Samadai "Dolphin House"

Considerations on a Tourist Impact Mitigation Plan

A Report to the Nature Conservation Sector,
Egypt Environmental Affairs Agency

by

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1. Executive summary

An experimental, precautionary scheme is proposed by which limited underwater dolphin watching is permitted in Samadai reef under strict management and control measures. Key to the success of the operation will involve: (a) the zoning of the reef to devote a sanctuary area to the exclusive use of the dolphins; (b) the use of experienced guides; ad (c) a careful monitoring programme. The described effort is suggested as a pioneering experiment opening the way to the development of an innovative approach to tourism based on sustainability, responsibility and the offer of extraordinary naturalistic experiences.

2. Background

Spinner dolphins (*Stenella longirostris*, a circumtropical species) occur in the Red Sea where they are known to occupy during daylight hours selected sheltered reefs for their resting needs. One of such reefs, Samadai, is located a few miles off the Egyptian coast in the vicinity of the town of Marsa Alam (at approx. 25°03'N, 34°056'E), within easy reach of boats catering to divers and snorkelers. A maximum of 200 dolphins are said to make use of the reef at any single time, with a marked preference for a shallow and protected area in the

lagoon's northern portion, known as the "dolphin house" (see map on pag. 12). The site can thus be considered a critical habitat for this species in the region.

Tourism in the area of Marsa Alam is rapidly developing, with a large number of new hotels and resorts being built along this coast at this moment. The predominant attraction for Marsa Alam tourists is the Red Sea, with its largely intact reefs and associated marine fauna. However, diving locations are not very numerous along this stretch of coastline, and Samadai is by far the most attractive of them, not only because it affords at least three good diving sites, but also for its remarkable snorkeling opportunities.

Spinner dolphins in Samadai used to be nothing more than a side attraction for divers until four years ago. In that period, however, a number of factors changed dramatically the situation: (1) the word spread across the tourist community at large and specialised Red Sea tour operators, that the presence of dolphins in a conveniently reachable and scenic situation afforded a rare opportunity for close encounters with charismatic marine fauna; (2) when inside the Samadai reef, spinner dolphins are found in very shallow water, and are best seen when snorkeling as opposed to during dives (it is said that noise and bubbles from SCUBA tanks disturb them); (3) the increased volume of tourist flux in Marsa Alam brought to the area a large number of visitors with little or no diving expertise but with snorkeling capabilities; (4) the fame of the Samadai dolphins has attracted day tourists from as far north as the Hurghada area, with several buses bringing daily to the reef hundreds of people, in addition to the Marsa Alam tourists.

Due to these circumstances, in summer 2003 the human pressure inside Samadai reef peaked sharply, reportedly with up to 500-800 swimmers being present in the small lagoon on a single day. Hordes of tourists are said to having been brought in the water, in close contact with the resting dolphins, with little or no concern for safety aspects, for the ecological uniqueness of the situation, and for the need of respectful behaviour in the presence of the mammals. Excess in swimmer density and the objectionable behaviour of some within the "dolphin house" was seen as causing noticeable distress in the dolphins, who would try in vain to avoid being disturbed and to carry on with their normal resting and social activities. It was largely thought that the situation must be brought under strict control as soon as possible if the continued presence of the dolphins in Samadai was to be ensured.

Quite wisely, the decision was adopted by the governing authorities to suspend all visits to Samadai reef until a management scheme is in place, and this measure is still enforced at this time.

These developments have created a typical problem of governance of the coastal environment, by which conflicting needs must be expeditiously reconciled if the natural resource which is the subject of conflict – the Samadai dolphin/reef complex – is to be allowed to continue to exist. A management scheme needs to be put in place as soon as possible based on the knowledge currently available (e.g., basic information on the behaviour and ecology of spinner dolphins, reasons for the use of the reef by the dolphins, details of the use of the reef by the dolphins, what human behaviours do and what do not elicit obvious avoidance reactions in the dolphins). Where such knowledge is insufficient to inform decisions, then a precautionary approach is advisable while targeted monitoring and research activities are being carried out in the short term to provide such needed information

(e.g., what level of respectful, well-behaved human presence in the lagoon is sustainable? Are some dolphins attracted by people in Samadai?[1]).

