THE SMITHSONIAN LED MARINE GLOBAL EARTH OBSERVATORY

Understanding how coastal ecosystems work — and how to keep them working

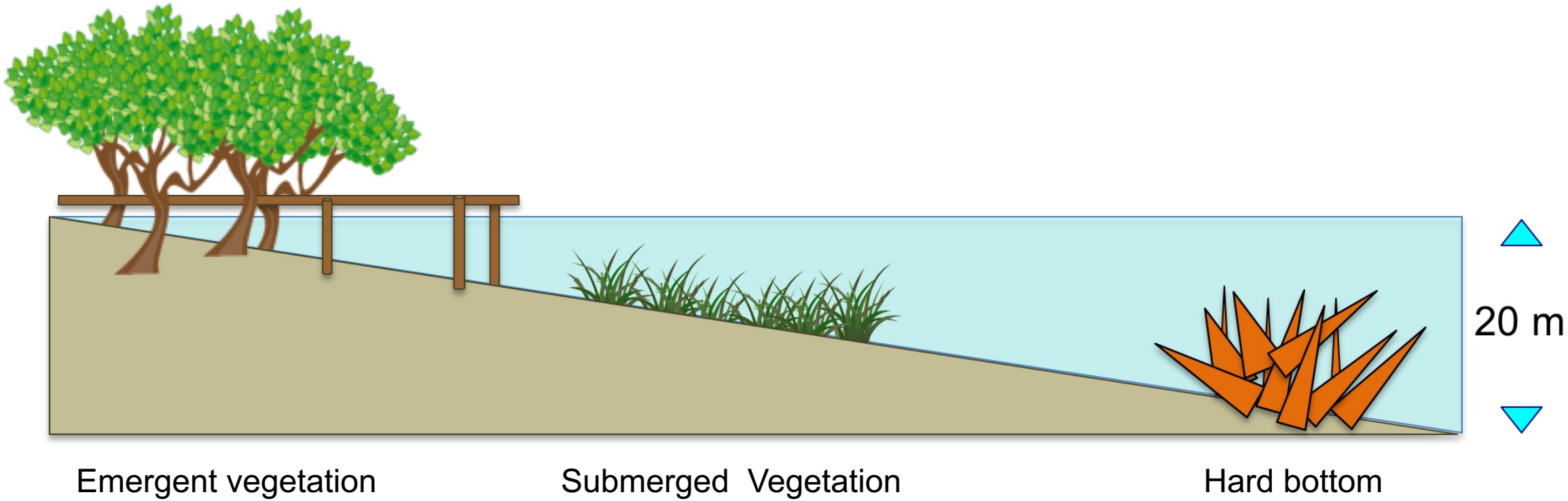
MarineGEO
THE TENNENBAUM
MARINE OBSERVATORIES NETWORK
Smithsonian Institution

