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WHALES AND VESSELS: Economic Valuation of Whale Watching and Marine Spatial Planning Surrounding Dominica

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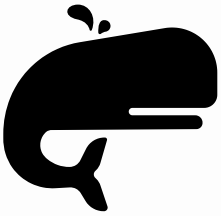
THE PROBLEM

Ship strikes are a known source of significant mortality for sperm whales and other large whales worldwide. The west coast of Dominica attracts heavy vessel traffic in and out of two primary ports, but does not currently use shipping lanes to manage vessel traffic. As a result, the local eastern Caribbean sperm whale community faces ship strike threats from unregulated vessel traffic. Ship strikes may be a factor in the observed decline of this sperm whale community, exacerbated by the lack of vessel traffic regulation.

WHY CARE?



At current reproduction and mortality rates, the eastern Caribbean sperm whale community could reach a dangerously low population size by 2030. This sperm whale community is geographically and behaviorally isolated, which makes it unlikely for the community to rebound if they are extirpated.

Dominica is known as the "Whale Watching Capital of the Caribbean." Its economy relies heavily on tourism and travel, which accounts for approximately 33% of the country's total gross domestic product (GDP). The recent decline in Dominica's sperm whale community is threatening the longevity of the community and therefore the stability of the related whale tourism sector of this Small Island Developing State.

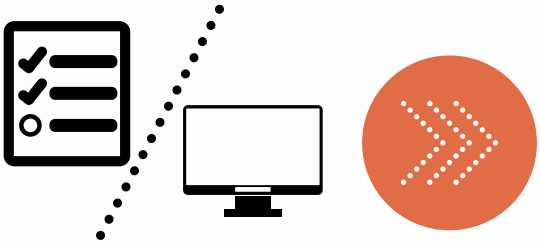
OUR GOALS

1. **Determine the monetary value of sperm whale tourism in Dominica through an economic valuation.**

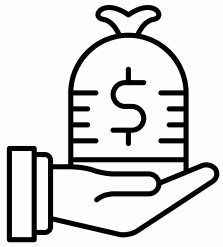
2. **Develop a marine spatial plan for Dominica that regulates vessel traffic and reduces vessel speed within sperm whale habitat.**

1 SPERM WHALE TOURISM IN DOMINICA

Sperm whale tourism in Dominica is comprised of three main business groups: **whale watching tour operators, swim-with-whale tour operators, and cruise lines that offer whale watching excursions to passengers.** The goal of our economic valuation was to find the **annual net profit** generated from sperm whale tourism in Dominica, and specifically how much of that value directly contributed to Dominica's economy. Data collected from a survey and online research were used to calculate a range of annual net profit values.



Economic Model



Whale Watching and Swim-With-Whale Economic Model

$$NPW = (WET * W) - E$$

- **NPW** = Annual net profit from sperm whale tourism
- **WET** = Average whale tourist expenditure per trip
- **W** = Number of whale tourists per year
- **E** = Average expenses for whale tour operator

NPW estimates for whale watching and swim-with-whale operators allowed us to determine the estimated contribution from cruise line tourists. This equation was modified to account for the proportion of whale watchers that come from cruise ships and the ticket price difference between what whale watching tour operators charge and the prices cruise lines charge their passengers to go on whale watching tours in Dominica.

