Measuring Tourists’ Experiential Values for Planning a Sustainable Destination in Natural Areas: A Case of the Rock Islands Southern Lagoon in Palau

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Abstract
Tourism sites under increasing pressures is expected to apply the concept of “Tourism Carrying Capacity (TCC)” for planning and management. In the context of natural protected areas, it is said that considering various managerial dimensions and tourists’ experiential dimensions with resource dimensions to determine the extent of changes that are acceptable is more realistic, as ecosystem changes are dynamic and cannot be easily identified over short periods. This approach is known as the “Limits of Acceptable Change” (LAC)”, but the LAC approach and its methodologies are still evolving. This study therefore aimed to develop a framework for measuring the experiential dimension of the LAC approach, focusing on the Rock Islands Southern Lagoon (RISL) in Palau. We used six indicators defined through the preliminary research, and did experimental surveys with the structured questionnaire, the line census and the noise investigation for collecting both subjective and objective data. Results indicated that tourists’ experiential satisfaction was remarkably high which could outweigh concerns about congestion. On the other hand, the analysis of the relation among indicators illustrated a candidate threshold of the number of visitors at a time, although we cannot be decisive with only one-time research. From the perspective of the evaluation of the methods, we found that subjective data was not effective in some cases as they could be too affected by personal background to reproduce an actual condition at the site. Further research including surveys on the resource dimension are needed for obtaining more reliable results for developing the LAC approach.

Keywords
tourism carrying capacity, limits of acceptable change, protected areas, recreational use, experiential satisfaction, congestion level

1. Introduction
Ecologically speaking, prohibiting human’s intervention and use of the natural environment would be the best option for conservation. However, conservation could not be successful without the substantial funds provided by tourism revenues; thus, conservation and tourism has become increasingly interconnected nowadays. Nevertheless, even as the world’s flora, fauna, and geological and geographical wonders have become valuable tourism resources around the world, uncontrolled tourism often causes losses of the natural environment in local areas and degrades resources. It is often mentioned that tourism sites under increasing pressures should introduce and apply the concept of “Tourism Carrying Capacity (hereinafter TCC)” for planning and management; yet, the term TCC must be handled carefully, as it is used in various contexts under different frameworks and methodologies. It is important to understand the context of tourism sites and resources in terms of TCC, which is representatively used in (a) the macroeconomic context,
to refer to the capacity of tourism sites, or in (b) the context of protected areas, natural parks and their recreational use.

This study focused on the latter context in the case of a World Heritage-listed natural area, the Rock Islands Southern Lagoon (hereinafter the RISL) in the Republic of Palau. In the country, sustainable use of marine resources in relation to tourism is a crucial issue since the World Heritage listing has resulted in an increase of the number of tourists and pressures on the marine ecosystems have concurrently grown larger; on the other hand, tourism revenue is contributing to conservation funds. Thus, it is an urgent task for the country to achieve sustainable tourism without compromising its marine resources and tourism benefits.

When considering the sustainability of natural parks, protected areas and tourism, it is important to maintain ecological resources but equal attention should be paid to experiential (user experience) and managerial (park management) factors, both of which are important in the context of natural parks and recreation\(^1\). With the natural environment constantly changing, its environmental capacity cannot be easily quantified; and furthermore, when social and economic factors of visitor use must be taken into account in this context, it is almost impossible to come up with a single figure that covers ecological factors and socioeconomic factors such as tourism at the same time. Accordingly, it has become a recent common consensus that it is not the best way to set a single figure (e.g. an upper limit in the number of visitors) for TCC management in the natural tourism site, as ecosystem changes are dynamic and cannot be easily identified over short periods of time. Instead, as numerous studies have pointed out, it is more realistic to consider various managerial dimensions and tourists’ experiential dimensions with resource dimensions, as shown in Figure-1, to determine the extent of changes that are acceptable\(^{1(2)34(5)6(7)8(9)}\). This approach is known as the “Limits of Acceptable Change” (hereinafter LAC)\(^9\), which is now an essential tool in recreational uses at natural sites. The experiential dimension and the resource dimension in Figure-1 are known to have a correlation in many cases\(^8\). The LAC approach can be described as a process of monitoring and making decisions with the goal of balancing conservation and use among various stakeholders, based on the results of scientific research and data, and it requires introducing appropriate management measures before visitor satisfaction and changes in natural environment reach their limits\(^{9(10)}\); and therefore, many studies have pointed out to promote the participation of various stakeholders is important\(^{1(8)(9)(10)(11)}\). Ideally, results of the monitoring and information of the standards, as well as applicable managements, must be shared and mutually agreed upon among stakeholders in order to ensure collaboration in pursuit of the same goals as shown in Figure-2. Thus, the LAC approach has been theoretically developed; yet, the practical methodologies for applying it are still evolving.

This study therefore aimed to contribute to further introduction of the LAC approach by developing a framework for measuring the experiential dimension of an actual natural site under tourism pressure, focusing on the RISL in Palau. Additionally, we tried to clarify the current tourists’ characteristics and needs, which would be useful for policy development for sustainable tourism in the RISL, as there is no tangible research and results on these issues in Palau yet.
2. Methods

2.1 Study site and background

The Republic of Palau is located in the Pacific, about 2 to 8 degrees north latitude and 131 to 135 degrees east longitude, about 804 km equidistant from the Philippines to the west. Its unique natural landscape and cultural attractions make it a popular destination for tourists from around the world. As shown in Table-1, Palau is dominated by marine areas, including its exclusive economic zone (EEZ), of which almost 80% is designated as protected areas. Tourism
is a leading industry, and tourists’ activities mainly focus on scuba diving and snorkeling among the islands’ rich marine environment. Tourism consumptions account for more than half of Palau’s GDP, and the number of tourists is about 5.7 times that of the total population (Table-1). Within the country, the RISL in the Koror state (Figure-4) is an area of great importance for its biological, cultural, historical and economic values, which was inscribed as a mixed UNESCO World Heritage Site in 2012\(^{17}\). Since then, however, pressures from tourism have become higher because of the popularity of the World Heritage site. Consequently, the government of Palau has been considering various approaches toward sustainable tourism management. For example, in 2016, they tried reducing by half the number of charter flights from mainland China, as the number of tourists increased dramatically since 2014 (Figure-3), of which Chinese tourists were almost 50% at that time\(^{14}\). The decision of reducing the charter flights slightly decrease tourist arrivals as shown in Figure-3. Moreover, the Bureau of Tourism in the Ministry of Natural Resources, Environment and Tourism, published the “Palau Responsible Tourism Policy Framework 2017-2021” at the end of 2016 to represent what Palau as a destination wishes to accomplish\(^{18}\), and this included educational aspects for tourists. Additionally, the government introduced the “Palau pledge” in 2017\(^{19}\): as all visitors enter the country, they need to sign a passport pledge to act in an ecologically responsible way on the island, for the sake of Palau’s children and future generations of Palauans before an immigration officer. With the pledge, the government also released the ethical tour guide checklist that educates guides and visitors on what not to do and to do during their stay in Palau.

