

An underwater photograph of a vibrant coral reef. The scene is dominated by various types of coral, including branching orange corals, yellowish-green soft corals, and a large, dark, spiky sea urchin in the foreground. A fish is visible on the left side, swimming near the coral. The water is clear and blue, with sunlight filtering through, creating a bright and colorful environment.

MARINE *Life*

The Extreme Weather (V2) edition

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Our Goal

To educate, inform, have fun and share our enjoyment of the marine world with like-minded people.

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Disclaimer: The views expressed in this publication are not necessarily the views of the editorial staff or associates of this publication. We make no promise that any of this will make sense.

Cover Photo: deep sponge garden – Emma Flukes

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NATIONAL News Roundup

The Noise about Seismic Testing

Human underwater noise could be harming marine life and it is an issue of growing concern.



Human ears are really lousy underwater as we are evolved to hear in air, but for a marine animal the ocean is full of sound. We know that whales and dolphins rely heavily on their hearing, but that's not the full picture. According to one defense scientist, "You have choruses where the whole background noise rises by 20 decibels – it's like the cicadas in the trees. Many fish have swim bladders that they can drum or strum, it's a very efficient source of sound. And shrimps make a lot of noise."

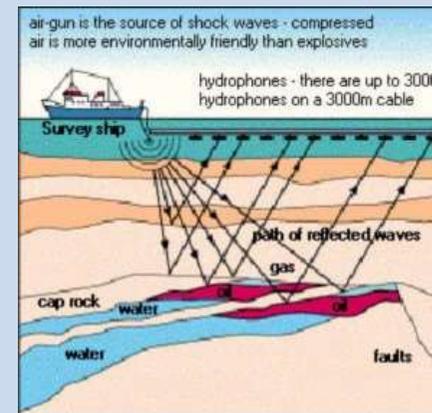
Humans can make a lot of noise too with ships, scientific instruments, defence exercises and construction work. That could interfere with animal feeding, breeding and migration behaviour.

Oil and Gas

The new "noise pollution" issue on everyone's lips at the moment is oil and gas seismic testing, which uses repeated underwater sound blasts to map potential oil and gas reserves. Recently, oil companies are ranging further and deeper in search of oil.

In Australia, professional fishermen have recently claimed that "anecdotal and scientific evidence" suggested the testing could affect stocks of black jewfish, arrow squid, scampi, blue warehou, orange roughy, gemfish and the loggerhead turtle. A southern bluefin tuna quota survey in the Great Australian Bight showed tuna numbers crashing from around 22,000 tonnes to 3000 tonnes at the same time as BP conducted a seismic survey. Numbers recovered when testing ceased.

In 2011, NT fishermen also protested testing and claimed "We have proven drops in fish catches from previous surveys, where fisheries have now actually been through the data and can demonstrate that our catch rates have dropped". A study from the Faroe Islands showed that although 75% of the fishermen interviewed claimed a detrimental effect on fishing in the neighbourhood of seismic activity, there was no evidence of a catch decline in their logbooks.



The Australian Petroleum Production and Exploration Association said "...more than five decades of experience and research shows no evidence that sound from oil and gas exploration activities causes injury to marine species ..." "And unlike the activities of other industries [such

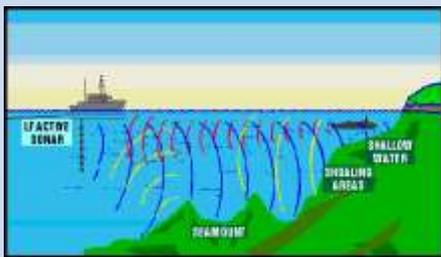
as fishing itself], there is no scientific evidence that would suggest oil and gas exploration activity has detrimental impacts on fisheries or fish stocks."

Ouch, we should also note that commercial fishermen also use high power output fish finders and side scan sonars. Even small boats have fish finding and echo sounders with characteristics broadly similar to high frequency military sonars.

Defence Uses

Another controversial source of "noise" have been the acoustic devices used by defence agencies to detect submarines. Claims of whale strandings caused by the military are frequent and these conclusions are generally rejected by authorities.

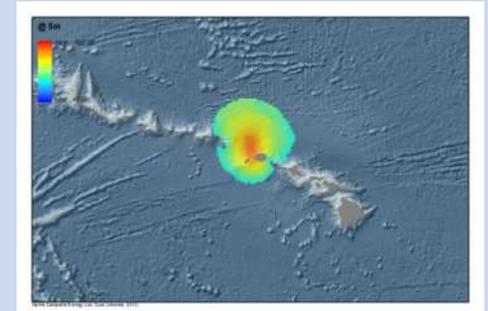
Despite not doing a lot of noisy exercises, the Royal Australian Navy (RAN) has been quick to recognise the potential of the issue. The 'Behavioural Response of Australian Humpback whales to Seismic Surveys' program is the largest project in the world on the effects of noise on whale behaviour. It's partly co-funded by the oil and gas industry and US Government regulators.



For noisy activities at sea, such as seismic surveys and naval exercises, the impact of noise is usually managed by having an exclusion zone around the noise source. Observers look out for marine mammals and can halt operations.

Exclusion zones are based on limited information and there is concern, even within the RAN, about whether or not they are the most effective measures.

"We've found that [whales] react at levels which are right down near the background noise when exposed to tonal sounds". However, that may not have longer-term consequences. "But if it's something that causes animals to, say, move away from where they normally feed, that might have a longer-term effect". These long-term effects are going to be the subject of a lot of further study.



Sound footprint of a US Navy exercise in Hawaii

Scientific Uses

Even scientists get into trouble over noise. Researchers often use sound to predict earthquakes, employing long submersible cannons called airguns. Testing by Geoscience Victoria for possible carbon storage areas below Bass Strait in 2010 is alleged by fishermen to have killed 24,000 tonnes of Bass Strait scallops, worth \$70 million. Surveys of a control area before and after the seismic survey did not detect any changes in the abundance of live scallops, or their condition or size in the period less than 2 months after testing. The CSIRO found no biological causes, but natural die-backs are not uncommon with this species.