It must be considered that in other parts of the world the practice of swimming with dolphins in the wild is generally discouraged by regulators. Among the many available examples, the "Guidelines for commercial cetacean-watching activities in the ACCOBAMS Area" issued in August 2003 by the Scientific Committee of ACCOBAMS[2], state the following under the heading "Swim-with": "Because of the risks to cetaceans and humans there should be a presumption against commercial programmes that include entering the water with the animals. Only under exceptional circumstances should such "swim-with" programmes be licensed". Although it is generally recognised that spinner dolphins will not pose a physical threat to well-behaved swimmers, the opposite may be true. Without careful management and control, human presence is likely to disrupt the behaviour of the dolphins in the short-term, may introduce in the mammals' habitat pathogens noxious to their health, and in the long-term could dislodge the dolphins from their critical habitat, should the intensity and frequency of short-term disturbance become intolerable.

With a view of providing scientific advice to the formulation of an emergency mitigation plan of the human impact on the Samadai dolphin/reef complex, and to support the preparation of a long-term management plan for the area, I was welcomed by the Director of EEAA's Nature Conservation Sector (with a letter dated 30 November 2003) to make a short reconnaissance trip to Marsa Alam. The tour took place from 5 to 8 December 2003, and allowed me to verify in person the nature and context of the presence of spinner dolphins in Samadai reef, and discuss planning options and details with EEAA officials, rangers, and various stakeholders. The comments included in this document, based on this brief experience and on ecological considerations, only pertain to the objective of ensuring the continuation of the use by spinner dolphins of their critical habitat located inside Samadai reef. Equally important administrative considerations connected with management, which should also be addressed in parallel through the involvement of specialised expertise, are not treated in this document.

3. Vision and management objectives

A future vision for the Samadai reef, which may be extended to the Marsa Alam coastal reef system, or even to wider portions of the Egyptian Red Sea coasts, may be: *to ensure the indefinite future enjoyment of the Red Sea coastal and marine biodiversity, for the benefit of the local populations and for all concerned human beings, carried out in a sustainable fashion and in full harmony with, and respect for, the needs of the marine species that are part of that biodiversity*.

Certainly such vision, albeit easily endorsable, offers serious challenges due to the amount of human pressure that is already present on the concerned coastal environment, and which is forecasted to considerably increase in the near future. Clearly, some limitations will be imposed on users if such vision is to be pursued. However, this vision is consistent with the notion that Egypt may decide to take on a world-leading role in developing innovative eco-

[1] Anecdotal evidence exists that individual dolphins in Samadai reef deliberately approach closely snorkelers in non-stressful situations, and position themselves as if to solicit tactile interaction in what is clearly a friendly, non-antagonistic behaviour. Such was also my personal experience on 5 December 2003.
[2] The UNEP CMS Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (www.accobams.org).

tourism (possibly connected with the sustainable fruition of protected areas), alongside the continuation of "traditional" mass tourism, currently concentrated along its northern Red Sea shores. Such innovative tourism, catering to an elite of affluent and demanding customers, at the same time discerning and respectful, will capitalise on the extraordinary attractiveness provided by the southern Egyptian coasts and seas, so long as these will remain intact and beautiful as they are today, and will continue to host the current superb levels of marine biodiversity.

Specific management objectives to pursue the above vision, applied to the Samadai reef, may include:

(a) To constrain the extent of human presence in the "dolphin house" within limits that are clearly acceptable to the dolphins, and will not cause the quality of their habitat to degrade, and the dolphins' abandonment of the reef; and
(b) To allow the continuation of a tourist activity involving a respectful interaction with the dolphins which is important for the local economy and which contains, if properly conducted, a high educational value having the benefit of enhancing human attention, attraction and care for the marine environment at large.

Depending on decisions based on the above policy considerations, two scenarios can be envisaged.

In the first scenario, only management objective (a) is considered. Like today's condition, the entire "dolphin house" is declared a no-entry zone, thus affording to the resting dolphins minimal or no human disturbance. Boats would still be allowed to reach Samadai reef, but shall be permitted to hold fast only in pre-defined mooring facilities. If all mooring spots are occupied, no other boats would be allowed, thus setting an upper ceiling to the number of boats present in the reef at any time. Divers and snorkelers would only be allowed to peruse the outer limit of the reef. Precaution would be applied in a strict sense, and enforcement greatly simplified.