In addition to such political strategies, the government of Palau had been keen to introduce scientific approaches for sustainable tourism management. Accordingly, they signed a memorandum of understanding (MOU) with the Nippon Foundation and the Sasakawa Peace Foundation of Japan in 2016 for the support necessary to realize eco-conscious tourism in Palau. This study was a part of the collaborative projects under this MOU, as a pilot study for introducing the LAC approach (Figure-1) in the RISL. Since the RISL is in the Koror states and under their management, the actual research was conducted with the Koror state government, especially with the rangers and the officers of Coastal Management Office, Department of Conservation & Law Enforcement. We first carried out preliminary research to select a pilot site and to define appropriate indicators in the context of the RISL; we then conducted empirical research for measuring the experiential dimension of LAC. The details of methods are explained in the following sections.

### Table-1 Palau’s feature

| Land Area        | approx. 460 km\(^2\) |
|------------------|-------------------|
| EEZ              | approx. 615,000 km\(^2\) |
| Number of islands| more than 340     |
| Inhabited islands| 9 islands         |
| Population       | approx. 20,000 (2018) |
| Number of Tourists| approx. 115,000 (2018) |
| Ratio of Tourists/Population | approx. 5.7 times |
| GDP              | approx. 30 billions JPY (2018) |
| Tourism consumptions| approx. 16 billions JPY (2018) |

Source: ADB Data library\(^{13}\), Palau Government Service\(^{12}\), \(^{14}\), The World Bank\(^{15}\), Macrotrends.Net\(^{16}\)

![Figure-3 Tourist arrivals in Palau](source: Data from Palau Government Service\(^{14}\) is used)
2.2 Preliminary research for defining a pilot research site and indicators

We carried out preliminary research including interviews, group discussions with main stakeholders, and on-site inspections in the RISL as shown in Table-2, in July 2016 and February 2017. Interviews confirmed that all stakeholders were worrying about the degradation of natural resources in popular tourism sites such as the Milky way and the Jellyfish Lake, and agreed with the needs for introducing any TCC framework. The state government told us that they were recently tightening the control with a new certification scheme for tour operators, and they expected that any monitoring measure would strengthen their current scheme. We identified sites that were likely to develop issues related to visitor use (e.g., level of congestion) and defined relevant indicators based on the results of the preliminary research. Firstly, we decided to focus on the snorkeling sites, as the managers of the RISL told us their priority on these sites packed with general tourists with fewer awareness of environment (1); then, we chose the Milky Way as a pilot site for empirical research since it is the most popular site for tourists in the RISL. The congestion level at the site was already high during our on-site inspections, and many of interviewees mentioned the emergency of the site. Although the recreational activities at the Milky Way is not literally ‘snorkeling’ but ‘swimming or soaking’ in the water as it is an unclear water body with unique white clay of limestone, we considered these activities as the same as snorkeling from the perspective of measuring experiential dimension: in fact, this site is generally included as one of the snorkeling sites in one-day tours of the RISL. Figure-4 shows the location of the Milky Way in the RISL, where the pilot research was conducted.

We defined six indicators as: 1) experiential satisfaction; 2) sense of congestion; 3) safety concerns; 4) noisiness; 5) number of boats; and 6) number of snorkelers (2) for the pilot research site. Both “experiential satisfaction” and “sense of congestion” are indicators often used for the
LAC approach, and we found they were also appropriate for this study (3). Table-3 shows reasons for selection of other indicators based on the results of the preliminary research. Regarding “noisiness”, on-site inspection found loud music coming from some tour boats and people talking loudly as a result at snorkeling sites, and these could annoy visitors who expect to enjoy the wilderness of “Pristine Palau” (4). Additionally, interviews and discussions with stakeholders identified that safety issues (e.g. collisions between boats and snorkelers) were a crucial aspect. Danger of this kind was also observed during our on-site inspection, resulting in our decision to use “safety concerns (sense of danger)” as one of the indicators. Finally, the “number of boats” and the “number of snorkelers” were chosen as indicators because these provide important objective data that can be compared against the subjective data of the indicators. These two indicators are also common with the LAC approach.

Table-2 The list of Interviewees of preliminary research

| Interviewee                                      | Method                  |
|-------------------------------------------------|-------------------------|
| Palau Visitors Authority                        | Group Discussion        |
| Local Tour Operators                            | Group Discussion        |
| Koror State, Dept. of Conservation and Law Enforcement | Interview              |
| Koror State, Ranger, Coastal Management         | Interview               |
| Belau Tourism Association                       | Interview               |
| Bureau of Tourism                               | Group Discussion        |
| Coral Reef Research Foundation                   | Interview               |
| Palau International Coral Reef Center           | Interview               |
| Palau Conservation Society                      | Interview               |
| Palau China Chamber of Commerce                 | Interview               |

Source: Preliminary research

Table-3 Reasons for the selection of indicators:

Based on the results of interviews including group discussions, and on-site inspections

| Indicators     | Interviews and group discussions | On-site inspections                                                                 |
|----------------|----------------------------------|-------------------------------------------------------------------------------------|
| Safety concerns| -Safety issues, especially       | -Although the congestion of each site was not excessive in July 2016 (a general summer season), safety concerns were observed in some physically closed snorkeling sites. |
|                | collisions of boats and         | -During the Chinese New Year, in February 2017, the popular snorkeling sites were packed with visitors and some encounters of boats and snorkelers were observed. |
|                | snorkelers have grown as the    |                                                                                     |
|                | number of general tourists      |                                                                                     |
|                | increased.                      |                                                                                     |
| Noisiness      | -The catch copy and image of    | -Loud artificial music were played in the boats in almost all snorkeling sites, both in July 2016 and in February 2017. |
|                | “Pristine Palau” is the most    | -Rangers took us to the Milky Way in the very early morning before tourists' arrival to show the image of “Pristine Palau”, where we could only hear the sounds of birds, winds and waves. The impression is totally different |
|                | important marketing strategy    |                                                                                     |
|                | and all tourism activities need to follow. |                                                                                     |
|                | -In past days, tour boats were  |                                                                                     |
|                | quiet and seemed               |                                                                                     |
enjoy the natural sounds; however, some Chinese tour-boats started to play a loud music in the sites a few years ago and it spread out to other tour-operators with artificial music in such natural areas. -Loudness of the music hindered the communication between tour-guides and visitors, which could also lead any danger.

