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Environmental Impact Assessment of Ecotourism on Mangroves

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Abstract

Ecotourism, to be successful, must promote sustainable development by establishing a durable productive base that allows local inhabitants and ecotourist service providers to enjoy rising standards of living. However, to achieve this goal, the adverse effects of visitor activity on the natural environment and the tourism experience must be identified to guide management actions and thus to sustain the resources on which ecotourism ultimately depends. This study, conducted in Iran, efforts to identify the impacts of ecotourism from the perspective of visitors. Environmental conditions of greatest influence on visitors' experiences included litter and biophysical conditions such as soil erosion and vegetation damage. These conditions were of greater concern to visitors than social conditions, such as the number of people. These results suggest that management efforts can be directed towards indicators of greatest concern such as litter, soil erosion and vegetation damage. The broad support given by those surveyed for a range of management actions provides managers with a choice of strategies to sustain ecotourism in Hara biosphere reserve in Iran. This study, with its sociopolitical approach, contributes to a greater understanding of the implications of the ecotourist experience for ecotourism management in Iran.

Keywords

Ecotourism, Environmental Impacts, Hara Biosphere Reserve, Iran

1. Introduction

Within the tourism industry worldwide, ecotourism is one of the fastest growing sectors [1]. The World Tourism Organization (WTO) has recently estimated that ecotourism is worth some $22 billion a year, and together with nature-based tourism, accounts for 22% of global international travel [2]. The promise of ecotourism is that financial benefits originating from the influx of tourist income may be employed to finance the provision and management of national attractions to conserve the natural resources that ecotourists so willingly pay to experience [3].

However, despite this mutually beneficial relationship between ecotourism and natural resource conservation, the impacts of ecotourism may also adversely affect the resources on which it depends. Therefore, it is essential to understand the potential effects of the expanding ecotourism sector on the natural environment, so as to identify management priorities for present and potential ecotourist destinations [4]. It is widely recognized that both the environmental conditions of natural areas and the quality of the ecotourist experience are influenced not only by the number of visitors, but by the impacts those users have on the ecological and social conditions [5]. In this way, visitors are at the centre of ecotourism management: they impact the natural environment and the tourism experience, while the quality of the experience is affected by the management actions necessary to ameliorate those impacts. Hence, users represent a valuable resource for gaining information about the presence and extent of impacts, the acceptability of environmental change, and the consequences of management actions for their experience.

The centrality of visitors is embodied in the approach

taken by the Visitor Impact Management (VIM) planning framework, which explicitly recognizes the value of both judgmental and scientific considerations for effective management of natural areas [6]. This recognition means that identifying the significance of biophysical and social impacts is necessarily value-laden, and as such, natural area planning and management must be recognized as a sociopolitical process [7, 8]. Therefore, rather than relying on technical assessment to determine carrying capacity and use-limits–an approach that has proved unworkable in addressing resource management problems [9]. The VIM approach is based on the principle that both the environment and the quality of the recreation experience are complex, and are influenced by a number of factors besides use levels. The VIM process thus incorporates a number of successive stages: review database (identify unacceptable visitor impacts); review management objectives; identify measurable indicators; select standards for indicators; assess current conditions of impact indicators; identify probable causes of impacts; identify a range of alternative management strategies; and implement selected strategies [6].

This paper reports on a study of visitors impacts in Hara biosphere reserve Hormozgan province in Iran. Specifically, the aims of this study were to:

i. Identify unacceptable visitor impacts from the perspective of visitors (step 1 of the VIM process);
ii. Identify potential indicators based on the impacts identified (step 3 of the VIM process);
iii. Identify visitors' support for potential management actions (step 7 of the VIM process).

The environmental impacts of ecotourism have been published by a number of writers. Some have focused on tourism in natural areas [9, 10], while others have taken a specifically ecotourism approach [4]. Of particular relevance to the study reported in this paper is a number of visitor impact studies conducted in natural areas [11, 12].

