

SUMMARY AND PRINCIPAL FINDINGS

Increased sub-tidal abundance of blue linckia (*Linckia laevigata*) could precede outbreaks of COTS.



similar larval development - Planktotrophic

same predator - Giant Triton



Linckia



Charonia



Acanthaster

On Heron and Wistari Reefs, most species of starfish did not occur below low water. Increased subtidal abundance of blue linckia (*Linckia laevigata*) could precede outbreaks of COTS (*Acanthaster planci*) due to many factors including similar larval development and the same predators.

#CharoniaResearch 1

Most species of starfish are rare, cryptic, toxic and in one case (*Acanthaster planci*) even venomous.



similar larval development - Planktotrophic

same predator - Giant Triton



Linckia



Charonia



Acanthaster

On Heron and Wistari Reefs, most species of starfish are rare, cryptic, toxic and in one case even venomous

These two protected reefs are not known to have experienced COTS outbreaks even though outbreaks have been recorded further south on the GBR.

#CharoniaResearch 2

The preferred prey is the species hunted and attacked preferentially by the predator.



similar larval development - Planktotrophic

same predator - Giant Triton



Linckia



Charonia



Acanthaster

The preferred prey is the species that is hunted and attacked preferentially by the predator. Mortality data alone can not indicate a predator's preferred prey species as predatory attacks can be unsuccessful and predation can also be sub-lethal

#CharoniaResearch 3

Heron Reef (23° 27' S, 151° 57' E) in Capricorn Group at southern end of the Great Barrier Reef.



similar larval development - Planktotrophic

same predator - Giant Triton



Linckia



Charonia



Acanthaster

Heron Reef (23° 27' S, 151° 57' E) lies in the Capricorn Group which is towards the southern end of the Great Barrier Reef. It is a lagoonal platform reef with a vegetated cay at its western end. The cay supports a tourist resort and research station. A harbour has been dredged in the reef.

#CharoniaResearch 4

The attack of the triton elicits an escape response by the starfish.



Starfish - Predator or Prey

similar larval development - Planktotrophic

same predator - Giant Triton



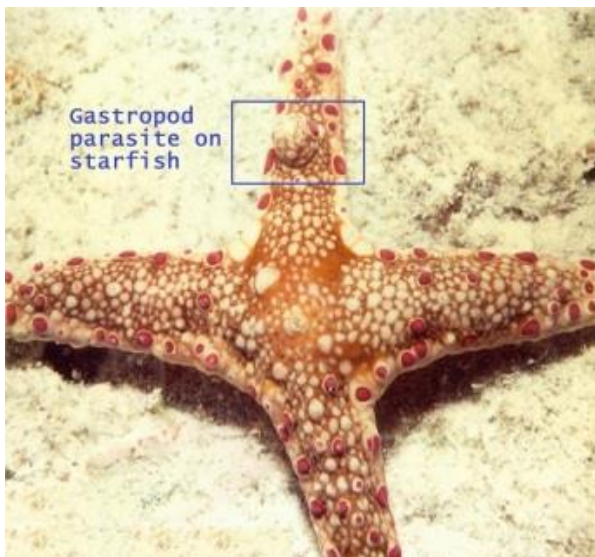
Linckia

Charonia

Acanthaster

The attack of the triton elicits an escape response by the starfish which, if successful, results in rapid prey dispersion with the loss of only a few arms. The escape response varies in its successfulness and is heavily dependent on (1) size and hunger of predator, (2) prey size and degree of cumulative prey injury and (3) physical composition and relief of substrate. [#CharoniaResearch 5](#)

Species of coral reef starfish may trigger larval settlement in the giant triton.



Gastropod parasite on starfish

similar larval development - Planktotrophic

same predator - Giant Triton



Linckia

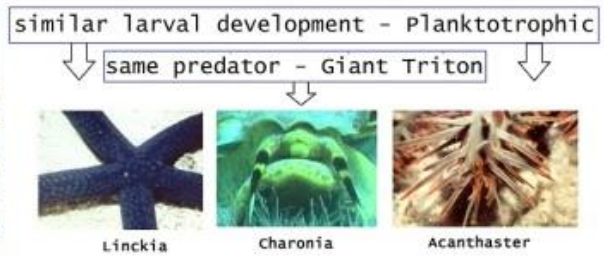
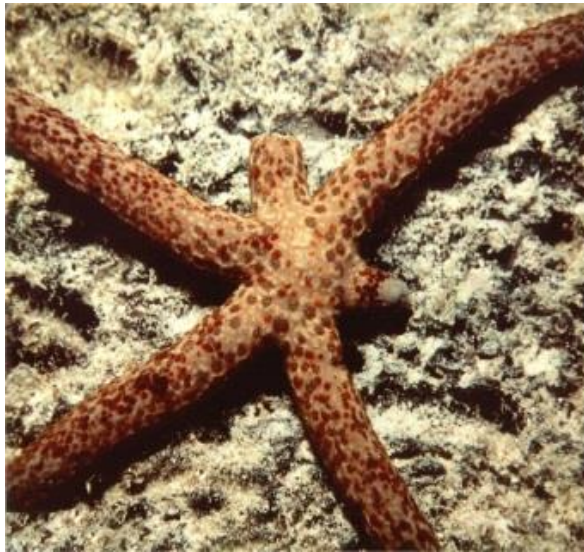
Charonia

Acanthaster

A number of species of coral reef starfish may trigger larval settlement in the triton. While previous studies managed to rear larva almost to the point of settlement, they could not produce settled larvae that crawled on the bottom. The cultured larva all died in the plankton and the missing link may well be another species of starfish.