In the second scenario, management objectives (a) and (b) are pursued simultaneously. To achieve this, a strict and demanding management regime is needed. Given that uncertainties still exist concerning the ecological and behavioural mechanisms that tie the dolphins to the reef and that regulate their tolerance of the human presence, management should be highly precautionary. However, if successful, this scenario shall provide far greater benefits than the other. While the dolphins will continue to be protected, the local economy will gain substantially, and at the same time tens of thousands of people every year will have had an extraordinary personal experience, likely to change in subtle ways their attitude towards marine conservation. Tiny Samadai reef may thus give a significant contribution to the global construction of a greater marine stewardship.

In either case, it is advisable that the entire reef be even informally declared a "dolphin sanctuary". This would have a powerful psychological effect on all visitors, whether snorkelers wanting to see the dolphins, divers mostly interested in the outer reef, or boat captains manoeuvring in the permitted areas, and will positively influence everyone's behaviour, in the water as well as aboard vessels.

At this stage of knowledge it is impossible to choose either of the two scenarios based on science, because scientific data to support such decision are not available. Excessive precaution will deny human fruition and economic opportunities for no clear reason, while

dearth of management will jeopardise the continued presence of the dolphins in the reef. Neither option is desirable. My advice is that an experimental phase lasting one year (e.g., January to December 2004) be declared in which the second scenario (i.e., the simultaneous pursuit of both management objectives) is envisaged, with moderate human fruition under a strict management regime. During this experimental phase it will be crucial that appropriate monitoring of dolphin and human use of the reef be implemented. After the experimental phase is terminated, an assessment can be made based on the data collected, to inform decisions on the track to be followed in the future. Management options after the experimental phase may involve either the continuation along the lines of the second scenario, or the adoption of the first scenario, or even the relaxing of regulations if that is what the information collected will suggest.

The considerations that follow are provided under the assumption that the decision will be adopted of implementing the experimental phase, as defined above.

4. Zoning

The northern part of the inner reef (the "dolphin house", see map) should be made off-limits to vessels of any type. A hypothetical limit of this area is indicated on the map with a red line running from west to east. The "dolphin house" is further subdivided into two parts by a yellow diagonal line. The subdivision of zones through simple, straight lines is suggested with a view to simplify enforcement. The upper, northwestern portion is a strict no-entry zone approximately five hectares wide where the dolphins can remain undisturbed if they wish. The lower, southeastern part, slightly smaller than the no-entry zone, is also used by the dolphins when inside the "dolphin house", and it would be there that snorkelers are allowed to swim under the control of their guides (see further).

In marking the different zones at sea with buoys, it is important to limit the number of markers to the minimum needed for a clear identification of the different zones by rangers, guides and visitors. In addition of spoiling the view, too many markers my be bothersome to the dolphins and disruptive of their normal swimming and resting.

In this experimental phase, it is assumed that diving and snorkeling activities performed along the outer reef will not negatively affect the dolphins inside the "dolphin house". An upper limit to the number of large vessels, determined by the number of moorings available (with the use of the boats' own anchors forbidden), may serve the purpose of limiting overall human presence in the reef at any time. There shouldn't be any prejudice to large boats catering simultaneously to both outer-reef divers and snorkelers and to "dolphin-house" snorkelers, as long as the latter are provided with entry permits if needed (see further).

5. Time closure

To further contain impact and to facilitate enforcement, it seems advisable that the "dolphin house" be open only during part of the day to permit-holding snorkelers. A suggestion would be that visiting time be allowed between 10.00 and 13.00.

6. Enforcement

The need for the continuous presence of rangers on site is unavoidable, at a minimum from one hour before the opening of the "dolphin house", to one hour after the closure. Rangers should be housed aboard a sufficiently large vessel centrally moored for a best view of the area (see map for a hypothesis of a mooring location which will allow optimal enforcement and monitoring capabilities). The vessel should allow sufficient comfort, shelter and shade to the stationed rangers, and should provide good viewing opportunities through a high (i.e., on the upper bridge) observation platform.