The benefits of ecotourism include an enhanced appreciation of natural environments, both in terms of their intrinsic and economic worth for protection and conservation; the educational value of exposing visitors and locals to nature and conservation; and the potential of ecotourism to motivate the designation of additional natural areas for conservation and protection [13, 14]. Conversely, pressures originating from inappropriately managed infrastructure and visitor activities can adversely impact the receiving environment. Negative impacts on terrestrial ecosystems include destruction of plant and wildlife habitats; soil and dune erosion; soil compaction; disruption of soil stability; alteration of geological regimes; disruption of nutrient cycles; and reduction in biodiversity. Further to these biophysical impacts, increased human presence may lead to disturbances such as litter, as well as air and noise pollution caused by vehicles [15-17]. Many biophysical impacts also adversely affect the visitor experience. Reference [18] have identified damage to the natural environment as one of the major detracts ants from the visitor experience. Additional impacts on such experiences include noise (human and mechanical), visual impacts (such as infrastructural developments and signs) and crowding. With respect to the latter, both overall numbers of people and group size are conditions identified as impacting on visitors' experiences in natural areas [9].

2. Study Area

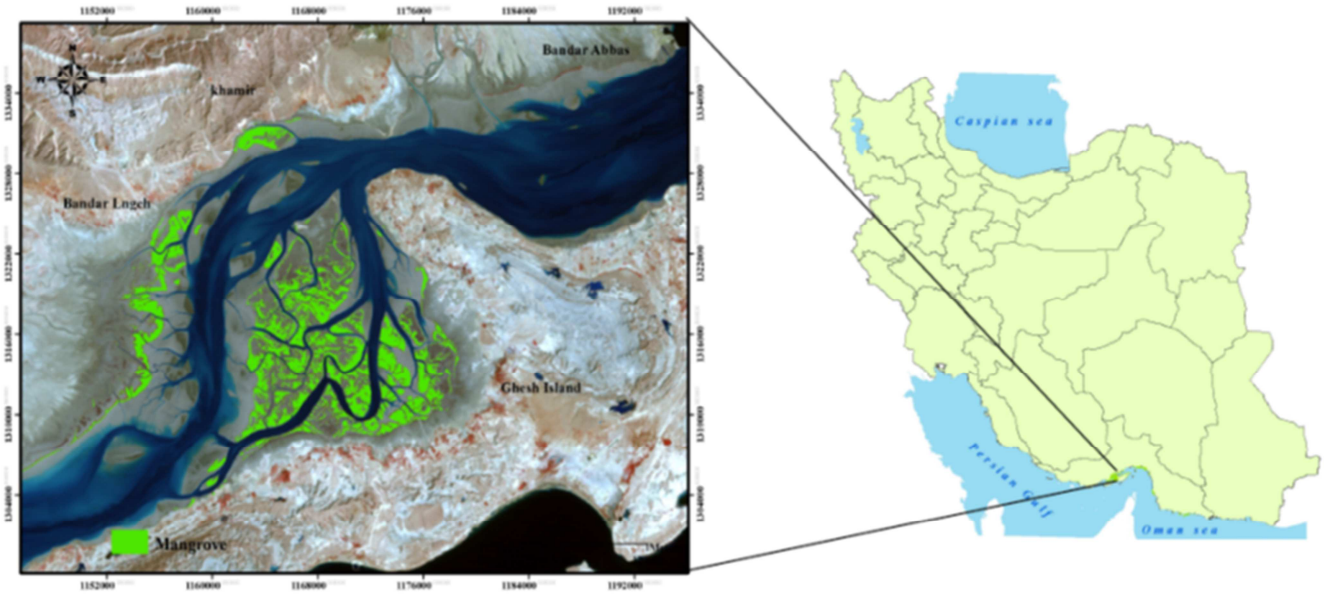

Figure 1. *Geographic location of Hara biosphere reserve in mangroves of Iran.*

Hara Biosphere Reserve with 85686 hectares areas is located in the south of Iran in the Straits of Khuran between Queshm Island and the Persian Gulf. The study area lies at 26°45' to 26°58'N; 55°30' to 55°50'E Situated in the Mehran River delta, it hosts the largest Avicennia mangrove along the Persian Gulf shoreline and, therefore, represents a centre of

biodiversity in Iran. The Strait of Khuran is also a Ramsar site, providing habitat to two globally threatened species: a wintering habitat for the pelican Pelecanus crispus, and a regular feeding place for the green turtle Chelonia mydas. In 2006, about 42,500 people lived in the area, mainly engaged in trading. Additionally, there are some palm tree plantations, animal husbandry and fishing activities and ship construction industries. Lacking freshwater supply and salty water intrusions constrain agriculture mainly close to the shoreline. Government owned, and administered by the Department of the Environment. The designated site includes 82,360 ha in Hara National Park, which was enlarged and upgraded from the 65,750ha Hara Protected Region established in 1972, and 85,360ha in the fully protected Hara Biosphere Reserve approved in June 1976. The unprotected areas in the east are threatened with degradation through illegal logging of the mangroves. Ramsar convention in 1975 has introduced 100,000 hectares of this region as on 23 June 1975 an international wetland and named it Khouran Straits [20]. Mangrove forests are 8000 hectare. For ecological reasons such as wetland environment, mangrove forests and biodiversity, this region has attracted many visitors and can be considered as the most spectacular regions of Iran for a unique coastal Seascape.