$3 million

ANNUAL NET PROFIT OF WHALE TOURISM IN DOMINICA

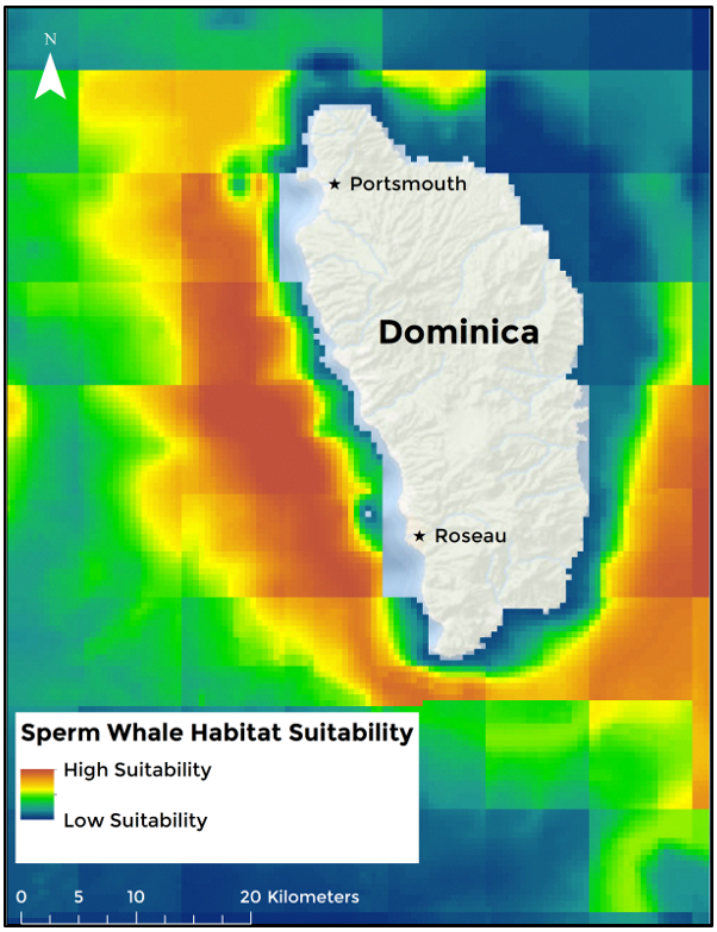
Sperm whale tourism in Dominica generates at least $3 million U.S. dollars (USD) in annual net profit. This includes whale watching, swim-with-whale, and cruise ship sources extrapolated over the total number of operators in Dominica.

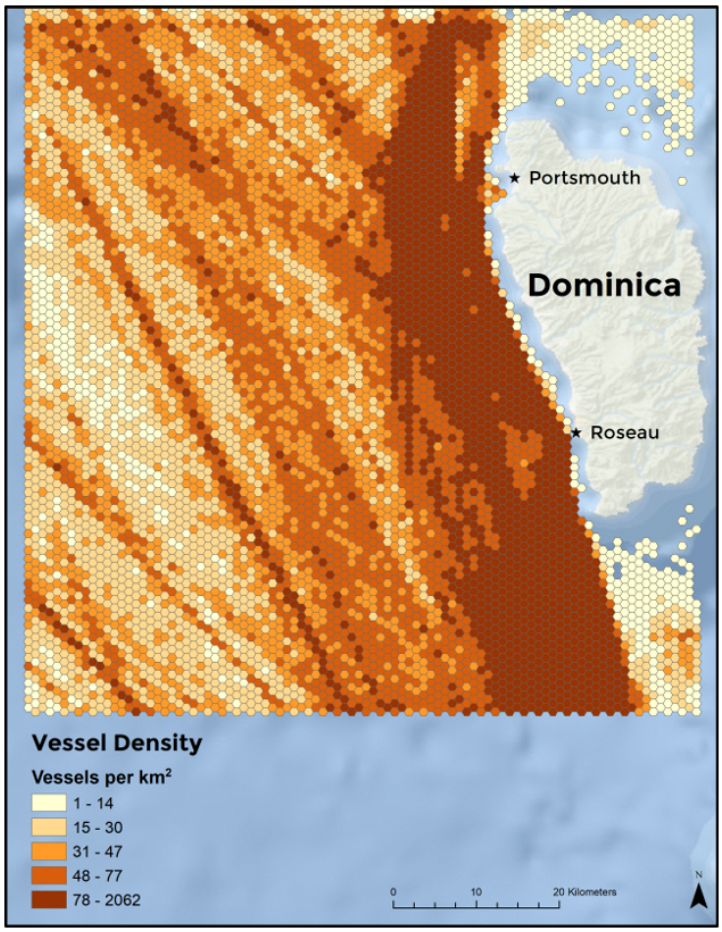
$1 million

ESTIMATED ANNUAL ECONOMIC BENEFITS TO DOMINICA

At least $1 million USD of the annual net profit benefits Dominica's economy directly. This mainly comes from operator fees paid to the government and boat charter fees that international companies pay to local boat owners. However, this number is likely higher when sources from tourist food, accommodations, and additional purchases are considered.