Samadai reef should also be remotely monitored during the hours in which the "dolphin house" is closed. This could be done from shore through the use of telescope lenses. Damage to the dolphins from possible cheating when rangers are distant is minimised by the habit of the dolphins of leaving the reef during the afternoon, and by the need of the daily trip tours to leave the reef to return to the resorts at about that time. In the rare cases in which dolphins were to be present in the reef in the afternoon hours, the risk of losing the permit should be sufficient to discourage cruise vessels spending the night anchored in the reef from allowing snorkelers to swim with the dolphins.

Feedback from visitors through survey forms, where a description of their experience is solicited, may also serve to support enforcement. A survey form could be appended to the back of the leaflet containing the code of conduct, which will be distributed to all visitors prior to the visit (see further). On the form, visitors can provide suggestions and report misbehaviours or the occurrence of problems. Enforcers may thus be made aware of problems that consistently arise with particular guides.

7. How many snorkelers should be allowed in the "dolphin house" every day?

During the 2004 experimental phase, the daily number of snorkeling visitors must be controlled. Limitations can be envisaged in different ways (e.g., through a maximum number of permits issued every day, or through fee increases). Administrative decisions on such matters do not pertain to the scope of this report.

During my reconnaissance trip I often heard that a suggestion was made of limiting the total number of daily visitors to 100. I am not able to provide precise indications on this issue, because a science-based decision at this time is impossible due to absence of data. However, on the basis of precaution, this suggestion seems reasonable during the experimental phase, because a maximum of ten clusters of swimmers in a relatively large area, staggered along a three-hour period and under control of experienced guides, certainly involves a much lesser impact on the dolphins than what has been inflicted on them in recent times[3].

If the decision is adopted to set a ceiling to visitors, it is important that such ceiling be set on a daily basis, to avoid reaching dangerously high densities during the peak of the high season in case mean numbers are accounted for.

[3] It should be considered that even this reduced regime would allow inside the reef a large number of yearly visitors (theoretically > 36,000), thus generating significant revenues from the reef.

An important consideration is that the damaging potential of incorrect behaviour by the snorkelers greatly overshadows the damaging potential of their sheer numbers. In other words, the presence of 100 well-behaved snorkelers staggered in groups across the three-hour period, under the control of guides, is likely to be much less impacting than 10 misbehaving snorkelers let lose to chase dolphins around the lagoon. For this reason, the function of the guides will be of crucial importance.

8. Code of conduct

Snorkelers may only enter the "dolphin house" in the company of certified guides. Guides may be allowed a maximum number of snorkelers under their control (10 was suggested). Guides must keep snorkelers together in a group, and will steer the group around the area in such a way as to minimise disturbance to the dolphins. For safety reasons and for better control, snorkelers should be requested to wear a lifejacket (possibly of the inflatable type for greater comfort). Children under 12 should be allowed only under the control of a parent[4].

The behaviour of the group and of individual snorkelers must follow a simple and obvious set of rules, based on "best practice" considerations derived from well-established whale watching guidelines. For example:

- never chase a dolphin;
- never touch a dolphin;
- never try to feed dolphins;
- never cut in front of the dolphin school, swim head to head to a dolphin or school, or cause the school to change its course;
- never corner a dolphin or school against the reef or against another group of snorkelers or any other real or perceived obstacle; if a guide notices that a school of dolphins intends to swim in or out of the "dolphin house", he/she will manoeuvre the snorkelers group to give the dolphin school wide berth;
- let the dolphins control the nature of the interaction; when dolphins are in sight underwater, stand still and silent and let them decide if they want to approach swimmers or not;
- no whistles, no shouting, no noise;
- no camera flashes.

Guides will be responsible for the behaviour of their group, and in case of mishap their certification may be withdrawn from the rangers at any time. They should advise snorkelers in their care that they might be asked to leave the water at any time in case of misconduct (with no refund due). In this case all the group will have to follow the guide out of the snorkeling area to allow for the misbehaver to be accompanied aboard a vessel (because no snorkeler can be left in the lagoon without a guide), and then follow the guide back in again. Guides shall collect trash and remove it from the "dolphin house" if they find any on the bottom or floating in the water. Guides should record data on dolphins (at a minimum, on dolphin school sizes), given their underwater vantage point, and transmit such data to the rangers regularly.

[4] Diving and aquacentres already ensure, as a matter of routine, that their customers are physically fit in relation to the envisaged activity.