3. Methodology

This study was based on a literature review and questionnaire. The literature review identified the potential impacts of ecotourism as described in the previous section, which were then used to guide questionnaire development. The questionnaire was designed to gain information from visitors to Hara biosphere reserve. The sampling frame was limited to Wetland visitors. Visitors were asked if they would like to participate in the study, and if they agreed, were given a brief description of the study objectives. Visitors were chosen randomly and interviewed personally. The study was conducted with 200 questionnaires distributed by one on-site researcher.

A total of 178 responses were obtained from the 200 questionnaires distributed by on-site researchers, representing a 89% response rate. The questionnaire was written in Persian, and comprised three sections: visitor and visit characteristics; activities undertaken; and visitor perceptions of impacts and management strategies. The assumption underlying all aspects of this study is that information about and generated by, visitors is essential to the successful planning and management of natural areas that aim to sustain ecotourism. The first part of the questionnaire was designed to obtain demographic information, including age, length of stay, travel companions, gender and source(s) of information about the Wetland. The second part investigated the types of activity visitors participated in, and asked visitors to rate the importance of each activity from 'not at all important' to 'extremely important'. The third part focused on impacts and Wetland management. Respondents were asked to identify impacts they had observed, as well as impacts with the potential to affect both the Wetland itself and the experience of the visitor, even if they had no obvious effect at the time of the survey. These impacts were drawn from the literature surveyed earlier in this paper, including visitor surveys conducted in Malaysia [9], Canada [12] and Australia [8]. Visitors were also asked to rate specific management concerns, and to express the extent of their support for potential management strategies.

The survey data was collated and analyzed using several techniques: Minitab for Windows software for collation of data; percentage comparisons to provide a general overview of responses; and statistical z-tests to analyze changes in the numbers of respondents identifying observed and potential impacts.

4. Results and Discussion

4.1. Statistical Analysis of Questionnaires

In this study, males and females were equally represented within the sample of visitors surveyed. A large proportion of visitors were aged between 20 and 42 years (81%), results supported by studies conducted in America, which have found that wilderness visitors tended to be younger than the general population [21]. These results contrast with those of a 1998 study of ecotourists visiting five Latin American and Caribbean countries, conducted by the World Wide Fund for Nature, which found that the average age was slightly higher than that of 'leisure tourists' at 44 years [22].

Most of the visitors (51%) come from the neighboring Province of Boushehr and 17% are inhabitants of in Hormozgan. Forty-five percent of visitors stayed less than 24 hours in the Wetland. The extended length of stay of over half of all visitors signals an opportunity for the use of education as a potential management tool.

Visitors were asked about the motives for their visit to Hara biosphere reserve and to indicate the degree of importance of some given motives, using a 5-point Likert-scale (1 = not important; 5 = very important). The three most important motives were observing Wildlife, observing Landscape/Nature and Historical values. Percentage values of responses are shown in Table 1.

Table 1. *Visitors' motivation.*

Percentage of respondents	Motive
50	Observing wildlife
44	Observing landscape/Nature
40	Historical values
38	Cultural values
33	Adventure
29	Rest
24	Sport

Respondents were given a list of possible activities in Hara biosphere reserve and asked about their interest in practicing in these activities, using a 5-point-Likert-scale (1 = not interested and 5 = very interested). The top rated activities were observation of landscape and observation of flora and fauna, showing the visitors' high interest in nature

(Table 2).

Visitor perceptions of observed and potential impacts were examined to identify possible indicators for monitoring, based on the premise that conditions of importance to visitors themselves are the best indicators of factors likely to adversely affect visitor experiences [22, 24]. Impacts most frequently observed by visitors included soil erosion around the Hara, litter along the shore and smelly/discolored water (Table 3). Vegetation damage was also noted as current impacts by over 30% of the sample. In contrast to these biophysical impacts, only 5% of respondents perceived visitor numbers- a social impact- to be a current concern (Table 3).

