

## **Introduction**

Indonesia has established the most extensive system of protected areas in southeast Asia, with a total of 375 national parks, nature reserves, wildlife reserves, nature recreation parks and hunting parks covering 165,000km<sup>2</sup> or 8.5% of the land area and 45,000km<sup>2</sup> or 0.8% of the territorial marine area [1]. Management of protected areas rests with the Directorate General of Nature Protection and Conservation (PKA), which is responsible for planning the network of protected areas, drafting appropriate conservation legislation and implementing management programmes for individual protected areas. Under the Conservation of Living Natural Resources and their Ecosystems Act of 1990, management programmes in the 39 national parks of Indonesia are directed towards preserving biodiversity whilst allowing for sustainable use of natural resources by the local population.

The ability of the PKA to fulfil these obligations has been severely affected by the devaluation of the rupiah in 1997, which was reflected in a 40% reduction in funding for all national parks to a total of \$US 5.7 million in 1998 [1]. Furthermore, continuing political and economic instability has also undermined foreign income derived from tourism, with annual receipts decreasing by 24% to just over \$US 4 billion between 1995 and 1998. The establishment of marine national parks or MNPs are seen as one means by which these problems may be addressed through designing appropriate policies to conserve the marine environment whilst also generating economic benefits through tourism. With over 17,000 islands and 55,000 km of coastline [2], the marine resources of

Indonesia represent a potentially lucrative focus for nature based tourism or ecotourism, capitalising upon the range of recreational attractions associated with the wide diversity of marine life in coral reefs and lagoon environments.

However, the threats to nearshore marine ecosystems and coral reef environments in particular are acute throughout southeast Asia, including dynamite and cyanide fishing, mining of coral for construction purposes, felling or clearance of mangroves for fuel or mariculture, pollution from coastal settlements or sedimentation problems associated with logging and erosion [3]. These problems may be exacerbated by the potential for damage to coral reefs from anchors and divers themselves in intensively used tourism destinations [4,5].

Many studies have been conducted which highlight the institutional and practical problems affecting management of marine resources in Indonesia and elsewhere in southeast Asia [6,7]. Institutions based upon community-based management or co-management of coastal resources are increasingly cited as means by which marine environments can be managed in a more cost-effective manner [8,9] This study is directed towards identifying management issues in a newly established marine national park in eastern Indonesia with particular reference towards the potential to address these through the incorporation of local economic and cultural factors into management. This may benefit managers through strengthening the economic viability of the park whilst also establishing the foundations for a more community-based approach to park

management, thereby generating an increased acceptance of the need for a marine protected area amongst resident communities in this region.

## **Introduction to study area**

The Wakatobi Marine National Park, located in southeast Sulawesi, Indonesia (figure 1), and is one of the largest and newest areas to be designated under this category, receiving official recognition in 1996. The park encompasses the four major islands of Wangi-Wangi, Kaledupa, Tomia and Binongko which support a total of around 80,000 people, as well as sixteen smaller uninhabited islands and atolls. The average monthly temperature in this area varies from 28°C to 31°C, with a warmer dry season extending from August to November and an annual precipitation of around 2600mm. The marine environment includes extensive fringing shallow water coral reef systems and reef walls which descend to around 200m depth. The limestone islands, formed through uplift of fossil coral reefs, are relatively low-lying, with a maximum elevation of 400m on the island of Wangi-Wangi.

The long history of human settlement in this area has resulted in virtually all the original forest cover being replaced by secondary regrowth or plantations. Sweet potato and maize are the predominant food crops grown in the islands alongside small scale cultivation of cash crops such as coconuts, cashew nuts and cocoa. The scale of all agriculture is limited by the poor quality of the sandy soils and water shortages during the

dry season. Most households own small numbers of chickens and goats, with duck and, less frequently, cattle being raised.

