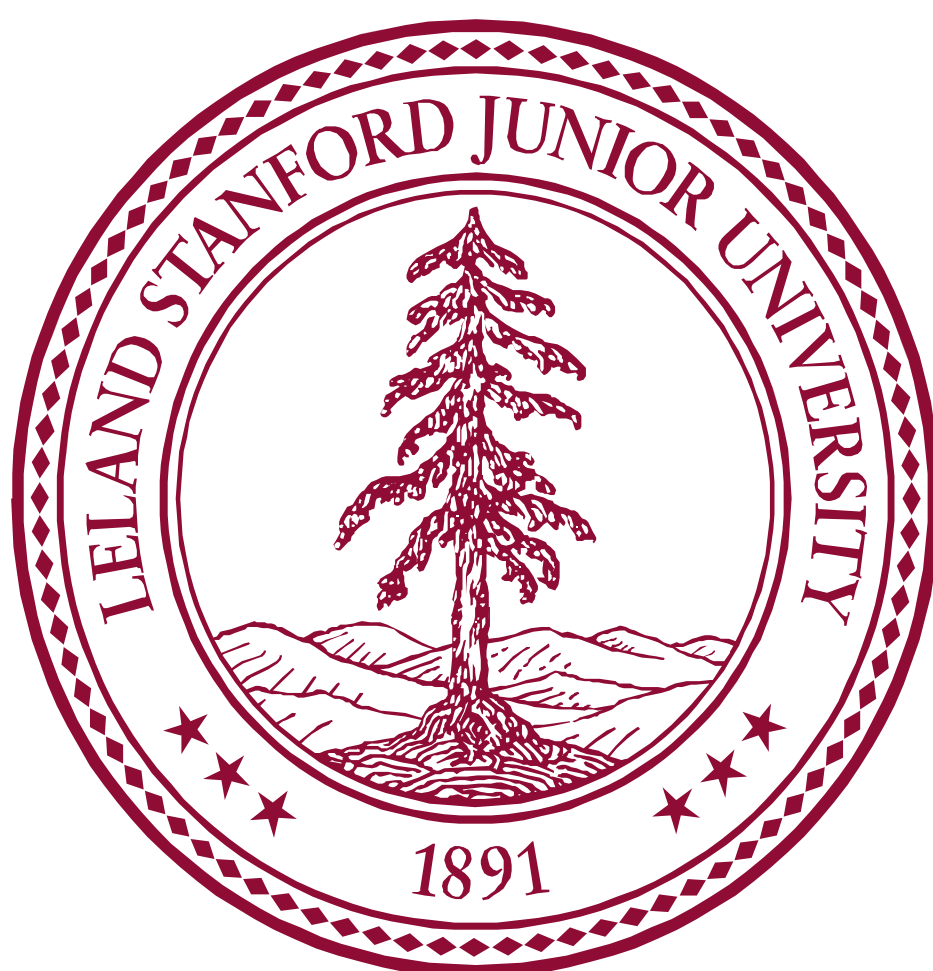


Evaluating the Effectiveness of Large Marine Protected Areas

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Introduction

Currently, 4.5% of the ocean is protected by marine protected areas (MPAS). MPAs are sectioned portions of ocean with restricted or prohibited fishing laws put in place to protect biodiversity. The protection of MPAS range from no-take (no fishing within the reserve) to multi-zoned (some no-take areas).

91% of MPAs are large MPA (> 100,000 km²). Yet large MPAs, due to their massive size, have not been closely studied or had their effectiveness quantified. However, a new dataset has recently become available that allows the fishing patterns in and around large MPAS to be studied.

This dataset, provided by Global Fishing Watch, uses satellite data to track fishing hours and fishing location of fishing vessels over over the past six years. With this dataset, it is possible to view individual boats and see where and when they fished.

Using this dataset, I worked with the De Leo Lab from the Hopkins Marine Station to understand the effects of the creation of large, no-take MPAs on fishing patterns. Our main questions include: Are fishing bans adhered to after the creation of a large no-take MPA? Is fishing redistributed to the borders of large no-take MPAs after their creation?

Over the past decade, countries have exponentially designated and created MPAs. This rush to create MPAs is in part due to the UN's goal of protecting 10% of the ocean by 2020. Therefore, our project is geared towards informing relevant policies on MPA creation.