| Number of boats | Number of snorkelers |
|-----------------|----------------------|
| The number of boats and snorkelers has been dramatically increased in recent years, but never be counted yet. In some time zones, the number of boats are too many and congestion level is serious. | In July 2016, a general summer season: the congestion of each site was not excessive. e.g, around 20-25 visitors at a time in the Milky Way, although some physically closed snorkeling site as Soft Coral Arch seemed congested. In February 2017, the Chinese Year: the number of boats and snorkelers was apparently too many in each snorkeling sites, which seemed to directly affect the quality of experiential dimensions including safety issues. |

Source: Results of interviews listed in Table 2 and on-site inspections

2.3 Empirical research method

We conducted empirical research in the Milky Way to measure the experiential values of tourists; and to identify general trends of tourists in Palau. We carried out the surveys focusing an extremely busy period, the Chinese New Year, in February 2019. Research included a structured questionnaire survey, a line census and a noise measurement to identify the actual condition of the site, and to examine how the indicators related to one another by collecting quantitative data. All the surveys were carried out with the rangers and the officers from the Coastal Management Office of the Koror State Government under effective collaborations. Details of each method are explained below.

2.3.1 Structured questionnaire survey

The questionnaire was prepared to examine mainly four indicators subjectively: “experiential satisfaction”, “sense of congestion”, “safety concerns”, and “sense of noisiness”. Multiple questions with psychological scales were used to identify the psychological status of respondents. The questionnaire also included questions for identifying the respondents' attributes, which were also useful for further tourism planning strategies. The questionnaire consisted of 24 questions; an overview is shown in Table-4. Essentially, all questions were given in a closed-ended format. The number of questions was kept as low as possible, as the survey was conducted during recreational activities, it was necessary to shorten the time for answer in order not to disturb tourists' activities. The questionnaire, once designed, was translated into the five languages most common among tourists in Palau: Japanese, English, Korean, simplified Chinese, and traditional Chinese. The subjects were asked to respond upon returning to their boats after swimming, when their memories of experiences were still fresh in their minds. Considering that the respondents would likely be still wet, we printed the questionnaires on water-proof papers, and provided permanent markers for their answers. At the site, we stayed on the boats and the questionnaires were distributed and collected by kayakers whenever a tour boat appeared. Importantly, we recorded the time of both distribution and collection of the questionnaires for each boat by developed sheets as shown in Figure-5 in order to collect data on the time sequence of boat arrivals and departures. A researcher recorded the time when he / she distributed the questionnaire to a
boat with giving ID number to the boat; and the time when the questionnaire was collected from the boat was also recorded with the same ID number. Since we distributed the questionnaires when each boat arrived at the site and collected them when they were leaving; thus, we could record the staying time of each boat. Additionally, the 360-degree cameras’ time-lapse function was used to shoot images every 10 seconds at the site as a supplementary for the manually recorded data.

Table-4 Overview of the questionnaire with selected indicators

| Indicators                  | Questions                                                                 |
|-----------------------------|---------------------------------------------------------------------------|
| Respondents’ attributes     | Nationality; Age; Occupation; Number of times to visit Palau; Purpose of visit |
| Experiential satisfaction   | Satisfaction of snorkeling; Impression of the landscape; Revisit willingness; Worth the expense; Degree of expectation before and after snorkeling |
| Sense of Congestion        | Feeling of people’s and boats’ existence around a respondent; Assumptive Degree of enjoy without congestion |
| Safety concerns            | Closeness of boats; Feeling of danger; Actual experiences of encounter of boats |
| Sense of Noisiness         | Degree of perceived noisiness; Source of noisiness                        |

Source: Developed questionnaire sheet in this study

2.3.2 Line census for boats and snorkelers

In addition to the recording process of the time sequence explained above, we conducted a line census to count the number of boats and snorkelers in order to objectively ascertain the congestion level. This survey is directly related to two objective indicators: “number of boats” and “number of snorkelers”. Line census is a method often used in bird censuses and we regarded it as useful in this case as well. As shown in Figure-6, a kayaker traveled up and down (10 minutes each way) the study site several times and used a tally counter to manually count the number of boats and snorkelers.
2.3.3 Noise investigation

A standard-grade SL-1370 noise meter was used to measure noises by a researcher on a kayak, anchored at discreet locations at the study site as shown in Figure-7. We used the L50 method, which measures noises 50 times at five-second intervals, disregards the five highest and the five lowest readings, and averages the remaining 40 readings to determine the site’s noise level. With no specific environmental standards defined at sea in Palau, we decided to measure and compare the noises of “quiet hours” with few boats at the site and “hours that are perceived to be crowded and noisy” after the arrival of tour boats.
3. Results

3.1 Results of the questionnaire surveys

The overall response rate was considerably high (82.6%)\(^{(5)}\), and the total number of respondents was 458. The use of the simplified questionnaire likely contributed to the high response rate. None of the respondents provided inappropriate answers; therefore, we treated all responses as valid when aggregating the data. Some respondents did not provide answers to every question, and these omissions were eliminated in the analysis stage. All results were statistically tested by the Cronbach’s coefficient alpha for the homogeneity of questions as well as by the GP analysis for the validity of psychological scales, which demonstrated no issues\(^{(6)}\). Regarding the points of psychological scales of each question, the answer option representing the highest level was given 4 points, and the option representing the lowest level was given 1 point. Since the number of options varied from question to question, the score was evenly distributed between one and four points based on the number of options. For example, for a question with four options, the options were given 1, 2, 3, and 4 points; whereas for a question with five options, they were given 1, 1.75, 2.5, 3.25, and 4 points. This is because having the uniform scores for the highest and lowest options could make it easier to calculate the weight of questions for comparison. Importantly, we also did various comparisons of the aggregate results by country, by nationality, by age, and by occupation (related to the respondents’ attributes asked by Q1-6 in Table-4) to check the differences and effects on key indicators, since our preliminary hypothesis was that there would be strong characteristics and differences among countries especially for subjective data such as “experiential satisfaction”, “sense of congestion” or “sense of noisiness”. Yet, we found that there were not significant differences to note for discussion; thus, for space reasons, we have not explained all the results by attributes here, except those results that were significant.