The sound of an airgun explosion is reputedly 265 decibels at the source, and 110 decibels almost five miles away, too loud for human swimmers, and especially some concerned environmentalists. In the past, explosives were used to create seismic waves, and compared to that, airguns are eco-friendly. Environmental and animal-rights groups acknowledge the need for airguns but insist researchers could do a better job. Scientists have stated they are taking reasonable efforts to prevent harm and the risks are overstated.

In the US the issue has been big news and has been used as a reason to kill politically sensitive development. The Diablo Canyon nuclear power plant was stopped from conducting seismic surveys to assess earthquake risk. Post Fukushima, hackles were raised and the government hearing turned into a public rally. The power company promised that they would compensate fishing operations for any losses, and would spend \$8 million on a monitoring program. One protester suggested the testing wasn't needed to determine that, "A nuclear power plant on a fault line is dangerous. Period." The commission unanimously agreed and the decision was greeted with cheers from hundreds of environmentalists and commercial fishermen.

Do marine critters react to airguns?

It depends upon which study you prefer, but the answer seems to be "often No". There is some evidence that very few fish species can detect noise at a distance of greater than 15 m. A 2003 Norwegian literature review concluded that testing will have variable but relatively small impacts on the behaviour of trawl fish. Some fish were scared off temporarily, other much less so. Research in Scotland showed that fish had stronger reactions to a plume of air or mud than from the airgun pulse. Airguns could cause a fish egg and larvae mortality rate of 0.018%, which is way smaller than the natural mortality rate of 5 – 15 % per day. A recent UK study found that large crabs experienced stress when exposed to ship noise, but if it became frequent they soon adjusted to it. Since then, studies on crayfish reactions in Victoria (admittedly on sites some distance from intense testing) showed no impacts affecting the catch rate.

The impact of seismic surveys is likely to be more sensitive during spawning or migration. A safe zone of a few kilometres has previously been seen as adequate.

Whales and noise stress

Whales may well be a special case and there is some evidence that they do experience noted long-term stress from noise pollution. Baleen whales communicate at 20 to 200 hertz, the same wavelengths as emitted by the propellers of many big ships. Some species have adjusted to this by emitting louder and more frequent acoustic signals. After the 9/11 terrorist attack shipping movements fell along the North Atlantic coast for the first time in 50 years, allowing scientists to measure the impact of reduced noise. In Canada's Bay of Fundy this caused an immediate drop in whale stress hormones. Constant exposure to low-frequency ship noise may cause chronic stress in whales and reduced reproductive success.



While trying to seem whale friendly, our Federal government hasn't wanted to harm the energy sector. BHP has been allowed fairly broad scope to explore the Great Australian Bight. Recently, the Federal government approved testing south-west of Port Campbell. It will occur in

November and December 2013, in an area known to be frequented by endangered blue whales. The Government says special conditions will be enforced during testing to protect migrating whales. Seismic testing is also proposed for the Kangaroo Island Canyons region in March 2014.

Summary

The jury is still out. Noise is clearly a relevant issue for the management of marine ecosystems, although its impacts are variable. In many cases it may be able to be managed with a few prudent measures. Like many things to do with the sea, the data is noticeably incomplete and we could do with a lot more study in this area.



Antarctic & Southern Ocean News

Seals with 'diving gear'

- Per NSF and CSIRO



The thing to do at the moment, if you don't have the money for a fancy robot, is to glue a camera to a seal and see what happens...

Data collected by seals is becoming an important tool in Antarctic research and complements traditional oceanographic sampling from ships, satellites and drifting buoys.

A team of US Antarctic researchers have gained new insights into two little-known Southern Ocean fish species. The team equipped 15 Weddell seals with video cameras, infrared LEDs and data recorders and released them to follow the fish and record their behaviour. Most prior knowledge about the silverfish and toothfish had come from a catch information and the stomach contents of predators.

The team's 2002 findings shed new light on the two species. For the silverfish were seen to occupy the depth range from 160 meters to 414 meters. Toothfish were found deeper than 180 meters. Silverfish seem to migrate from deeper to shallower water using ambient light as a cue, even in the absence of a sunset during the Antarctic summer.

Another international team including scientists from CSIRO, the ACE CRC, the University of Tasmania and Charles Darwin University have been bothering elephant seals. CSIRO Elephant seal "divers" fitted with special sensors are providing a 30-fold increase in data recorded in parts of the Southern Ocean. "They have made it possible for us to observe large areas of the ocean under the sea ice in winter for the first time," The polar regions are changing more rapidly than any other part of the world. "By providing ocean measurements under the sea ice, the seals are helping us to establish the global ocean observing system we need to detect and understand changes in the ocean," he says.

The seals typically covered a distance of 35-65 kilometres a day. The seals dived repeatedly to a depth of more than 500 metres on average and to a maximum depth of nearly 2000m. These deeper diving seals also punched through into a layer of dense water cascading down into the abyss north-west of the Amery Ice Shelf. When the seals surfaced, their tags relayed information (via satellite) back to land, where it is collected by the Integrated Marine Observing System (IMOS), also based in Hobart.



This data identified the fourth known pool of 'Antarctic bottom water'. Dense pools of this Antarctic bottom water are a key driver of global ocean circulation and therefore of the earth's climate. "The seals went to an area of the coastline that no ship was ever going to get to, particularly in the middle of winter, and measured the most extreme dense shelf water anywhere around Antarctica," Dr Williams said.



SA News

New book on SA shipwrecks



Author Stuart Moody has contacted us recently to let us know about his new book "Port Victoria's ships & shipwrecks".