Arable and pastoral activities are mainly practised by the Wakatobi ethnic group, which constitutes around 92% of the islands' population. The other group in the area are the Bajau or 'sea gypsies' who are scattered throughout coastal environments of southeast Asia. These communities rely almost exclusively on marine resources for food, fuel and building materials, whilst engaging in small scale trading of surplus fish catches with the Wakatobi.

Proposals to establish a marine protected area in this region arose principally as a result of the threats to marine biodiversity associated with the increasing local use of destructive fishing practices due to competition with outside fishermen [10] which was highlighted through marine survey work undertaken by overseas non-governmental organisations (NGOs) in the early 1990s. These plans were further justified through reference to the historical significance of the region in connection with the studies of Alfred Russel Wallace, in addition to the potential income which could be generated from ecotourism in this remote area of Indonesia. The perceived urgency of the need for protection resulted in the park receiving official status within 3 years of the initial proposal by the regional governor in 1993.

The purpose of this paper is therefore to provide an overview of issues as voiced by park authorities and local residents with respect to the present management and future development of the region. These will be used to suggest ways in which managers and

local inhabitants may work together in the future in order to facilitate the progress towards sustainable resource use and allow a greater degree of local participation in conservation and management.

## **Field research**

To this author's knowledge, no academic studies of the management of the Wakatobi Marine National Park have been published to date. Field research was therefore directed towards identifying management issues through discussion with key informants and local residents which was carried out over a four week period in July 2000. The first phase of the research comprised a series of semi-structured interviews with the head of the park, the chief of conservation and a total of 10 park rangers. These explored themes relating to the designation of the park and the extent of local involvement, the nature of threats to marine resources in the park, the responsibilities of park management and rangers with regard to enforcement and education, the potential role for local communities in park management and the future development of the park with reference to tourism and conservation of fish stocks. Interviews were also conducted with the owners of the tourism facilities currently operating in the park which focused upon the extent of tourists' interaction with local communities and the nature of any perceived problems associated with the presence of tourists in the area.

The perceptions of local residents with regard to these topics were explored through similar interviews with key informants including village heads, elders and local

fishermen on the islands of Kaledupa and Tomia. As tourism within the park is currently limited to operations on these two islands, it was felt that these communities would be suitable research foci within which perceptions of the national park and its management could be assessed. Whilst logistical factors prevented the cross checking of this assumption through interviews with residents of other islands, the unanimity of views expressed during these discussions implies that the information presented is a representative summary of local opinion with regard to these issues. Qualitative information regarding fishing activity was also collected through a questionnaire survey of 40 fishermen from a total of 8 villages on the island of Kaledupa. This was designed to supplement the qualitative information obtained from interviews with data regarding fishing activity, views on the stability of fish stocks, individual perceptions of park rules and regulations and the extent of community interaction with park rangers. All interviews were conducted in informal settings in local communities, with resident islanders being employed as translators. In the case of the Bajau, a local Bajau individual was employed in order to ensure questions were phrased in the Bajau dialect and in an appropriate cultural context.

## **Discussion**

### **1) Designation of the national park and usage of marine resources**

The Wakatobi Marine National Park employs 55 staff, 15 of whom undertake administrative duties in the central office located in the town of Bau-Bau on the mainland

of Sulawesi, approximately 100km west of the island of Wangi-Wangi. The remaining 40 staff are employed as park rangers in permanent bases on each of the four major islands.

A management plan for the Wakatobi Park is currently being prepared by Bogor Agricultural University in Java which, following national guidelines drawn up by the PKA in 1993, must comprise three volumes incorporating the framework for management, background biological data and a site plan [11]. A summary document and a zoning scheme for the park have been completed to date. The zoning scheme conforms to national standards concerning the definition of zones and the nature of resource use appropriate to each and these are summarised in figure 2 and table 1.

