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MAGAZINE OF

THE GREAT BARRIER REEF AQUARIUM



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Coralines

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Great Barrier Reef Marine Park Authority

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DIRECTOR'S MESSAGE

As the Aquarium celebrated its seventh birthday, visitors to the Great Barrier Reef continue to increase and heighten the need for reef education.

The Aquarium has grown over the last year. Two major exhibits were opened along with expanded visitor services and active education and volunteer programs. We are now recognised as Australia's national reef education centre, promoting the protection and wise use of the Great Barrier Reef.

We need your support more than ever. Enjoy a visit to the Aquarium and see the new displays. Please consider joining the Aquarium family by becoming a Friend of the Aquarium. For more information, see the enclosed brochure - or pass it on to a friend.

Community support is vital to our success and we are counting on you.




Martin Jones
Director

EDITORIAL

Regular readers of *Coralines* will be aware that changes occur regularly within the Aquarium. New exhibits are created and old ones updated to ensure that our visitors continue to receive the Aquarium message of 'Caring for the Reef'. Two exhibits have been created since the last issue of this magazine. The Stone Fishtrap was launched in May and Reefworks completed in August.

Changes have occurred in this magazine also. You will notice that it is slightly different to past issues. What happens in the Aquarium tanks is important to us all so Curatorial Notes remains unchanged but we have reduced the number of major stories from two to one. The Aquarium is a dynamic place - things are always happening. Our aim is to keep you informed about changes and the interesting things which occur here.

We need feedback from our readers to ensure that the magazine is meeting your needs. We would really enjoy hearing from you. Please telephone us on 818886 if you wish to share your thoughts with us.



Grace Brice
Editor



Would you want to drink - what you're putting down the sink? Finlay and the Punk Mermaids show their disgust at the thought!
Photo: S Hutchinson

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CURATORIAL NOTES

Dr Janice Morrissey

COTS Nursery

Understanding the early life of a crown-of-thorns starfish (COTS) is crucial to explaining starfish outbreaks on the Great Barrier Reef. As part of the GBRMPA's Crown-of-thorns Starfish Research Program, the Aquarium has recently constructed a culture system for growing young starfish.

A climate-controlled laboratory was partitioned from the Aquarium workshop. Culture tanks were installed together with seawater filtration and monitoring equipment. Seawater is supplied from the Aquarium system which maintains water quality close to natural reef conditions.

The facility was commissioned last December, when it received its first intake of starfish larvae. Initial tests established the capability of the culture system to reproduce conditions known to be suitable to young starfish. Natural food in the form of coralline algae was also maintained in the system.

From October, the 'no vacancy' sign will again be posted as the culture tanks are stocked with starfish larvae from this summer's spawning. The research will complement studies already underway at the Australian Institute of Marine Science. It will also provide juvenile starfish for feeding and predation studies by other scientists. Over the coming years, the Aquarium facility will be an invaluable research tool in tackling this thorny problem.

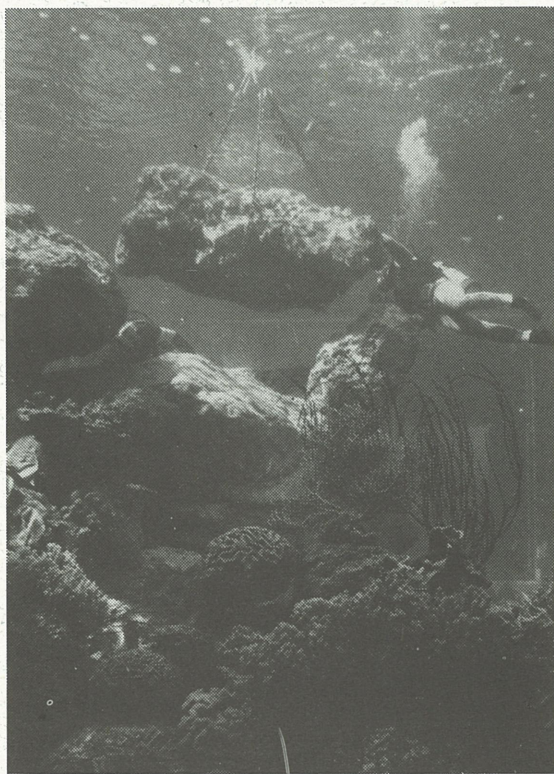
Reef Renovation

The Coral Reef Exhibit is undergoing some major changes. The reef shape, untouched since its construction in 1987, has been modified. The wave pattern has also changed.

