Using Systematic Planning to Assess the Existing Coverage MPAs on the Insular Shelf of Cuba

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ABSTRACT:

A national scale analysis to identify potential areas desirable for a system of Marine Protected Areas (MPAs), and to assess the coverage of the existing MPA sites on the shelf of Cuba was undertaken using the Decision Support Tool MARXAN. Two major goals were set for identification of new areas: first, they should be representative to Cuba’s coastal and marine bio-diversity, and second, they must contribute to enhancing sustainable fisheries. No connectivity considerations were included in the preliminary analysis. Data for eight criteria relevant to the two goals were compiled and mapped and desired target levels for their representation within the system of MPAs were set across three different scenarios of low, moderate and high target levels. The areas identified in the various scenarios ranged from a low of 8.7% to high of 26.7% of the total area of the shelf of Cuba. Three different types of comparisons in coverage of area between the identified and existing system i.e. gap analyses were conducted. Depending of the scenario, between 20-80% more area than that currently designated as MPAs would be required to meet the set target levels. The implications of the analyses for future MPA planning in Cuba are discussed.

EXTENDED ABSTRACT:

While the need to establish MPAs has been on the marine conservation agenda for several decades, it is relatively recently that approaches to identify suites potential MPA sites have become more sophisticated and explicitly defined (Day and Roff 2000, Roberts et al. 2003a, Roberts et al. 2003b). The emergence of systematic and analytical approaches for MPA site selection, and the methods and tools to support such approaches have become common and are now routinely used by marine conservation planners (for examples see Beck and Odaya, 2001, Ardron et al. 2002, Airme et al. 2003, Leslie et al. 2003). System planning among other things includes; regional considerations for representation of conservation features, efficient selection of a ‘portfolio’ of sites, and incorporating connectivity considerations among sites. Within protected areas planning, these considerations are as crucial as the identification individual sites (see Margules and Pressey, 2000). In many countries, the establishment of MPAs has preceded the emergence of these systematic and more analytical approaches for
MPA planning, and MPAs have already been established on a site-by-site basis through ad-hoc and expert opinion/delphic approaches (see Ray (1999) for a classification of approaches). While these site-by-site approaches may have more applicable and appropriate at the time, they did little in the way of considering system wide or regional aspects of MPA planning.

Cuba, the largest of islands in the Caribbean offers some insight into this issue. Designated MPAs comprise approximately 4% of its insular shelf, and with several additional areas in the process of being approved as MPAs, the proportion is closer to 10% or approximately 6000 sq.Km. Our study was premised in employing a systematic planning approach to setting explicit goals targets for the system of MPAs and analytically selecting areas desirable for such a system on the insular shelf of Cuba, and to compare the more analytically selected sites to those already established or in the process of establishment. The emphasis of the study was to identify gaps and provide guidance to any additional selection of areas for MPA establishment so as to better encompass systematic aspects and meet conservation objectives.

We employed a multi-step planning approach that included; (a) defining the goals and conservation objectives for the areas to be selected, (b) Identifying appropriate criteria for site selection, (c) setting targets for the level to which each criterion/conservation feature should be represented, (d) preparing spatial data for each criterion, (e) site selection using algorithms on the basis of available data. Two major goals were set for identification of new areas: first, they should be representative to Cuba’s coastal and marine bio-diversity, and second, they must contribute to enhancing sustainable fisheries. No connectivity considerations were included in the preliminary analysis. Data for eight criteria across 11 eco-regions, relevant to the two goals were compiled and mapped. The desired target levels for their representation within the system of MPAs were set across three different scenarios of low, moderate and high target levels. We utilized the decision support tool MarXan (Ball and Possingham, 2000) using simulated annealing to generate selection of areas that largely met all the selection criteria and conservation targets under the assumption that no MPAs existed. Under this scenario the areas identified in the ‘best solutions’ of various target scenarios ranged from a low of 8.7% to high of 26.7% of the total area of the insular shelf of Cuba.

Making use of the functionality in MarXan for considering existing protected areas and irreplaceable areas, we conducted three different types of comparisons in coverage of area between the identified and existing system of MPAs i.e. gap analyses. In the first comparison, examined how well designated MPAs together with those in the process of approval met the various targets that were set. Of the 11 eco-regions, only 3 were represented to within the set target representation ranges. 4 eco-regions have no representation at all, 4 were represented at levels between 1-6.5%. There were no eco-regions where all feature targets were met and even in highly represented eco-regions, some conservation features were not represented. In the second comparison, we ‘locked in’ designated and in-process MPAs and forced the selection to include these existing areas. New areas were annealed to existing areas until set targets for various criteria were met. We found that approximately between 0.25 (low scenario) to 1.7 (high scenario) times more area than that in designated or in the process of approval would be required to meet the set conservation target levels. In the third comparison, we examined the best solutions generated by MarXan under the assumption that there were no MPAs, and compared this to the areas covered by the designated and proposed MPAs. We found that only between 23.2% (low scenario) to 20.9% (high scenario) of the selected areas were contained within the existing MPAs or those in the process of approval. In a related comparison, we compared the areas selected most frequently (>75% selection frequency)
with MarXan in the process of generating a best solution, with those in existing or in process MPAs. We found that between 56.8% (low scenario) and 41.8% (high scenario) were contained within existing or in process MPAs.

The results from these various gap analyses suggest that the coverage of existing designated MPAs was inadequate in meeting conservation targets we set. Further more, the designation of areas currently in the process of approval that would more than double the existing coverage of MPAs on the insular shelf, would still not completely meet all conservation targets we had set. These results tend to suggest that MPA implementers in Cuba may need to carefully re-evaluate the placement of some of the proposed MPAs so that they better achieve ‘system’ goals. A limitation of the analyses was that they did not consider socio-economic information and it is likely that the some of the proposals for MPAs may have been developed with some of those considerations. The analyses consistently revealed that certain geographic regions such as the Gulf of Batabano and the Los Colorados eco-regions showed gaps in MPA coverage at all target levels. The Gulf of Guacanayabo and Sabana-Camaguey eco-regions showed gaps in coverage at higher target levels. It is postulated that the gaps in the current system are expected consequence of ad-hoc/opportunistic planning and those selected on a basis of the best available information at the time, and some times adjacent terrestrial features. The analyses conducted in this exercise were based on a set of explicit criteria that we believe may have had been different that those that were implicitly used to select areas that have been designated or proposed. The analysis was also based on best available information available to us and may it self be improved on in the future.

References