The Smithsonian is the National Institute of Biodiversity

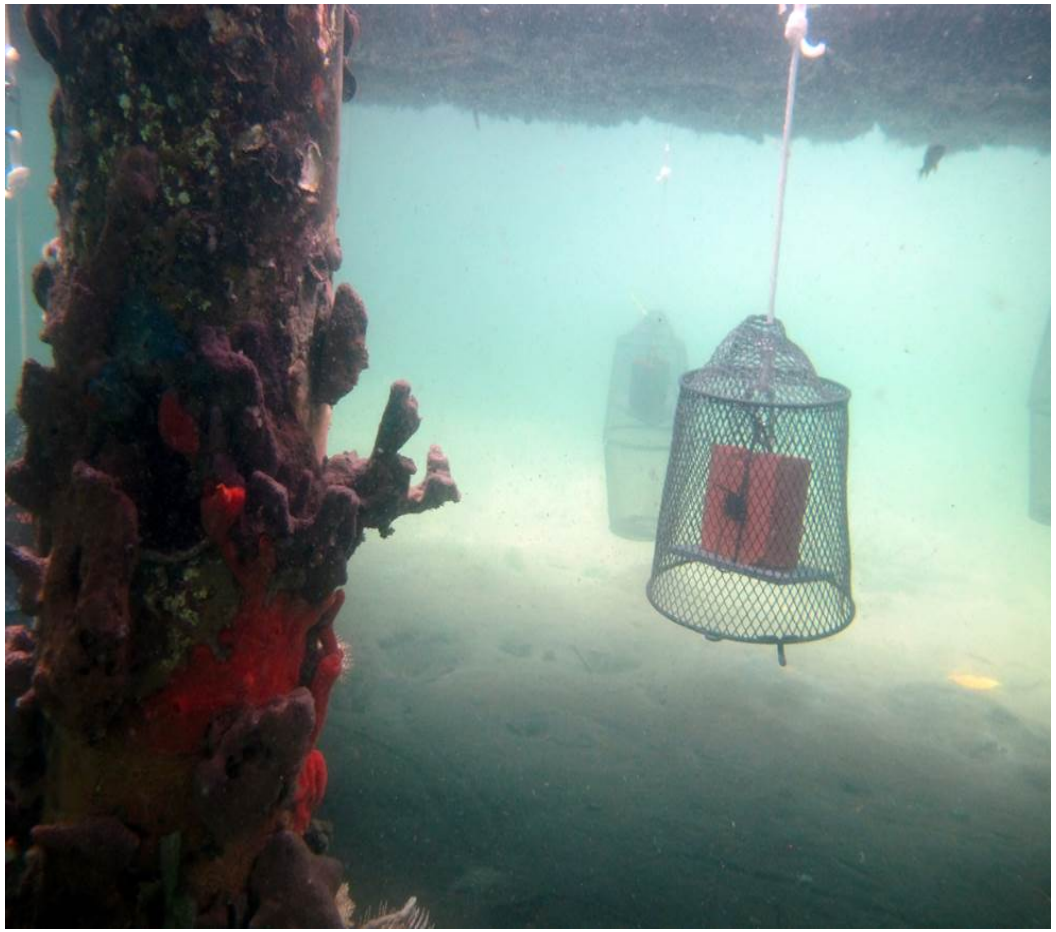
MarineGEO

MarineGEO's niche is building the biodiversity library

MarineGEO's niche is nearshore habitats where biodiversity and people concentrate



