

Snowflake coral (*Carijoa riisei*)

An alien invasion of Hawaii's coral reef community



What is *Carijoa riisei*?

- An alien species of soft coral originally from the tropical Western Atlantic – commonly called “snowflake coral” or “branched pipe coral”
- A non-photosynthetic coral which feeds on zooplankton (tiny larvae of shellfish and crustaceans) and organic particles by capturing them with tentacles upon contact
- *Carijoa riisei* is an octocoral; its polyps have eight tentacles versus six in most stony corals
- First discovered in Hawaii in 1972 in Pearl Harbor, it has since spread to all the main Hawaiian Islands
- It is believed to have been transported to Hawaii on the bottom of a ship or as larvae in a ship's ballast water

Where does *Carijoa riisei* grow?

- *Carijoa riisei* requires firm surfaces to which it attaches using stolons – root-like structures
- As a passive filter feeder, it requires moderate amounts of water flow which can be provided by wave surge, tidal currents, or long-shore currents
- It does not grow in direct sunlight and is often found under ledges and under piers in shallow water
- At depths below significant light penetration, it can grow in the open on rocky surfaces swept clean of sediment
- *C. riisei* grows well in turbid waters rich with zooplankton and organic matter
- It also grows well on artificial surfaces such as metal, concrete, plastic, rope, and even old automobile tires
- *C. riisei* is commonly found on artificial reefs visited by recreational SCUBA divers



Geographic Range

- *Carijoa riisei* naturally occurs in the Western Atlantic and Caribbean from Florida to Brazil
- In the Western Pacific, a species of *Carijoa* has been reported from many other islands and on the continents of Australia and Asia, however, it is not known which populations are the same as *Carijoa riisei* in Hawaii
- It is likely that other Pacific islands have also been invaded by *C. riisei*
- Based on appearance, there may be at least one or more different species of *Carijoa* native to Australia



Snowflake coral (*Carijoa riisei*)



Why is *Carijoa riisei* a problem?

- As a highly successful invasive species, *Carijoa riisei* threatens Hawaii's biodiversity by monopolizing food & space resources and by displacing native species
- Under favorable conditions, it out competes other organisms and saturates the available space
- In 2001, deep water surveys of the Maui Black Coral Bed discovered *C. riisei* overgrowing and killing over 60% of the black coral trees between 80 and 105 meters depth; it now threatens Hawaii's \$30 million precious coral industry
- As a voracious eater, *C. riisei* consumes large quantities of zooplankton although the ecological impacts of its appetite are not yet known
- Of the 287 nonindigenous marine invertebrates found in Hawaii, only four are known to have spread outside the harbors and proliferated to pest status in coral reef communities; *Carijoa riisei* is by far the most invasive

Why is *Carijoa riisei* so successful?

- Capable of explosive growth which enables it to smother competitors
- *Carijoa riisei* can actually settle and grow on other stationary organisms like corals and shellfish
- Exhibits high fecundity – producing hundreds of eggs per axial polyp; appears to reproduce continuously
- Has male, female, and hermaphrodite colonies capable of single parent reproduction
- Also spreads via vegetative growth using horizontal “runners” or stolons which are used to quickly colonize adjacent territory in all directions
- Resistant to predation; only one known predator identified to date – a small nudibranch
- Has a planktonic larval stage that facilitates dispersal via ocean currents
- Effectively feeds on a wide variety of zooplankton
- Habitat and dispersal aided by human activities



Sam Kahng



Sam Kahng

Ongoing Research

A research program is underway to determine the ecology and ecological impact of *Carijoa riisei* on Hawaii's coral reef communities. Time series analysis of population dynamics is being conducted in shallow and deep water communities. SCUBA and deep water submersible dives are being employed to survey the extent of distribution & abundance, especially at depth. Molecular genetic analysis is being applied to determine phylogeography and origin of Pacific populations. Research supported by Sea Grant and Hawaii Undersea Research Laboratory (HURL).



Sam Kahng



Sam Kahng
Department of Oceanography
University of Hawaii
kahng@hawaii.edu



Department of
Oceanography