

# Impact of climate change on coral communities of remote atolls of the Indian Ocean: problems and prospects

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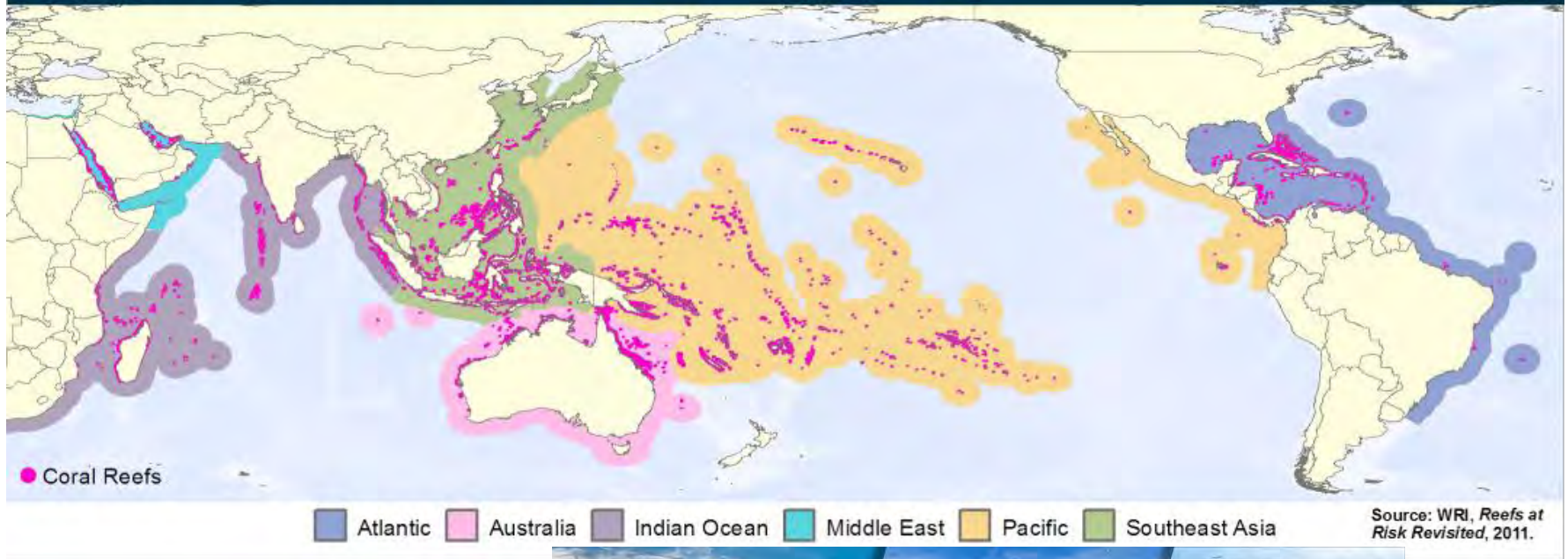
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# MAJOR CORAL REEF REGIONS OF THE WORLD



- There are tens of thousands of small coral islands and atolls, most of which are uninhabited.
- We also know that coral reefs disappear at high speeds.
- The more reefs are disappear, the more we lose potential agents that can fight human diseases.

