 50NTD         | 100NTD        | 75NTD         |                |
| Please, pick your choice                        | □□□□□         | □□□□□         | □□□□□         | □□□□□         | □□□□□         |
diversity of the birds positively influences the probability of tourists visiting. When the number of species increases by one, the probability of tourists visiting increases by 6.4%, or the admission fee can increase by 6.4 NTD. These results indicate that when tourists come to the Black-Faced Spoonbill Reserve, they not only watch Black-Faced Spoonbills but also other bird species.
The estimated value of crowdedness is \(-0.007\), which is significantly different from zero, indicating that the degree of crowdedness negatively affects the probability of tourists visiting. Specifically, when the degree of crowdedness increases by 1%, the probability of tourists visiting decreases by 0.7%. In relation to the WTP price, when the degree of crowdedness increases by 1%, the admission fee that tourists are willing to pay decreases by 0.7 NTD. The estimated value of transportation convenience is 0.00, indicating that transportation convenience does not affect the probability of tourists visiting and does not affect the admission fee they are willing to pay.

The levels of necessary facilities, non-necessary facilities, and interpretation quality that best meet respondents’ demands are all “medium quality.” For necessary facilities, if the facility quality decreases from high to medium, the WTP price of tourists increases by 30.6 NTD; if the quality of necessary facilities decreases from medium to low, the WTP admission fee of tourists decreases by 9.8 NTD. These results indicate that the number and quality of necessary facilities should be at medium levels. The non-necessary facilities also display the same characteristics. When the quality of the non-necessary facilities decreases from high to medium, the WTP price of tourists increases by 10.6 NTD; when the quality decreases from medium to low, the WTP price of tourists decreases by 28.4 NTD. When the interpretation quality decreases from high to medium, the WTP price of tourists increases by 18.9 NTD; when the quality decreases from medium to low, the WTP price decreases by 26.5 NTD.

Tourists most likely prefer medium quality facilities because the Black-Faced Spoonbill bird-watching pavilions are outdoors, there is no surrounding man-made facility or building, and the landscape appears semi-primitive. It is possible that the tourists think that if there were too many bird-watching pavilions and the pavilions were too elaborate, the surrounding primitive landscape would be affected, and the views and habitats of the wild animals would be compromised. Therefore, facilities that meet tourists’ recreational demands but are not over-enjoyed can best serve tourists’ desires. In addition, people who enjoy engaging in wildlife tourism activities may pay more attention to environmental resources and may not like to see man-made structures; therefore, they may prefer facilities that only meet basic demands. Furthermore, based on the preference of respondents regarding interpretation quality, managers at the Reserve do not need to arrange professional, time-consuming package interpretation trips; flexible arrangements that mainly include bird watching but are supplemented with interpretation will best meet the demands of the tourists.

Based on the above estimation results, the total WTP price of tourists for the Black-Faced Spoonbill Reserve can be calculated. Based on the alternatives that either the Reserve will remain in its current status or that it will be used for industry and disappear, all tourists will lose 52.4 NTD in benefits if the Reserve does not exist. If the tourism and recreation environment is improved and

| Variable | WTP   |
|----------|-------|
| The number of Black-Faced Spoonbill individuals seen | 0.3 |
| Degree of crowdedness | -0.7 |
| The number of other bird species seen | 6.4 |
| Waiting time | 0 |
| Necessary facilities (Low level) | -9.8 |
| Necessary facilities (Medium level) | 30.6 |
| Non-necessary (Low level) | -28.4 |
| Non-necessary (Medium level) | 10.6 |
| Interpretation quality (Low level) | -26.5 |
| Interpretation quality (Medium level) | 18.9 |

Note: *30.68 NTD is equal to 1 USD on 24th, August 2018.
the quality of necessary and non-necessary facilities increases from low to medium, the WTP price of tourists will increase by 38.2 NTD, which means that if the Reserve is changed to industry usage, all tourists will lose 90.6 NTD in benefits. These results indicate that the promotion of tourism activities at the Black-Faced Spoonbill Reserve and the proper maintenance of the tourism and recreational facilities will increase the WTP value of tourists for this Reserve. The increase of WTP price of tourists for the Reserve is similar to the increase in the cost of transferring the Reserve’s land to another use; thus, the possibility of developing the Reserve should decrease.

This study agrees with some conclusions of the relevant literature. That is, our research results support biodiversity conservation. Juutinen et al. (2011a) and Lee et al. (2010) assessed the recreational value that tourists are willing to pay in order to see more birds and find the values are increasing with bird species. The tourists’ willingness to pay for bird biodiversity in that study is positive as those in Juutinen et al. (2011a) and Lee et al. (2010). In addition, the estimated value of bird biodiversity is NTD 6.4. Manning et al. (2002) show that crowdedness reduces recreational quality. Our result indicates that the loss of welfare caused by one percentage of crowdedness is NTD 0.7.