3.1.1 Overall characteristics of respondents

Since we conducted this research during the Chinese New Year, most of the respondents were accordingly from mainland China, and there were also many Taiwanese. The home country of the respondents was: Mainland China 52%; Taiwan 20%; Japan 8%; South Korea 7%; Others 13% (including the United States 3%; EU nations 2%)\(^{(7)}\). In the ratio of the nationalities of visitors through a year, the Chinese are currently dominant and there is a same tendency for other nationalities; thus, the ratio during our study can be regarded as a general trend in recent years\(^{(8)}\). Regarding the ages of respondents, people at 23 to 50 years old were dominant, with this ratio: 18 or younger 12%; 18-22 6%; 23-35 30%; 35-50 31%; 51-65 17%; and 66 or older 4%. The ratio of occupation was this: company employee 46%; unemployed 23%; self-employed 19%; housewife 7%; civil servant 3%; NGO/NPO 2%. These results indicated that the majority of tourists during this period were families comprising working people with unemployed children and housewife. There were many first-time visitors to Palau (87%), but it was found that there were quite a few repeaters from Japan who had visited Palau relatively frequently. We also did all the analyses by country as explained in 3.1, but there were not compelling differences to note for discussion contrary to our hypothesis.

Figure-8 shows the purposes of the tourists’ visits. Many cited snorkeling, which is a predictable result given that the surveys were conducted with those who participated in snorkeling tours. One important result was that of the choices offered, cultural experience, hiking, and birdwatching were not chosen by many respondents, even though these activities are also provided as attractions in Palau. Our analysis by countries showed that many Japanese and category of others
(representatively those from the United States or EU nations) visited Palau not only for snorkeling but diving; in contrast, many Korean and Taiwanese came for a beach vacations or cultural experiences. Respondents from China had a more diverse range of purposes than people from other countries or regions, but this could be because there was such a high proportion of respondents from China during this survey.

![Figure-8 Purposes of visit (Multiple answer allowed)](image)

Source: Results of the structured questionnaire

### 3.1.2 Experiential satisfaction and other subjective data of indicators

Table-5 shows the overall results of subjective indicators as obtained by the questionnaires. The respondents’ experiential satisfaction was remarkably positive (39%+54%=93%). Also highly rated were the impressions of land (57%+37%=94%) and ocean landscapes (62%+33%=95%). Willingness to revisit was rated as 89% (38%+51%), and 88% (39%+49%) of respondents regarded the experience to be worthwhile to pay. In addition, 80% (24%+56%) of respondents said that their experience was better than they had expected. Some respondents felt that the sites were congested (with people 2%+44%=46%; with boats 3%+35%=38%) as shown in Table-5, but there was no strong indication unlike the results of experiential satisfaction and there were substantial answers as ‘I don’t know’. Yet, 55% (38%+17%) of respondents felt that they would have enjoyed their activities more if there had been fewer tourists. Results on safety concerns showed that most respondents were not too worried about their safety (32%+39%=71%) and very few people actually experienced to bumped into a boat (1%). On the other hand, regarding the sense of noisiness of respondents, which was expected to be supplementary data for the objective noise investigation by a noise meter, there were not striking findings as: only 20% of respondents considered the site to be noisy, and a substantial number of respondents felt that it was quiet (31%+11%=42%), nevertheless the high-level noises were recorded by the noise meter objectively as explained in the next section. Moreover, 38% of the respondents had difficulties answering the question (“I don't know”), and there were many different perceived sources of noisiness. For example, some of respondents even regarded the natural sounds of waves, winds, and birds’ calls as noises (17% for the sounds of waves and winds, and 3% for the bird calls). Such a perception of noisiness to regard natural sounds being noisy was one of the unexpected results in our survey.
| Indicators                | Summary of questions                                      | Answers’s trend (n=458)                              |
|--------------------------|----------------------------------------------------------|-----------------------------------------------------|
| Experiential satisfaction| Were you satisfied with your activities?                 | Very satisfied 39%, Satisfied 54%, I don’t know 6%, Not satisfied 1% |
|                          | Were you impressed by the landscape viewed from the sea? | Very impressed 57%, Somewhat impressed 37%, I don’t know 5%, Not impressed 1% |
|                          | Were you impressed by the landscape in the ocean?        | Very impressed 62%, Somewhat impressed 33%, I don’t know 4%, Not impressed 1% |
|                          | Would you like to revisit this area?                     | Very much so 38%, Yes 51%, I don’t know 8%, No 3%   |
|                          | Was your experience worth the expenses?                  | Definitely worth it 39%, Somewhat worth it 49%, I don’t know 8%, Not worth it at all 4% |
|                          | How did your experience measure up to your expectations? | Much better than expected 24%, Better than expected 56%, I don’t know 16%, Not as good as expected 4% |
| Sense of congestion      | Were there many people around you during activities?     | Too many 2%, Many 44%, I don’t know 34%, Not many 16%, Very few 4% |
|                          | Were there many boats around you during activities?      | Too many 3%, Many 35%, I don’t know 38%, Not many 18%, Very few 6% |
|                          | You’d enjoy activities if there were fewer tourists?      | Probably 38%, Yes 17%, Wouldn’t make any difference 28%, I doubt it 14%, No 3% |
| Safety concerns          | Did the boats come too close to one another in the area? | Yes 2%, I guess so 21%, I don’t know 29%, I don’t thinks so 48% |
|                          | Did you worry about your safety while snorkeling?         | Not at all 32%, Not much 39%, I don’t know 16%, Somewhat 12%, Very much 1% |
|                          | Did you experience any close encounters with a boat in the area? | Never 96%, Nearly bumped into one 3%, Actually bumped into one 1% |
|                          | Did you experience nearly bumping into a person in the area? | Never 79%, Nearly bumped into someone 12%, Actually bumped into one 9% |
|                          | Did you ever see a boat approaching the area at high speed? | Never 91%, Yes once 5%, Yes more than once 4% |
| Sense of noisiness       | How did you find the surrounding noise while snorkeling in the area? | Very noisy 2%, Rather noisy 18%, I don’t know 38%, Rather quiet 31%, Very quiet 11% |
| (Supplementary data)     | What noises bothered you?                                | Voice of people 34%, Nature sounds such as waves and winds 17%, Bird calls 3%, Music from a boat 4%, Other 9%, No answer 33% |