All boats transiting or stationing inside the reef must also comply with a code of conduct (hence the useful idea of declaring the reef a "dolphin sanctuary"). Within the reef perimeter, moving boats of all types (i.e., including inflatables) must limit movements to a minimum, and never exceed "no wake" speed. Larger boats heading for a mooring must do that expeditiously, and turn off their engines as soon as it is safe to do so. Inflatables moored must not keep their engine idling unnecessarily. No music should be heard outside of the vessels. Whistling or emitting any type of noise with the intent of attracting the dolphins (a popular misconception) must be strongly discouraged. Throwing trash of any type in the water must be forbidden, as well as attempting to feed the dolphins.

9. Guides

Counting on the availability of well-trained, experienced and motivated guides is a key to the success of the experiment. Guides must be trained through an *ad hoc* course, based on both theory and practice. At the end of the training, guides will be certified. The certification of a guide may be removed from the rangers at any time. The training of guides may be either the responsibility of the concerned authorities, or of diving centres involved. In any case, a strict cooperation between authorities and centres is desirable for best results.

10. Boat owners and skippers

It seems advisable that all boats accessing the reef will need a permit. A permit system will allow to promote awareness of boat owners and skippers concerning the rules contained in the code of conduct, through a certification issued by the rangers, which can be withdrawn.

11. Other training

In addition to the guides and the skippers, other training efforts are needed.

Rangers will need to practice enforcement procedures in this experimental management setup, and be ready to face novel and occasionally difficult situations. Monitoring of the dolphins and of human use of the reef will be crucial to the experimental setup. Therefore, a training course on monitoring for the rangers will be necessary, in which both the monitoring procedures and use of the appropriate data collection forms, and the type of analyses that the data will be used for, are fully explained.

Training of researchers will also be an important product of the Samadai reef management setup, in case the funds needed for scientific research will become available (see further).

The cooperation and involvement of the diving centres in this effort is fundamental. Some diving centres may possess the capacity of providing training and making available material useful for the promotion of awareness and education campaigns. Others may need training to ensure their participation to the programme in tune with the management objectives.

12. Governance

Customary reef users and economic operators are likely to be initially disconcerted and confused by the experimental management scheme suggested here, and will need easy access to the information on the new procedures and requirements which the scheme implies. It is strongly advisable that all possible efforts be undertaken by the governing authorities to ensure that stakeholders are provided with timely, unambiguous information and communication on measures and requirements, and changes thereof. Communication can be provided through ordinary channels (e.g., coast guard facilities), as well as through innovative means (a dedicated website).

13. Education and awareness

A wide programme of education and awareness is the logical complement of the significant effort undertaken by the Egyptian authorities in the implementation of a management experiment in Samadai reef. The main targets of this action should possibly be:

- the local population: local officials, teachers, school children, and the population at large could be invited to conferences prepared *ad hoc* in which the situation is explained and the reasons for the adopted policies are given;
- diving centres (see remark under "Other training");
- tour operators need to be made aware of the management effort and of the need of their full cooperation in all phases of the activities;
- tourists: it is fundamental that everybody will be provided with all the information needed on the operation.
    - Prospective visitors to the "dolphin house" must be made aware of the special properties of the reef and its dolphin guests, and be thoroughly informed through leaflets, books and booklets, posters, video and other material in the appropriate detail.
    - Visitors must receive a full briefing from their guide on the experience they are going to have shortly before the visit, on why such experience is special and rare, and on what are the procedures to be followed and their obligations during the visit. A printed code of conduct should be distributed to all.
    - After the visit, a de-briefing will be certainly appreciated by most visitors, with explanations of specific events and of the observations made. This will help to cement the experience in their memory and make it memorable and fully enriching.
    - Prospective divers and visitors intending to travel to Egypt and to the Marsa Alam area, particularly if attracted by the possibility of experiencing close encounters with dolphins at Samadai reef, can be made aware of the complex of problems and opportunities involved with information diffused through TV programmes and diving magazine articles in countries such as Italy and Germany, where most of the Marsa Alam visitors come from.

14. Stakeholder involvement

The involvement of most of the stakeholders currently participating in the Samadai reef "dolphin house" issue is already envisaged through the operational, training and awareness activities discussed above. It is important to ensure that all stakeholders are involved, that they understand the need for the policy decisions adopted, and share as much as possible the views of the governing authorities. Incentives to concur to the success of the experiment are built-in in the experiment itself, since it will be from the success of this effort that long-lasting economic advantage and prestige will derive for all (the alternative being, in case of failure, the closure of the "dolphin house"). All stakeholders should be made clearly aware of this situation.

