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Consensus Building for Environmental Issues: Marine Protected Areas as a Case Study

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This paper describes the key components of a consensus-building activity on environmental issues; while we present one example, we describe how similar activities can be built around other environmental issues. The activity's primary goals are for students to build critical thinking skills solving real-world problems, and to appreciate the complexity of creating environmental policy given the often-difficult communication between scientists, policy-makers, resource managers, and the general public. Our case study concerns the creation of marine protected areas (MPAs), in which students negotiate the terms of use of an MPA while assuming the identities of individuals with interests in the use and/or protection of the MPA.

Keywords: Consensus-building, critical thinking, environmental issues

Introduction

General Framework of the Activity

The objective of this exercise is for students to practice critical thinking and negotiation skills using an environmental issue as the focal topic. Prior to the activity, students are asked to read a review paper on the topic in preparation. In the activity, students are divided into four groups which represent individuals with differing opinions about the topic under discussion. Each group is given time to answer the same three questions which help them to flesh out their identity before interacting with the other groups. After sufficient time, each group describes their position to the others by offering their answers to the three questions.

Students are then given data and specific information concerning the environmental issue under discussion. In our case study, this is an existing Marine Protected Area (MPA), and students are given a map and information about a variety of ecologically and commercially relevant attributes in the MPA. Groups are given time to look over this information and formulate their preferred solution to the problem presented (controlling various uses of the MPA); they are also asked to consider the aspects of their position which they are – and aren't – willing to negotiate. One of the four groups (the policy makers / government officials) acts as moderators for the negotiation. The moderators spend their time determining how to run the negotiation between the other three groups, as well as considering their own interests. After sufficient time for the groups to independently identify their preferred solutions to the problem, the moderators run the discussion and negotiation. The goal that the students are given is to come to a consensus on how the MPA will be used, including which uses will be allowed and which will be banned, region by region. After the activity, students are given an assignment to write a reflective essay about the process of reaching consensus.

We have used this activity in a 2.5-hour laboratory period, but it could be divided over two class periods. While we have used this activity in marine biology classes, the basic structure is easily tailored to many different environmental issues and would be appropriate for an environmental science class, or any class that covers environmental topics where the parties involved have disparate interests and opinions, and where a consensus may not be easily obtained. While we present here the specific case study we have used, we also break the activity down into its essential components to facilitate its application to another topic.

Background for Our Case Study

We present students with some background information on the topic in the form of an assigned reading. At the beginning of the activity, we present some additional information in a mini-lecture format, although this could easily be accomplished by giving students assignments to further re-

search the topic ahead of time. The information we present in our mini-lecture is broad and basic, and addresses what Marine Protected Areas are, why they are created, where they exist, what sizes they are, and what they protect. As a brief introduction to help the reader follow this exercise, we share some of this information here.

Marine Protected Areas (MPAs) are similar in concept to National Parks, while protecting underwater, rather than terrestrial, resources. The resources they protect are quite varied among MPAs; in some cases, MPAs protect single species or a special feature such as a sunken vessel or a highly productive reef ecosystem. In other cases, they preserve a region of high biodiversity or a unique ecosystem. Some MPAs are intended to protect source populations of marine organisms that are exploited elsewhere; an example includes nursing grounds for commercially important species (Pauly *et al*., 2002; Guidetti, 2007; Claudet *et al*., 2008).

MPAs vary widely in size, although most are relatively small; the smallest is just 17 m^2 in area (North Pond State Nature Preserve, Lake Erie), while the largest is 363,680 km^2 and encompasses 95% of the total area in MPAs in the United States (Papahānaumokuākea Marine National Monument in Hawai'i, **http://www.mpa.gov/pdf/helpful-resources/factsheets/us_marinereserves.pdf**). The level and type of uses allowed within MPAs also varies greatly, from areas where multiple uses are allowed, including extraction of certain resources by recreational or commercial interests, to "no-take" areas where certain resources cannot be exploited by either particular users, or all users. Overall, while approximately 40% of U.S. waters are in an MPA, only a small percentage (3.1%) of U.S. waters are "no-take" areas, also known as marine reserves (**http://www.mpa.gov/resources/publications/factsheets/**, Snapshot of United States MPAs).

We share some examples and maps of MPAs (e.g. from **http://www.mpa.gov**) with the students, although we could ask them to investigate these on their own, prior to the activity.