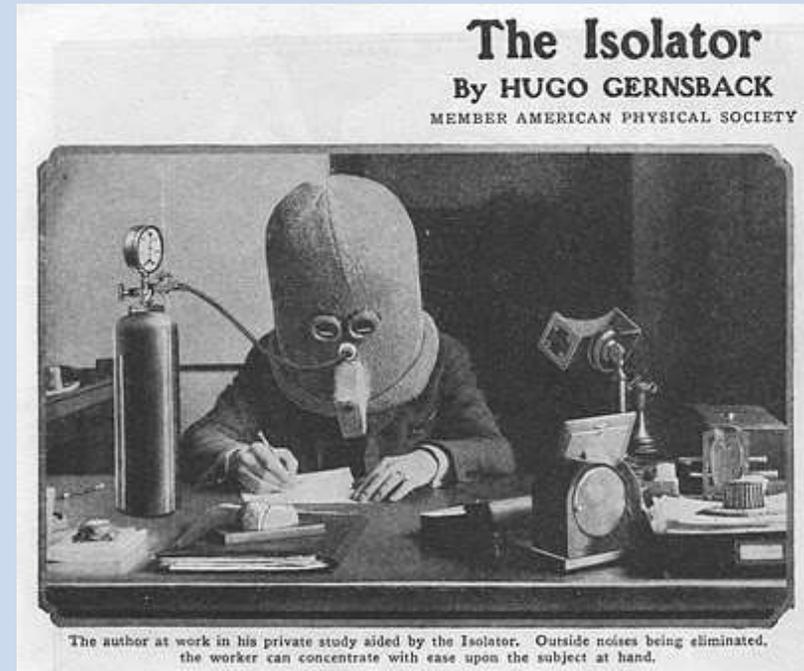
Divers and visitors to the Yorke Peninsula will probably have heard of the wrecked square-riggers, "Songvaar" and the "Notre Dame D'Arvor" off Wardang Island

that are still visited today by divers and snorkellers. There are plenty of other great stories about Wardang Island and its nine shipwrecks. The dramatic rescue of the crew from the *Albatross* on Eclipse Rock, being just one great yarn.

Port Victoria was not only the last port in Australia, but the last in the world where these types of ships sailed. The book is not only as the title reads, but covers much more in relation to the maritime history of Port Victoria. The book is on quality paper, A4, 325 pages, 400 b/w, 50 colour photographs, maps and charts (\$55 for softcover plus postage) . Many of the photographs and maps etc, have not been published before. It is available in hard cover and soft cover. Further information can be found at

<http://www.portvictoriasshipsandshipwrecks.com.au/index.html>

The rest may require some concentration, so don your "Isolator", now...



FEATURE - VIC

Cape Schank

text by Mike Jacques, photos Phil Watson & Mike Jacques



Cape Schank is one of the more prominent landmarks on the Bass Strait shoreline of the Mornington Peninsula in Victoria. It was named in 1800 after a friend of master of the "Lady Nelson". It remained largely undeveloped as the majority of the bushland and coastal scrub around it was cleared for agriculture.



Its prominent location led to the erection of lighthouse here in 1859. It was soon popular with sightseers and this led to its protection as a local government reserve. Even in 1867 it was

recognised as being "...replete with subjects both for the artist and the man of science. It presents geological formations in curious shapes of rocks and caves for the latter, and bold, picturesque, and richly coloured views for the former". In 1975, the former Cape Schanck Coastal Park was incorporated into the Mornington Peninsula national park and is now managed by Parks Victoria.

The park covers most of the remnant vegetation in the area. The Mornington Peninsula is the most popular recreation area in Victoria and has been described as 'Melbourne's Playground'. For a long time the reserve had been largely undeveloped and heavy foot traffic and plagues of rabbits quickly denuded the vegetation in the area. The soils were probably always a bit crumbly, but when I say denuded, I mean massive soil erosion, trampled and washed away. The area is of geomorphic significance, but even the 'rocky' cliffs are crumbling as the rain erodes the steep sides of prominent hillocks. This has forced Parks Victoria to build some big, alienating walkways to keep people off what is left of the vegetation.

The area is very popular with tourists and rock fishermen and is visited in calm seas by divers. A glance at a 1988 copy of Ian Lewis' "Dives of the Southern Ocean" will reveal how much places like Cape Schank have changed. Divers once scrambled over the bare soil down steep slopes to the tidal platform. Unfortunately, the closure of open access hasn't yet led to a recover in the vegetation.



Photo Phil Watson



Photo Phil Watson

The area is very wave exposed, but still harbours excellent marine life. The tidal platform is covered in kids looking in the rock pools. Below the low tide mark there is even more life. The rougher shores on the western side are rarely visited but have many crevices and some spectacular small sea caves. "The Arch" area includes a smooth sided underwater cave hollowed out by the swell. This cave area boasts rock walls covered in marine life. Another feature is the "Shark Cave", usually full of Port Jackson sharks. This dive can only be done in very calm conditions and is unsafe in any swell.

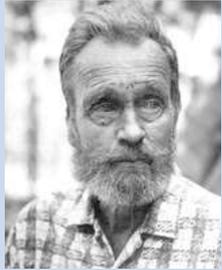
There is also lots of medium depth reefs (15–25 m) offshore from Cape Schanck. This area consists of rubble and bedrock covered by sand. On more secure rocky areas there are large kelp gardens. In even deeper depths there are even larger reefs, pinnacles and canyons that support lots of colourful sponges, sea tulips and lace corals.

According to Underwater Victoria, the deep reefs, canyons and pinnacles off Cape Schanck are of high conservation value, but they have not yet been properly surveyed and are not currently protected.



Photo Phil Watson

(HERITAGE) FEATURE - QLD



Escape artist and Beachcomber – Ian Fairweather

After World War II, a number of Australian artists began to migrate to the tropical coast for inspiration. They started an art movement and became “Escape Artists of the North”.