Source: Results of the structured questionnaire

3.2 Noise investigation

Table-5 shows the objective results of noise investigation taken by the noise meter. Column No. 1 shows the measurement taken when there were no tour boats in the Milky Way on the first day, and that value was just over 40 dB, indicating that was notably quiet, equivalent to the noise level applied to the areas that particularly require quietness (e.g. nursing homes) according to Japan’s environmental standards. After 10:00 a.m. on the first day and after 9:30 a.m. on the second day, as more and more tour boats arrived, the noise level rose accordingly to maximums of 77.9 and 66.9 dB, respectively. In lay terms, most people consider anything above the sound pressure of 60 dB as noisy and consider 70 dB quite loud(9). We observed that most of the noise came from the artificial music playing on some tour boats, boat engines and raised voices (guides’ and tourists’ shouting), as the same as we observed in preliminary research. We also found that when the music was loud, the tour guides’ and tourists’ speaking voices consequently grew louder.
3.3 The numbers of boats and snorkelers

Figure-9 shows the results from both the record sheets (distribution and collection time of the questionnaires) and the line census counting, which visualizes the time-series congestion level per 5 minutes. The colored portions of the figure tabulated by the times recorded during the questionnaire survey indicate the amount of time that each tour boat stayed at the site; in contrast, the numbers in the column “Count by line census” shows the actual number of boats and of snorkelers swimming in the water based on the line census counting. Although there are slight differences in the numbers caused by time lags, the results from these two measurements were verified with a strong correlation (February 4th: $R=0.87$ and February 5th: $R=0.78$); therefore, we regarded that these two different methods gave similar results and were reliable measurements.

As shown in Figure-9, the number of boats and snorkelers was particularly high on February 4th, whereas the inclement weather and lower temperatures on the next day seem to have depressed the number of tourists. The average staying time was 35.3 minutes on February 4th and 32.7 minutes on February 5th, which indicates that the staying time of each boat was almost the same regardless of weather conditions. For considering the congestion level, however, it is better to focus on the result of February 4th without any effects by the bad weather. The most crowded hours started after around 10:00 a.m. and continued until around 11:00 a.m., when there were more than 60 to 70 snorkelers at a time and 16-17 boats at peak times. The relation between the actual congestion level and the sense of congestion of respondents is examined in the next section.

![Table-6](image_url)

**Table-6** Time-series noise level by the noise meter (objective data)

| No. | Date and Time | Noise Level |
|-----|---------------|-------------|
|     | Year | Month | Date | Hour | Min | Hour | Min | L50 | Max | Min |
| 1   | 2019 | 2     | 4    | 9    | 5   | -    | 9   | 10  | 42.6| 48.9| 40.4|
| 2   | 2019 | 2     | 4    | 9    | 45  | -    | 9   | 50  | 53.9| 63.6| 48.8|
| 3   | 2019 | 2     | 4    | 9    | 55  | -    | 10  | 00  | 53.7| 63.9| 49.1|
| 4   | 2019 | 2     | 4    | 10   | 5   | -    | 10  | 10  | 59.3| 71.5| 54.9|
| 5   | 2019 | 2     | 4    | 10   | 15  | -    | 10  | 20  | 63.1| 72.0| 57.2|
| 6   | 2019 | 2     | 4    | 10   | 25  | -    | 10  | 30  | 59.8| 73.1| 55.7|
| 7   | 2019 | 2     | 4    | 10   | 35  | -    | 10  | 40  | 58.2| 62.6| 55.2|
| 8   | 2019 | 2     | 4    | 10   | 45  | -    | 10  | 50  | 61.1| 69.3| 55.1|
| 9   | 2019 | 2     | 4    | 10   | 55  | -    | 11  | 00  | 62.4| 77.9| 54.6|
| 10  | 2019 | 2     | 5    | 9    | 10  | -    | 9   | 15  | 48.6| 52.2| 47.1|
| 11  | 2019 | 2     | 5    | 9    | 25  | -    | 9   | 30  | 49.7| 59.2| 45.5|
| 12  | 2019 | 2     | 5    | 9    | 35  | -    | 9   | 40  | 51.9| 66.9| 46.9|
| 13  | 2019 | 2     | 5    | 10   | 35  | -    | 10  | 40  | 56.0| 64.5| 53.2|
| 14  | 2019 | 2     | 5    | 10   | 45  | -    | 10  | 50  | 60.2| 68.1| 55.6|
| 15  | 2019 | 2     | 5    | 10   | 55  | -    | 11  | 00  | 58.6| 61.3| 52.7|
| 16  | 2019 | 2     | 5    | 11   | 5   | -    | 11  | 10  | 57.5| 62.8| 52.0|
| 17  | 2019 | 2     | 5    | 11   | 15  | -    | 11  | 20  | 57.4| 61.7| 50.1|
| 18  | 2019 | 2     | 5    | 11   | 25  | -    | 11  | 30  | 54.9| 60.2| 50.8|
| 19  | 2019 | 2     | 5    | 11   | 35  | -    | 11  | 40  | 54.2| 64.1| 48.7|
| 20  | 2019 | 2     | 5    | 11   | 45  | -    | 11  | 50  | 53.0| 59.8| 49.4|

Source: Results of the noise investigation
Figure-9  Time-series congestion level in the Milky Way by the number of boats and snorkelers (objective data)

Source: Results of the record sheets during the structured questionnaire survey and of the line census
3.4 Examination of the relation among indicators

We integrated a variety of data that are explained in 3.1, 3.2, and 3.3 with an intention to examine the relation between indicators, which is shown in Table-7. This table does not represent the correlation analysis but for reviewing the differences of results of each indicator per congestion level, of which the calculations is based on the average number of snorkelers while each boat was staying. For instance, during the staying time of Boat ID 1 in Figure-9, snorkelers counted by the line census were 11, 16, and 17 people; thus, the average number of snorkeler was \((11 + 16 + 17) / 3 = 14.6\) people for the staying time of Boat ID 1. Likewise, we calculated the average number of snorkelers for each boat’s staying time, and then, making the ranges in the left column: for example, \(50 \leq S < 55\) represents the situation when there were average 50 to 55 snorkelers at the site. Besides, the columns of ‘Experiential Satisfaction’, ‘Sense of Congestion’, and ‘Level of Safety Concern’ show the average psychological point of all respondents in this situation, which is subjective data. On the other hand, ‘Average of Boats MAX’ and ‘Average of Snorkelers MAX’ show the maximum value of the average number of boats and snorkelers in each range, and ‘Average of Noise Level MAX’ shows the maximum value of the average noise level in each range: for example, in the range of \(50 \leq S < 55\), three boats as Boat ID 11, 13, and 21 (in Figure-9) were staying in this situation, while the maximum number of boats are 17 during the staying time of Boat 11, also 17 during the staying time of Boat 13, and 10 during the staying time of Boat 21. Additionally, the number of respondents are 11 people in Boat 11, 8 people in Boat 13, and 2 people in Boat 21. Then, we calculated the maximum value of the average number of boats in this situation as:

\[
\text{Average of Boats MAX} = \frac{(17 \times 11 + 17 \times 8 + 10 \times 2)}{(11 + 8 + 2)} = 16.3
\]