Student Outline

There are no instructions handed out to students with this activity, although there are several questions to answer, tables to fill in, and figures to interpret which are given to students before, during, or after the activity. This section includes those materials, along with descriptions of how they are to be used, and in what sequence, for the instructor's benefit. Additional comments on preparation and running the activity are provided in the Instructor's Notes section further below.

Pre-activity Preparation

Students are assigned a reading to give them introductory background knowledge on Marine Protected Areas (we assign Palumbi, 2000 and Crowder *et al*., 2006). They are asked to bring answers to several questions on the day of the activity, to ensure they do the reading and have synthesized the material enough to be prepared. The questions assigned are shown below.

Questions on background readings

What constitutes an MPA (marine protected area)? What is a marine reserve?
Who, and what (not just humans), serves to benefit from MPAs?
Who, or what, could be harmed by the creation of an MPA?
What are some of the difficulties involved in designing an MPA?
How does one decide where to put an MPA?
What types of marine habitats, or what factors of interest, do you think we should be protecting in MPAs?

Part 1: Groups Self-identify

The four groups in this activity include: 1) commercial fishermen, 2) ecologists / environmentalists, 3) policy makers / government officials, and 4) recreational users, including recreational fishermen, boaters, and SCUBA divers.

Each group is asked to discuss the following three questions, and to later share their responses with the other groups. Students are given two handouts; the one below with the questions, and Table 1, with room for them to note the responses of the other groups to these questions. This table will help them later in their negotiations, by outlining the position of the other groups.

Group: _____

1. What are your interests in the creation (or the prevention of creation) of Marine Protected Areas (MPAs)? What reasons do you have (if any) to support the creation of MPAs? What reasons do you have (if any) against the creation of MPAs?
2. What factors do you want to know about a habitat and the organisms living there, in order to make decisions concerning the creation and design of an MPA? Outline the reasons for your answer.
3. Which MPA planning strategy do you prefer: basing the MPA design on a) a single species, b) multiple species, or c) using an ecosystem-based approach (all species in the habitat, and abiotic conditions as well, considered)? Outline the reasons for your answer.

Table 1. Handout for groups to use in self-identification. Columns correspond to the three questions each group is asked to answer. Each group fills out their row, but can fill out the rest of the table as other groups share their answers.

	Interests in MPAs, Reasons for/or against MPAs	**Habitat Factors of Interest**	**Single-species / Multi-species / Ecosystem Planning?**
Fishermen			
Ecologists/Environmentalists			
Policy Makers/Government officials			
Recreational Users/Recreational Fishermen			

Part 2: Students Work within Groups to Identify their Preferred MPA Uses or Restrictions

After each group has identified its answers to these questions, and therefore its interests in MPAs, students are given information about a specific MPA, the Stellwagen Bank National Marine Sanctuary, off the coast of Massachusetts and north of Cape Cod (Table 2, Figs. 1 or 2). Depending upon the time allotted for this exercise, one can use the map of the entire MPA (Fig. 1) and ask students to use the information in Table 2 to determine which quadrangles most interest their group, or one can use a subset of the full MPA area (Fig. 2) for a smaller and shorter activity.

During this part of the activity, groups are asked to identify not only their preferred uses or restrictions to particular areas within the MPA, but also which preferences they are willing to negotiate. The policy makers/government officials group is asked to moderate the negotiation that will follow once the other groups have outlined their preferences; while the other groups are preparing their preferences, the policy makers/government officials are tasked with developing a negotiation strategy to get the three other groups to reach a consensus. Their objective is to guide the class towards the ultimate goal of the activity: designing (or redesigning) the allowable and restricted uses of the Stellwagen Bank National Marine Sanctuary, for all quadrangles on the map (Figs. 1 or 2).

Table 2. Resources or Other Items of Interest in Stellwagen Bank. Map Quadrangles Are the Numbered Areas Shown in Figs. 1 and 2.

Map Quadrangle	Resource or Item of Interest
7 (NW corner) 10 (SW corner)	Massachusetts Bay Disposal Site
7	sunken vessel (good diving site)
all	rich whale-watching grounds
16 (just outside the boundaries)	outfall tunnel of treated water from Boston
1, 4, 7, 10, 13, 16 (western edges)	spawning area for cod, pollock, and in winter: flounder
all	pollock (fast-swimmer), bluefin tuna
2,5,6 (some), 8, 15 (some)	shallow water: high productivity

Part 3: Negotiation and Finalization of the MPA Uses and Restrictions

The negotiation can begin once the groups have had enough time to prepare their preferred uses and restrictions, by quadrangle, as well as planning the requests they are willing to negotiate. The policy makers/government officials group needs to have enough time to formulate a clear strategy for moderating the negotiation, and they need to keep their focus on the goal of determining consensus on the uses and restrictions in each quadrangle of the Stellwagen Bank National Marine Sanctuary. See the Instructor's Notes for some thoughts on how to help this group be effective in achieving this goal.