Ian Fairweather was raised in Scotland and joined the army in 1912. During World War One he became a prisoner of war and drew sketches to while away the time. Following the war, he resolved to become an artist. Over the next couple of decades Fairweather travelled the world, frequently living in extreme poverty. In 1933, Fairweather arrived in Melbourne via Bali. After the "painter's paradise" of Bali, Melbourne appeared dreary. His life became increasingly chaotic and he failed to organise exhibits of his works. He seemed more interested in calligraphy and learning Chinese.



In 1943, Fairweather arrived in Cairns and decided to remain in Australia. He then left Cairns in 1950, making his way to Darwin. There he found an old wreck washed up on the shore and made it into a home. He became the stereotypical beach bum and his odd house earned him a local nickname, “The Rear Admiral”.

In 1952, at age 60, he built a raft out of junk and sailed it out to sea. By day two he was being circled by sharks. He had to sleep with his legs wrapped around the mast in case he was washed overboard. By day 5 he was hallucinating. Search planes failed to locate him and he was



presumed dead. The raft was sinking all the time and got very low in the water. A fishing vessel saw him and offered a lift, Ian just yelled back, “is this the correct road to Dili? And no thank you.” It wasn’t until day 15 that he ran aground, on Roti Island, west of Timor in Indonesia. He was starving by that stage. He refused an RAAF offer of a free flight back to Australia “on principle”, but was deported from Indonesia anyway.

By 1953, he went to Bribie Island in Queensland, “The first night I came to Bribie Island at sunset, it was just so beautiful I decided to stay”. He constructed a thatch hut where he lived in apparent squalor, much to the ire of the local council. He spent the rest of his life there and was happy despite never showing much interest in money or possessions. Art dealers loved his work as it sold well, but he did it purely for his own reasons, often painting frantically on newspaper and cardboard when the canvas ran out. It was on Bribie Island that Fairweather produced his masterpiece “Epiphany” and he was soon touted as Australia’s greatest living artist. Becoming increasingly frail and eccentric as the years progressed, he died of a heart attack in May 1974. His ashes were scattered on Bribie Island.



The foreshore walkway at Frances Bay Darwin has been named in his honour. His Bribie Island home was near the Esplanade on the left hand side of the road bridge as you enter Bribie.

(HERITAGE) FEATURE - NT

Once in a lifetime adventure – wreck of the *Sanyo Maru*

by Grant Treloar

Our NT correspondent recently volunteered to be involved in an expedition to survey the newly-discovered historic wreck of the Japanese pearling mother ship "Sanyo Maru".



In November 2012, the Northern Territory Government organised an expedition to the historic wreck of 1930s Japanese pearling mother ship "Sanyo Maru". The vessel is one of the most significant historic shipwrecks

discovered to date in the Territory and will attract interest from archaeologists in Australia and internationally, especially from the Japanese. I was lucky enough to be invited along.

The "Sanyo Maru" mother ship supported a fleet of smaller pearling ships called luggers operating in Boucaut Bay off the Arnhem Land coast. The mother ships provided the smaller luggers with food, water

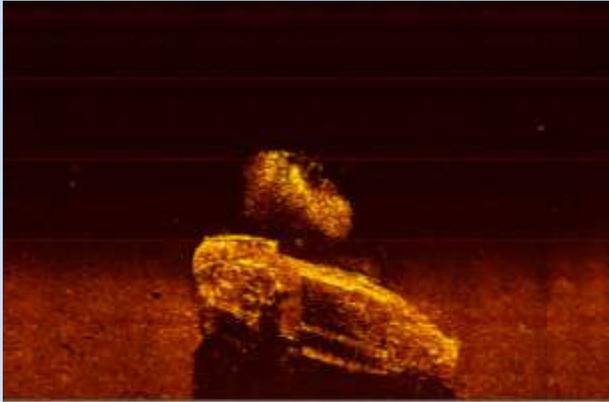
and fuel for many months before returning to Palau fully loaded with pearl shell. The mother ship "Sanyo Maru" sank while fully loaded with pearl shell during a freak storm in July 1937. The value of the lost cargo was estimated to be £42,000, and the overall loss of the sinking estimated at £100,000. Two crew died during the initial sinking and another diver during the salvage attempt. This ship was relatively new being built only a couple of years prior to the sinking and was modern and well equipped for the time.

The pearling industry in the 1930's was a thriving industry. During this time the majority of shell was turned into buttons with the remaining shell turned into furniture inlay, instrument dials, and other decorative items.



During the 1930's many Japanese pearling luggers frequented the Northern waters of Australia with divers using heavy metal dive helmets and air supplied by rubber hose from the surface. These divers spent up to an hour on the bottom collecting oyster shells it was very hard and dangerous work with divers often doing 6 to 8 dives a day.

The wrecked vessel was located by the Royal Australian Naval hydrographical survey vessel HMAS "Leeuwin" in 2001 and initial side scan imaging showed a vessel approximately 38m long resting in 27m of water. The naval vessel HMAS "Huon" also recorded some video footage using a remote operated vehicle.



A prior expedition to access the site in 2002 experienced poor visibility and large swells. That expedition was abandoned and little data was recovered. The aims of our new expedition were to confirm the wreck's identity, draw sketches,

produce a site plan, and obtain photo and video footage from the site.

We studied the weather and tides to select a suitable week to try and give us the best possible chance of smooth seas and small tidal movement. The weather in the region is quite good during the build up to the wet season. We were trying to get good visibility and gain more information than the previous field visit.

The 2012 expedition was organised by David Steinberg, Northern Territory Government heritage officer, and included experienced divers and archaeologists James Parkinson and Peter Taylor from Victoria, Amer Khan and Jason Raupp from South Australia and myself, Grant Treloar from the Darwin Sub Aqua Club.