The machine which creates the waves has been upgraded to computer-controlled wave generation. This change allows the engineering staff to easily alter the wave pattern from gentle swell to rough breakers. Such a variable wave pattern is more representative of the natural environment than the previously fixed wave type.

Reef shape renovation has concentrated on the reef front. It aimed to reconstruct a steeper reef slope and a higher reef crest which is periodically exposed by breaking waves. The rocks used for this 'reefscaping' have been removed from other areas of the Aquarium reef. Rocks as large as 2.5m wide have been carefully relocated using the 5-tonne overhead gantry crane. Divers had the difficult job of selecting the right size and shape of boulder to rebuild a stable structure, a task akin to assembling a complex jigsaw puzzle.

Changes to the wave pattern and reef shape have combined to produce more effective water movement for the reef's inhabitants. The motion of the water is also more apparent from the viewing windows. These changes are part of the Aquarium's ongoing program to improve the appearance of the Coral Reef Exhibit and enhance the survival of our captive corals.



Slowly and carefully, divers guide a large rock into its new position on the Aquarium reef. Photo: G Shield

ACTIVITIES

SEPTEMBER 1994 - FEBRUARY 1995

The following activities are free with membership or Aquarium admission.

* **Theatrette**

Presentation on the Great Barrier Reef:

10.00 & 11.00 am
& 12.00 noon,
1.00, 2.00, 3.00 &
4.00 pm (Daily)

* **Diver Talkback:**

10.30 am (Daily)

Talk to the diver in the water of the Coral Reef Exhibit. Amazing stories and answers to your questions.

* **Discovery Tour:**

11.20 am & 2.20 pm (Daily)

* **Turtle Feeding: 12.20 pm (Daily)**

* **Marine Cuisine:**

Either Tuesday or Wednesday and either Saturday or Sunday at 3.20 pm. See how and what some of the Aquarium animals eat.

* **Shark Feeding:**

Sunday, Tuesday and Thursday 3.30 pm. The feeding is often preceded or followed by a talk on sharks.

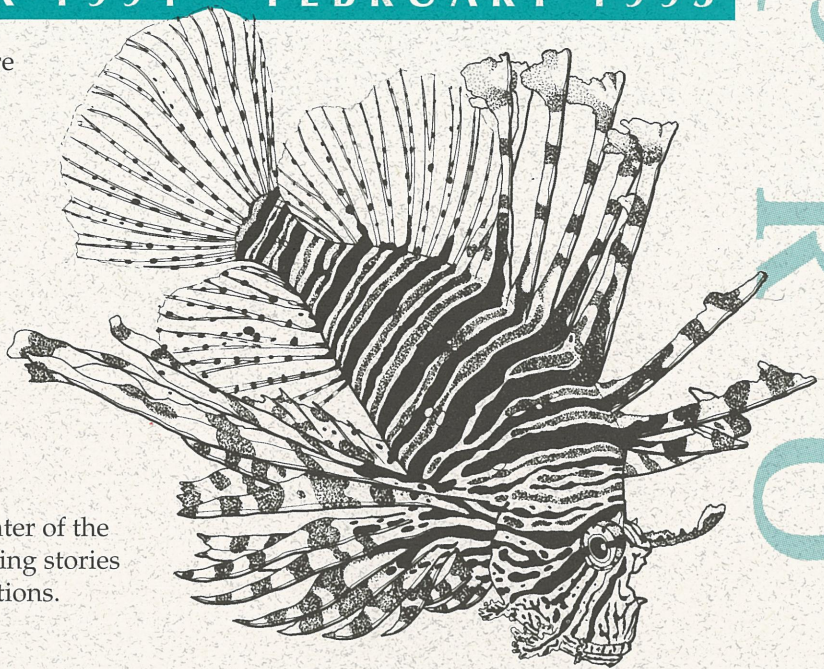
* **Kid's Corner**

(a craft session for children):

Saturday and Sunday
11.00 am - 12.00 noon
& 2.00 - 3.00 pm.

School holidays:

11.00 am- 12.00 noon (Daily)



* **Sunday Sessions:**

2nd and 4th Sunday of the month, 1.30 - 2.00 pm. Sunday sessions are an opportunity to have an in depth look at various marine topics. The aim is to help members gain a greater appreciation of the marine environment and its inhabitants.

Some of the topics to be covered:

Turtles, Jellyfish, Reef Fish, Coral Cays, Echinoderms, Sex on the Reef, Stocking the Aquarium, Reef Relationships, Sharks, Corals.