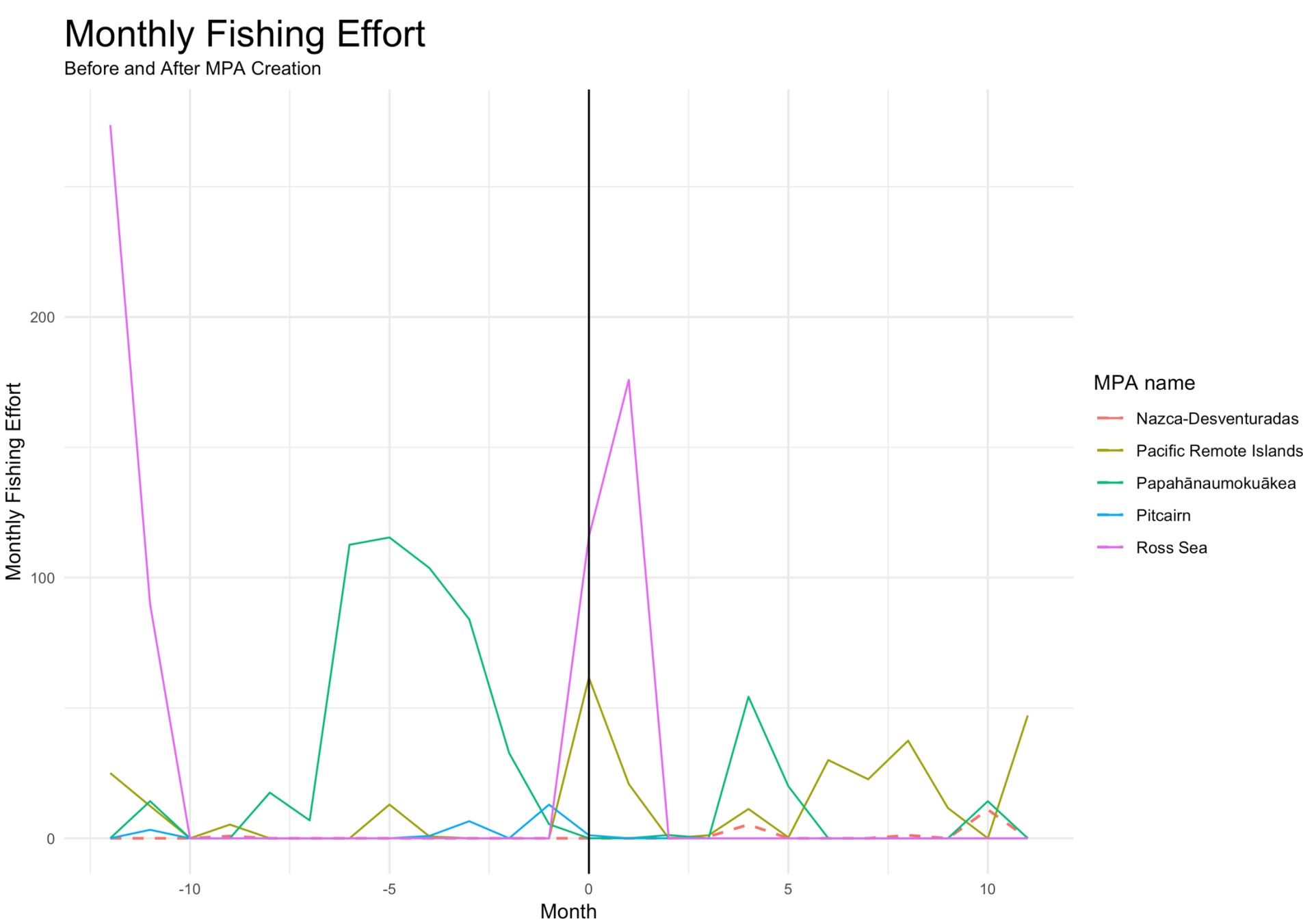
