Marine Policy 68 (2016) 100–107

Contents lists available at ScienceDirect

Marine Policy

journal homepage: www.elsevier.com/locate/marpol

Sustaining marine wildlife tourism through linking Limits of Acceptable Change and zoning in the Wildlife Tourism Model

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ARTICLE INFO

Article history:
Received 7 January 2016
Received in revised form
18 February 2016
Accepted 19 February 2016

Keywords:
Wildlife Tourism Model
Diving
Ecotourism Opportunity Spectrum
Management
Zoning
Sustainability

ABSTRACT

Marine wildlife tourism can benefit both conservation and communities when managed effectively. The Wildlife Tourism Model (WTM) is a framework used to assess sustainability. This paper illustrates how two aspects of the model, the Limits of Acceptable Change (LAC) and zoning can be linked to improve management direction. Four of the nine steps of the LAC process were applied to identify sustainability concerns about Scuba diving in five Azorean islands and to propose standards of acceptable limits. Qualitative and quantitative survey data were used as well as descriptive indicators. Stakeholder interviews identified main concerns (step 1). Case study islands were described according to the Ecotourism Opportunity Spectrum (step 2) and indicators were selected (step 3). Indicators were measured with the help of gap analysis based on a diver survey (step 4). The islands demonstrated differences in access, infrastructure, diving attractions, clientele and satisfaction levels suggesting two zone types. Results show that perceived and descriptive indicators are valuable input variables for the LAC process and LAC can be related to zoning as suggested by the WTM.

1. Introduction

Marine wildlife tourism has the potential to provide significant benefits to both local communities and conservation when it is carefully managed [1]. At a time when marine ecosystems are increasingly under pressure and fisheries declining [2–4], coastal and marine tourism remain one of the largest and fastest growing segments of the global tourism market [5–7]. However, herein lies the essential management problem. Conservation can benefit from the income derived from coastal and marine tourism activities as fishing dependent communities turn to less extractive, tourism-based sources of income generation. However, conservation values can also be highly impacted if those tourism activities are not planned and executed effectively to foster sustainability [8–12]. The Wildlife Tourism Model suggested by Duffus and Dearden [13] has been widely used as a framework to assess the sustainability of marine wildlife tourism including whale watching [14,15], sharks [16], birds [17], manatees [18] and diving [14]. The study reported here relates to the sustainable management of diving, but applies two aspects of the model that have previously received virtually no attention, but are potentially the most important, application of the Limits of Acceptable Change (LAC) framework and its link to spatial zoning and the Recreation Opportunity Spectrum (ROS). The paper contributes to the continued development of the model through this application and also makes specific recommendations based on a case study of scuba diving on the Azores.

2. Conceptual frameworks

2.1. The Wildlife Tourism Model

The Wildlife Tourism Model [13], first developed in relationship to whale watching, is recognised as being the most commonly used wildlife tourism management framework [19]. The framework (Fig. 1) synthesises several different theoretical approaches. It uses the Butler curve of resort development [20] to show how a wildlife attraction can pass through several stages as use grows and how the increasing impacts of visitation can lead to the demise of that particular attraction. Wildlife-based tourism is particularly susceptible to this progression, due to its popularity, and this outcome, due to the frequent vulnerability of the attraction. Duffus and Dearden [13] observed that as visitation increases there is also a change in the type of clientele attracted and this has many implications for management. Using Bryan's specialization

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http://dx.doi.org/10.1016/j.marpol.2016.02.016
0308-597X/

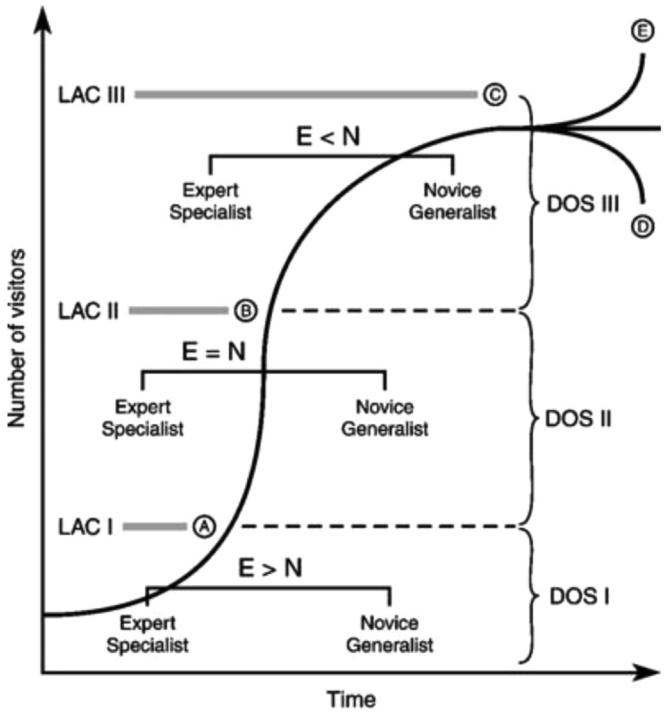

Fig. 1. The relationship among users specialization, Limits of Acceptable Change (LAC I–III) in the stages of evolution of a wildlife tourism site (A–E) over time [after 13, 23]. The diver opportunity spectrum (DOS I–III) is used as a basis for matching dive site characteristics with specialization levels.

