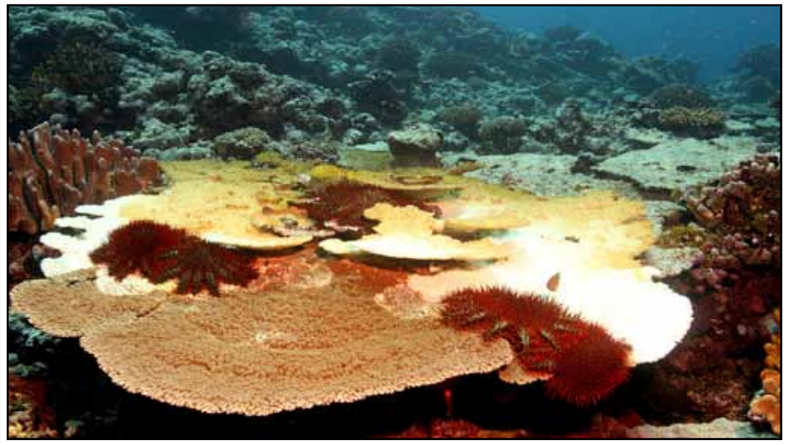
Corallivore

Crown of Thorns Starfish Wreak Havoc in American Samoa — The NPS Responds

Found throughout the Indo-Pacific, the crown of thorns starfish, *Acanthaster planci*, is one of the largest sea stars in the world (up to 45 cm across). Unlike the typical starfish with five arms, the crown of thorns starfish is disc-shaped with multiple arms (up to 21) covered in poisonous spines. These unique features gave rise to this starfish's commonly referred to name of the crown of thorns.

Acanthaster planci is a corallivore, which means that it feeds on live coral tissue. After climbing on a coral colony, the crown of thorns starfish extrudes its stomach out through its mouth and spreads it over the surface of the corals. The stomach secretes digestive enzymes that liquefy the coral tissue which is then absorbed. After this process, the coral colony is left devoid of living tissue and only the white skeletons of the colony remain. On the skeletons, the starfish leave behind observable feeding scars which mark the paths of their destruction. Without the living tissue, the skeletons become more vulnerable and brittle, and are often colonized by non-reef building organism such as algae.

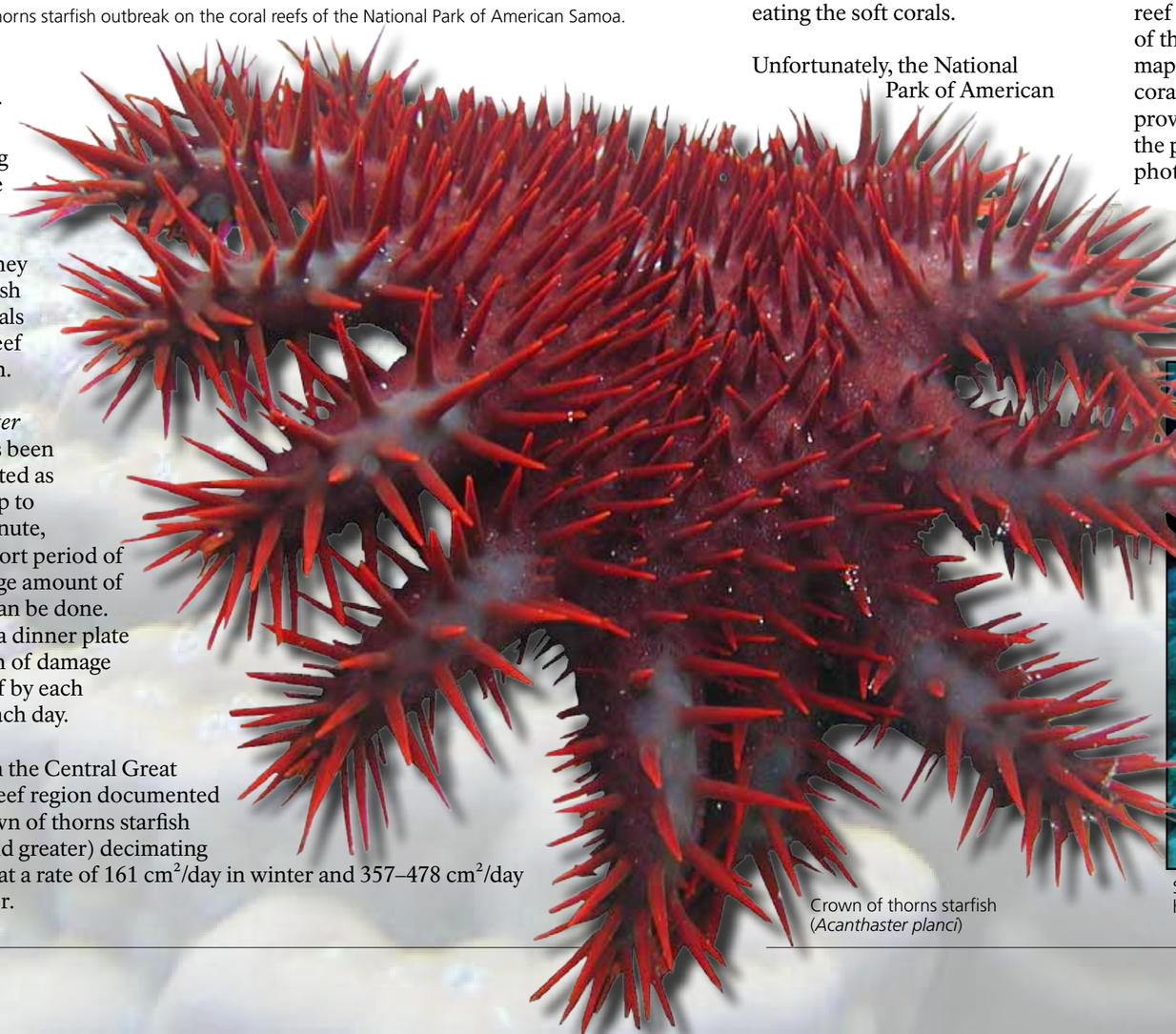
Known as voracious predators, a single crown of thorns starfish can consume approximately 6-10 square meters of living reef per year. Low densities of *Acanthaster planci* naturally occur on reefs with little impact to the ecosystem. However, under certain conditions periodic population explosions of these starfish can occur on reefs, generating alarm due to the extensive damage they can unleash to the corals and the reef ecosystem.



