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Current Presence and Possible Repercussions of UV Filters in Coral Reef in Okinawa Prefecture

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Abstract

Ultra-violet (UV) filters are pollutants of arising concern due to its persistence in water environment. In previous researches, UV filters have been reported in pristine coral environment in Okinawa, Japan. The main objective of this research is to review the spatiotemporal variation of 12 of the 16 UV filters, categorized as 3 groups by the Food and Drug Administration (FDA) on the Act to Modernize the Regulation of Sunscreen Products in the United States proposed in 2019. The target area is the Japanese coral reef environment in Ryukyu Trench, Ryukyu Islands, and Okinawa trough, for highlighting its toxicological and bioaccumulating impacts on coral reefs ecosystems. The web of science database from 2000 to 2020 was searched with the key words: anthropogenic activities, persistent organic pollutants, sunscreens, UV filters, UV protection, sunblock, UV stabilizer, coral, Japan, and Okinawa. Most of the studies agreed that organic UV filters such as oxybenzone, octinoxate or octocrylene significantly degrade the water quality, which may have potential risk to coral ecosystems. In addition, the wide spread of UV filters has shown a perceivable presence in some Okinawa beaches, containing around 1.4 µg/L oxybenzone during summer season. Nevertheless, oxybenzone at some reef sites have been found to be around 0.01 µg/L which is almost 500 times lower than the LC50 range of 5.4 to 14.5 µg/ for *Acropora cervicornis* larvae. More toxicological and bioaccumulate studies on coral reef bleaching by UV filters have to be performed to support this statement and re-evaluate their ecological risks in coral reef ecosystems at different season and complex environmental exposure.

Keywords: *UV filters, Okinawa, UV protection, coral, Oxybenzone*

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CURRENT PRESENCE AND POSSIBLE REPERCUSSIONS OF UV FILTERS IN CORAL REEF IN OKINAWA PREFECTURE

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A rising concern

Food and Drug
Administration (FDA)
on the Act to
Modernize the
Regulation of
Sunscreen Products

Japanese coral reefs

Objective

- The main objective of this research is to review the spatiotemporal variation of 12 of the 16 UV filters, categorized as 3 groups by the Food and Drug Administration (FDA) on the Act to Modernize the Regulation of Sunscreen Products in the United States proposed in 2019.



Introduction

- ❑ Japanese coral reefs location.
- ❑ A popular tourist spot
- ❑ Coral reef declining since 1980's
- ❑ Importance of UV-filters
- ❑ FDA regulation 2019

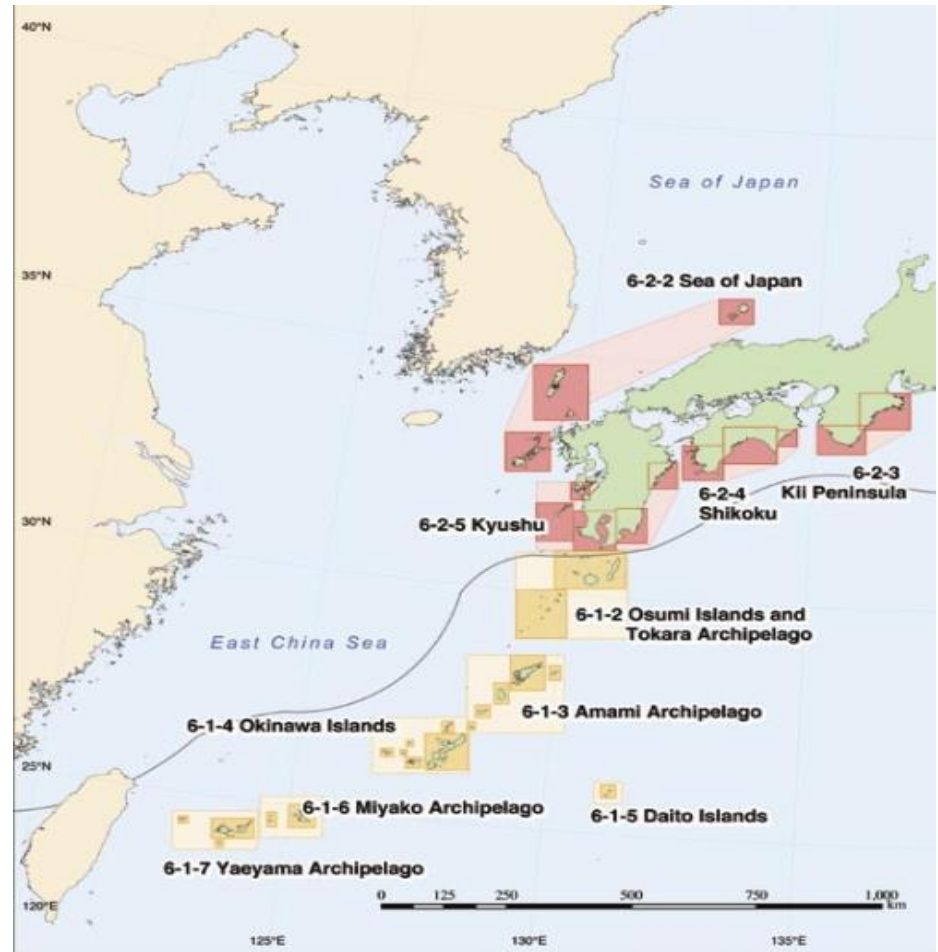
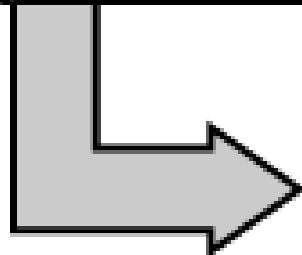