theory they proposed an initial tourist clientele composed mainly of more highly specialised participants, who have the knowledge and impetus to find out about new attractions, that over time becomes displaced by an increasingly generalist clientele. As the latter occur in greater numbers, often have higher impacts and are willing to pay less for the activity, this progression is often not of benefit to conservation [21]. Many studies have documented these changes in clientele over time at wildlife attractions [22,16] and this has been the dominant use of the model.

Duffus and Dearden [13] suggest that unless management is applied then there is a certain inevitability about the outcome. The key to effective management is to determine explicit objectives for the site. For example, is this a fragile and rare phenomenon where the target market will be a smaller number of higher-paying participants (A in Fig. 1) or a resilient site that can accommodate large numbers of participants (e.g. C in Fig. 1), or somewhere in between (e.g. B in Fig. 1). The challenges then is to determine the Limits of Acceptable Change (LAC) that should be ascribed to that site to enable those objectives to be met and development of indicators, standards and monitoring systems to achieve those LACs.

2.2. Limits of Acceptable Change

Stankey et al.'s [24] *Limits of Acceptable Change* framework has been used to monitor nature-based tourism activities by identifying standards of quality and placing emphasis on positive planning and management anticipating over-use e.g. [11,25–29]. The Secretariat of the *Convention on Biological Diversity* and IUCN recommend it as a control mechanism for tourism in natural and protected areas in part due to its potential to achieve a sustainable balance between environmental and social needs [30–32].

The LAC framework is similar to the concept of carrying capacity that establishes the number of recreationists that an area can sustain without sustaining ecological damage or impairing the recreation experience. However researchers realised that it is not only the numbers of visitors that create impacts but also other factors, such as their behaviour. In response the approach to managing impacts changed to setting targets for the amount of change allowed in particular settings and developing monitoring to assess these changes. The LAC approach is now used widely in management of recreation settings e.g. [1,11,13,27–29] and this paper shows how LACs can be applied to the management of scuba diving activities.

LAC focuses on setting targets for the amount of change allowed in particular settings and on developing monitoring to assess these changes [33]. Appropriate limits are determined to meet the objectives through the establishment of indicators, standards and monitoring programmes. The process of establishing LAC identifies desirable (and achievable) social and ecological conditions, assesses current conditions, identifies management actions, and monitors and evaluates implemented management actions [24]. Both physical indicators and users' perceptions are potential input sources of social indicators and their acceptable thresholds.

The original LAC process involves nine steps: (1) identification of the area of concern and related issues, (2) definition of opportunity classes or zones, (3) selection of indicators of resource and social conditions (as they apply to classes or zones), (4) inventory of resource conditions, (5) specification of standards for resource indicators, (6) identification of alternative opportunity class allocations, (7) identification of management actions for each alternative, (8) evaluation and selection of an alternative, and (9) implementation of actions and the monitoring of conditions [24].

Of particular interest in this study are the first four steps of the LAC process. In the first step main issues and concerns are identified, such as features needing special attention or managerial problems that have to be dealt with. In this step usually the opinion of stakeholders and public is gathered. The second step implies the definition and description of the (recreation) activity with its conditions and resources according to opportunity classes. In the third step indicators are selected that represent specific elements of the biophysical and social setting conditions and are deemed to be appropriate and acceptable in each opportunity class. The fourth step requires an inventory of resources and social conditions, through the measurement of indicators identified in the previous step.

Most studies applying the LAC framework use either descriptive e.g. [27] or perceived indicators e.g. [28,34,35]. Limited research on LAC applications has integrated both biophysical descriptive and perceived indicators [11,30]. In this study management zones are determined with the help of LAC through the measurement and analysis of social and biophysical indicators providing practical management suggestions for a relatively new and quickly growing dive industry in the Azores. Only Roman et al. [11] have previously used LAC in scuba diving management applications and their application was at a very site specific level. The current study explores the use of LAC to distinguish amongst different islands in the Azores archipelago at the mesoscale. The approach can also be applied to other marine tourism activities elsewhere.

2.3. Recreation Opportunity Spectrum (ROS)

The WTM suggests that in the absence of management interventions wildlife tourism sites will progress along the curve and foster increased displacement of specialists by generalists. In many cases, as suggested above, this may not be desirable and it may be beneficial to retain the full range of recreational opportunities within a site or region. An early manifestation of this variation in settings, infrastructure, access, social attributes and management needs was the Recreation Opportunity Spectrum (ROS). This approach divides a landscape into zones along a continuum from