Crown of thorns starfish outbreak on the coral reefs of the National Park of American Samoa.

Acanthaster planci has been documented as moving up to 35 cm/minute, thus in short period of time a large amount of damage can be done. Envision a dinner plate size worth of damage to the reef by each starfish each day.

A study in the Central Great Barrier Reef region documented large crown of thorns starfish (40 cm and greater) decimating live coral at a rate of 161 cm^2/day in winter and 357–478 cm^2/day in summer.



Crown of thorns starfish (*Acanthaster planci*)

In addition to being a fast eater, the crown of thorns starfish can also be a picky one, having innate preferences for certain coral species over others. Corals species from the genera *Acropora* and *Pocillopora* are their preferred foods. Controlled laboratory studies have shown preferences even within the genus *Acropora* with the most preferred species being *Acropora hyacinthus*, followed by *A. gemmifera*, *A. nasuta*, and *A. formosa*. However, when food becomes limited, the crown of thorns starfish is known to eat all species of hard coral, and then start eating the soft corals.

Unfortunately, the National Park of American Samoa (NPSA) is experiencing an ongoing outbreak of this hungry corallivore. Luckily, the park and the Pacific Island Network Inventory & Monitoring Program (I&M) have been monitoring the benthic marine community in NPSA as a "Vital Sign" since 2007. Site specific reef data on the coral species are included as a part of the benthic marine community monitoring protocol. By knowing which reefs have the crown of thorn's preferred food species (e.g., species from the genera *Acropora* and *Pocillopora*), park managers can better identify reef sites for culling and removal of this starfish. Geo-referenced maps of monitored reefs showing coral cover and species were rapidly provided by I&M to NPSA to help the park prioritze their efforts (see photo caption below).

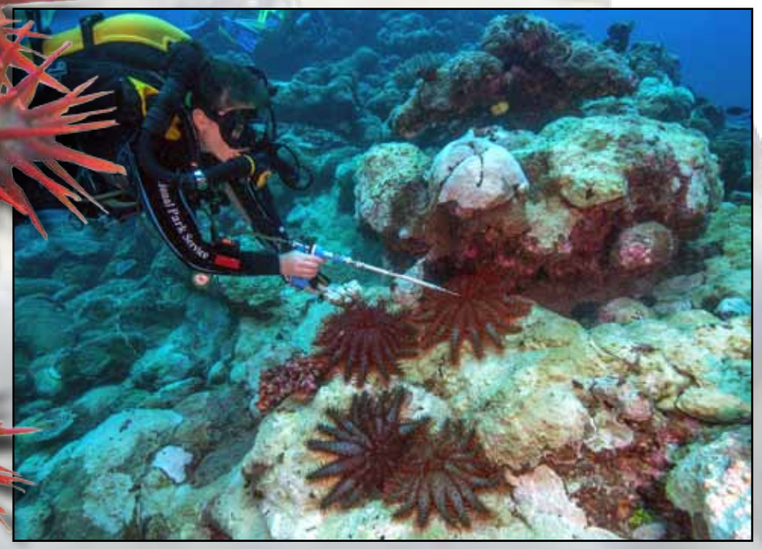
Combining this data with proven field techniques, National Park of American Samoa Marine Ecologist, Dr. Tim Clark, has estimated that 6,433 crown of thorns starfish have already been removed from several sites across Tutuila Island. But there is much work left to do.

This is an excellent example of employing long-term monitoring data to inform efficient management action for one of our most precious natural resources.

—Sheila A. McKenna, NPS Marine Biologist

For more on the outbreak in the National Park of American Samoa, visit this posting on the Pacific Island Parks blog.

Short video on coral reef monitoring in Pacific Island national parks. <-- CLICK



Sodium bisulfate is injected into the destructive starfish to cull them. The chemical is harmless to the surrounding reef ecosystem, but deadly to the corallivore.