Table 2: Permitted activities in zonation plan for Wakatobi Marine National Park

<b>Activities</b>	<b>Buffer zone</b>	<b>Traditional usage zone</b>	<b>Rehabilitation zone</b>	<b>Wilderness zone</b>	<b>Core zone</b>
<b>Research and education</b>	4	4	4	4	4P
<b>Tourism</b>	4	4	4	4	5
<b>Building construction</b>	4	4	4P	5	5
<b>Traditional fishing activities</b>	4	4	5	5	5

P indicates permit required from National Park central office

Traditional fishing activities comprise hook and line, gill netting, spear fishing, fish traps, hookah compressors and manual collection of reef species at low tide

Other activities or fishing methods are not permitted in any area of the park

Interviews conducted in this study revealed a complete lack of local involvement at all stages of park designation from initial survey work through to designation and subsequent planning of resource usage. Such a picture, whilst not atypical in Indonesia, has not been evident in recent studies of other Indonesian marine national parks such as Taka Bone Rate [12]. The lack of public participation during the delineation of park boundaries and usage zones is frequently cited as an important factor contributing towards a low degree of local commitment to protected areas, which in turn leads to difficulties in ensuring the sustainable use and conservation of park resources [13]. An analysis of the situation affecting the establishment of protected areas in Indonesia, and the eastern islands in particular, indicates that a range of political, institutional, legislative and financial constraints may contribute towards the emphasis on ‘top-down’ as opposed to collaborative approaches as demonstrated in the Wakatobi.

The Indonesian government has stated its commitment to designate 300,000km<sup>2</sup> of marine and coastal environments as protected areas by the end of 2000 [14]. Whilst this is partly in response to pressure from (mainly overseas) environmental NGO’s, such areas are potentially financially lucrative both through catering to the growing ecotourism market and as a means by which environmental conditions attached to the disbursement of loans to the national government may be met [15]. Given these driving forces, it is likely that the less populated and relatively pristine coastal environments in the eastern islands of the archipelago will be the subject of future protected area designations. However, delays in park implementation are most often found to reflect the requirements of local consultation exercises [16]. Given the political pressure to designate protected

areas and the associated increase in the workload of the provincial PKA offices in the eastern islands, it is evident that the need to integrate consultation into park designation may easily be relegated to an issue of minor importance in the future.

Various institutional factors may be identified which further restrict local consultation in park management. The PKA, as the lead authority in protected area management, operates a policy whereby all new staff undergo the same training programme regardless of whether they are to work in marine or terrestrial protected areas, and are subsequently rotated on a regular basis throughout Indonesia's network of protected areas.

Consequently, the diversity of stakeholders and range of conflicts of interest inherent in managing marine protected areas may not be fully recognised by PKA staff, which may partly explain the low priority accorded to consultation which became evident during interviews conducted in this study.

The legal requirement on behalf of the PKA to produce lengthy and detailed management plans for protected areas cited earlier will add to the demands upon PKA resources and thereby increase the role of outside agencies involved in plan production, which will evidently not be conducive towards local participation. It is instructive to note that the completion of management plans fulfilling these criteria have often been dependent upon the provision of aid and assistance through foreign-based NGOs as in the cases of Bunaken and Taka Bone Rate Marine National Parks [11,12]. Such organisations are not currently involved in the Wakatobi Park, with NGO activity being limited to village-based community development work and, unless this situation changes, it is difficult to

see how local contribution to management plans can be enhanced. Furthermore, these financial restrictions have been considerably exacerbated following the economic difficulties currently afflicting the nation.

These factors may have combined to varying effect in restricting the opportunities for prior consultation with local communities and participatory decision-making during the designation of the Wakatobi Marine National Park. The zonation plan may therefore conflict with traditional uses of marine resources as practiced by the local community, thereby hindering its effectiveness. This was explored through identifying the fishing areas used on a daily basis by Kaledupan fishermen as part of the questionnaire, which are illustrated in figure 3. This confirms that there is a heavy reliance on coral reef flats adjacent to Kaledupa for daily fishing needs, which reflects the limited range of the small sailboats or sampans which are used by the majority of fishermen. The fact that these areas lie within the wilderness and rehabilitation zones and are therefore theoretically out of bounds to local fishermen serves to underline the consequences of excluding local communities from the planning process and the difficulties faced by park management in enforcing its rules.

