

Original article

**Snorkelers' Perceptions toward Coral Bleaching at
Tarutao National Park, Satun Province**

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ABSTRACT

The coral bleaching in 2010 has led to substantial coral mortality in Tarutao National Park. This phenomenon affects the well-being of coral and its associated marine life, and can potentially harm marine tourism activities in the park, particularly snorkeling and scuba diving. The main objectives of this research were to investigate snorkelers' perception of coral bleaching and their satisfaction level as a result of snorkeling in the park. Three hundred and twenty two on-site snorkelers were interviewed through a structured questionnaire. The data were analyzed using descriptive statistics, chi-square test and t-test. The results revealed that most snorkelers (56.2%) did not realize that the park had experienced coral bleaching. A similar number of snorkelers (55.9%) responded that the closure of snorkeling sites did not affect their decision to visit the park, and a majority of them (68.9%) never noticed any coral bleaching while snorkeling. For hypothesis testing, three factors, namely, nationality, perceived information, and coral bleaching knowledge, were found to be significantly correlated to snorkelers' perception of physical appearance of coral bleaching. It was also found that coral bleaching moderately affected snorkelers' experience or satisfaction as they expressed their willingness to visit the park again in the future. Moreover, the hypothesis testing revealed that snorkeling satisfaction was not correlated with both coral bleaching observed and information perceived about the coral bleaching situation. The overall findings of this study implied that coral bleaching has no significant impact on snorkelers and their satisfaction. The long-term viability of marine tourism in the park could rest on high quality of other park resources and environment besides coral reef, such as, clean beaches, clear sea water, seascape and other esthetic values.

Keywords: Snorkeler, Perception, Coral Bleaching, Tarutao National Park

INTRODUCTION

Tarutao National Park, an ASEAN heritage site, is one of the most popular destinations for marine tourism in Thailand. The park opens for public use during the months of October and May. Most visitors to the park tend to engage in snorkeling and other water-based activities. The known sites for such activities include Haad Sai Khao, Ko Jabang, Ko Hin Ngam and Ko Takeang (Pukkalanun, 2013). The tourism income generated to local economy was over 1,800 million baht in 2007 (Thailand Community Based Tourism Institute, 2014).

Since the past decade, coral bleaching has been recognized as a serious issue faced by marine tourism worldwide. The main cause for such phenomenon is climate change or global warming. Rising sea temperature is a key environmental factor controlling the well-being of marine life. Temperature changes can also affect the relationship of mutual dependence between animals and the algae which live within their tissues (Hoegh-Guldberg, 1999; Center for Ocean Solution, 2014). At Great Barrier Reef, the publicity associated with coral bleaching and the image of the coral reef as being 'damaged' by climate change created a negative impact to marine tourism, which consequently could reduce visitor numbers (Great Barrier Reef Marine Park Authority, 2014).

The coral bleaching at Tarutao National Park was first observed in 1991 (Research and Development Institute for Coastal, Marine Resources and Mangrove Forest, 2010). In 2010, the sea temperature at the park was

measured between 30-34 degree Celsius and in the following years the coral bleaching was found extensively in the park (Prempree and Paakbara, 2014). The coral bleaching in the park coincided with the decrease in visitor numbers during the same time period. In 2010, the park received 42,778 visitors but this number dropped to 18,619, 26,036 and 26,107 in 2011, 2012 and 2013, respectively (Department of National Parks, Wildlife and Plant Conservation, 2014). In this regard, the marine tourism at Tarutao Park was and could be potentially vulnerable to coral bleaching as a result of climate change. While the tourism industry has to prepare for the negative impacts on its business and adapt to situation caused by climate change, scientist should support the industry by carrying out well-designed research projects catering to the problem at hand.

This study focused mainly on snorkelers' perception of coral bleaching and their satisfaction in snorkeling at Tarutao National Park. Its specific objectives were to 1) study the socio-demographic profile of snorkelers, 2) understand the perception of snorkelers on coral bleaching and the level of satisfaction on snorkeling experience, and 3) investigate some factors affecting snorkelers' perception. Two hypothesis statements were set for testing, namely, 1) coral bleaching would be likely to affect snorkelers' satisfaction on snorkeling experience, and 2) differences in socio-demographic characteristic of snorkelers would tend to affect their perception of the physical appearance of coral bleaching.

