PLOS Science Wednesday: Hi Reddit, my name is Pedro Afonso and I recently published a paper in PLOS ONE that showed changes in sea surface temperature can predict whale shark habitat use patterns – Ask

PLOSScienceWednesday [1] and r/Science AMAs[1]

[1]Affiliation not available

April 17, 2023

Abstract

Hi Reddit, My name is Pedro Afonso, and I am a senior researcher at the Institute of Marine Research and MARE - Marine and Environmental Sciences Centre, both based at the University of the Azores. I recently published a paper in PLOS ONE entitled "Dynamics of Whale Shark Occurrence at Their Fringe Oceanic Habitat", where we investigated the patterns of occurrence of whale sharks over the mid north Atlantic ridge. Using 16 years of observational data from a pole-and-line fishery across the Azores and GAM models, we investigated the spatial and temporal patterns of whale shark occurrence in relation to oceanographic features. Our study found that whale shark sightings in this oceanic region increased sharply in 2008, and that sea surface temperature helps predict whale shark occurrence in the region. Our research also showed that the Azores are at a thermal boundary for whale sharks, which can help explain the post-2007 increase in sightings and has further implications in the face of climate change. I will be taking questions at 1pm ET – Ask Me Anything!

the WINNOWER

REDDIT

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PLOSSCIENCEWEDNESDAY R/SCIENCE

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What are your thoughts on PLOS one's pay to publish model?

drf24

I think this will get worse. You have tens of times more reserachers publishing now than 20-30 years ago.

Sorry for bad english...

Have you seen big differences/changes in marine life while you have been studying and researching it? Because, you know, climate change. How do you think it will be in 50 years? Just wondering.

Thanks for AMA and good luck with your research.

Dreamer_tm

Some. For example, an increase (although irregular) in jellyfish occurrence in the Azores. Or an increase (steady) in plastic and microplastic washed ashore. In 50 years time we will surely have great increased capacity to forecast what will happen (in another 50 yers) but it is hard to say where we will be in 50 years from now. There are many studies forecasting it (ex. stock declines), but the uncertainties are still too high

Hi and welcome to /r/science.

I'm curious as to whether ye have tried using upper ocean (say, top 200m) temperatures or heat content as a predictor for whale shark habitat use?

Also, where do you see whale shark habitats shifting to over the next few decades as the 22C isotherm spreads pole-ward?

IceBean

We only used SST, not the mixed layer T or the heat content.

It is foreseenable that the 22 isotherm will not move continuously northward. And so also not the WS habitat expansion. But it appears very possible that it will expand northward to some extent. But because there is not a WS population expansion (as much as we can say) concomitant to such a habitat expansion, one wonders what wil the consequences be for the population ecology (e.g. encounter rates between adult reproductivelly active sharks).

Do you ever feel like studying the habits of whale sharks in the face of climate change is a bit like playing the fiddle while Rome burns?

monkeydave

Good point. Sometimes. But using particular animals as indicators of broader ecosystem changes is almost a mandatory approach given our knowledge constraints. And whale sharks are obviously an interesting animal.

What gave yiu the initial idea to even study this topic?

bonafart

Whale sharks are typically epipelagic and know to migrate large distances, which makes them great models to study this topic. PLus, we had access to a great dataset from fisheries observers.

Based on your brief description above (rather than a read of your paper), it sounds as if you've concluded increasing ocean temperatures are extending the normal range of whale sharks into more northerly latitudes. Since whale sharks are plankton/basking feeders, this suggests the range of the species on which these sharks feed is also shifting north. Is there also a corresponding reduction in the southern range of whale sharks? --ie are increasing ocean temperatures also killing the whale share prey species or making the waters too warm for the sharks to survive at the southern end of their range?

shiningPate

We don't really know the answer to either of the 2 questions. To answer the first, it would be necessary to have a good multiyear tagging dataset in order to assess how individuals fine-tune their migrations and habitat use in response to temperature.

Hi there! Thanks for the AMA!

With usage patterns, predicability and the likes becoming more of a thing do you ever feel like this could be abused in the future and if so is there anyway or ideas to prevent that?

Thanks.

ShyguySquid

not sure what you mean

If the whale shark patterns are becoming more predictable due to increasing ocean temperatures, would you say that the geographic range of whale sharks is becoming smaller as they can no longer tolerate certain areas? Do you believe that your findings have implications towards the whale shark soon being unable to tolerate the water temperature of the ocean in general?

Meowsandpurrs

See previous answer. It is possible, but that hypothesis requires testing. It is true that WS can tolerate huge (>20º C) temperature ranges during the course of their diel migrations. What is less know is how they factor that in (directly via physiological constraints or indirectly via prey availability) for their seasonal habitat use decisions.

Are these whale sharks important in the maintenance of ocean ecosystems? If climate change disrupts their geographical patterns, will that in itself have important downstream effects?

dark_magnetar

I don't know. We do not have good estimates of food consumption by whale sharks and, incredibly, not even of population numbers. We know that they have also indirect ecological links (e.g. with associated tuna) that necessarily broaden our perception of potential importance (and effects) of these creatures in the ecosystem.

Have there been other studies looking at the effects of global climate change on thermal boundaries for other aquatic animals? Are fish or whales as sensitive to the temperature changes as these whale sharks? Could this be a possible explanation for the increased rate of shark attacks in recent years?

shiruken

There is an increasing number of studies indeed. We start to know more about range expansions (e.g. in fishes or zooplankton) and physiological effects on megafauna. But not really on sharks. As to the supposed increase in shark atacks, as the new says, 'While shark attacks may seem to be on the rise across the globe, that doesn't mean sharks are on a rampage, according to experts who note that it could in fact be the result of people seeking more fun in the oceans.'

I'll ask it: how dangerous are whale sharks to humans? Particularly as sightings increase?

some_random_kaluna

I know of no attack of WS to humans. It is even hard to get bumped by one: they seem to be very good in avoiding a human swiming. I gess you could get tail beated...

[deleted]

[deleted]

You mean selg-regulating mainetence?

Why? What is the benefit of this data. The cost compared to the return?

asanemaniam

This study was done making use of a fisheries observer dataset not specifically desygned to provide WS data. So it is as good as it gets.