The dive team flew into the remote Arnhem Land community of Maningrida to meet Mr Steinberg. We attended the local Djelk sea ranger headquarters and briefed the rangers on our plans to travel, dive and survey the wreck prior to boarding our dive vessel Glen Allen. We boarded the Glen Allen proceeded out to entrance Island and anchored overnight. Here we reviewed previously recorded remote operated vehicle footage taken by HMAS Huon and by using this footage we constructed a rough site sketch so we had an idea of what we would encounter in the coming days.

Early the next morning we proceeded the 60 km out to the wreck site. On arrival the first thing we noticed was the site was abundant with fish life. The Glen Allen tender was used to conduct several side scans of the sunken vessel some good side scans recorded.

After lunch all dive equipment was set up and all dive briefings were conducted. All dives were to use a single tank 34% nitrox, 6 litre bail out bottle full face Auga mask and surface tethered communications.

This configuration is used by commercial divers and is very safe and easy to use, the only difference being you are attached by the communications cable to the

boat at all times. The diver needs to be in contact with the surface and your diver tender instructing him to allow or haul in slack in the communications cable as required.

The first dive team attached a 50m tape to the steering Quadrant and laid a base line as far as the mast just forward of the poop deck (Mast now broken and laying over the starboard side). The second team extended this tape and ran it past the cargo hold and tied it off on the bow. This gave us a base line to perform all future site measurements and sketches.

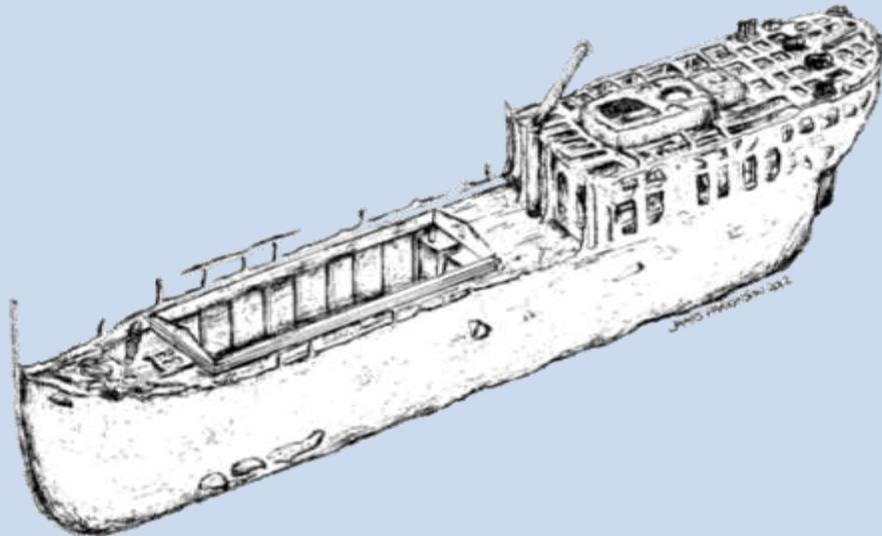
The following dives all involved allocating specific tasks to each team to build a complete picture of the site. Each team then used photographic equipment, drawing slates and tape measures to record data at various locations across the site, these were then used back on board Glen Allen to draw a full site sketch and identify areas that needed further investigation.





Items identified included a winch moved from its original location possibly during one of the earlier salvage attempts by the Japanese.

- Various blocks, pulleys, coils of hose and fittings possibly for transfer of the liquids from the tanks in the hold.
- Other items located and recorded include a sandal, rusting harmonica and a sea boot believed to belong to the crew.
- Various pieces of blue and white ceramics and stone ware jars in what was possibly the galley.
- A large bank of batteries possibly for lighting and radio use were located on the aft poop deck



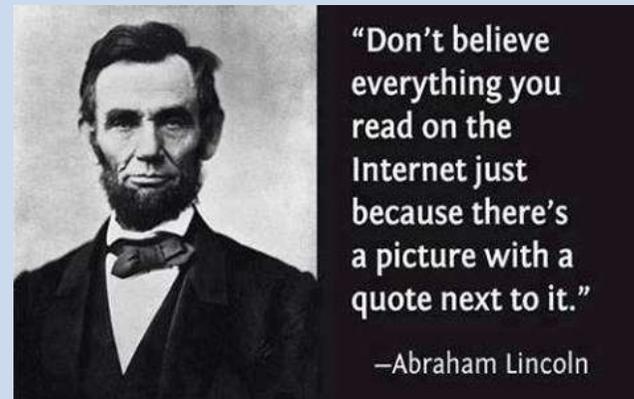
The cargo hold was completely empty except for:

- The two large tanks located at both forward and rear of the hold possibly fuel and water for the floating fleet of smaller luggers.

Photos and video of the site were taken and archive and details of the items and their location recorded

It is important to note that this wreck is covered by Section 13 of the Commonwealth Historic Shipwrecks Act, it is an offence for a person to damage, remove, or disturb a historic shipwreck or an associated relic. The penalty for any person breaching section 13 of the Historic Shipwreck Act is a fine up to \$10,000 or imprisonment for a period not exceeding 5 years

[random] Wisdom of the Ages



Critter Files

Cardinalfish SUPERDAD!



A Mouthful of little eyes , the tropical species *Cheilodipterus* Photo: R Kuitert

Here is a 24/7 Dad who starves himself to death just to give the kids a head start...

Species of cardinalfish are pretty common throughout Australia and they are usually found near the bottom under ledges or in caves. They are also called "Bigeyes" or "gobbleguts".

These small fish have the odd habit of brooding eggs in their mouth. This childrearing work is done entirely by the male.

Instead of laying thousands of eggs in a batch like other fishes, female cardinalfish lay hundreds of slightly larger eggs. When the female releases the eggs, the male gathers them into a tight bundle which he keeps safe in his mouth (he usually manages to recover about 70% of them). The faithful dad sits still and doesn't feed until they hatch. It's hard work and he even struggles to breathe with a mouthful of kids. Mum hangs around the crevice, but only because she is jealous and wants to make sure no other female makes off with such a valuable child minder.