Once the class has reached consensus on their version of the MPA (or after sufficient attempts to achieve this consensus, if time is running out), we moderate a discussion of the difficulties in reaching agreement in a real-life situation. We ask the students how their negotiation differed from what the actual process most likely entails, and have them discuss how groups with disparate interests can work together to reach consensus. The final assignment in this activity is a self-reflection, in which students are asked to individually write short reflective essays that include their answers to the questions below.

Questions on the MPA activity

How convergent or divergent were the interests of the different groups?
How difficult was it to come to consensus on the MPA you designed as a class?
What were some of the problems the class faced in reaching a consensus?
What were the easier details to agree upon?
What did the final marine reserve look like, and what uses or protections were mandated for the entire reserve and/or individual areas or quadrangles?
What recommendations do you have for further talks or agreements on MPAs? How could you resolve some of the differences you saw in this exercise?

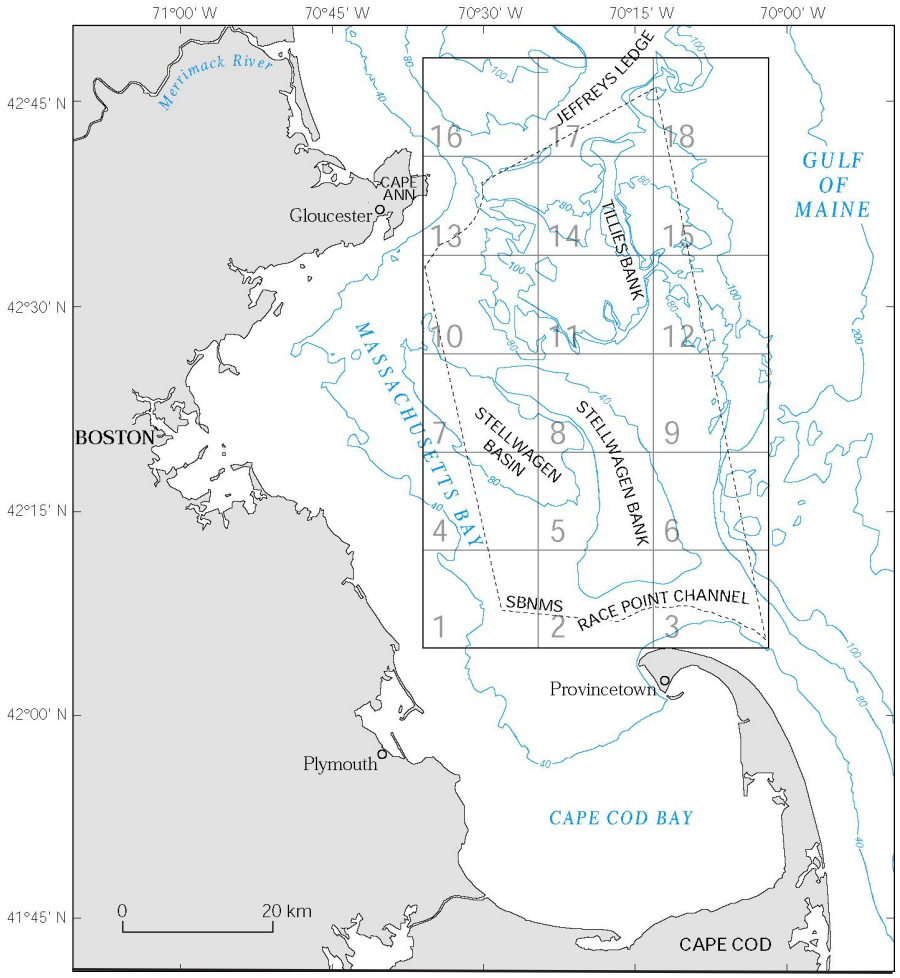

Figure 1. Map of Stellwagen Bank National Marine Sanctuary used in the consensus-building activity. Information is provided to students on items of interest within each map quadrangle, including resources of commercial and recreational use. *Map courtesy of USGS, details in the Acknowledgements*.

