Localization of Marine Endangered Species Richness in Protected Waters of Southeast Asia

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GIS 101 Intro to GIS

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Introduction

The oceans of Southeast Asia contain some of the highest marine biodiversity in the world, but only a small portion of this area is actually protected. Establishing a marine protected area (MPA) is a highly politicized process with many conflicting interests influencing the final reserve location. Are the current MPAs in Southeast Asia established in areas with high concentrations of endangered species?

This analysis used species richness (how many species are found in a specific area) of endangered species as a proxy for ideal locations of protected areas, focusing on marine mammals, fish, and corals. Comparison of species richness with protected areas allows for identification of where current MPAs are most effective and suggests where future MPAs could be located.

Methods

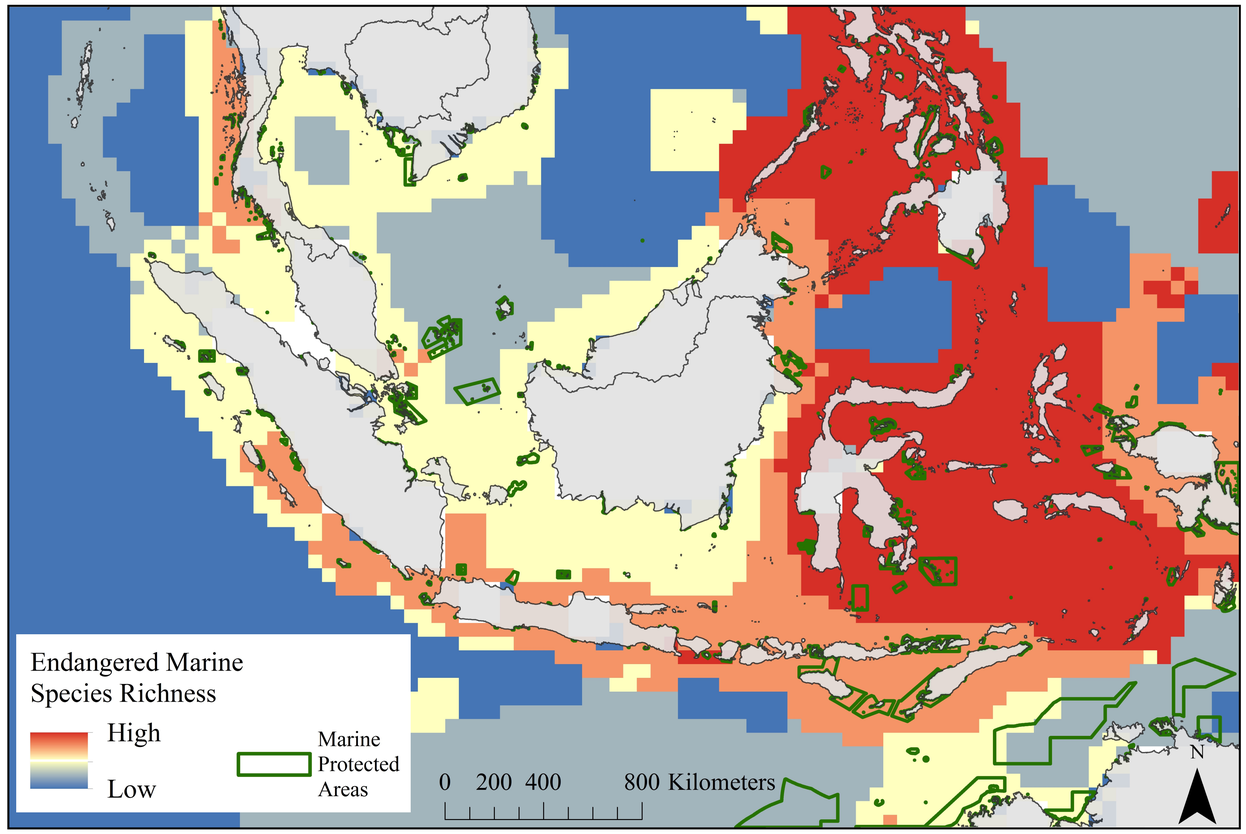
Marine Protected Areas:

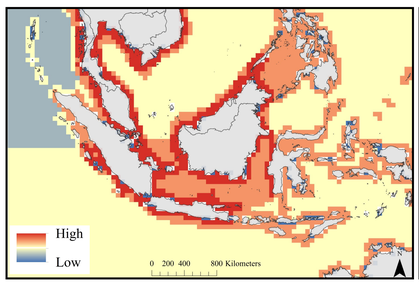
1. Obtained location of protected areas (marine and terrestrial) for each country in Southeast Asia from ProtectedPlanet.net.
   - Countries: Brunei, Cambodia, Indonesia, Malaysia, Myanmar, Philippines, Singapore, Timor-Leste, Thailand, Vietnam, and northern Australia
2. Removed all terrestrial protected areas

Endangered Species:

1. Obtained global species distribution data of marine groups listed on the IUCN Red List of Threatened Species
   - Groups: Marine Mammals, Marine Fish, Corals, Cone Snails, and Lobsters
2. Selected species whose distribution range included Southeast Asia
3. Chose only species identified as Critically Endangered, Endangered, or Vulnerable as these are the "threatened categories" identified by the IUCN
4. Identified species richness for each marine group
   - Summed individual species distribution to determine total number of species found in each grid cell
5. Reclassified species richness on a scale from "Low" to "High" so different marine groups could be compared
6. Combined all marine groups to create a single species richness map of the region.

Note: No threatened species of cone snail or lobsters were found in the region.



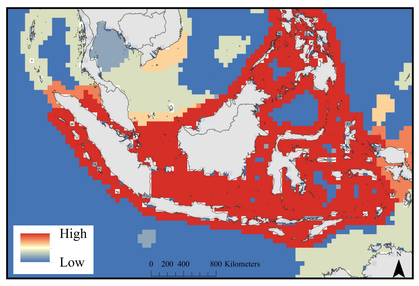


Marine Mammal Species Richness

0—6 Species

Fish Species Richness

0—15 Species



Coral Species Richness

0—70 Species

Results

Under **20%** of areas with the highest richness of endangered species were contained in marine protected areas (MPAs). This puts endangered species at increased risk to human impacts as they are largely located outside of protected areas.

Species richness differed for all three marine groups examined, but highest overall species richness was found in the eastern area of the study site, near eastern Indonesia and the Philippines. This suggests that creation of future marine protected areas should be focused on these locations, especially if conserving endangered marine species is the goal.

Limitations

There are many other factors besides species richness and location of marine protected areas that may make endangered species increasingly vulnerable that were not able to be incorporated in this analysis, including:

- Species identified as "Data Deficient" by the IUCN
- Rates and locations of endemism
- Habitat types
- Residence times of species
- Individual species resilience
- Water temperature and acidity
- Additional species not listed as threatened (especially microfauna)

Further Analysis should attempt to incorporate these factors, as well as the multitude of human impacts in the region to identify the areas most at risk. Human impacts could include:

- Shipping
- Commercial or destructive fishing
- Ocean Pollution
- Climate change and effects

Data Sources

IUCN and UNEP-WCMC (2015), The World Database on Protected Areas (WDPA) [On-line], [December 2015]. Cambridge, UK: UNEP- WCMC. Available at: www.protectedplanet.net.

IUCN 2014. The *IUCN Red List of Threatened Species. Version 2014.1*. http://www.iucnredlist.org. Downloaded in December, 2015.

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