Western Gobbleguts live in estuaries and have to grow up quickly as they might be unexpectedly washed out of places like the Swan River.

Their larvae hatch in an unusually advanced stage, with a functional mouth, developed eye and completely formed fins. This seems to work a treat and this fish is very common in Western Australia.



Another WA cardinalfish is the red-striped cardinalfish. Their courtship behaviour is often seen at the observatory at Busselton Jetty. The relationship between Mum and Dad seems pretty stable despite the rampant female jealousy that seems to be a feature of their behaviour.

In cooler waters cardinalfish are commonly seen under ledges in the daytime. The *Vincentia* genus of cardinalfish is endemic to southern Australia. At night they come alive to feed on plankton in open water, using their big eyes to spot prey.



Red-Striped cardinalfish : Busselton Observatory

In Southern Australia, divers often see the Southern cardinalfish floating near the bottom on night dives, or jammed up under rocks and crevice during the day. This species has been seen down to 65 metres as far west as WA, but it is rarely encountered west of the Great Australian Bight.

When the males are brooding, a collection of tiny eyes can just be made out shining through the thin skin on the chin. Being easy to keep in a lab, this species is often kept for study. We know it breeds year round and lays 140-200 eggs of 3-4.5 mm diameter. They will hatch 34-73 days depending on the water temperature. Mysid shrimps are a favourite food.

Species of the *Glossamia* family of cardinalfish are a bit odd as they can also live in freshwater in northern and north eastern Australia. Studies in New Guinea show they can form up to 25% of the fish biomass in



Southern cardinalfish per Museum Vic

floodplain streams. This is unusual because their habit of mouth-breeding should make it hard to survive. River water often isn't as well oxygenated as the sea.

Many species of cardinal fish (especially the deep water species) are "bioluminescent" and produce light. These species often have a bacteria-harboring "gland" and even paired reflectors that focus the light around the mouth. At night when feeding, the luminous mouth cavity of these fish acts as a lure to attract small prey. They may get their bacteria from the bioluminescent shrimp they eat. Maybe they get too much. A cardinalfish has been recently filmed spitting bioluminescent bacteria.

This superdad really lives a hard life. Child-rearing duty wears out male cardinalfish. Dad is only likely to live about two years, but the trade-off is that he can breed with great success several times a year with the young protected in his mouth. This arrangement has been working really well and cardinalfishes have survived unchanged for 50 million years. The only design change they have needed to evolve is a larger jaw cavity so they can keep more young in their mouths. Perhaps they have been a bit too successful because tropical marine species haven't evolved to expand their diet and behaviour. They only feed on certain plankton and need branching coral for shelter. These features are all vulnerable to climate change and threaten their survival. This might well be the case with some of the more finicky tropical cardinalfish species, but as a family strategy, it seems like letting Dad take over all the childcare 24/7 has been particularly successful.

Source: To feed or to breed: morphological constraints of mouthbrooding in coral reef cardinalfishes", by Hoey et al; Aust Museum; Busselton Jetty Observatory



It got too big and radioactive, remember whatever you flush -it all ends up in the sea

Extreme Weather Part II

Here we go again! – The 2013 Bundaberg Floods

by Mike Jacques

Recently we put out a supplement explaining what storms do to our reefs. Basically, they bounce back from massive events, provided the habitats are in good shape and events aren't too frequent. We continue the story where we left off last time but sadly, the extreme events keep coming. **Check out Part 1 of the extreme weather edition here:** http://tudc.org.au/news/apr-may13_supplement.pdf

Human Resilience

As if the 2011 cyclones hadn't been enough, ex-tropical cyclone "Oswald" hit southern Queensland in January 2013, dumping huge amounts of rain and causing widespread flooding and several deaths resulting from drowning.



Bundaberg seemed to cop the worst of it and the flood level broke all previous records, meaning the two biggest floods in Bundie's history have both been in the last 2 years. A one in 100 year event, followed by a one in 200 year event. The Burnett River broke its banks and flooded the CBD area and the northern suburbs. Anything in the way of the flood was swept away, trees, yachts, jetties, retaining walls, a cable ferry. Roads, cables, pipes and drains were damaged and the riverbank scoured. 2000 homes were flooded over the floorboards, a few were swept away. At the Burnett Heads, near Bundaberg, an 81-year-old man died when he fell off his yacht while trying to secure it against fierce winds.

Normally yachts are relatively safe in a cyclone as the city is 13 miles upstream from the mouth of the Burnett River. Usually floods take a couple of days to peak and owners can move their boats, but this time the flood was preceded by tornados and 130 boats were washed inland, swept out to sea, sunk in the river, or smashed to pieces. The smashed floating wharves on the north bank had all been newly installed after the 2010/11 floods.

The rain kept up for weeks, but as soon as the river level fell the local population went into overdrive to repair the damage. When I arrived 6 weeks later, most of the visible damage had been cleared up, but a sense of deflation has remained. The real problem with this flood was that it hit so soon after another historic mega-flood. Even then, smaller cyclones kept on coming, causing high winds and cancelling more tourist bookings. While I was there "Tim" was stopping me from spending up on touristy adventures and also dampening the spirits of those still camped under canvas.

Following a severe weather event, a significant part of the community, as many as one in five, will suffer the debilitating effects of extreme

stress, emotional injury and despair. The emotional and psychological toll of disasters can linger, affecting whole families. Evidence is beginning to emerge that drought and heat waves lead to higher rates of self-harm and suicide, as much as 8% higher.

The floods have dented confidence and compounded other issues affecting Bundaberg. The CBD is starting to look shabby and deserted



compared to when I saw it 10 years ago. Investment in tourism in the 'old town' has stopped with ratty old empty hotels hardly encouraging people to stop. The new shops being built aren't in the

low-lying areas, speeding up the growth of new and swankier outlying centres at the expense of Bundie's old heritage listed CBD.