MATERIALS AND METHODS

The survey research using questionnaire interview was employed to collect data and information from 322 snorkelers in the park. The confidence level for data and information collection was 0.05. The survey questionnaire was reliability proved with the α coefficient of 0.708 in perception scale and K.R.20 of 0.935 in knowledge scale. The data were analyzed using descriptive statistics. The Chi-square test and t-test were then employed for hypothesis testing at the 0.05 significance level.

RESULTS AND DISCUSSION

Snorkeler's profile

A majority of the respondents was female (60.2%) with average age 33 year (S.D. = 10.03). The Thai snorkelers outnumbered the foreigners (69.9% to 30.1%). Most Thai snorkelers were from Bangkok Metropolis, and central and southern Thailand while the foreigners were from Europe, Asia and North America. The education level of snorkelers was considerably high with 82% of them having a bachelor degree or higher. The biggest percentage of snorkelers was the employees of various private enterprises (40.9%). The average monthly income of

respondents was approximately 15,001-30,000 baht.

As for the travel pattern, they mostly traveled as a group of friends (45.3%), with an average number of 14 people per group. The purpose of the park visit included relaxation with friends and family members (56.2%), being with nature (48.1%), and snorkeling (33.2%). An average number of the overnight stay in the park was 3 nights. The respondents' key motivation to visit the park comprised wishing to see corals (29.3%), clean and clear sea water (28.2%), affordable price (20.6%), reef fish (12.9%) and other natural and cultural resources in the park (9%).

Respondent's knowledge about coral bleaching phenomena

Ten questions or statements were asked to measure respondents' knowledge and their understanding about the coral bleaching phenomenon. The knowledge score was classified as very little knowledge = 0-2.0, low = 2.1-4.0, moderate = 4.1-6.0, high = 6.1-8.0, and very high = 8.1-10.00. The result revealed that the respondents received an average score of 4.7. Most incorrect answers were to a few specific questions about the causes of coral bleaching (Table 1).

Table 1 Measurement of the respondents' knowledge on coral bleaching

(n=322)

Questions/statements	Frequency and % of respondents answering the question correctly
1. Coral bleaching is the color of corals change into white color	206 (64%)
2. Coral bleaching is not a dead coral; it can recover by itself naturally	101 (31.4%)
3. Coral bleaching can only find in Thailand	229 (71.1)
4. Coral bleaching can affect the well being of other marine life	255 (79.2)
5. Coral bleaching is related to climate change	203 (63%)
6. Increase number of snorkelers can cause coral bleaching	81 (25.2)
7. Sediment can cause coral bleaching	2 (0.6)
8. Rising of sea temperature can cause coral bleaching	198 (61.5)
9. Closing of coral bleaching diving sites has no effect to coral recovery	146 (45.3)
10. Co ₂ emission around the world has nothing to do with coral bleaching	92 (28.6%)

Snorkeler's perception of coral bleaching and level of satisfaction on snorkeling

Perception is known as an insight, intuition, or knowledge gained by perceiving through various sensory stimuli and people interpret them based on their past experiences or memories (Maphobsuk, 2003; Hilgard, 1962). From that notion, snorkeler perception towards coral beaching at Tarutao National Park was described as follows.

About 64.3% of respondents had heard about coral bleaching before. Most of them received that information through television (47.2%), internet (21.7%), printed materials such as magazines and newspapers (15.5%), friends and relatives (13%), and other means such as

radio and travel agencies (7.1%). Regarding the specific situation of coral bleaching at Tarutao National Park, 55.9% of snorkelers did not know before that most snorkeling sites in the park were experiencing coral bleaching. The 'not know' percentage of this case was relatively close that of a study at Mu Koh Similan National Park which showed 51.8% (Samsuvan and Yeemin, 2012). However, only one-third of respondents expressed that coral bleaching situation affected their travel decision to Tarutao Park. Furthermore, almost 70% of respondents said that the closing of some snorkeling sites had no effect on their decision to visit the park as well. It suffices to say that the respondents were less aware

of coral bleaching situation in Tarutao, thus, they did not take it as a major concern when making the decision on a trip to the park.