Other activities may be scheduled during the day, please phone to confirm times.

* *The Aquarium reserves the right to cancel or change program times. To confirm daily events please telephone the Aquarium on (077) 818886 Monday to Friday and (077) 818891 weekends only.*



GREAT BARRIER REEF AQUARIUM

AQUARIUM UPDATE

Dangers of the Deep

Swimming now at the Aquarium is a special exhibit - **Dangers of the Deep**.

Dangerous reef creatures are highlighted through live displays and posters identifying the dangerous characteristics of the animals.

Complete the self-guiding trail and enter the competition to win a monthly prize. A special talk on dangerous animals is scheduled for 1.20 pm daily. Don't miss this new exhibit which finishes in October.

It's Party Time!

The 24th June was our 7th birthday. As it occurred during the school holiday period we took advantage of this opportunity to invite everyone along to a fun day of activities. Our volunteers showed their skill and versatility in producing a play about caring for the reef. There were also craft activities and the children made fancy hats. Those who brought along their cameras took photos of their children with Finlay - our new mascot; and our

Aboriginal and Torres Strait Island interpreters told stories, danced and played traditional instruments. And of course there was a cake!

Aquarium Volunteers Help Clean up Australia

Aquarium volunteers are often thought of as the vital link between the local community and the Great Barrier Reef Aquarium. It is common to see volunteers around the Aquarium, helping visitors gain an understanding and appreciation of the Great Barrier Reef. This year the link with the community was taken one step further with their involvement in the Clean Up Australia campaign. Words about cleaning up the marine environment were transformed into positive actions. Allocated to one section of The Strand, the bags soon filled up with all types of rubbish - aluminium cans, glass bottles, thongs, old clothes and food wrappers.

The volunteers involved felt a sense of achievement. Plans for involvement in next year's campaign are underway and Aquarium Friends are invited to join in.



Volunteer Emma Campbell smiles as she tidies up the rubbish that her fellow Australians have left behind. Photo: S Hutchinson

Craft Book in the Making

The Aquarium is a very popular place to be on Saturday and Sunday during Kids Corner. This is a special time when staff and volunteers are involved in craft activities with children. Many ideas have come out of Kids Corner and it has often been mentioned that these ideas should be put together as a book.



Make a wish and blow. Finlay, Lyn Hastings and Michelle Dousset blow out the candles on the Aquarium's 7th birthday cake. Photo: G Shield

Now it is about to happen! The Great Barrier Reef Marine Park Authority has contracted the Aquarium Volunteers to put together the ideas for a kid's activity book about the Great Barrier Reef. The book will be used by teachers, parents and tour operators.

Many volunteer hours have gone into the development of the book which is expected to be published late in 1994.

Reef Education is the Name of the Game

How many of you have been to other aquariums around Australia or around the world? If you have, you will have realised that the Great Barrier Reef Aquarium is different - it is special. Its specific purpose is to educate visitors and members about the Great Barrier Reef.

Since one of the aims of the Volunteer Association is to help people understand about the Great Barrier Reef, it offers, in conjunction with Reefwatch, courses in Coral Reef Biology and Coral Reef Ecology. Both have proved very popular - watch out for them again next year.

In October, a Home Aquarium Course will be offered. Refer to the Activities Section for details. This course is for those interested in setting up a home aquarium

or anybody who is just a beginner. Come along and learn more from the experts - at the national reef education centre.

The Stone Fishtrap

Have you seen it yet? The exhibit was opened in late May and is a source of considerable pride. So many people are involved in the creating of an exhibit. Glenn Shield (our exhibits officer) played a design and co-ordination role. Consultation took place with Russell Butler, James Cook University, ATSIC, and local Aboriginal and Torres Strait Island community members. Aquarium workshop and curatorial staff played a major role in the building of the exhibit and stocking of the fishtrap.

The exhibit tells the story of how the original users of the reef cared for it and how they hunted and gathered their food. A major component is the audio visual display. Push against the 'hand print' rock and a conversation between father and child begins. The rock wall painting is progressively lit as the story unfolds.

Learning about care and use of the reef continues every day as visitors talk with the Aboriginal and Torres Strait Island staff who create their traditional crafts as they interpret the exhibit.

If you have not already seen it, do so soon.

HOME AQUARIUM COURSE

Have you ever wanted to keep a home aquarium? What better way to relax than with your very own home aquarium. We offer you the opportunity to find out what is involved with this relaxing pastime.