Some property owners on the Burnett River flood plain are wondering if it's worthwhile rebuilding with flood insurance premiums now reputedly hitting \$1800 a month for the most vulnerable properties. Some are asking taxpayers to front for a buyout, or a system of expensive flood levees, but no-one seems too keen. Bundaberg has only 45,000 ratepayers and the council has little flexibility. The State government is also in debt, partly due to the 2011 floods. The speed of the cleanup demonstrates the drive of the local inhabitants and they will recover, but what if they get another big flood in another 2 years?

Old Bundaberg isn't a rust-belt town doomed to die anyway, it has a real future with many innovative new industrial, agricultural and tourism-based ventures. It is even a popular dive spot that recently

supported 4 dive shops. One of the local dive businesses had already moved to higher ground at West Bundaberg after the 2011 floods and is hanging on. The other surviving dive business has decided this is the last straw, and will close its doors. This means that there are fewer people drawing attention to the local marine attractions, and I noticed that the 'traditional' coastal activities were already less heavily promoted in local tourist literature. Dive shop failures are also being caused by competition from other attractions and changes in the retailing sector, but natural disasters have also played their part.

However, the speed of the clean-up demonstrates the high levels of local resilience, Bundaberg will survive and thrive despite all the injuries.



Hard times for Bundaberg's reefs?

Some people think Bundaberg is just a grimy old sugar town, but many also think of Bundaberg in terms of its iconic natural attractions, including its unique coastal nature parks.

The Burnett River often has relatively low wet season rainfall and as a consequence, usually lower pollutant and sediment discharges to the nearby coastal coral reefs. Thus, the Woongarra coast between the Burnett Heads and Elliott Heads has the most southerly coastal fringing coral reefs on the eastern Australian mainland. Extensive coral reefs (both hard and soft coral) are found adjacent to the rocky foreshores, a rarity on the southern Queensland mainland. These reefs support a high diversity of invertebrate marine life including lots of colourful nudibranchs. The reefs also support a wide variety of fish species due to their close proximity to nursery areas in local estuaries and wetlands (the fish have also attracted heaps of olive sea snakes that are scary looking but harmless).



Bundie's coastal reefs are recognised as some of Australia's best tropical shore-dive sites, a diver's oasis among the mangroves and shallow sand that dominates much of the mainland Queensland coast. Divers are particularly attracted by the safe and relaxing shore and snorkel dives available at the Barolin Rocks and Hoffman Rocks.

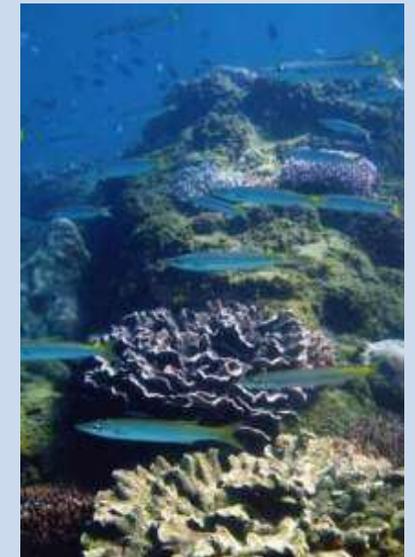
Families also flock to the summer turtle shows at Mon Repos turtle sanctuary and having experienced it myself, I'd have to say it's one of the must-do natural spectacles in Australia. It is doubly

amazing that it occurs on a coast not far from an urban and agricultural centre that is heavily altered by man.

What will happen to Bundie's reefs?

Corals are very attractive to tourists, but they are also critical to the survival of a damaged reef ecosystem. Even dead corals can provide shelter for a variety of creatures. After a storm, the bare bones of dead coral are soon covered in slimy algae. If fish life is healthy algae-loving fish will control this to manageable levels. Fast-growing types of coral like Acropora make use of all the free space by breeding up big time. Within a few years a diver will be able to see lots of pretty corals, but to an expert eye it isn't the same. There are only a few species and the structures aren't very complex, or big. For a long while they won't support all the species that might once have occupied the reef. It may take decades or even centuries for slow-growing coral species to recover if they are killed.

Under ideal conditions, within five to 10 years of a cyclone, the corals look pretty spectacular. In the Keppel Islands, a 2006 coral bleaching event killed off the coral. Over the next two years, surviving coral fragments regrew, and new corals settled so that now it is well-covered. However, its normal biodiversity isn't fully recovered. The recovery time of coral communities is strongly influenced by the density of corals prior to disturbance. Recovery at North Keppel Island after the 2006 bleaching was weak, possibly due to lower existing coral cover. If the base of the reef is unstable, young corals are frequently damaged before they can regenerate. Then it may take centuries for some coral to recover.



As far as other colourful bottom-dwelling animals go, recovery rates vary: fast for ascidians (sea squirts), moderate to slow for a range of sponges and gorgonians (sea fans). Recovery times vary from one to 64 years depending on the degree of disturbance and how quickly the species grows or reproduces. The frequency of repeated disturbances such as cyclones, crown-of-thorns starfish outbreaks and flood events have kept some coral reefs of the Great Barrier Reef (especially the inner reef) partly degraded for decades.

The onshore reefs of Bundaberg had been hammered by sediment plumes after the 2010 floods. They were just starting to recover when "Oswald" hit. Big sediment outflows are likely to cause months of cloudy conditions and loss of coral. Bundaberg's reefs and coastline can recover, but only after a sustained break from further major disturbances like the recent floods. I say "like" floods, because they are not the only disturbances occurring on this coastline.

Bundie has been growing in recent years. There is evidence of deterioration in some of the fringing reefs on the Woongarra coast due to discharges of stormwater and treated sewage effluent, well before these headline grabbing incidents. Degraded areas hit by repeated incidents can become an underwater desert. Dire impacts like this are pretty common in heavily developed parts of the world like the Caribbean Ocean.