Most respondents (75.5%) did not notice any sign of coral bleaching at the snorkeling sites. This could be explained by the fact that the corals were just in the beginning stage of bleaching when the research was carried out. Thus, the physical appearance of corals looked so normal and had no sign of bleaching. In contrast to the other study at Mu Koh Surin National Park, the result showed that most respondents (53.7%) thought the coral sites there were not as good as they expected before making a trip. An average of satisfaction score for snorkeling experience at Tarutao Park was 2.75 out of 5. This number reflected a moderate satisfaction level on the part of snorkelers. Nevertheless, a majority of respondents (60.4%) indicated they wanted to be back again for snorkeling at Tarutao Park, while 31.9% were not certain, and only 7.7% never wanted to. According

to those respondents who noticed the coral bleaching at their snorkeling sites, over one-half of them (50.6%) perceived that the park's marine resources in general were still in good shape and attractive.

The t-test analysis shown in Table 2 found that the difference in snorkeling satisfaction between the snorkelers who noticed coral bleaching and those who did not during their time of snorkeling, was not statistically significant ($t = 0.145$; $p\text{-value} = 0.885$). As well, the difference in snorkeling satisfaction between the snorkelers who perceived information on Tarutao's coral bleaching before making a trip and those who did not, was not statistically significant ($t = -1.564$; $p\text{-value} = 0.119$). It is concluded that the satisfaction of snorkeling experience at Tarutao Park had no correlation with both the coral bleaching observation, and information perceived on coral bleaching situation in the park.

Table 2 Factors affecting the respondent satisfaction level on snorkeling activity.

(n = 322)

Independent variable	Snorkeler satisfaction (\bar{x})	S.D.	t-test	p-value
1. Observation of coral bleaching at dive sites				
- Observed	2.76	1.39		
- Not observed	2.73	1.61	01.45 ^{ns}	0.885
2. Perception on coral bleaching information				
- Perceived information	2.89	1.37		
- Not perceived information	2.64	1.49	-1.564 ^{ns}	0.119

Remark: ^{ns} Non-significant level at the 0.05 level.

Snorkeler expectation related to snorkeling activity

The results revealed that for good snorkeling experience, the snorkelers expected clear sea water the highest ($\bar{x} = 3.44$, S.D. 0.66) followed by clean water ($\bar{x} = 3.28$, S.D. 0.89). The third highest expectation was the richness and undestroyed coral reef ($\bar{x} = 3.15$, S.D.

0.89). It is worth noting that the expectation on feeding fish and opportunity to touch corals were low ($\bar{x} = 1.60$, S.D. 1.27 and $\bar{x} = 1.76$, S.D. 1.44, respectively). This reflected the positive behavior of the respondents in terms of marine conservation. Further details are showed in Table 3.

Table 3 Expectation of snorkelers related to snorkeling activity at Tarutao National Park (n = 322)

Snorkeler expectation	Expectation levels in snorkeling activity					\bar{x}	S.D.
	No (1)	Low (2)	Medium (3)	High (4)	Very High (5)		
1. Appropriate weather for snorkeling	2 (0.6%)	5 (1.6%)	53 (16.5%)	183 (56.8%)	79 (24.5%)	3.03	0.73
2. Clear sea water	1 (0.3%)	4 (1.2%)	13 (4.0%)	138 (42.9%)	166 (51.6%)	3.44	0.66
3. Water depth less than 1.5 meters	22 (6.8%)	50 (15.5%)	120 (37.3%)	103 (32.0%)	27 (8.4%)	2.20	1.02
4. Diversity and richness of marine life	4 (1.2%)	13 (4.0%)	61 (18.9%)	134 (41.6%)	110 (34.2%)	3.03	0.90
5. Clean water (no trash)	5 (1.6%)	9 (2.8%)	37 (11.5%)	110 (34.2%)	161 (50.0%)	3.28	0.89
6. Undamaged diving site	3 (0.9%)	13 (4.0%)	49 (15.2%)	126 (39.1%)	131 (40.7%)	3.15	0.89
7. No strong wind and waves	1 (0.3%)	11 (3.4%)	71 (22.0%)	145 (45.0%)	94 (29.2%)	2.99	0.82
8. Not crowded at diving site	2 (0.6%)	26 (8.1%)	105 (32.6%)	123 (38.2%)	66 (20.5%)	2.70	0.91
9. Learn about marine resources	1 (0.3%)	30 (9.3%)	84 (26.1%)	136 (42.2%)	71 (22.0%)	2.76	0.91
10. Take underwater photos	27 (8.4%)	58 (18.0%)	90 (28.0%)	90 (28.0%)	57 (17.7%)	2.29	1.19
11. Feed fishes	80 (24.8%)	83 (25.8%)	75 (23.3%)	55 (17.1%)	29 (9.0%)	1.60	1.27
12. Touch coral and other marine life	96 (29.8%)	47 (14.6%)	65 (20.2%)	66 (20.5%)	48 (14.9%)	1.76	1.44