However, there are options through which these problems may be alleviated. The Bajau population have been highlighted elsewhere as important potential local managers of marine protected areas on account of their extensive local awareness of fish spawning grounds and trends in fish stocks [14]. Inclusion of indigenous knowledge in the management plan could therefore enhance the viability of proposed zonation schemes.

Furthermore, interviews with local fishermen conducted during this study highlighted the existence of traditional no fishing grounds which are believed to be inhabited by ancestral spirits and are therefore avoided. This practice may be comparable to the *sasi* system commonly observed in the Moluccan islands of eastern Indonesia which places periodic restrictions upon access to fishing grounds [17, 18]. These have been recommended as a basis for devising modern zonation plans which are acceptable to local communities [9] and could evidently play a similar role in the Wakatobi park. However, this information will be difficult to incorporate into large scale zonation schemes such as that currently applying to the Wakatobi park. This underlines the need to adapt the zonation plan in order to produce simple large scale maps appropriate to local fishing communities, preferably including reference to land features which may be easily identified as boundary markers.

## **2) Enforcement**

Problems of adequate staff levels and resources are commonly cited issues affecting management of many protected areas in Indonesia [4]. The Wakatobi park is no exception, with park managers and rangers expressing the opinion that their ability to catch offenders was limited by these problems. The most recently available data indicates that a total of US\$89,272 was allocated to the Wakatobi park in 1998 [1]. Whilst this sum is comparable to the funds received by other marine national parks, the scale of the Wakatobi park means that this equates to approximately US\$6 per km<sup>2</sup>, as opposed to US\$86 per km<sup>2</sup> in Bunaken Marine National Park. The inadequacy of resources available to rangers is reflected in the fact that only two boats are available at any time in the park, severely restricting the ability to mount regular or effective patrols.

These problems relating to enforcement led to two negative perceptions of park rangers on behalf of local residents interviewed. The first of these was that the rangers were ineffective, particularly when local residents had reported incidents which had subsequently not been acted upon. Furthermore, there was a strong feeling that enforcement was directed unfairly at local fishing communities, despite the fact that both rangers and local fishermen agreed that the decline in fish stocks was due primarily to destructive fishing practices and trawling carried out by fishermen from outside the National Park. Interviews with fishermen indicated that the most common fishing method was the traditional hook and line technique which was used by 80% of interviewees. This was often employed in conjunction with gill nets (46%) and spear fishing (20%), although the latter was mentioned only by Bajau interviewees. The reliance on traditional

techniques and the common perception that destructive fishing practices are employed by outside fishermen may underlie the perception that rangers are unduly concerned with the activities of local fishermen. These circumstances led to a suspicion within the fishing community that the rangers may be susceptible to undue influence from economically and politically powerful fishermen from outside the area who were seeking to use banned fishing practices within the park.

A further issue receiving widespread complaint from fishermen relates to the regulations regarding the use of hookah compressors, which are similar to simple scuba devices. These enable individuals collecting benthic fauna such as sea cucumbers and lobsters to collect far greater numbers than those relying upon fish traps or reef gleaning at low tide. However, there is a strong perception that these devices, which are classified as traditional techniques and are therefore permitted within usage zones, are used in conjunction with banned destructive techniques such as cyanide or dynamite fishing. Furthermore, the use of compressors generates opposition on the grounds that those fishing from the surface are disadvantaged due to the disturbance of fish at depth by divers, particularly through the use of underwater torches when night fishing. Fishermen also voiced concern over the consequences to nearshore fish stocks resulting from divers disturbing fish gathering to reproduce in offshore areas. It is interesting to note in this context that the Bajau community has demonstrated a capacity for self regulation in terms of fishing techniques, several interviewees mentioning the exclusion of individuals from the Bajau village who had continued with the use of hookah compressors against the wishes of the wider community. It appears that the banning of the hookah compressor,

which has also been recommended on ecological grounds [19] would be a useful step towards gaining community support for park rules and thereby bridging some of the gaps between the park authorities and the resident fishing communities.