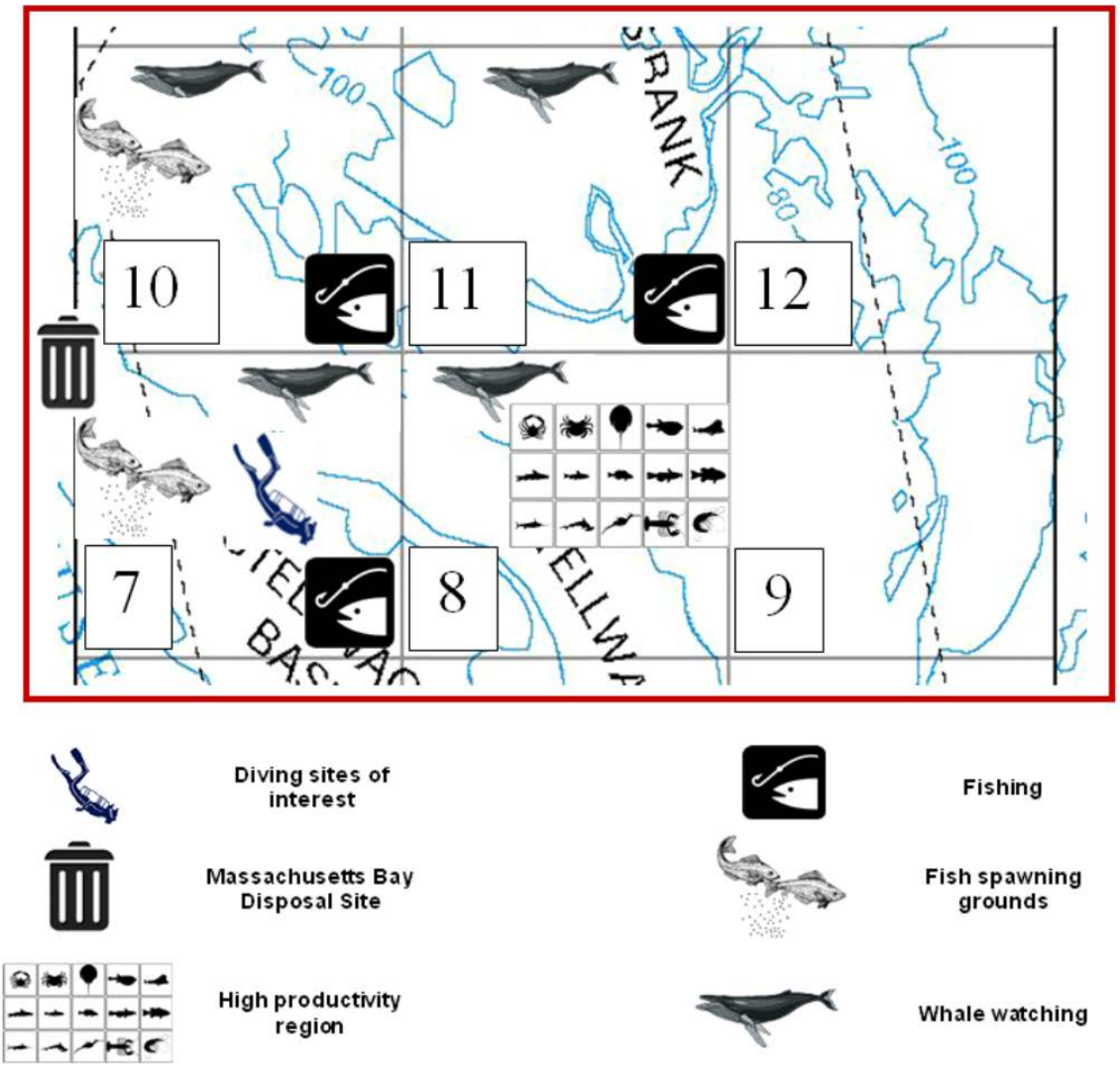

Figure 2. Subset of the map in Figure 1, with an example of how one might provide information on the resources in each region in a visually accessible manner. *Map modified from the one provided by the USGS; details in the Acknowledgements.*

Notes for the Instructor

Student Preparation

Students can be directed to do reading and research prior to this activity. For this particular case study, we assign two readings on marine reserves (Palumbi, 2000; Crowder *et al*., 2006). Students can gather additional general information from the NOAA website on Marine Protected Areas (**http://www.mpa.gov/**), and more specific information on our case study area, the Stellwagen Bank National Marine Sanctuary, on its website (**http://stellwagen.noaa.gov/welcome.html**) as well as from the many maps shown on the USGS website (**http://woodshole.er.usgs.gov/project-pages/stellwagen/stellwagenbank.html**).

