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STANDARDS

- **CCSS:** RST.9-10.1, 2, 4, 5, 6, 8, 10; RST.11-12.1, 2, 4, 6, 8, 10

ONLINE CONTENTS

- [*Crown of Thorns Starfish Crisis Video*](#) The crown-of-thorns starfish (COTS for short), named for its bristling helmet of sharp venomous spines. These giant starfish, found in the Pacific and Indian Oceans, have up to 21 arms and can grow as large as a meter in diameter. They are a major coral predator and eat coral by extruding their stomach through their mouth and excrete digestive enzymes that allow them to absorb the dissolved coral tissue externally.
- [*Ocean Alert: Overfishing Video*](#) The world's oceans are the biggest source of food for the whole planet. Almost 35% of the world's population gets most of their protein from ocean animals. Although seafood markets around the market appear to be full, they hide a crisis: overfishing. Overfishing occurs when people catch more animals than the ocean can sustain.

CORAL REEF THREATS

This lesson is part of the *Coral Reef Threats* unit, which describes the natural and anthropogenic threats to coral reefs. Below is a summary of what is included in the entire unit. **THIS UNIT IS STILL IN DEVELOPMENT.**

UNIT CONTENTS

A. Lessons

Bleaching

[Read It! Life & Death on the Reef](#)

- A worksheet to accompany the [*Life & Death on the Reef*](#) field blog

Crown-of-Thorns

[Watch It! Crown-of-Thorns Crisis](#)

- A worksheet to accompany the [*Crown-of-Thorns Starfish Crisis*](#) video

[Read It! Addressing Acanthaster](#)

- A worksheet to accompany the [*Addressing Acanthaster*](#) field blog

[Read It! Life, Death, and Rebirth](#)

- A worksheet to accompany the [*Life, Death, and Rebirth \(Part 1 and Part 2\)*](#) field blogs

Overfishing

[Watch It! Ocean Alert: Overfishing](#)

- A worksheet to accompany the [*Ocean Alert: Overfishing*](#) video

[Read It! The Man-eaters](#)

- A worksheet to accompany the [*The Man-eaters*](#) field blog

[Read It! Best Wishes for Reef Fishes](#)

- A worksheet to accompany the [*Best Wishes for Reef Fishes*](#) field blog

[Read It! Sea Cucumber Craze](#)

- A worksheet to accompany the [*Sea Cucumber Craze \(Part 1 and Part 2\)*](#) field blogs

Pollution

[Watch It! Pollution Everything is Connected](#)

- A worksheet to accompany the [*Pollution Everything is Connected*](#) video





WATCH IT!

CROWN-OF-THORNS CRISIS

INSTRUCTIONS: Watch *Crown-of-Thorns Starfish Crisis* YouTube video (<https://youtu.be/Yb0RvgxGkeg>) and answer the following questions.

1. What population can threaten the balance of the coral reef ecosystem?

2. List the oceans where we find crown-of-thorns starfish (COTS)?

3. Describe at least 3 characteristics of the crown-of-thorns starfish.

a. _____

b. _____

c. _____

4. List the steps that allow COTS to feed.

a. _____

b. _____

c. _____

5. What time of day do corals typically feed?

6. How much coral can COTS eat per year?

7. Why is there a problem when there are COTS populations spikes?

8. How many eggs can one COTS produce?



9. How many COTS can be found on a reef during an outbreak?

10. How old are some of the corals that COTS eat?

11. What are two events that can be more damaging to coral reefs than a COTS outbreak?

a. _____

b. _____

12. List four COTS predators.

13. What is thought to cause COTS outbreaks?

14. How do scientists mitigate a COTS outbreak?

15. List 3 factors that corals require in order to recover from a COTS outbreak.

a. _____

b. _____

c. _____

16. Can a coral reef recover after a COTS outbreak?

VIDEO SCRIPT:

Warm water coral reefs are some of the most magical, lively habitats on earth.

Usually the creatures that live on coral reefs, and the reefs themselves, thrive in a state of dynamic equilibrium.

Up and down the food chain, competition among predators and prey creates diversity and balance.

But sometimes it all goes wrong, and one population threatens the entire ecosystem.

For reefs in the Pacific and Indian Oceans, this is public enemy number one: the crown-of-thorns starfish, named for its bristling helmet of sharp venomous spines.

Where other starfish have five arms, the crown-of-thorns, or COTS, for short, has between fourteen and twenty-one.

On hundreds of hydraulically powered tube feet, it moves fast for a starfish – 20 meters an hour. And it can grow as large as a meter in diameter.

Here's a COTS at work. First, it positions itself on top of live coral. Then, it extrudes its stomach through its mouth, smothering the coral. Next, it secretes digestive enzymes and absorbs the dissolved tissue externally.

Each night the nocturnal COTS can eat its own body area in coral.

That adds up to, on average, 13 square meters of reef per year. During population spikes, clusters of COTS consume corals faster than they can grow and reproduce.

They change vibrant ecosystems into lifeless, grey graveyards.

To make matters worse, COTS are more fertile than any other invertebrate in the world.

“One animal can produce hundreds of thousands of eggs at one time. The larvae will settle on the bottom, grow into a juvenile starfish, and eventually two or three years later they start eating coral, and you have what are called outbreaks. When you have outbreaks, you can have thousands of these starfish moving through an area and they can eat pretty much everything in their path. And they're eating corals that are a hundred, two hundred, three hundred years old in a period of a week or two.”

All told, only cyclones and mass bleaching events are more destructive to coral reefs than the crown-of-thorns starfish.

But something can be done.

This trumpet triton is eating a COTS. For tritons and other gastropods, such as the helmet snail, COTS are a key food source. Wrasse, triggerfish, and pufferfish also feed on COTS.

On a healthy reef, predators keep COTS populations in check.

Overharvesting these predators is one contributor to outbreaks.

A more direct cause is sewage and agricultural runoff. This runoff is a nutrient bonanza for plankton, which is what COTS larvae eat. That means more larvae survive to adulthood.

So, the best defences against COTS outbreaks are a healthy, diverse ecosystem and clean water

When scientists can't prevent an attack, sometimes they can mitigate one by taking matters into their own hands.

This is a reef near Fiji in the South Pacific. Here, while performing a reef survey, divers from the Khaled bin Sultan Living Oceans Foundation encountered a COTS crisis.

They decided to intervene and collected hundreds of crown-of-thorns starfish.

When they returned to their ship, scientists placed them in a container of fresh water where they died from lack of oxygen.

Reefs can recover from crown-of-thorns' attacks, but the speed of recovery depends on several factors.

Water quality must be good, or the reef may survive only to be attacked again.

The reef must be biologically diverse and support COTS predators.

And, there must be enough coral left after the attack to reseed damaged areas.

Recovery can take decades.

But with luck and good management, a balanced, vibrant reef can be born again.