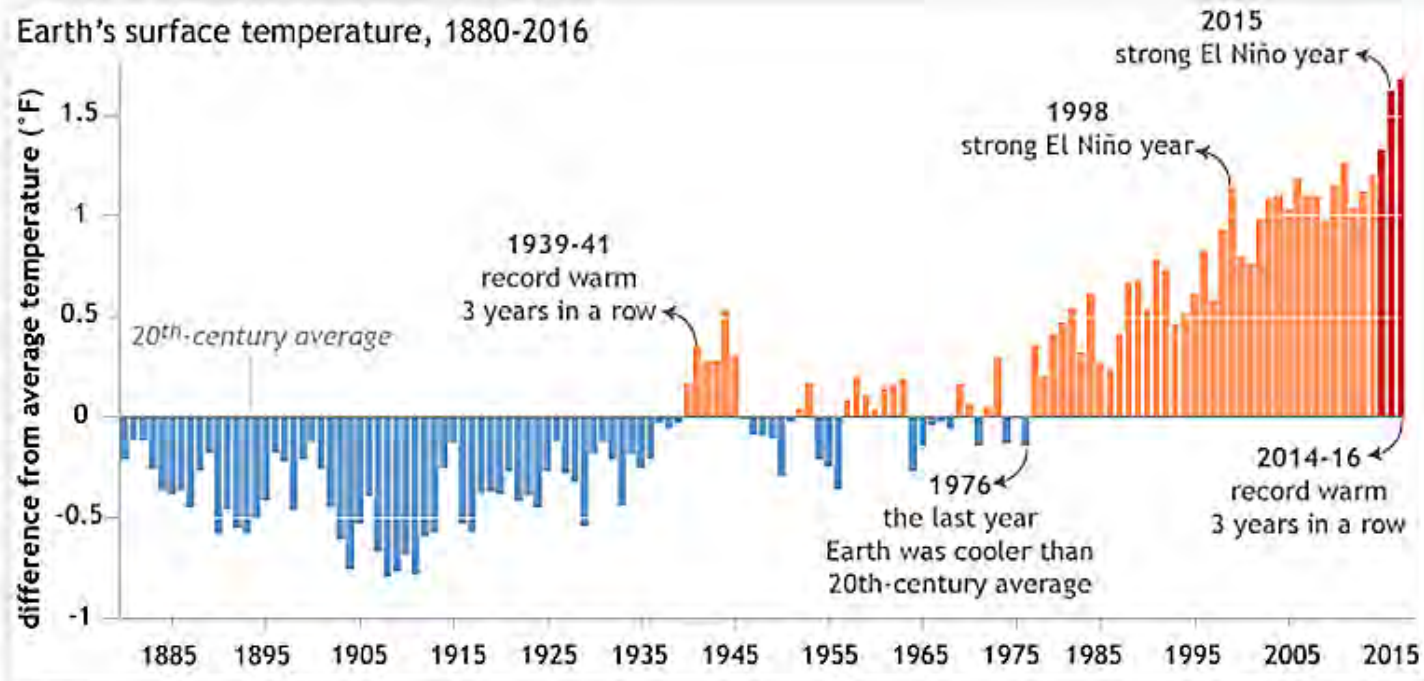


A reef in American Samoa before, during, and after a coral bleaching event in 2015.  
*XL Catlin Seaview Survey*



# Coral reefs are disappearing because of:

- Pollution that enters coastal waters with run-off,
- Uncontrolled fishing,
- Acidification of the ocean, which causes coral to grow more slowly,
- Abnormally long periods of high temperatures, for which coral reefs are not adapted.

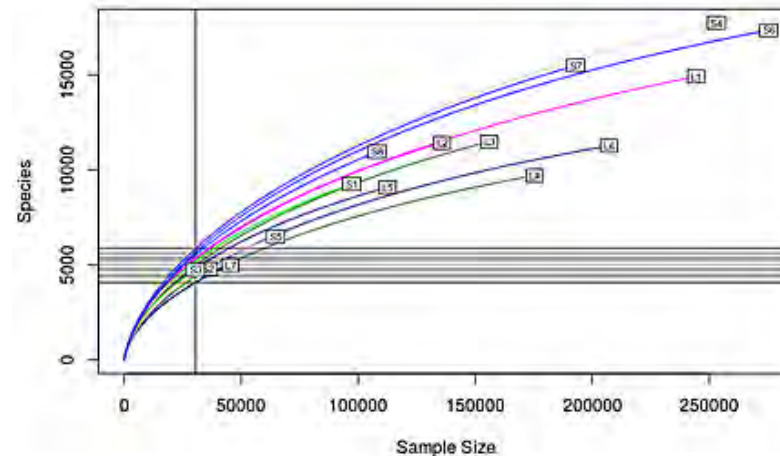


Graph by NOAA  
Climate.gov, based on  
data from NCEI's Climate  
at a Glance.