Table 2. *Activity preferences of wetland visitors.*

Percentage of respondents	Motive
49	Landscape observation
44	Observation of flora
39	Observation of fauna
37	Boat trips
36	Beach
33	Photography
30	Swimming
28	Fishing
26	Camel riding

Table 3. *Visitor perceptions of observed and potential environmental impacts in Hara biosphere reserve.*

Impact	Observed	Potential	Comparison: Observed and potential
	Percentage of Respondents*		
Soil erosion	45	45	NS*
Litter along beach/shore	42	53	<0/01
Smelly/discolored water	37	37	NS*
Vegetation damage	33	36	<0/05
Litter around accommodation area	28	37	<0/01
Soil erosion at accommodation area	24	44	<0/01
To many people	19	40	<0/01

Percentages have been rounded to the nearest whole number and therefore do not sum to a total of 100% in all cases NS = Not Significant

For almost all of the impacts, a greater number of respondents expressed concern about the potential impact than the observed impact. Statistical analysis using z-tests indicated statistically significant increases at the 1% level for most impacts (Table 3). In particular, about five times as many respondents indicated that 'too many people' represented a potential impact compared with the impact observed. Soil erosion at the accommodation area was identified as potential impact by about double the proportion of visitors that had observed the impact. Differences between several other observed and potential impacts, namely wildlife attraction to bins and vegetation damages, were statistically significant at the 5ő level (Table 3). These results suggest visitors believe that this suite of environmental conditions is likely to worsen in the future. Such perceptions are probably based on previous experiences in natural areas combined with pessimism regarding the ability of managers to deal with such problems.

Soil erosion along shore and smelly/discolored water were the only two impacts where no statistically significant difference in respondent numbers was found for the observed and potential impact. For soil erosion, these results could be due to visitors' perceptions that the present severity of the impact means it is unlikely to get any worse. However, the results for water purity suggest a recognition that the observed problem is caused by naturally high tannin levels, which do not pose any health problems. Therefore, although water quality was identified as an impact, respondents did not consider it to be a factor influencing visitor experience of Hara biosphere reserve in the future.

When asked to indicate how they felt about environmental impacts in Hara biosphere reserve, respondents emphasized biophysical rather than social conditions, such as the number of people or groups encountered (Table 4). These results contrast with the assertion of reference [21] that social conditions generally affect visitor experiences more than natural conditions. However, the most important concern was litter, which is an indirect social (as well as a biophysical) impact. Thus, issues felt to be a problem by more than 52% of visitors (inclusive of 'slight problem' and 'serious problem') included litter around the wetland (67%), erosion around wetland (63%) and damage to natural vegetation (58%). These results are consistent with visitor perceptions of the hierarchy of potential impacts, where litter impacts were perceived as the most important issues (including litter along the shore), followed by erosion around wetland, and then vegetation damage (Table 3). The significance of litter as one of the most basic concerns of Hara biosphere reserve visitors is supported by the results of similar studies in Australia [23], Canada [12] and the United States [21].

These results regarding visitor perceptions of the impacts of tourist use can be used to identify potential indicators for monitoring environmental conditions in Hara biosphere reserve. This approach is based on the premise that the best indicators are the conditions of most importance to visitors. As such, litter, erosion around the wetland and damage to natural vegetation are potentially suitable indicators. These indicators are measurable, allowing standards to be selected and measured by managers (step 4 of the VIM process).

Table 4. *Visitor perception regarding environmental condition in Hara biosphere reserve.*

Impact	Observed	Potential	No problem	No response
	Percentage of Respondents*			
Litter around wetland	34	36	23	5
Damage to vegetation	21	35	30	7
Erosion around wetland	19	41	28	6
Health/condition wildlife	16	22	40	10
Number of people encountered overall	10	20	60	4
Size of group encountered	9	22	58	3
Number of manmade structure	7	20	64	5

*Percentages have been rounded to the nearest whole number and therefore do not sum to a total of 100% in all cases