### **3) Education and awareness**

Educational and awareness-raising exercises are an essential part of recommended management activities [20] and are considered to lead to environmental and economic benefits to managers whilst simultaneously empowering local communities if they are implemented effectively [21]. Managers and rangers interviewed in this study both expressed the conviction that education of the local community was a vital part of the park's responsibilities in order to increase awareness of park rules and it was felt that their efforts had been successful in this respect. These have been conducted through community meetings in public spaces such as village halls, which concentrated on explaining which activities were now forbidden under park rules. Door to door visits within communities were also carried out, particularly with respect to known offenders, whilst pictorial material illustrating restricted species have been distributed to schools.

Interviews with local fishermen confirmed that a high proportion of those interviewed (70%) were aware of the existence of the park, the majority citing park rangers as the source of information. However, many indicated that personal contact with park rangers had virtually ceased since 1997, which could reflect the need to prioritise activities in

favour of enforcement following budgetary cutbacks associated with the devaluation of the rupiah in 1997.

The majority of interviewees expressed their awareness of the park rules with reference to the existence of core zones where fishing was excluded, although few were aware of where such restrictions applied, which could reflect the absence of recent educational programmes in the area. However, all were aware of the bans upon dynamite and cyanide fishing, which is prohibited throughout Indonesian coastal waters. With respect to individual species, all interviewees correctly identified turtles as being a protected species, whilst 85% recognised giant clams and napoleon wrasse as similarly protected. Fewer individuals recognised the horned helmet shell (44%) and coconut crab (32%) as being protected, although this may reflect a lack of individual association between the names of species used in this survey and their visual appearance.

These results indicate that whilst it is the stated intention of the park authorities to use educational programmes in order to raise awareness of park rules, this results in a greater awareness within local communities of restrictions upon resource use rather than the potential benefits which could accrue as a result of the designation of the park. Whilst the main priority of the park authorities is to conserve the marine environment, this should be coupled with training in alternative income-generating activities in order to compensate for the loss of access to resources. It is an accepted tenet of marine national park management that if such a programme is not implemented, then support for the park's

activities will be short lived and could generate deliberate non-observance of park rules [16].

#### **4) Realisation of park benefits by local communities**

##### *a) Tourism*

The establishment of protected areas in remote parts of Indonesia is intended to capitalise upon the increased potential for nature based tourism or ‘ecotourism’ which can broaden the economic base of these areas and raise awareness of the need to conserve natural resources within local communities [22]. It is therefore necessary to examine how tourism is currently being promoted and managed within the Wakatobi park in order to ascertain the extent to which this can help achieve the aims of conservation and generation of economic returns to local communities.

The development of tourism in the area covered by the park dates from 1995, when a resort catering for the upmarket international diving community was established on the island of Tomia. This facility operates for 9 months each year and currently has the capacity for 22 visitors who stay for a set period of 11 days at a cost of around US\$2000 per capita, the majority originating from the United States. Since the park’s designation, another destination catering for ‘research tourists’ [22] has been operating on the island of Hoga off Kaledupa. This is primarily geared towards university students from the United Kingdom who pay approximately £2500 per capita for a 6 week placement on the island, during which time a range of scientific and community-oriented work opportunities are offered. The facility has grown since 1996 to cater for a total of 300

people in 2000, with a maximum of around 80 individuals being present at any one time in the peak period from July to September.

The impacts of tourism with respect to local communities are frequently classed into economic, social, and environmental categories [23]. These will be examined in order to illustrate how such operations in the Wakatobi are meeting the needs of local communities and provide recommendations for future developments in this area.