Thus, we did not simply use the maximum value of recorded data even for these objective data, but considering the number of respondents in order to reflect the situation where those people were, for making a comparison between subjective and objective results. We applied the same methodology as explained above for ‘Average of Snorkelers MAX’ and ‘Average of Noise Level MAX’ (11). We cannot clarify the direct correlation by only one-time survey but we aimed to examine the tendency how different indicator affect each other for further research. Among results in Table-7, the range of \(60 \leq S\) included the data of only one boat which stayed too short time to reflect the actual experiential value: therefore, we regarded it would be better not to include this result into consideration. Table-7 showed that respondents felt the highest level of congestion (2.82) when the number of snorkelers was highest (70.5), of which the range is \(35 \leq S < 40\), and both sense of congestion and the number of snorkelers are relatively high over this range. At the same time, the noise level is relatively high over this range, which shows the maximum noise levels are over 62.0 when the maximum number of snorkelers are over 62.0. These indicates that the range of \(35 \leq S < 40\), which represents the situation when the average number of snorkeler is around 35 to 40 at the site and the maximum number of that is 70, is a candidate threshold of changing both the subjective feeling and the objective condition. Even though the experiential satisfaction is also relatively low (3.15) when the number of snorkelers was the highest (70.5), we could not identify the proportional changes of the experiential satisfaction. It indicated that the experiential satisfaction was not directly affected by the sense of congestion or by the number of boats and snorkelers in this case. Since the experiential satisfaction was highly positive throughout the whole respondents as explained in the section 3.1.2, it seemed that this subjective data was not simply affected by the congestion level (12).
Table-7 Examination of the relation among indicators*1

| S=Number of snorkelers AVERAGE | Experiential Satisfaction | Sense of Congestion | Level of Safety Concern | Average of Boats MAX | Average of Snorkelers MAX | Average of Noise Level MAX |
|--------------------------------|---------------------------|---------------------|------------------------|---------------------|-------------------------|--------------------------|
| 60 ≤ S < 60                    | 3.69                      | 2.00                | 1.12                   | 17.0                | 62.0                    | 63.1                     |
| 55 ≤ S < 60                    | 3.24                      | 2.75                | 1.35                   | 16.3                | 69.3                    | 62.8                     |
| 50 ≤ S < 55                    | 3.27                      | 2.66                | 1.43                   | 16.5                | 67.3                    | 63.1                     |
| 45 ≤ S < 45                    | 3.63                      | 2.70                | 1.41                   | 17.0                | 62.0                    | 63.1                     |
| 40 ≤ S < 40                    | 3.15                      | 2.82                | 1.45                   | 9.5                 | 70.5                    | 62.4                     |
| 35 ≤ S < 40                    | 3.13                      | 2.54                | 1.54                   | 8.3                 | 36.0                    | 58.8                     |
| 30 ≤ S < 35                    | 3.19                      | 2.47                | 1.42                   | 8.0                 | 39.7                    | 60.1                     |
| 25 ≤ S < 30                    | 3.24                      | 2.57                | 1.33                   | 6.3                 | 20.2                    | 58.1                     |
| 20 ≤ S < 25                    | 3.33                      | 2.53                | 1.39                   | 6.0                 | 19.9                    | 58.2                     |
| 15 ≤ S < 20                    | 3.13                      | 2.43                | 1.34                   | 2.9                 | 12.6                    | 49.0                     |
| 10 ≤ S < 15                    | 3.64                      | 2.36                | 1.20                   | 6.0                 | 6.0                     | 51.9                     |
| 5 ≤ S < 10                     |                           |                     |                        |                     |                         |                          |
| S = 5                          |                           |                     |                        |                     |                         |                          |

Source: Results of the structured questionnaire, of the line census and of the noise investigation

*1) The figures of this table are calculated based on the same results explained in the section 3.1, 3.2 and 3.3; i.e. the number of respondents and the calculation method of psychological scales are the same as explained in 3.1. Likewise, the noise level is from data shown in 3.2, and the number of boats and snorkelers are from data explained in 3.3. The blanks (35 ≤ S < 40 and 55 ≤ S < 60) mean that the situations in this range were not happened during our survey.

*2) The data in the top line is not included into consideration as explained in the body text 3.4.

4. Discussion

Visitors’ experiential satisfaction in the pilot study site, the Milky Way, was remarkably high as 93% of respondents showed their satisfaction as explained in 3.1.2, but almost half of the respondents felt the congestion of the site with the ratio that 46% recognized there were too many people; simultaneously, as explained in 3.3 (visualized in Figure-9), the high level of congestion was recorded in some hours at the site, which means the actual congestion was observed subjectively and objectively. During the site inspection in the preliminary research conducted in a general summer holiday period in July, we found that the average number of snorkelers at a time was around maximum 20-25 people in the Milky Way (explained in Table-3); whereas it was around maximum 60-70 people in this survey. Thus, the congestion level during the Chinese New Year clarified this time was almost three times that of the general season. Furthermore, as the results from the comparison among indicators in 3.4 (shown in Table-7), the sense of congestion became higher as the number of boats and snorkelers increased. This result is the same as Terasaki et al. (2011)20, which showed the tendency that the sense of congestion became stronger as the density of visitors became higher. Additionally, more than half of respondents (55%) answered that they would have enjoyed their activities more if there had been fewer tourists, as explained in 3.1.2, suggested the needs for considerable attention to the congestion level.