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“a complex twist to more typical asteroid life-history strategies.” – Knott et al (2003)

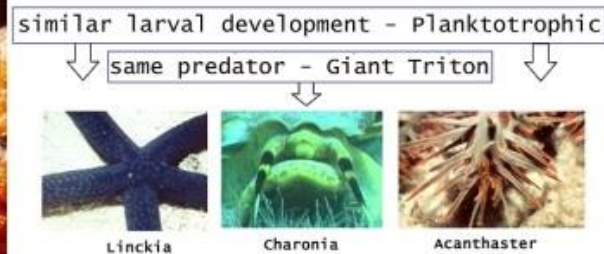


"Within the asteroid family Ophidiasteridae, many species are capable of asexual reproduction as adults, particularly Linckia. The presence of larval cloning in species that also alternate between sexual and asexual reproduction as adults would be a complex twist to more typical asteroid life-history strategies."

Knott et al, Biological Bulletin (June 2003), 204: 246-255

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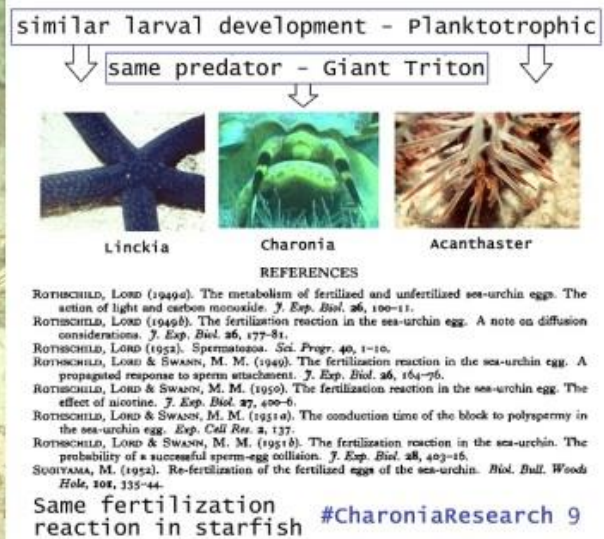
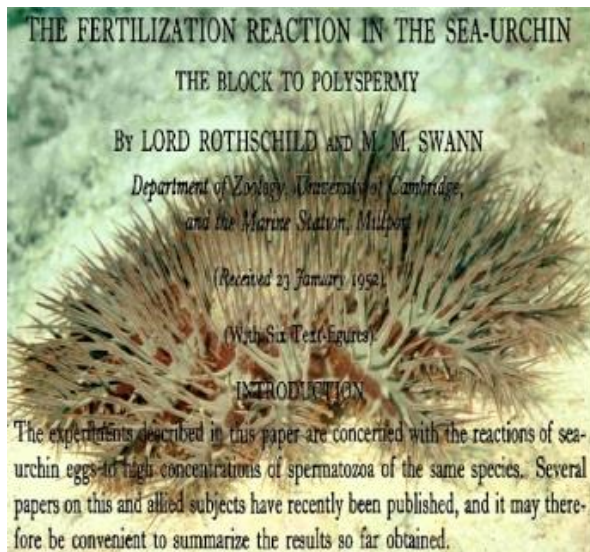
Many eggs may never be fertilised when adult populations exist at low densities.



It is possible that many eggs are never fertilised when adult populations exist at low densities, such as at Heron Reef. On Heron Reef, and possibly the Great Barrier Reef in general, where many reefs exist in relatively close proximity, lecithotrophic genera such as Nardoa, Fromia and Echinaster appear to be more abundant than they are on atolls.

#CharoniaResearch 8

Just like the fertilization reaction in the sea-urchin.



SUMMARY OF RESEARCH

Sea-urchins and starfish both belong to Phylum Echinodermata and while early research on the fertilization reaction was conducted by Rothschild and Swann (1949) on sea-urchins, the conclusions regarding egg fertilization and proximity of spawning individuals were just as applicable to starfish.

Human collection of the Giant Triton and other predators was suggested by Endean (1969) as a causative factor in starfish outbreaks, but this Predator Control Hypothesis was generally disregarded due to the enormous potential numbers of starfish. Recent research demonstrating the strong avoidance reaction of the starfish to the triton together with an understanding of the importance of starfish aggregation to reproductive success may be slowly changing this opinion.

The existence of crown-of-thorns starfish outbreaks influenced many important world economic decisions of the 1960s, including the rejection on ecological grounds of a new sea-level Panama Canal. Starfish radial nerve extract (1-methyladenine) has been used to experimentally induce starfish spawning since Noumura and Kanatani (1962), but any possible causal connection with the starfish outbreaks has never been investigated.