Instructor Role in the Activity

The instructor's role is to facilitate this activity, while letting the students do the work and run the negotiation as much as possible. For Part 1 (students self-identify), we assign students to groups at the beginning of the activity, rather than earlier, so they can answer the pre-activity questions and prepare their thoughts about MPAs independently of knowing the identity they will be asked to assume in class. Groups tend to need approximately 30 minutes to discuss their identities, answer the three questions within their group role, and share their thoughts and answers with the class. We use a white board to recreate Table 1, and have students fill in the table on the board so the entire class can see their answers. Then we ask a reporter from each group to present their position to the other groups. We are careful to ask the students not to respond to other groups' positions at this time, but merely to listen and ask questions for clarification; debate and discussion will come later.

Part 2 (students identify their preferred MPA uses or restrictions) can take 30-40 minutes, depending upon the level of detail the students are instructed to address in their ideal MPA design. We ask them to have a plan for each of the 18 quadrangles in Stellwagen Bank National Marine Sanctuary (Fig. 1), and allow them to request anything from complete closure ("no-take" and no access) to a range of recreational and commercial uses, including resource extraction, for each quadrangle separately. They are also asked to identify which of their requests they are willing to negotiate, and which ones they will not compromise on, during this group discussion period. During Part 2, it is helpful if the instructor spends some time talking with the policy makers/government officials group, to provide guidance when necessary concerning moderating the ensuing discussion and negotiation. The success of the rest of the activity is dependent upon this group having a solid plan for helping the other three groups to reach consensus on the MPA. This group will also be more successful in running the negotiation if they spend some time identifying regions that are likely to be problems in terms of selecting a balance of uses and restrictions that all other groups will accept, and then brainstorming about possible solutions that would be acceptable to all groups.

In Part 3 (negotiation of MPA uses and restrictions), the instructor will need to be careful to allow debate and discussion while reining in the class if the conversation veers into unconstructive territory. Some moderator (policy maker/government official) groups do this well themselves, while others need the instructor to intervene upon occasion. One successful negotiation method we have seen included the moderating group asking each of the other three groups to draw the map of 18 quadrangles on the board, indicating their preferred uses and restrictions within each map quadrangle. It is always helpful if the moderating group asks the other groups to display or formally present their preferences to the rest of the class, as this allows everyone to quickly identify points of easy consensus. The class can then spend their time discussing the remaining contentious regions.

The instructor will have to use judgment concerning how long to allow this negotiation to continue, as every class is different. Upon occasion, the groups have been able to reach consensus relatively easily, if they have all thought a good deal about how they might compromise. In other instances, the consensus may take some time to reach, or may not be achieved. In both instances, we conclude the activity by asking the students to share their thoughts on what was – and wasn't – realistic about the negotiation process, and then to discuss how a variety of interested parties might successfully reach consensus in real situations.

Translating this activity to another environmental issues

While we have detailed how we conduct this activity using Marine Protected Areas as a focal topic, the structure of the activity is simple and easily translated to other environmental issues. The four key components to the success of this activity include:

1. Use a real-life example with inherent complexity
2. Role play within self-defined groups
3. Consensus moderated by students
4. Students reflect and report out at the end

We recommend using available data and other information concerning the real-life example used, so students can easily understand the implications of their negotiations. We find that having students role play helps them to consider positions they may not have naturally taken on an issue, and asking them to define their position requires them to get into the mindset of the real individuals they represent. Adding structure to the activity, including targeted questions and a clearly defined goal for the negotiation helps the students to flesh out their roles and then to stay in them while participating in the discussions. Since our primary goals in this activity are to help students build critical thinking skills solving real-world problems, and to appreciate the complexity of creating environmental policy given the variety of interested parties, we have purposely structured the activity to have the

students work out the means of negotiation, and to work together to reach consensus, with minimal intervention on our parts. While the moderating group is assigned the primary role in guiding the negotiation, all groups are tasked with the ultimate goal of reaching consensus, so they should also work on their conflict resolution skills by actively participating in the negotiation process. Finally, the in-class discussion at the end of the activity, and the individually written self-reflection essays, are designed to make students consider viable solutions to difficult problems.

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