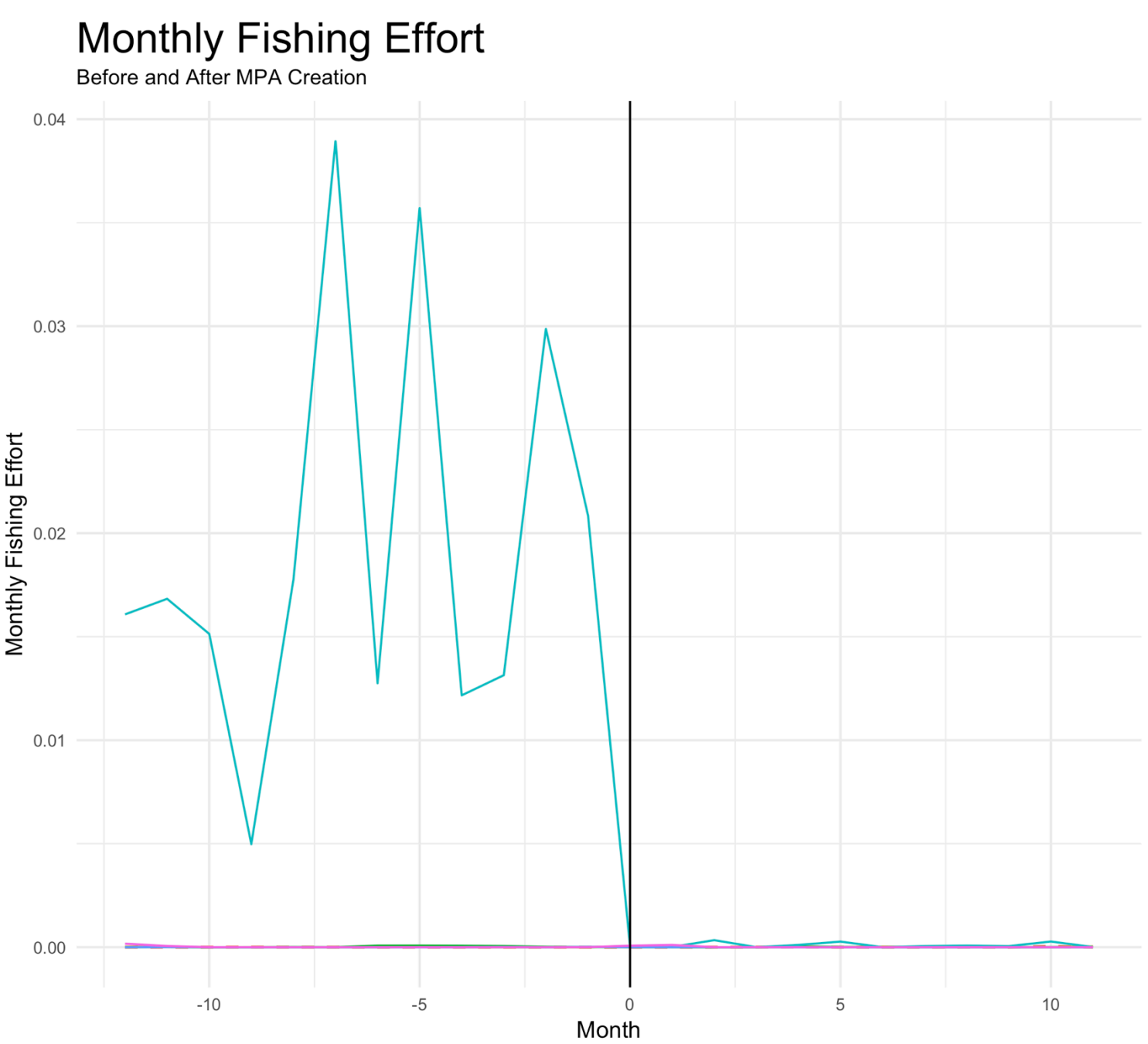
Methods and Results