MarineGEO's niche is coordinated experiments: *tests of mechanism*



MarineGEO

Smithsonian can use its convening power for analysis and synthesis

MarineGEO

MarineGEO's infrastructure is people

1. What have you done in the past year to address user needs?

MarineGEO led intensive ‘bio-blitz’ inventories in Hawaii, BC

We are progressing toward an integrated data system

Data Packages

csv + eml

Fish Occurrences

Protocol

Squidpop methods

photo + meta data + eml

Photos

Repository

OBIS/GBIF

Ocean Best Practices

OSF

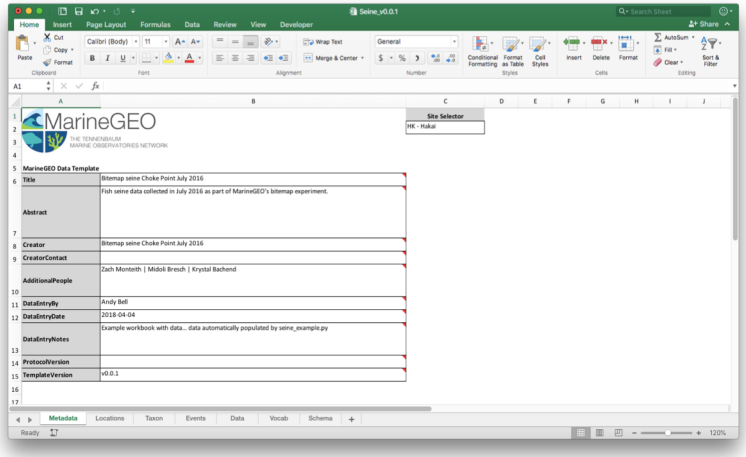
Portal

MarineGEO Portal

R package* outputs data package and summary graphs

** under development*

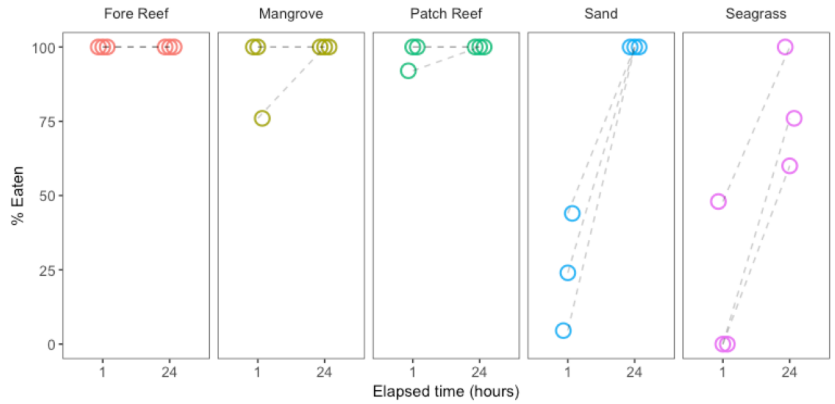
Excel data entry template

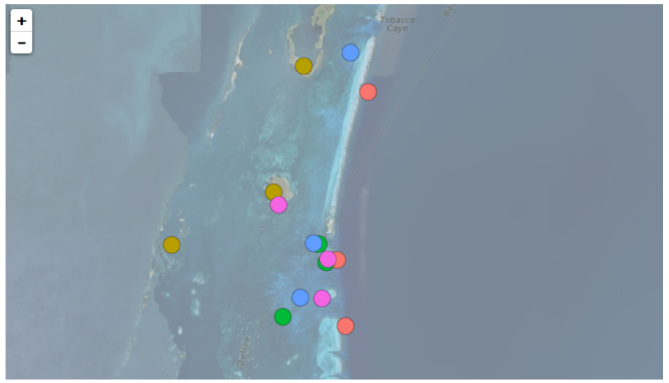


MarineGEO R package

```
devtools::install_github("marinegeo/marinegeoParser")
library(marinegeoParseR)
marinegeoParseR::readSquid("squidpop.xlsx")
```

Standardized reports + visualizations





Data Package (archived)

CSV

+

EML

Synthesis: *Biodiversity is as important as climate*

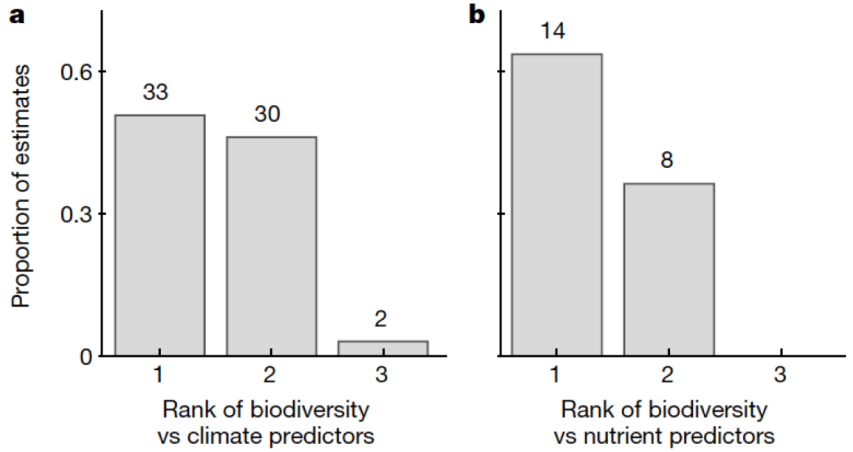
LETTER

doi:10.1038/nature23886

Biodiversity effects in the wild are common and as strong as key drivers of productivity