The economic impacts of tourism on local communities can be classified as direct impacts, involving money spent by tourists on local produce, indirect impacts relating to the provision of goods and services to the tourist industry and induced impacts associated with the multiplier effect of an increased amount of money in the local economy [24]. In the case of Tomia, the most significant impact relates to the employment of 22 local individuals in the catering and maintenance sector. Little locally-produced goods and services are utilised, owing to the preference of visitors for a Western-style diet, whilst land rental is paid to a local absentee landlord. Given this situation, the economic benefits accruing to the local community are limited due to the small scale of the enterprise and the nature of its operation.

The social benefits of tourism in Tomia are similarly restricted, with interaction between visitors and the local communities being limited to occasional guided tours of the nearest village. Furthermore, the presence of the tourist operation is a source of division within the local Wakatobi and Bajau ethnic groups, as the latter expressed dissatisfaction over

the perceived emphasis on recruiting Wakatobi people for employment within the facility, despite stated efforts to the contrary by the tourist operators. There was also concern voiced by local residents over the environmental impacts of untreated domestic waste from the tourist facility, which is discharged directly to sea and affects downdrift communities.

The other tourist operation in the park is a larger scale enterprise and places much emphasis on its close involvement with the local community. Direct economic benefits accrue to the nearby villages on Kaledupa through the employment of 29 local people and the rental of land and purpose-built accommodation from local landowners. Analysis of records for the 1999 financial year indicated that the direct annual spend amounts to the equivalent of the local average wage of 150 people. Indirect and induced economic benefits are also encouraged through the sourcing of locally produced supplies from a large number of local farmers and fishermen. Investments are also made in the building of artificial reefs and fish aggregating devices as part of a programme to reduce fishing pressure on the coral reef between Hoga and Kaledupa. There is a high potential for positive social interaction between visitors and local residents, both in a casual sense through the employment of local people and through the community-oriented projects offered by the operators, which frequently entail the placing of visitors in local family homes for the duration of the project. Whilst domestic waste from the larger buildings is recycled or burned, the nature of the privately built accommodation results in some domestic waste being channelled into nearby fissures in the limestone of the island, which could pose a longer term environmental problem.

It is not possible to draw direct comparisons between these two examples of ecotourism within the park, which cater for particular niches in the market and thereby operate on differing principles. In light of the fact that both are owned by foreign organisations, there will inevitably be a significant leakage of economic benefits overseas and it is difficult to see how this situation will change in favour of local residents in the future owing to the capital and organisational requirements of establishing viable ecotourist operations catering to an expanding global market in such a remote area. Tourism in this area may well expand in the park in the future with the pending completion of a runway capable of accommodating small chartered jets on the island of Tomia. This is being developed initially for the benefit of the Tomian tourist facility, but the operators indicated that it could be used by other similar companies in the future. It therefore seems that the extent of local involvement in ecotourism in a park catering increasingly for upmarket visitors will be restricted.

However, there is also a continuing expansion of the research tourism facilities on Hoga, which places a high emphasis on ensuring local community involvement. Despite many local Kaledupan interviewees being unaware of the purposes of the research orientation of this operation, all were in favour of its continuing development in light of the economic benefits opportunities this presented. However, there was some resentment in more outlying villages that they were not able to participate in these benefits, which is reflected in the fact that over 80% of the local employees originate from 5 nearby villages. In addition, there was concern amongst elders in the local Bajau fishing village

that Bajau employed by the operation were in danger of losing touch with the local community and, in particular, abandoning their traditional beliefs and cultural values through close contact with western visitors. The fact that such concerns were present involving such a small scale operation where particular care was being taken with respect to the interaction with local communities highlights the importance of ensuring equitable economic benefits and observing local cultural traditions and values.

The above case studies of tourism in the Wakatobi park indicate that these activities are small scale at present and at best are benefiting a very small proportion of the local population. It is unlikely that the scale and number of tourist facilities will expand markedly in the near future, given the remote nature of the area which presently necessitates a minimum of 2 days travel on local ferries from the domestic airport at Makassar (formerly known as Ujung Pandang) to the nearest island of Wangi-Wangi. This is an advantage in one sense as it is apparent that the ability of park management to influence the development of tourism in favour of local communities will be restricted by the restrictions upon funding and resources outlined previously. However, park authorities are anxious to promote tourism within the park and view both present examples of tourism as beneficial to the future existence of the park. This is reflected in the fact that, under the current management plan, any tourism proposals in the usage zones will take precedence over other activities currently existing or planned in these areas. There will therefore need to be particular attention given as to how future tourism operations can realise local economic benefits if they are to avoid generating opposition amongst residents.