Regarding the noise level, it became comparably higher at the same time when the number of boats and snorkelers were higher (Table-7). Results from the objective data by noise-meter identified substantial noise level as explained in 3.2 (shown in Table-6), of which the recorded
maximum level was 77.9 dB. It seems inappropriately high for the wilderness area. Even though it would be impossible and off-putting to enforce a “No talking” rule among tourists, it is worthwhile to consider the regulating the artificial music on the tour boats as it could increase the loudness of talking, in order to put value on the original quietness of the Milky Way. Granting that most of visitors do not recognize what is the original state of the Milky Way, it would be important to protect the image and the condition of “Pristine Palau” (4).

Moreover, the relation among indicators shown in Table-7 indicated that respondents’ sense of congestion and the actual noise level began to be relatively higher from a range of $35 \leq S < 40$, while the maximum number of snorkelers became over 60 and that of boats became over 9. This means that the average 35 snorkeler in the water (the average 8 boats) (13) in the Milky Way seems a candidate threshold of the limit of acceptable change. We schematically illustrated the situation at the site with the snorkelers and boats in the maximum number (Figure-11) and in the minimum number (Figure-12). The overview image of the Milky Way is shown in the aerial photo in Figure-11, but the main activity area is only the inner site of the whole area which is 11,600m², and snorkelers generally enjoy their activity in a group from one tour boat as shown in Figure-10. The highest level of congestion observed in this study in Figure-11 shows that the density is remarkably high in this small area, whereas the minimum level in Figure-12 shows the best situation of Pristine Palau. Although it is not realistic to keep the situation of Figure-12, the desired condition is shown in Figure-13 with the candidate LAC standard with 35 snorkelers and 8 boats. This is a corresponding result with Roman et al. (2007) (21) in the Koh Chang National Marine Park, Thailand, which showed roughly 30-35 snorkelers per site could be a useful LAC threshold value (14). It is nonetheless appropriate to simply fix a single figure for setting a limit based on only a single research, since LAC approach needs continuous monitoring as explained in the introduction section. What is important is to continue monitoring with referring a possible LAC standard.

Regarding the safety concerns, results found that not many people reported safety concerns with the ratio that 71% of respondents were not worried about their safety as explained in 3.1.2, indicating that respondents did not feel unsafe during their activities. Although we had observed several encounters of snorkelers and boats during our preliminary research in 2016 and in 2017 (Table-3), we rarely detected such situations in this survey. According to the manager of the Coastal Management Office, Department of Conservation & Law Enforcement in the Koror State Government, they started the Tour Guide Training and Certification Program in 2016 and this scheme had spread out to the tour operators in the RISL. It seems that the regulations and management for tour guides and tour boats came to work effectively and that the tightened control contributed to better management. This is a good example of the managerial dimension of the LAC approach shown in Figure-1.
Figure 11: Main activity area in the highest congestion*
Source: Results of line census in Figure-9 and on-site inspection
*We illustrated the size of a tour boat in Figure-11, 12, and 13 with the average size of a boat most frequently used by tour operators in the RISL (about 10.9m long and 2.4m wide).

Figure 12: Main activity area in the lowest congestion
Source: Results of line census in Figure-9 and on-site inspection

Figure 13: Condition with a candidate LAC standard
Source: Results of examination in Table-7
On the other hand, results in Table-7 showed that there was not a clear correlation between the experiential satisfaction and other indicators in this study, although the satisfaction level is the highest when there were the fewest snorkelers. Results of the questionnaire in Table-5 also indicated that there were not strong relations between level of satisfaction and sense of congestion because all the answers related to the experiential satisfaction reminded singularly high (more than 80% answered positively in all questions), even though some degree of respondents felt the congestion (46%). We assume that the astonishingly beautiful landscape (both above and under the water) of Palau’s nature and recreational activities in such surroundings offer a high level of satisfaction that could possibly overrides the level of congestion to some extent, as it was indicated in respondents’ highly positive impression of landscapes of the RISL (94% were impressed by the land and 95% by the ocean). In such a case, where experiential satisfaction is able to outweigh concerns about congestion, the comparison between visitor satisfaction and resource quality could be more effective. For example, Roman et al. (2007)\(^1\), which investigated the relation between the visitor perceptions (the experiential dimension) and the coral conditions (the resource dimension), showed that the visitor satisfaction was higher when the coral conditions was better. As we can see from this case, the experiential satisfaction and the resource condition often have a correlation in many cases (Diedrich et al., 2011). Therefore, it would be important for further study in the RISL to do the survey on the resource dimension in order to make a comparison with the experiential satisfaction. Importantly, this suggests the need to make the resource dimension the highest priority for the LAC approach (Figure-1) in the RISL, since there would be possibilities that resources had already been degraded by over-crowded situation, even while tourists’ satisfaction had remained high.

From the perspective of the evaluation of the methods in this study, it was demonstrated that both counting by record sheets and by the line census were reliable methods to obtain the data of congestion level. We used these two methods to evaluate the validity each other in this study; as a result, it would be possible to apply either of them depending on the purpose of a survey or of monitoring. For instance, rangers or officers at the monitoring tasks can decide to apply either of these methods or both depending on their capacity and constraints such as human resources, budgets, and time. The easier way would be more effective considering continuity and sustainability.

Furthermore, we found that subjective data was not useful for measuring the level of noisiness as the respondents’ subjective answers showed that only 20% of the respondents felt that the site was noisy (explained in 3.1.2), although the high level of noisiness was measured objectively by the noise-meter. This may be because many respondents were visiting Palau for the first time and were not familiar with the area in its original tranquil state. It is also assumed that every individual has a different perception on what kind of sounds are regarded as noisy, although there were not significant differences by nationality as explained in 3.1. For example, 17% of respondents perceived the sounds of waves and winds as the noisiness and 3% felt the same even with birds’ calls, of which these natural sounds are the symbols of the wilderness in the RISL.

This implies that only the subjective data is not enough for measuring the experiential value of tourists. From the findings in this study, the methods for further research in this context can be suggested as below:
1) Experiential satisfaction: data can be obtained by the structured questionnaire but needs to be compared with the results of resource condition;
2) Sense of congestion: data can be obtained by the structured questionnaire and can be compared...
with the objective data of 5) and 6);
3) Safety concerns: do not need to be included into regular monitoring for the moment as there is not significant issues so far; however, it would be better to check it when laws or regulations are updated or revised;
4) Noisiness: better to obtain objective data by noise-meter; subjective data as the sense of noisiness cannot be useful indicators in this context and can be deleted from the questionnaire;
5) Number of boats and 6) Number of snorkelers: data can be obtained both/either by record sheets and/or by the line census developed in this study.