J. Emmett Duffy[1], Casey M. Godwin[2] & Bradley J. Cardinale[2]

More than 500 controlled experiments have collectively suggested that biodiversity loss reduces ecosystem productivity and stability[1–3]. Yet the importance of biodiversity in sustaining the world's ecosystems remains controversial[4–8], largely because of the lack of validation in nature, where strong abiotic forcing and complex interactions are assumed to swamp biodiversity effects[6–9]. Here we test this assumption by analysing 133 estimates reported in 67 field studies that statistically separated the effects of biodiversity on biomass production from those of abiotic forcing. Contrary to two decades in which the prevailing opinion was that biodiversity would have rare or weak effects in nature, we show that biomass production increases with species richness in a wide range of wild taxa and ecosystems. In fact, after controlling for environmental covariates, increases in biomass with biodiversity are stronger in nature than has previously been documented in experiments and comparable to or stronger than the effects of other well-known drivers of productivity, including climate and nutrient availability. These results are consistent with the collective experimental evidence that species richness increases community biomass production, and suggest that the role of biodiversity in maintaining productive ecosystems should figure prominently in global change science and policy.



Offline: Planetary health's next frontier—biodiversity

Medicine's inspiring power is the moral importance it attaches to human life. The commitment of health workers to the protection and strengthening of humanity is a bulwark against violence, repression, and abuse. It is in their defence of life and human flourishing that medicine and medical science find their political and social force. But the priority medicine gives to being human is also its great conceit—and flaw. What has become increasingly clear is that, as Emmett Duffy and his colleagues put it in *Nature* earlier this year, "Human well-being depends strongly on the interacting web of living species, so much so that we take this for granted." If we are concerned about human health, we should also be concerned about the health of the biosphere that we inhabit. It is rare to hear health advocates talk about biodiversity. Health and climate change is now fixed in the lexicon of global and public health. But biodiversity remains largely invisible. It's time to make protecting the biodiversity of our planet the next great cause of planetary health.

*

If one text could ignite this movement for biodiversity, it might be E O Wilson's book, *Half-Earth: Our Planet's Fight for Life* (Liveright, 2016). Wilson reminds us not to lose sight of our humble place on our planet—"we remain a biological species in a biological world". The biosphere on which we so depend is "razor thin and negligible in weight". Given this fragility, it is worth recalling that "The biosphere does not belong to us; we belong to it." But today our living world is passing through a Sixth Extinction, with rates of species loss as much as a thousand times pre-human levels. The extent of our planet's biodiversity is truly astonishing. By 2015, over 2 million species had been discovered. The expectation is that there are a further 6 million species to be found. The speed of discovery of new species is also remarkable. But, "Humanity is losing the race between the scientific study of global biodiversity and the obliteration of countless still-unknown species." Few among the public, including the health community, understand these facts. That this is so is, according to Wilson, "a massive failure of education and media attention". Wilson poses our predicament as one that tests "the reach and quality of human morality".

*

The solution? Half-Earth—"a fundamental shift in moral reasoning concerning our relation to the living environment". In practical terms, Half-Earth means committing 50% of the planet's surface to nature. Conservation works. But it isn't anywhere near the scale needed to protect the diversity of life around us. Of around 26 000 known vertebrate land animals, only a fifth have been stabilised through conservation. If one could protect half the world's ecoregions, at least 85% of the world's biodiversity could be saved. But today only 15% of the world's land surface is safe. The official 2020 goal is an unambitious 17%. Eric Dinerstein and colleagues dedicated their recent paper in *BioScience* to Wilson. They found that half of the world's existing ecoregions could achieve the Half-Earth goal. Namibia, Nepal, and Bhutan are exemplar countries that have already achieved their Half-Earth target. Meanwhile, a quarter of ecoregions are in peril. Dinerstein recommended a Paris-like international agreement on biodiversity—a Global Deal for Nature, with 2050 as the target date for 50% conservation. In addition to the goal of Half-Earth, Wilson argues for investment to understand better the ecosystems on which we rely. The focus must be on discovering species that remain unknown and on studying the lives of those species intensively. Species are the crucial elements of ecosystems. The understanding of species and their interactions will give us important clues about how ecosystems work. Wilson compares our understanding of ecosystems today with 19th-century phrenology. In one strange sense our future is circling back to our past. It was Carl Linnaeus (1707–78) who was the father of scientific taxonomy. The future of human life (and health) now depends on a new Linnaeus-inspired generation of naturalists. Wilson quotes the French writer, Jean Bruller: "all of mankind's troubles are due to the fact that we do not know what we are and cannot agree on what to become." But we do know that our future wellbeing depends intimately on the wellbeing of the living world around us.