15. Monitoring

Monitoring is a fundamental component of the experiment, because it will be on the basis of the monitoring results that subsequent decisions will be made. A detailed monitoring protocol will have to be designed for (a) measures of the dolphins' presence in the "dolphin house", (b) measures of human use of Samadai reef, and (c) possible correlations between the two. Data to be collected should include the times of entry and exit of the dolphins in the various zones of the reef, and the size of the dolphins schools in each instance, as well as times of entry and exit of people and vessels in the various zones of the reef, and the type of human activities in each instance (e.g., snorkeling, diving, access by boat). Basic environmental conditions such as wind speed and direction, cloud cover and water temperature should be collected on a regular basis as well, to allow the determination of possible links between the environment and the dolphins' socio-ecological patterns.

Given the paramount importance of monitoring, the location of the monitoring platform (the rangers' vessel) close to the centre of the reef, with the best possible vantage point on the "dolphin house", is fully justified in this experimental phase.

Monitoring should be the responsibility of rangers. However, the cooperation of the guides (in particular concerning the data collected underwater on dolphin school size) will be essential. This should be borne in mind when designing the guides' training courses.

16. Research

Samadai reef and its regular dolphin visitors provide exceptional opportunities for the furthering of knowledge of these otherwise rather inaccessible marine mammals. It is beyond the scope of this document to list or suggest all the possible research projects that the Samadai reef situation might afford. Rather, few suggestions are given here concerning specific research projects, which would provide results and understanding relevant to improve existing conservation measures, based on a wider ecosystem approach.

Modern photo-identification techniques using digital photography and video can be very effective to investigate population studies of reef use by the dolphins, and to compare the ecology and behaviour of dolphins in reefs having different levels and history of human presence (e.g., Samadai vs. Satayah). Research projects having potential conservation

interest include: (a) photo-identification studies of dolphins using reefs along the whole of the Egyptian Red Sea coasts; (b) genetic comparisons among dolphin specimens from different portions of the area; (c) sighting surveys in the offshore waters adjacent to the coastal reef system; and (d) observations of dolphin interactions with swimmers to detect behavioural trends in the long-term, and compare reefs having different levels of human presence.

Possibly, a permanent installation of underwater recording equipment (i.e., dolphin "click detectors") inside the "dolphin house" could enable in the future the unmanned monitoring of the dolphin presence inside the lagoon. However, preliminary acoustic research is needed to determine the patterns of sound production by the dolphins during the daytime, to allow a prediction of dolphin presence and school size based on the time and density of the recorded clicks.

During my reconnaissance trip I was often asked questions concerning the possibility of long-term telemetry (satellite) tracking of individual animals to determine movement patterns when the dolphins are not found in the reef. I believe that the current technology of long-term tag attachment on small cetaceans, such as spinner dolphins, still requires very invasive techniques (i.e., the capture of the dolphins and the implant of bolts through holes drilled across the dorsal fin); this involves considerable risk for the individuals as well as the behavioural disruption of schools. Considering the early status of knowledge of the Samadai reef dolphins' ecology, urgent and significant results can be obtained without recurring to such invasive and expensive techniques. I have therefore discouraged considering the adoption of telemetry techniques for dolphin research at this time.

17. Diversification of activities

In addition to land-based activities, it is conceivable that dolphin watching trips may be organised aboard adequate vessels on calm weather days, to provide tourists with attractive occupations in the open sea that may ease pressure from the "dolphin house". In this respect, there is a great need of new ideas and initiatives.

In order to make dolphin watching and whale watching profitable, it is necessary to ensure a minimum level of sighting opportunities. Boat trips in which no dolphins are sighted should be rare for such a scheme to be successful. During sightings, opportunities for observing the animals must be good. Considerations of the frequency of calm weather days, of the distance of the main sighting areas from the harbour, and of the type of boats and the safety they afford, are all very important.

Sighting surveys in the offshore waters adjacent to the coastal reef system (envisaged above under Research, c) will provide initial answers to the questions on whether the activity of dolphin watching is feasible.