We used the Global Fishing Watch dataset to study fishing patterns of large, no-take MPAs created after 2014 and before 2017. This date range was set because the dataset is incomplete before 2014 due to a lack of satellites orbiting and because MPAs created after 2017 are too new to be effectively studied.

We looked at the collective time spent fishing within large, no-take MPAs a year before and a year after its creation.

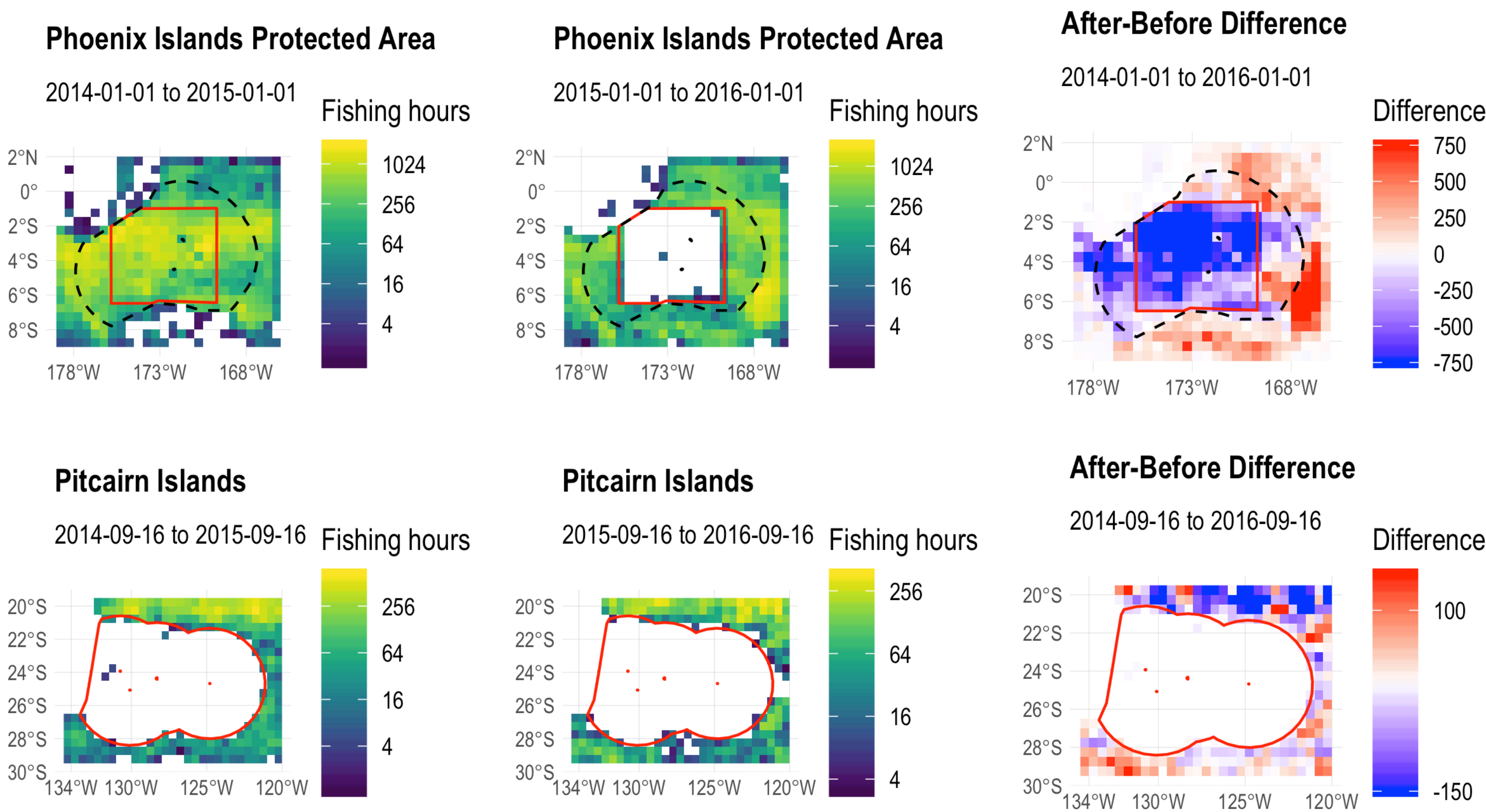
Of the 6 MPAs we studied, only one showed any sign of a change in fishing patterns after its creation.

Even within the 5 MPAs with the least fishing hours, there is minimal fishing before the MPA's creation.



Fishing Effort and Difference in select large MPAs

Heat maps help visualize fishing activity over the span of a year.



The Phoenix Islands Protected Area MPA showed clear signs of fishing halting during the year after its creation

The Pitcairn Islands MPA showed little sign of fishing change after its creation.

Discussion

Surprisingly, we found that many large, no-take MPAs had little fishing within its borders even before their creation. This discovery leads us to question the effectiveness of large no-take MPAs. Critics of large, no-take MPAs cite the creation of “paper parks” as a major fault. These “paper parks” have little real-world effect, despite purporting to protect biodiversity. They are put in place in order to fulfill quotas or to gain a country accolades. Our research perhaps confirms these critics’ claims.

Further research is needed to study the new large, no-take MPAs that have been created in the past year.

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