2 MARINE SPATIAL PLANNING



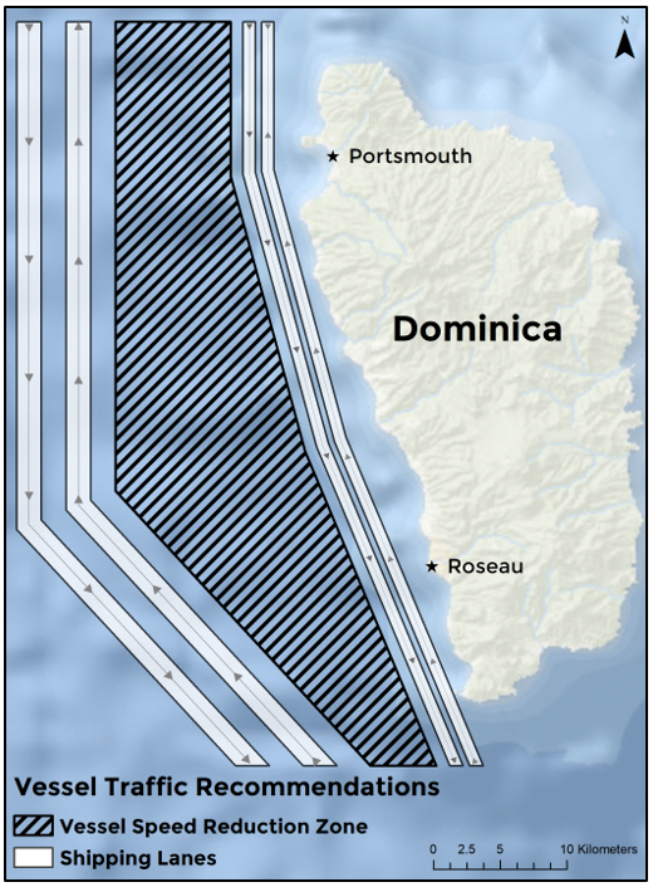


A species distribution model based on sperm whale presence data and environmental factors allowed us to estimate where sperm whales were located. From this, we could identify areas of high predicted habitat suitability for sperm whales off the west coast of Dominica.

A vessel traffic density analysis allowed us to visualize categories of vessels that pose the greatest lethal ship strike risk; these include cruise ships, merchant vessels, and high speed ferries traveling 10 knots or greater. We see that the highest vessel traffic density overlaps with high sperm whale habitat suitability areas.

It was important that our marine spatial plan consider areas where sperm whale abundance was greatest and areas where vessel traffic off the west coast of Dominica was busiest. This informed how we could best design recommended vessel traffic schemes to mitigate ship strike threats to the eastern Caribbean sperm whale community.

OUR RECOMMENDATIONS



Vessel Traffic Schemes. The Dominican government should implement shipping lanes and a vessel speed reduction zone off the west coast of Dominica. These measures could reduce ship strike threats by routing vessels around high suitability sperm whale habitat, and slowing vessels down when traveling through sperm whale habitat. These recommendations could also help manage vessel traffic in and out of the two ports.

Dynamic Whale Hot Spots. The Dominica Sperm Whale Project (DSWP) should continue to monitor the sperm whale community and update these reproducible analyses with new whale sightings and vessel track data to track any shifts in threat hotspots. This will allow DSWP and the Dominican government to collaborate on updating vessel traffic schemes if necessary.

Travel Impacts. Vessel management decisions should incorporate added time and other costs associated with the vessel speed reduction zone, so that vessels traveling through this zone can account for these costs.

Ongoing Economic Evaluation. DSWP and the Dominican government should continue to collect more complete data to improve the estimation accuracy of sperm whale tourism's monetary value in Dominica. We have designed an economic valuation spreadsheet that can update our estimates based on new information.

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