Finally, it may be even possible to organise dolphin watching within Samadai reef from aboard stationary vessels for those visitors who may be content to watch the dolphins without entering the water. Through careful management, this activity may be well received by part of the concerned public, and will release some of the pressure through a very low-impact human presence in the reef.

18. Acknowledgements

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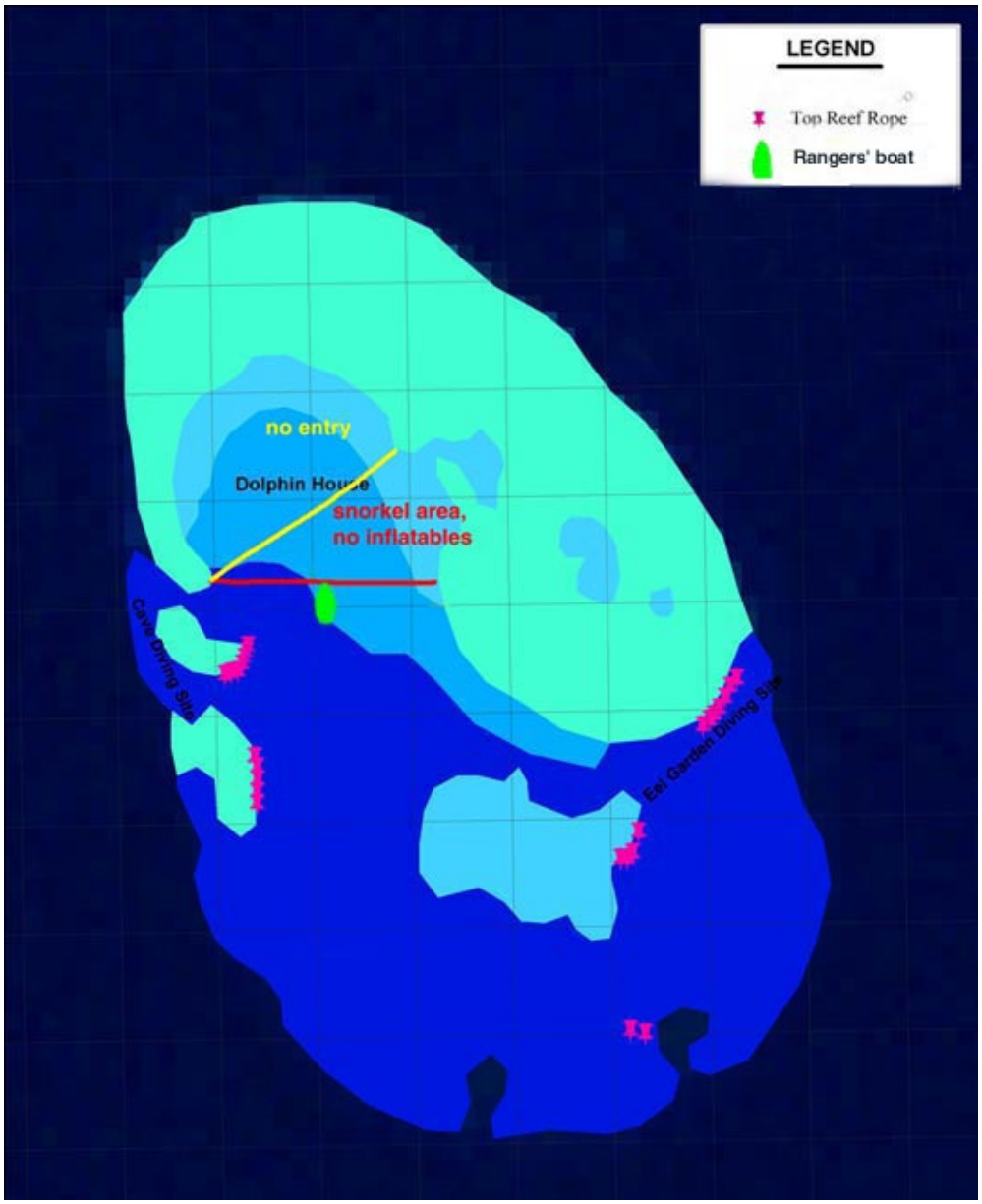

Samadai Reef. The "dolphin house" and a suggestion for zoning.