This study also presents results contrary to those in previous studies. Christie et al. (2007) propose that tourists’ degree of satisfaction can be increased with facilities. Lee et al. (2010) present that interpretation service can increase tourist satisfaction. However, in our studies, the results do not support “the more, the better”. The tourists’ WTP for switching from Necessary facilities (High level) to Necessary facilities (Medium level) is NTD 30.6, from Non-necessary facilities (High level) to Non-necessary facilities (Medium level) is NTD 10.6, and from Interpretation quality (High level) to Interpretation quality (Medium level) is NTD 18.9.

5. Discussion and conclusion
This study selected choice experiments to investigate the tourism benefits of the Black-Faced Spoonbill Reserve. In addition to evaluating the relationship between the number of Black-Faced Spoonbills, the richness of the Reserve’s ecology, and the WTP value of tourists, the effects of other management-related measures (such as interpretation, facilities, transportation service, and admission fee) on the willingness of tourists to visit were also investigated. The results of the modeling show that the number of Black-Faced Spoonbills has a significantly positive effect on the willingness of tourists to visit and their perceived benefits. If the population of Black-Faced Spoonbills increases by 10% from the current population, the willingness of tourists to visit the Black-Faced Spoonbill Reserve will increase by 3.6%. The data indicate that an improvement in the conservation effects for Black-Faced Spoonbills would increase local tourism activities.

In addition to confirming that Black-Faced Spoonbills are the most important tourism resource of the Black-Faced Spoonbill Reserve, this study also provides other important findings. For example, the study shows that the estimated parameter value of the species diversity of birds is 20 times higher than that of the Black-Faced Spoonbills. In terms of tourism benefits, increasing the Reserve by one species of bird is equivalent to an increase of 20 Black-Faced Spoonbills. Because Black-Faced Spoonbills are cross-border migratory birds, managers of the Reserve cannot increase the population of Black-Faced Spoonbills; therefore, the tourism benefits of the Reserve can be increased by increasing the number of species of local resident birds. The specific measure must maintain the diversity of the Reserve’s habitat to attract different species of birds.

Other management measures can also significantly affect the tourism benefits of the Black-Faced Spoonbill Reserve. If the degree of crowdedness at the bird-watching pavilions increases by 10%, the possibility that tourists will visit will decrease by 0.7%, and the WTP value for the Black-Faced Spoonbill Reserve will decrease by 7 NTD. The Reserve’s managers can prevent a negative impact from crowdedness by expanding the bird-watching pavilions or controlling the number of tourists. However, a plan to expand the bird-watching pavilions should also consider the effects of construction on different biological habitats; otherwise, the positive benefits of biodiversity will be reduced while reducing the negative impacts of crowdedness, and the gain will be outweighed by
the loss. A plan to perform tourist control should consider the time cost to tourists and evaluate the optimal number of tourists and the waiting time.

For transportation convenience, the estimation results show that tourists do not have preferences on the intervals of shuttle buses. Transportation convenience does not appear to affect the willingness of tourists to visit nor their WTP price. However, this result may be distorted. The location of the Black-Faced Spoonbill Reserve is very remote, and public transportation service is very inconvenient; thus, improvements in the transportation service for tourists should greatly increase the willingness of tourists to visit and their tourism benefits. Nonetheless, the results indicate that transportation convenience does not affect tourism benefits. The difference may result from the fact that transportation in the Black-Faced Spoonbill Reserve is very inconvenient, and most tourists drive their own cars or join tour groups. Tourists do not tend to use the public transportation system in the Reserve; therefore, the estimation result for transportation shows no effect. The managers of the Reserve may wish to conduct a survey of people who want to visit the Reserve but do not; perhaps such a survey would help managers to understand the impact of transportation convenience and correctly evaluate the influence of public transportation services on tourism benefits at the Reserve.

Necessary and non-necessary facilities are also important factors that affect tourism benefits at the Reserve. The results show that tourists demand medium quality facilities at the Reserve. Currently, the number of binoculars is slightly insufficient; therefore, one suggestion is that the number of binoculars should be increased from three to five, and the number of chairs should be increased to accommodate 40 people. The number of restrooms can remain the same. For non-necessary facilities, managers could increase the number of drinking fountains and multimedia animation interpretation facilities in the facilities that are not located at the bird-watching pavilions.

The average WTP price of tourists is 52.4 NTD. If an average of 10,000 people visits the Black-Faced Spoonbill Reserve each month, the monthly tourism benefit is approximately 500,000 NTD. If the non-necessary facilities are improved to a level of medium quality that meets the tourists’ demands, that is, if the multimedia animation interpretation facilities and number of drinking fountains are increased, the tourism benefits could increase by 80%. In addition, the Reserve could be made more suitable for birds to stay, for example, by limiting the number of tourists and increasing the food sources to attract more species of birds and allow tourists to view a richer level of biodiversity. All of these measures would increase the WTP price of tourists for the Black-Faced Spoonbill Reserve.

If the facilities and the biodiversity of the Reserve can be improved, tourists would enjoy more satisfaction and bird-related knowledge. Therefore, the value of the Reserve would increase at the same time as the utility value for tourists. More importantly, the Reserve could achieve its goal of supporting conservation through the development of wildlife tourism, thus creating the possibility of a win-win situation between the survival of wild animals and the welfare of tourists.

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