Date: begins Monday, 10 October 1994
Contact GBR Aquarium office for cost and further details.

UNDERWATER DREAMERS

An Aquarium explorer's delight. This is an opportunity offered only twice a year. Explore the Aquarium after dark. Will we see the parrot fish? What are those spiny, black creatures? Bring your torch and find out.

Date: Friday 7 October 1994
Time: 7.30 - 9.30 pm
Cost: Members
\$15.00 - Family of 2 adults and 2 children
(\$3.00 for each additional child)
\$7.50 Individual
Non-members
\$35.00 - Family of 2 adults and 2 children
(\$8.00 for each additional child)
\$15.00 Individual

Bookings Close: Friday 30 September 1994
Minimum: 10 families

1995 VOLUNTEER INTAKE

GBR Aquarium volunteers donate their time and considerable talents to help the Aquarium expand and improve its services to the public. Depending on your time, talents and interests you can assist in a wide range of Aquarium activities: guiding, assisting with Friends and Schools programs, clerical assistance, helping behind the scenes and some animal husbandry.

Application forms are available at the front desk from 11 February.

An open night for prospective volunteers will be held on 28 February from 7.00 - 9.00 pm. Find out exactly what volunteers offer the Aquarium and what the Aquarium offers volunteers.

Applications close on 28 February.

NIGHT STALKERS

Discover what happens when the Aquarium doors close for the day. Where do the animals go when the sun goes down? Does the white tipped reef shark swim all night?

Sleepovers in the Aquarium are exciting. Come along and be part of the fun.

Bring your own sleeping bag and torch. A light supper and breakfast will be provided.

NOTE: NO PARENTS ALLOWED!

Kids only sleepover

Ages: 6 - 12 years
Date: Friday 4 November 1994
Time: 7.00 pm - 8.00 am
Cost: Members

1st child \$22.00
2nd child \$18.00
3rd child \$16.00

Non-members
1st child \$27.00
2nd child \$23.00
3rd child \$21.00



Bookings Close: Friday 28 October 1994
Minimum: 20 **Maximum:** 30

Aquarium Christmas Party

North Queensland has no snow so where can you go to have a Christmas celebration which is a little different to the usual? The Aquarium offers you an opportunity to experience a reefy Christmas. Carols written especially around a reefy theme, games, and much more. A light supper will be provided. Children aged 12 years and under will receive a gift from Santa.

Date: Friday 9 December 1994
Time: 6.30 - 9.00 pm
Cost: Members

Adults \$13.50
Children \$9.00
Non-members
Adults \$16.00
Children \$12.00

Bookings Close: Friday 2 December 1994
Minimum: 80 children

All children must be accompanied by an adult.

Book and pay early to avoid disappointment! Use the booking form provided when you book at the Aquarium Office or Shop. For further information or additional booking forms, please contact GBR Aquarium Office, PO Box 1379, Townsville OR Phone (077) 818886 Mon-Fri 9.00 am - 4.00 pm.

THE CROWN-OF-THORNS STARFISH

Udo Engelhardt

The periodic and somewhat unpredictable outbreaks of the crown-of-thorns starfish have been one of the most difficult management problems facing the Great Barrier Reef Marine Park Authority (GBRMPA).

Twice in the last 30 years, this large starfish with the scientific name of *Acanthaster planci* has affected some of the reefs that make up the Great Barrier Reef. The first series of outbreaks occurred from 1962 to 1979, with a second wave of outbreaks from 1980 to about 1991. Interestingly, both these outbreaks were first detected near Green Island off Cairns. Research has shown that the outbreaks actually started on reefs somewhere between Cooktown and Cairns, before progressing southward to affect reefs as far south as the Whitsunday Islands and further into the Swain Reefs.

The most important question for which reef managers need an answer is whether or not the starfish outbreaks we have seen are natural or human-induced events, or a combination of both. These questions have been the main focus of the GBRMPA's research program into the starfish. Since 1985, independent groups of scientists have been advising the Authority on research required to address