Factors affecting snorkeler’s perception of the appearance of coral bleaching

The physical appearance of coral bleaching in terms of snorkelers’ perception of beauty was obtained to determine the impact of coral bleaching on snorkeling activity. It can be concluded that the perception of the beauty of marine resources was somewhat

split into about 50-50%. Snorkelers also gave opinions that even though the coral was not quite in very good shape, other marine life as well as clean and clear water made them satisfied with the snorkeling activity. Based on this information, it seems snorkelers consider clean and clear water as well as other marine life such as fish as important as coral condition.

A hypothesis was tested on factors related to the perception of beauty. The result is shown in Table 4. It revealed that factors statistically related to snorkeler's perception were: (1) nationality (Thais and foreigners) ($\chi^2= 36.075$; $df=1$; $Sig=0.000$), (2) perceived

information on coral bleaching ($\chi^2= 4.127$; $df=1$; $Sig=0.042$), and (3) knowledge of coral bleaching ($\chi^2= 7.971$; $df=2$; $Sig=0.019$). The other factors: age and education level, were not statistically significant.

Table 4 Factors affecting the snorkeler perception on the beauty of coral bleaching

Independent variable	Chi-square value	df	p value
1. Nationality	36.075*	1	0.000
2. Age	0.351 ^{ns}	2	0.839
3. Education level	2.701 ^{ns}	2	0.259
4. Perception of coral bleaching information	4.127*	1	0.042
5. Knowledge of coral bleaching	7.971*	2	0.019

Remarks: * Significant at the 0.05 level; ^{ns} Not significant at the 0.05 level

CONCLUSION

The results from the analysis of the questionnaire interview of 322 snorkelers at Tarutao National Park showed that most respondents were females aged 33 years and with bachelor degrees or higher. They traveled in groups of friends and spent about 3 nights in the park. The main purpose of the trip was to spend their holiday with friends and family members.

Coral bleaching did not significantly affect their decision to visit the park nor their snorkeling experience and satisfaction. Most snorkelers had little knowledge that Tarutao National Park had experienced coral bleaching and closed some of its snorkeling sites for visitor use. The majority of snorkelers did not notice any coral bleaching while snorkeling. From the t-test analysis, the study concluded that the snorkeling satisfaction was not correlated with both the coral bleaching observed and

information received on coral situation at the park. Instead, their expectations of the park were more of the quality of sea water, richness of marine resources, and the protection measures for the remaining coral reef from human activities. The results implied that the park authority with support from the tourism businesses should find ways to safeguard and maintain other tourism resources besides coral reef. These might include clean beaches, clear sea water, seascape and other esthetic values in the park. As well, the park should be aggressive enough to have snorkelers informed on the closure of snorkeling sites and its reasoning. As for the level of knowledge on the coral bleaching phenomenon, the snorkelers had a moderate scale. The park and tour operators should produce some appropriate interpretive materials on the values of corals, coral bleaching and its causes and effects to enhance visitor knowledge.

As for hypothesis testing, three factors, namely, nationality, perceived information, and coral bleaching knowledge, were significantly correlated with snorkelers' perception of the physical appearance of coral bleaching. This finding suggests that the management of snorkeling activity concerning snorkeler perception should be well aware of the differences in nationality, amount of information perceived, and status of snorkelers' knowledge on coral bleaching.

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