Richard Horton
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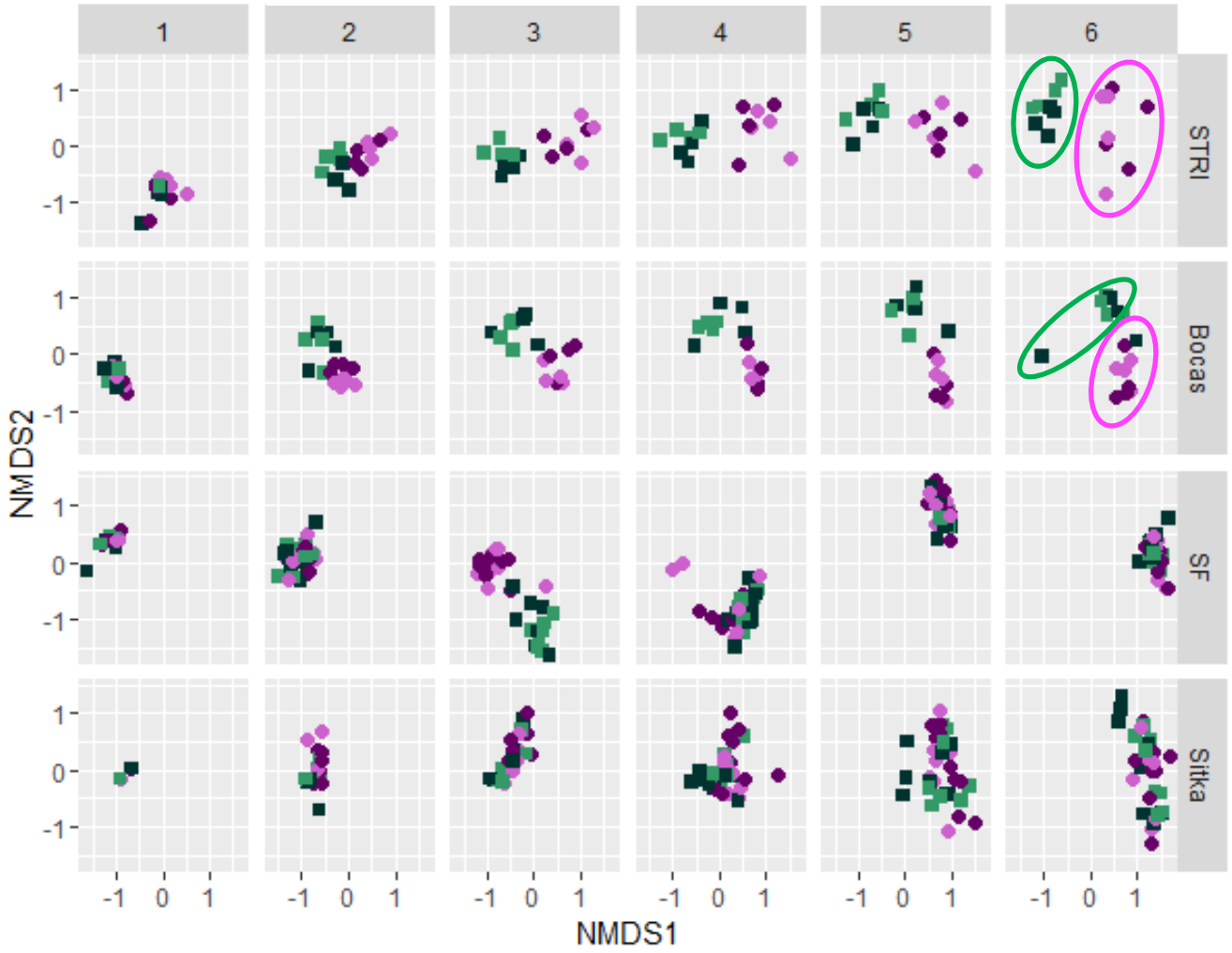
3. How are you progressing with shared cross-MBON priorities?