# Many groups of animals have been neglected in studies of coral reefs

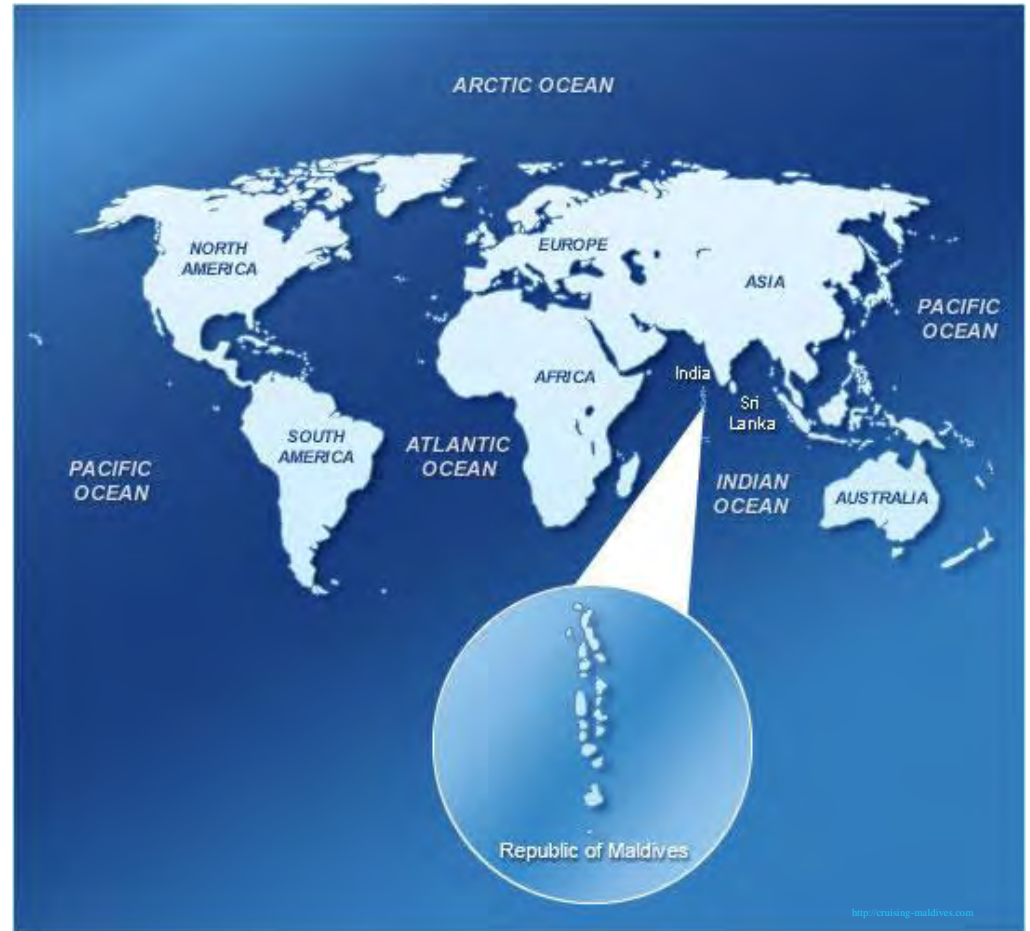
- Some very diverse but difficult-to-study groups of animals have been simply neglected in studies of coral reefs, such as microscopic copepods, symbionts of corals.
- Most of the samples we've collected of copepods include many new species.
- No one yet understands the relationship between these copepods and corals or whether copepods can transmit viral and bacterial diseases like oceanic mosquitoes.
- Our pilot study of the microbial composition of the intestines of some symbiotic copepods revealed more than 1000 species of bacteria in each of the tiny crustaceans.
- The viruses carried by these tiny animals have not yet been investigated.



Number of bacterial species in one copepod. Next-Generation Sequencing Technology

# Our expedition to the Maldives (Nov. 2016)

A year ago, a small group of researchers and students graduated and working at the Moscow State University went to the Maldives with the support of RUSAL



RUSAL



# What did we find?

- We found that coral of all reefs in the top 12-meter zone had mostly died months before we arrived.
- Coral reefs below 12 m were in different states, ranging from dead to stressed.
- We found 5 diseases never previously reported on the archipelago and a number of species never reported—all new for the Maldives and some entirely new to science.
- Only some certain species of coral were found in good shape.

Before 2016



In the end of 2016



# Study of coral requires more “boots on the ground”

- Some questions that must be addressed are:
- Can the reefs recover in 10—15 years?
- Is this possible if there are no new temperature anomalies?
- How will the reefs recover, and in what way?
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- More interdisciplinary study with the participation of climatologists, ecologists, mathematicians, molecular biologists, and marine biologists is necessary to answer these and other questions.



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