4.2. Potential Management Strategies

Visitor attitudes to potential management actions can assist in predicting the consequences of specific actions on the ecotourist experience, and thus result in management actions that take into account both visitor satisfaction and ecological well-being [24]. All management strategies gained substantial support (Table 5), including 'direct' regulatory actions such as limiting wetland use and limiting the number of people, as well as 'indirect' actions such as education. Visitor support for education in the Hara biosphere reserve study replicates that found in Western Australian [8] and British Columbian [21] studies. Hara biosphere reserve users also supported the provision of maps and signs in the wetland, a strategy which was also supported by WA [8] and US [25] visitors. Hara biosphere reserve respondents provided less support and more opposition to 'providing more visitor facilities' than any other suggested management strategy (Table 5). These results are supported by surveys of visitors to natural areas in Australia and the United States, where visitor expectation has been reported to be for little or no development. Similarly limited support was found for limiting the length of stay, indicating that visitors see the possibility of these actions reducing the quality of their experience.

Table 5. *Visitor response to Potential management actions in Hara biosphere reserve.*

Management action	Support/Strongly support	Oppose/Strongly oppose	Neutral
	Percentage of Respondents*		
Education visitor more about conservation	81	4	15
Provide more maps and signs at different points for direction	58	10	32
Limit overall number of visitors	57	13	30
Limit use of wetland area	55	18	27
Limit number of people per group	52	15	33
Provide more stuff	47	7	46
Limit length of stay during peak periods	44	20	36
Provide more visitor facilities	41	32	27

*Percentages have been rounded to the nearest whole number and therefore do not sum to a total of 100% in all cases

5. Conclusion

Soliciting the views and preferences of recent visitors to Hara biosphere reserve enabled the identification of impacts perceived as significant by ecotourists. Most important were litter, erosion and vegetation damage, all visual impacts with the potential to reduce the natural experience ecotourism offers. Greater visitor concern regarding potential impacts, compared to observed impacts, indicates a perception that social and biophysical conditions in the Wetland are likely to worsen in the future. Management concerns identified by the majority of respondents- litter, erosion and vegetation damage - correspond to the identified impacts of concern. Therefore, these management concerns are potential indicators for monitoring visitor impacts in Hara biosphere reserve. Further research is required to complete the remaining steps of the VIM framework if it is to effectively guide ecotourism management in the wetland.

Respondents indicated strong support for management actions in general, including both educational and regulatory strategies such as controlling visitor numbers and limiting wetland use. Such broad support provides managers with a choice of direct and indirect strategies to address management concerns. Such choice is essential as effectively minimizing the environmental impacts of ecotourism requires a combination of planning and regulation, behavioral incentives and education [18].

One of the major challenges for the management of ecotourism is using interpretation and education to help visitors gain a better understanding of the natural environment of an area, thereby enhancing their experience and protection of the area. As reference [21] notes, visitors to natural areas provide a particularly good audience for information and education, and such approaches are ideal for conservation reserves because they do not directly alter the natural environment. In this study, 81% of respondents indicated the importance of learning about nature as part of

their experience, suggesting that visitors to Hara biosphere reserve would be highly receptive to educational strategies.

The findings of this study also have implications for conservation management. The notable support for direct as well as indirect management actions implies that visitors generally recognize that overuse of wetland and overcrowding have the potential to further degrade natural areas, and hence are inclined to support restrictive measures. These results also suggest that visitors are likely to accept strategies for limiting access to wetland where, for example, erosion and vegetation damage require the implementation of rehabilitation strategies. Further, over 88% of Hara biosphere reserve visitors felt that being close to nature and observing nature/wildlife were important or very important. These results reinforce the value of Hara biosphere reserve for passive conservation-related activities and imply visitor support for conservation-oriented management.

The potential for increased numbers to adversely impact on visitor experiences also has implications for future wetland management, especially 'visitor displacement' [18]. This process, as visitor densities increase at a particular site and the characteristics of an area change in consequence, the nature-based experience is gradually replaced by activities such as sport or outdoor socializing [26]. As such, the type of people visiting the area changes because visitors who become dissatisfied with the changed experience will not visit again. This phenomenon has implications both for the future of ecotourism with respect to preserving the natural integrity of wetland, and for the challenge of monitoring the quality of visitor experience as visitors and their requirements and expectations change [16].

In conclusion, this study represents one of the first efforts to identify the impacts of ecotourism and associated indicators in mangroves of Iran, from the perspective of visitors. This work provides the foundation for a comprehensive framework for managing visitors in Hara biosphere reserve. More generally, the sociopolitical approach taken in this study contributes to a greater understanding of the implications of the ecotourist experience for ecotourism management in the natural environments of Iran.

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