Experiments are the gold standard of inference

How do predation and invasion interact across geography?

Community change through time



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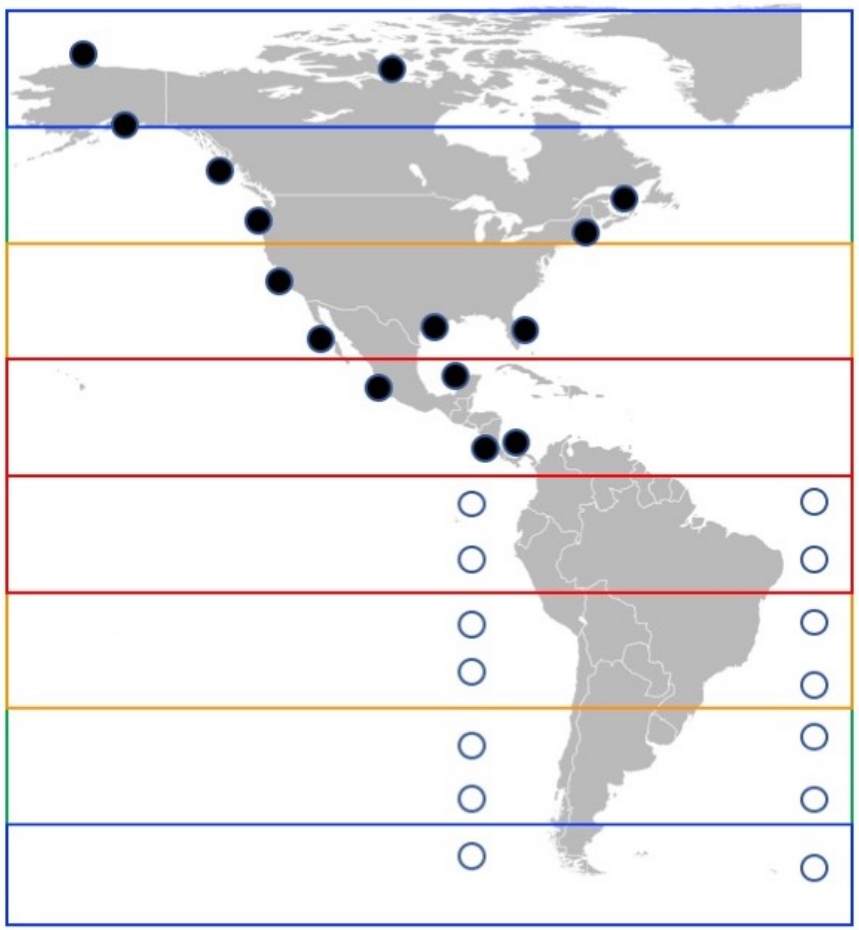
Pan American ***Ex***perimental Initiative in Marine Macroecology