Fig. 1. Japanese coral reefs. Provided by Marine Biotic Environment Survey.

Methodology

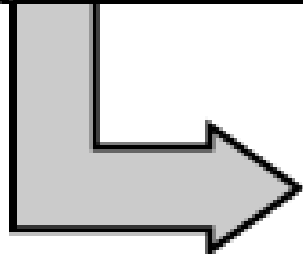
Data base
searching
key words

- UV filters, UV protection, sunblock, UV stabilizer, coral, Japan, and Okinawa



Screening
process

- 40 articles about the presence of persistent organic pollutants in Japanese marine environment



Final
screening

- 2 articles just addressed the problematic about the sunscreen pollutants in Japanese coral reefs



Results

High level of organic pollutants (Organo-tin compounds (OTCs) 10 ng/L

Surface water and sediments of some rivers and coastal waters of Okinawa 2008

Constant sampling Okinawa main Island

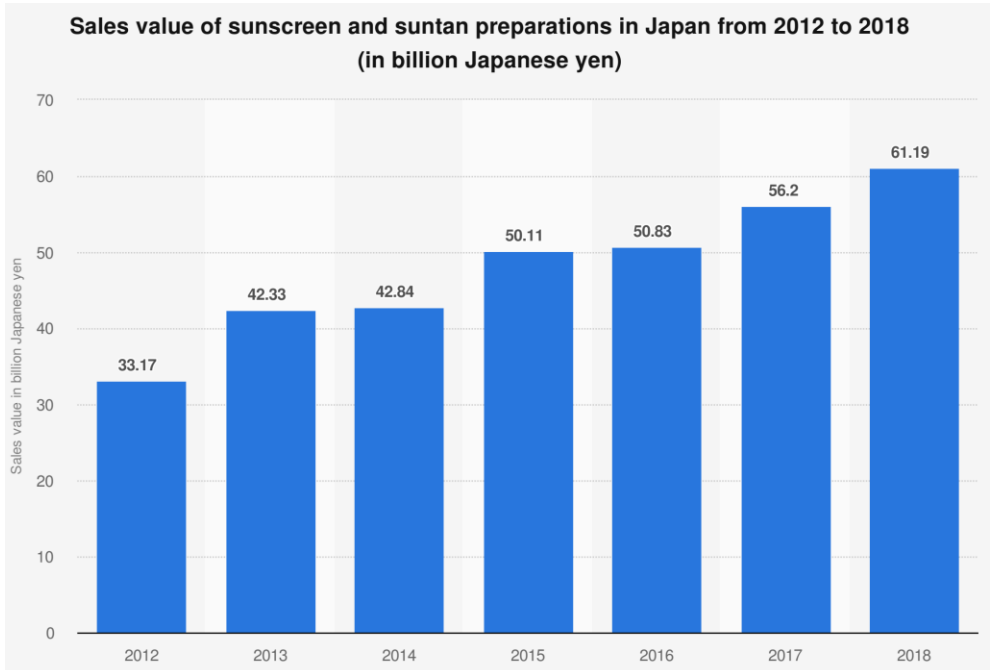
The maximum concentration of BP-3 (1.34 $\mu\text{g/L}$) detected at Sunset beach in July

Oxybenzone at some reef sites have been found to be around 0.01 $\mu\text{g/L}$

Discussion



- ❑ A gradual consumption of cosmetic sun products
- ❑ A novel report was released in 2019 in Hawaii, where UV-filters were reported in coral tissue in coral reefs.
- ❑ In 2016 in Sekisei Lagoon around 90% of the reef presented damage from coral bleaching, including 70% that died by the bleaching phenomenon



Conclusion

- Oxybenzone was found in Okinawa corals with a concentration of 1.4 $\mu\text{g/L}$, the potential harm for larvae species such as *Acropora cervicornis* is lower than the LC50 range.

Potential
ecotoxicological risks

Probable data of the
presence of sunscreen
chemicals

Spatial-temporal
variation of UV filters
in Japanese marine
environment and
ecotoxicological studies
in coral reef biota



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Thank You



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