*b) Promoting management of fish stocks*

Effective fishery resource management in protected areas requires a combination of regulatory measures designed to limit catches alongside habitat intervention techniques intended to compensate those affected by these restrictions [25]. The imposition of no-fishing zones as one regulatory option has long been favoured by tourism operators in light of their capacity to maintain coral habitat and species diversity [26]. There is also evidence to suggest that the neighbouring unprotected areas benefit through the export of fish biomass, although this is more difficult to evaluate [27, 28]. Aside from the scientific value of such reserves, however, there is increasing debate over the acceptability of such sanctuary zones to local users which has received less coverage to date [29]. It was found that, in the Wakatobi National Park, the implementation of such zones in proximity to tourist facilities was generating considerable debate amongst the local communities. The following section will outline some of the problems and consequences of establishing such measures identified in this case study and provide recommendations for future management.

The tourist facility at Tomia relies heavily upon the pristine nature of the ‘house reef’ as a visitor attraction, which extends for some 500m parallel to the shoreline at depths of up to 3m and acts as a nursery ground for reef fish whilst also harbouring several endangered species. This area was perceived by the owner of the facility to be at risk through destructive fishing practices and extraction of sand for building purposes by the local

community. A ban on all fishing and extractive activities has been enforced since 1995 and the area is now effectively closed to all fishing activities and used exclusively for recreational diving by tourists. This action generated extreme ill-feeling within the local community, who claimed to have not been consulted at any stage and expressed resentment over the loss of traditional fishing grounds, whilst adding that no destructive fishing practices in the past had been attributable to them. The continuing rancour over this action by the tourist facility has led to one instance of deliberate destruction of part of the reef by local residents. Moreover, the legal status of this no-fishing zone is uncertain, as it predates the establishment of the national park. The park management feel that, whilst such restrictions cannot apply following the designation of the park, they can negotiate with the owner in order to reach an agreement. Meanwhile, however, the restrictions upon fishing continue to be enforced with the help of park rangers stationed on the island.

It is apparent that the ‘top-down’ imposition of no-fishing zones with no local consultation as exemplified in this case will be rejected by the local community, which could be counter-productive in the long term to all parties if the affected fishermen feel that direct action is the only means by which they can make their feelings heard. The willingness of the tourist operators to reach some compromise or offer alternatives to the fishing community is vital to achieving a settlement to such disputes. This situation is exacerbated by the participation of the rangers, who are now identified with the tourist operators by local residents and therefore may experience difficulty in gaining the confidence of local communities in the future.

An alternative approach has been adopted by the tourist operator on the island of Hoga, where there is a proposal to designate two no-fishing areas of approximately 0.25 km<sup>2</sup> and 0.5 km<sup>2</sup> in an attempt to determine the potential increase in fish catches in adjacent areas. This suggestion has been followed up through meetings with the park manager and representatives of the local fishing community. Whilst there was acceptance of the proposal at these meetings, subsequent discussions with individual Bajau fishermen in this study found that there was a lack of basic understanding of the need for such restrictions. This derives from the belief that, although fish stocks are widely acknowledged to be declining in this area, such a trend was not attributed to fishing intensity or environmental causes. The culture of the Bajau places great emphasis on the link between fish catches and spiritual factors, with those favoured by ancestral spirits being rewarded through increased daily catches. As a result, there is a lack of empathy with the scientific reasoning behind the proposed no-fishing zones. Furthermore, the Bajau tend to follow instinctual reasoning or local tradition when deciding where to fish, hence the concept of planned or predetermined fishing activity, particularly when proposed and enforced by non-Bajau, is inimical to them. These findings reflect those of Zerner [30], who highlights the difference between local conceptions of the marine environment and those grounded in scientific understanding of marine dynamics. Finally, the Bajau rely more on bartering than trading, hence the monetary value of goods is relatively low in their society. In this context, the idea of delayed satisfaction implicit in the no-fishing zone concept has little resonance.