P2P Marine Biodiversity Workshop: from the Sea to the Cloud

Pole-to-Pole MBON & AmeriGEOSS
São Sebastião, Brasil
August 6-10, 2018

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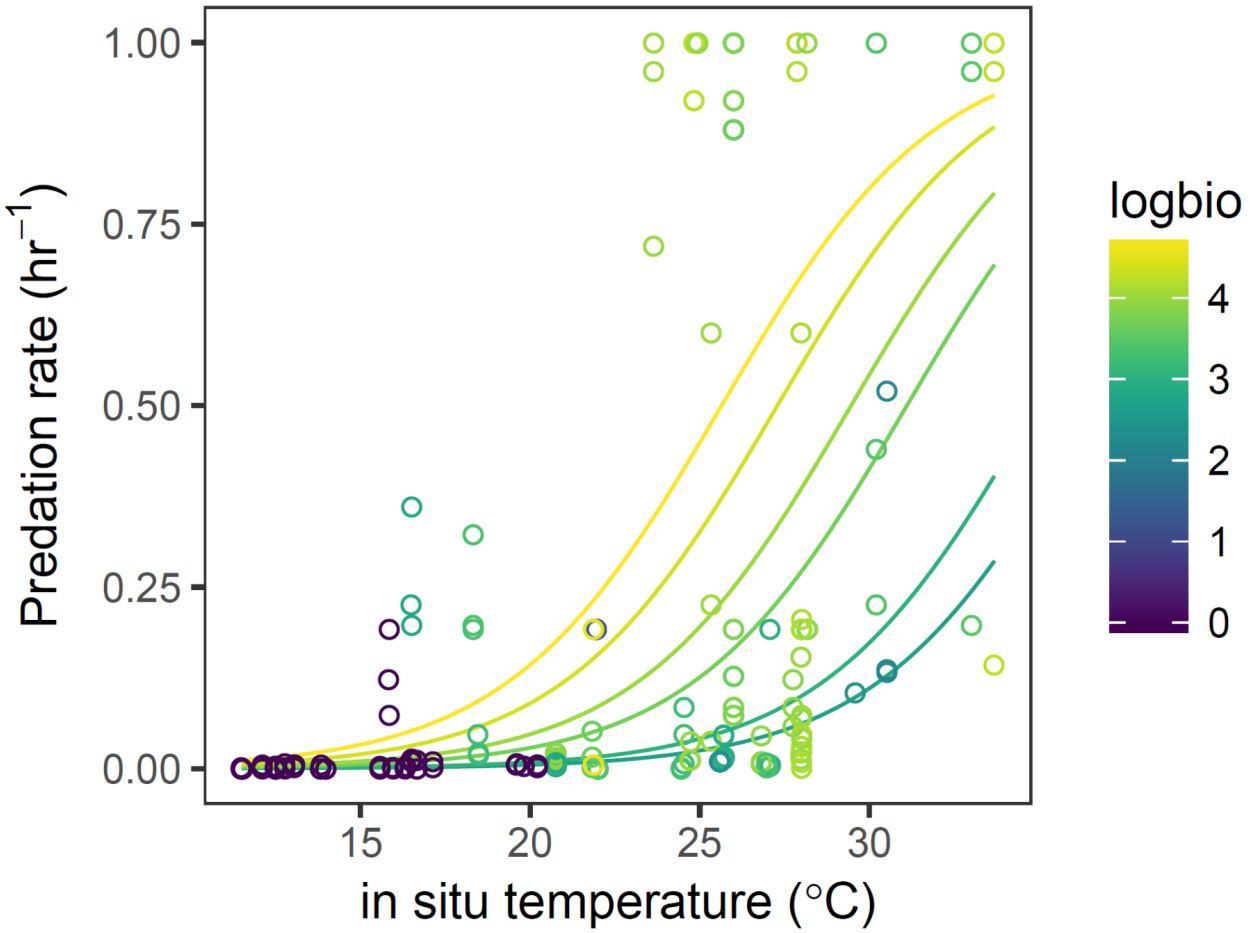
Bitemap: Fish predation increases with temperature & fish biomass



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Questions?


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Please allow 20 min. for speaking and 10 min. for discussion.

Please address the following:

- *What have you done in the past year, and how is that work addressing the needs of your targeted users?*
- *How are you measuring your impact on the user community that you serve?*
- *How are you progressing with shared cross-MBON priorities, e.g. advancing eDNA methods for the MBON community, and leveraging seascapes?*

The Cruise plan

Introduction

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Progress Report

[redacted]

Cross-MBON

4. xxx

5. xxx