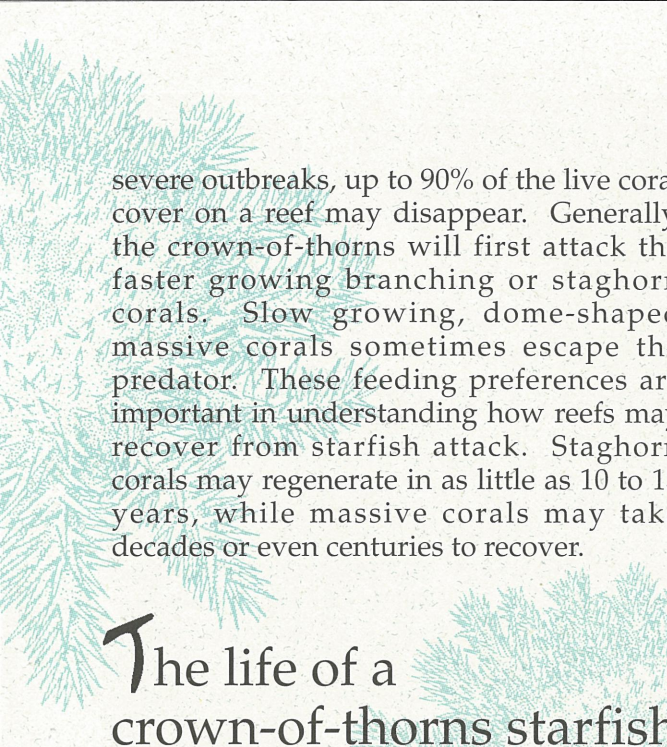
the question of what causes outbreaks. The resulting research program is the most comprehensive, coordinated scientific study ever conducted into this problem.

Although it is not yet known what actually causes an outbreak, the research program has produced some exciting and fascinating insights into the life and ecology of this important member of the coral reef community. In particular, the feeding and life cycles of the starfish have been closely studied.

Furthermore, the research has also contributed greatly to our understanding of the functioning of the Reef as an ecosystem. For example, crown-of-thorns starfish research has highlighted the links that exist between individual reefs in the Marine Park. The effect of water currents on the recovery of reefs after disturbances such as cyclones as well as starfish outbreaks has also become clearer through this research program.

Feeding

During an outbreak, the starfish's strong preference for feeding on hard corals may have dramatic effects on the reef. During



severe outbreaks, up to 90% of the live coral cover on a reef may disappear. Generally, the crown-of-thorns will first attack the faster growing branching or staghorn corals. Slow growing, dome-shaped massive corals sometimes escape the predator. These feeding preferences are important in understanding how reefs may recover from starfish attack. Staghorn corals may regenerate in as little as 10 to 15 years, while massive corals may take decades or even centuries to recover.

The life of a crown-of-thorns starfish

Male and female crown-of-thorns starfish spawn during the summer months between late November and February. The crown-of-thorns has an enormous ability to produce offspring - one female starfish may release as many as 100 million eggs in one spawning season. Eggs and sperm are released into the water, where the currents mix them, allowing fertilisation to occur. The resulting larvae are at the mercy of water currents that may carry them long distances to other reefs.

Given the right conditions, millions of new starfish may invade a reef, eventually causing an outbreak. The floating larvae are the only means for the starfish to travel from one reef system to another. While drifting in the ocean, the larvae feed on small plant cells, generally known as phytoplankton. After several weeks in open water they need to settle on a reef. Juvenile starfish initially feed on particular purple-coloured plants covering large areas of reef. These plants, referred to as coralline algae provide food to the starfish for about six months before it finally switches to a diet of coral. Starfish are fully mature when 2 or 3 years old and are then ready to reproduce.

Suggested causes of outbreaks

Since the occurrence of outbreaks was first discovered, scientists have offered various theories to explain the phenomenon. Some have argued that the outbreaks are purely natural events, while others suspect a strong influence by human activities. The Authority's research program into the starfish is to assess the potential role of a number of factors likely to influence crown-of-thorns outbreaks. Currently, the research program focuses on the role that water quality and the removal of natural predators of the starfish may play in triggering outbreaks.

It has been suggested that a deterioration of the water quality in the Marine Park may be involved in the outbreaks. Increased levels of some nutrients, such as phosphates and nitrates that are being washed into Marine Park waters may result in higher numbers of the floating plants on which the starfish larvae feed. In turn, the increased supply of potentially suitable food may allow more larvae to survive and settle onto a reef.