It would appear that there is a significant amount of work required in order to develop acceptance of no-fishing zones by the local community. Even where efforts are made to ensure local agreement through discussion with community leaders, these may not be reflected in individual perceptions and practices. A future model for such proposals may be that, assuming the initial suggestion for a no-fishing zone originates with outsiders, the concept is put to the community in an appropriate cultural context and subsequently promulgated through internal community discussions along traditional lines with limited outside involvement. This would facilitate a process whereby the community is able to reach a decision regarding resource management which may lead to a greater sense of community empowerment than a process of participation along externally defined parameters [31]. Furthermore, the Bajau community has demonstrated a capacity for self regulation and enforcement through the ban on the use of hookah compressors cited earlier. Whilst such a procedure would be time consuming and require a transfer of some authority from local managers, it may offer the best way to surmount the cultural barriers involved in changing traditional beliefs and fishing activities.

A second consideration relates to the provision of habitat intervention techniques designed to promote more sustainable use of fish resources. A range of such activities are indicated in the zoning plan, which emphasise the potential for various forms of mariculture in nearshore usage zones. It remains to be seen how such proposals could be implemented in light of more pressing needs to enforce park rules and lack of extra staff or resources available to park management. Such activities could be promoted by tourism operators and/or NGOs in the park and this has already taken place, with the

establishment of a 1.5km<sup>2</sup> area of seagrass or *agar* cultivation on the east coast of Hoga. Further initiatives are in place to encourage the use of rompongs, a fixed bamboo fish aggregating device (FAD) moored in deep water with a lantern which attracts fish at night. The use of rompongs is new to the area, having been introduced by the operator on Hoga in 1998. Whilst the use of such devices is welcomed by the community, there is little awareness of how to maintain or repair them and they are generally seen as a useful addition rather than a replacement for traditional fishing techniques. Alternative maricultural techniques are likely to meet a similar response and will require a long term commitment to promoting their use, which should not remain the sole responsibility of tourist operators within the park.

## **Conclusions**

The success of marine national parks in terms of resource conservation is increasingly recognised to be a function of the extent to which management plans take account of local stakeholders' livelihood needs. This study has indicated that there are a range of institutional, legal, technical and financial obstacles preventing this process taking place in the newly established Wakatobi Marine National Park. These barriers to a more participatory or community-oriented style of management will be replicated in other protected areas within Indonesia and elsewhere unless progress can be made towards a more flexible style of management suited to local conditions. Various options have been identified in this case study which could benefit park management through the transfer of

some authority and responsibility towards local communities. The frequently held assumption that the advent of nature-based tourism or ‘ecotourism’ will bring benefits to local communities has been challenged to some extent in this case study, which demonstrates the nature of economic, social and environmental impacts associated with differing forms of ecotourism. This highlights the need for the adoption or enforcement of a code of standards to be applied to ecotourism ventures, particularly where these impacts will be accentuated by the remote nature of the location. The future role of research-based tourism involving students or young people should not be underestimated as a potentially positive mode of ecotourism in this respect. However, the economic benefits of ecotourism will accrue to those most able to take advantage of them, whether by dint of geographical location or individual ability. The adoption of alternative income-generating activities and the establishment of no-fishing zones as proposed under the management plan will require specific educational programmes in an appropriate cultural context if they are to succeed. Given the extra demand upon management resources, this is a choice which may be best determined by informed discussion within local communities. It is evident from this study that the capacity of local communities within the Wakatobi Marine Park to aid park authorities is under-utilised at present and deserves closer consideration in the development of future management plans to aid marine resource conservation in this area.

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