Finally, it is important for further planning and marketing strategies to note that many respondents did not select cultural experience, hiking or bird-watching as the purposes of their visit, as explained in 3.1.1 with Figure-8. This indicates the importance and potential of promoting such activities across Palau, including the Babeldaob Island where there were appropriate sites for these activities. Promoting such ecotourism would not only lead to an increase in visitors staying for longer durations but would also reduce concentration on the RISL. Additionally, the strong experiential satisfaction and few safety concerns are independently confirmed in this study, which is a good sign to show the high level of experiential value in the RISL: however, it is better to keep monitoring to find any unexpected turn.

5. Conclusions
Since this study conducted a pilot research for measuring the experiential dimension of the LAC approach, it is needed to carry out the research multiple times and in different sites with using appropriate indicators in each context. For instance, an indicator related to snorkelers’ behavior such as “touches on corals by fins” would be useful in a popular snorkeling site with coral reefs. Moreover, it is significantly crucial to carry out further research on the resource dimension at the same time as explained in the discussion section. Regarding the surveys on resource dimension, possible indicators often used are coral mortality, coral morphological diversity, benthic coverage, fish diversity, or fish population; although the indicators differ by each ecosystem in the targeted site. It is preferable that the resource dimension (ecological aspects) would be surveyed by a local institution, as ecological changes cannot be examined by only a few research but requires longitudinal records.

Furthermore, sharing the results of this study with major stakeholders of the RISL would contribute to the development of the LAC process by promoting the participation of stakeholders, as shown in Figure-2, which is another important aspect. Since the LAC approach is regarded as a process of monitoring and making decisions among various stakeholders as explained in the introduction section, we also find the importance of developing a simplified method as much as possible for the sustainable monitoring by local institutions within their routine works, as shown in Figure-14. The continuity of monitoring of both the experiential and the ecological dimension is important for setting and revising rules as the managerial dimension.
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Note

(1) It was mentioned by the managers and the rangers of the RISL during the interviews, who have witnessed tourists’ behaviors in several years. They told us that Palau was used to be popular among the qualified and experienced divers who had more concerns on marine life but that the situation was rapidly changed with an increase of general tourists after the declaration of a World Heritage site.

(2) As it is already explained in the section 2.2, a “snorkeler” actually means a “swimmer” in the case of the Milky Way.

(3) Additionally, some of interviewees (the Koror state government, Belau Tourism Association and Bureau of Tourism) mentioned that there was no research on visitors’ perception for years. Thus, we believed that the survey on experiential satisfaction and sense of congestion could also help these stakeholders to know more about the current situation of visitors in Palau.

(4) "Pristine Palau" is the most important catch copy for Palau's tourism. The country has continuously used this phrase for tourism promotion as well as for nature conservation.

(5) The overall response rate was calculated as: the number of collected answer sheets divided by the total number of distributed sheets of the questionnaire. We distributed a questionnaire sheet to every visitor (with checking the number of visitors in every boat); thus, the number of distributed sheets was equal to the number of visitors. We recorded the number of sheets of distribution and of collection by the record sheets shown in Figure-5.

(6) Cronbach’s coefficient alpha showed that experiential satisfaction was high at 0.82, indicating stable homogeneity for all the questions. The Coefficient alpha for the sense of congestion and safety concerns was 0.58 and 0.56 respectively, which was not the best level but indicated...
that a certain extent of homogeneity was secured. We actually did several analyses by eliminating a question one by one regarding the indicators of the sense of congestion and safety concern to check the change of the Cronbach’s alpha, and found that the Cronbach’s alpha became 0.65 from 0.58 if we eliminated the Q19. However, we considered and put weight on the balance of batches of questions for each psychological scale at the same time, as too few questions could not effectively work on comprehending the psychological situation of visitors. Thus, we concluded not to remove Q19, since it was the only question to ask the relation between the number of tourists and the visitor satisfaction. We also carried out the GP analysis by ranking all survey samples based on the aggregated score for each of the psychological scales, dividing them into the top group (Good) and bottom group (Poor). All the analysis for experiential satisfaction, sense of congestion and safety concerns demonstrated similar results, which showed the aggregated score for each indicator represented of the level of sense of individual questions; thus, we concluded that the physiological scales were valid.

(7) Note that North America, European Union and other regions and countries are included in the category “Others,” due to the small quantity of data in this study.

(8) The ratio of nationalities during the year of 2018 are: Mainland China 43%; Taiwan 10%; Japan 21%; South Korea 11%; Others 15%.

(9) For example, the general environmental standard for the noisiness in Japan indicates that the area even with any commercial or industrial facilities is expected to keep the noisiness under 60dB during the day time and under 50dB during the night time. The noisiness over 70 dB is often regarded as the noises in the middle of a big city, in the underground, or under the highway. Although these examples are from the standard in residential areas in Japan, it gives the idea how the nosiness over 70dB is quite loud.

(10) For the tabulation of Figure-6, we used VLOOKUP function for ‘Count by line census’ and HLOOKUP function for the staying time of boats.

(11) For example, regarding the calculation of ‘Average of Noise Level MAX’ in the range of 50 \( \leq S < 55 \), there were three boats as Boat ID 11, 13, and 21, while the maximum value of noise level recording was 63.1 during the staying time of Boat 11, also 63.1 during the staying time of Boat 13, and 59.8 during the staying time of Boat 21. Then, the number of respondents are 11 people in Boat 11, 8 people in Boat 13, and 2 people in Boat 21: thus, we calculated the maximum value of the average noise level in this situation as: 

\[
\text{Average of Noise Level MAX} = \frac{(63.1 \times 11 + 63.1 \times 8 + 59.8 \times 2)}{11 + 8 + 2} = 62.8
\]

(12) We also carried out multiple regression analyses, after testing a frequency distribution of the variables, to examine the correlation of indicators. Results indicated that the number of snorkelers negatively affects experiential satisfaction with the Standard partial regression coefficient=−0.20, which was the strongest among other variables. Yet, we need further surveys for better accuracy, since it was shown as R²=0.145.

(13) The number of boats and snorkelers are not directly proportional because the number of visitors on a boat is quite different from each situation. Some tourists request to charter a boat by their own with only 2-3 people, although most of tourists join in an organized tour with more people.

(14) Even though their study site is bigger than the Milky Way, the situation of snorkeling activities is mostly similar to Figure-10 in general, where a batch of snorkelers from one boat is doing activity together as one group; thus, we drew this study as a reference.
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