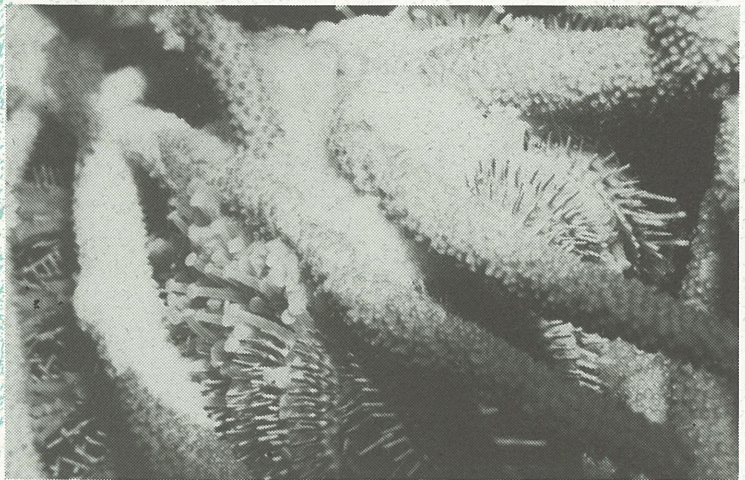
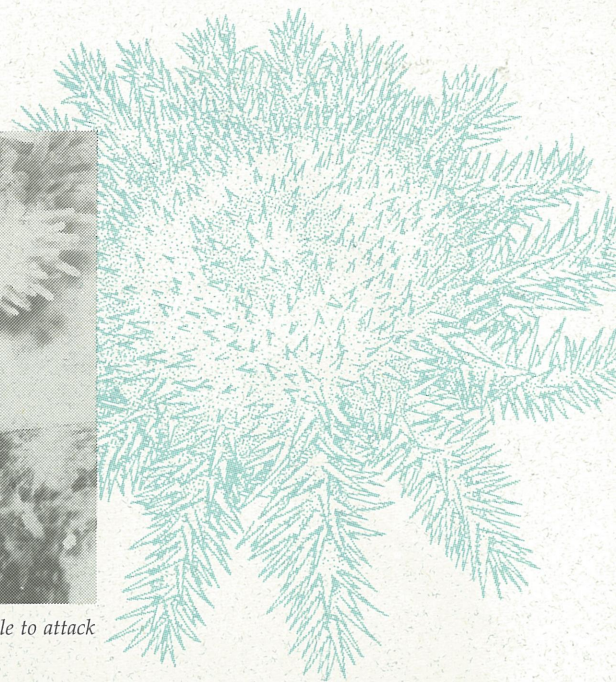
Other research assesses the role of predators of the crown-of-thorns. The giant triton shell (*Charonia tritonis*), a carnivorous snail, as well as some species of commercially exploited reef fish are known to sometimes feed on the starfish. These predators may potentially be important in controlling crown-of-thorns numbers on a reef.

Watching closely for answers

Monitoring of starfish populations on the Great Barrier Reef is also an important part of the research program. Two independent, yet complementary survey schemes are currently underway. A team at the Australian Institute of Marine Science (AIMS) is counting



The giant triton shell (*Charonia tritonis*) is one of the few predators able to attack mature crown-of-thorns starfish. Photo: L Zann



When feeding the crown-of-thorns starfish pushes its stomach out through its mouth wrapping it around the coral prey. The prey is digested outside of the starfish's body, leaving the white coral skeleton behind. Photo: L Zell

starfish numbers on up to 100 reefs every year. In addition, GBRMPA is coordinating a public participation scheme aimed at getting reports of starfish sightings from Reef users such as divers and local tourism operators. This scheme, named 'COTSWATCH' has been very successful in providing valuable additional information to GBRMPA. Since mid-1993, the Authority has been receiving increasing numbers of 'COTSWATCH' reports on sightings of the usually difficult to find juvenile starfish. In addition, the survey returns show a gradual but definite increase in the total numbers of starfish on some reefs between Cairns and Lizard Island.

It is difficult to interpret this current increase in starfish numbers. To date, no

information has been collected on what is actually happening to starfish populations just before an outbreak. No one really knows whether starfish outbreaks are a result of a slow, gradual build-up in numbers or whether they appear virtually overnight. Continual monitoring of the current situation is critical.

Scientific research on coral reef ecosystems is a time consuming and costly exercise. Coral reefs are among the most complex and diverse biological systems on this planet, and do not give away their secrets easily. Research into the ecology of the crown-of-thorns starfish needs to be maintained or even increased over current levels if we are to unravel the real causes of the outbreaks.



A stylized illustration of a sun with a human-like face, rendered in teal and black outlines. The sun has a large eye with a vertical pupil, a nose, and a smiling mouth. It is surrounded by wavy lines representing rays or clouds. The sun is positioned on the right side of the page, partially overlapping the text area.

Sunlight

is one of
the things
that make
a reef
work

Find out more about
the things that make
our reef survive
at *Reefworks*,
the new
Aquarium display