I get the feeling that Bundaberg's reefs, like it's people, will bounce back. Not everything will stay the same though, and we may look back fondly in future years at the wonderful life that once occupied this increasingly battered coastline.

Bundaberg - Loggerhead heaven

If you saw the extreme weather supplement you might have noticed that we said green turtles were common and doing pretty well after the recent disasters, but that isn't the whole story for turtles.

Unlike green turtles, that breed well and have a relatively stable population (although sizes are falling), the loggerhead turtle has been in long-term decline. The total loggerhead nesting population for Queensland was estimated at 3500 females in 1977, but less than 500 females by 2000. Changes in fishing and more fox baiting may result in the population 'turning the corner', but it will take 40 years for any new recruits to reach breeding age. Turtles are at the most risk from storms when young and living in shallow estuaries.



Loggerheads will travel all over the world's tropical and temperate areas, but they only breed in a few vulnerable areas. Pacific loggerheads are mainly confined to Mon Repos in Southern Queensland and Yakushima Island, Japan. The "Oswald" floods at Bundaberg in 2013 damaged their principal nesting beach, and the impact of the recent disturbances is still hard to assess.



Mon Repos' beaches re home to hundreds of nesting turtles each year, with January and February being the peak hatching time for young turtles, right as "Oswald" hit. Queensland Parks and Wildlife (QPWS) had to do a monster clean-up to remove debris from

heavily eroded beaches. "Turtle nests that were incubating on the beach would be lost, we're yet to assess exactly how many we've lost," said the head ranger to local news services. In fact, it may not be as dire as first thought, but it is likely that this years poor breeding season will dent turtle recruitment, for the relatively rare Loggerhead turtles that prefer Mon Repos. They were expected to experience a population surge by 2020 but that may be delayed.

Declining loggerhead turtle numbers at Mon Repos had only just been stabilised at a low level before the flood, by the introduction of turtle exclusion devices (TEDs) on trawlers, the proclamation of the Woongarra Marine Park, and the fox baiting and reforestation programs there. A lot more effort will be needed before he numbers are restored, even without further major cyclones.

Recruitment of loggerhead turtles is still slow, perhaps due to incidental capture in longline fisheries gear and the ingestion of marine litter. The anticipated population recovery planned for 2020 seems to have stretched out to 2040 in some publications.

The expanding coastal development along the Woongarra coast has also resulted in more coastal lighting being visible to newly hatched turtles; this may be affecting their ability to find the sea after hatching.

Fraser Coast Dugongs

As shown by the Moreton Bay studies, after the 2010/11 floods, a sediment plume is likely to cause starvation deaths in turtles and dugongs immediately after the flood. Cyclone Oswald will cause the third major loss of local seagrass in the region in the last two decades. More than 1,000 sq km of seagrass meadows were lost in Hervey Bay in February 1992, following two large floods in the Mary and Burrum Rivers.

Dugongs starting washing ashore starved 6-8 months later, 99 carcasses were recovered. Dugong populations dropped from 2,200 in 1988, to 800 in 1994. Some dugongs travelled up to 900 km to find food and four carcasses were washed up south of Sydney.



Most of the seagrass in Hervey Bay has now recovered from that earlier event and dugongs have moved back into the Great Sandy area. Aerial surveys indicate that the numbers of dugong in the Hervey Bay to Great Sandy Strait region has recovered to 1,650 in 1999 and 1,710 in 2001.

I suspect the local events are going to cause a dip in numbers again, but once again hopefully we haven't reached the point where chronic population instability causes long term damage to local dugongs.

Cyclones and floods – There are Winners

NORTH Queensland manta rays are booming in numbers after a post-flood surge in plankton on the Great Barrier Reef.



Up to 150 mantas have been spotted by Project Manta survey divers off Lady Elliot Island, something of a hotspot for aggregations of manta rays. Popular sites are also at North Stradbroke Island and Osprey Reef in the Coral Sea.

This aggregation is believed to have been caused by a spike in nutrients flushed out by record flooding at Bundaberg. DR Kathy Townsend said, "When we first started this project back in the early 2000s it was estimated that there was probably only about 40 individual manta rays that could be regularly found around Lady Elliot Island.

"Since then we have discovered we currently have over 700 individuals that we have identified from that region as well as the rest of the east

coast. [But] we've never seen anything to that extent; we certainly had ones of up to say 50 to 60 animals but have never seen the likes of having up to 150 animals."

Mantas will come from far and wide chasing food, migrating up to 3000km every year. They are counted when they arrive at known "cleaning stations", where smaller fish clean them of parasites and dead skin. The largest ray and one of the largest living fish, they are the third-largest marine species on the Great Barrier Reef (after whales and whale sharks). They grow to 5m in width and weigh several hundred kilograms.

Read more at <http://www.ladyelliott.com.au/manta>

A word from our North Korean correspondent

Extreme weather - only for capitalist dog



Playing God with the oceans and other bulldust

Big storms loaded with red bulldust from central Australia are a curse for everyone from asthmatics to airline pilots. Big storms can damage coasts, but they also charge the oceans with life.



This spectacular thunderstorm made landfall recently west of Onslow, in the Pilbara region in WA's northwest. It was photographed by a seaman, Brett Martin, aboard an offshore tugboat, "... it went from glass to about 40 knots in two minutes...there was a lot of lightning but not a lot of rain."

A Bureau of Meteorology forecaster said wind and rain caused the storm to dump sand and dust it had collected while passing Onslow. He said such storms were normal for the region at this time of year. Blankets of red bulldust have also cursed even Adelaide and Sydney, especially after long droughts. They are a loss of topsoil for farmers, but a gain for the oceans. Just like a lot of us, the oceans are really iron deficient. When a mass of iron-rich dust lands on the ocean, it often promotes a huge bloom in planktonic life.

Recent marine trials suggest that one kilogram of fine iron particles may generate well over 100,000 kilograms of plankton. This is enough to interest people in 'plankton farming' as a way of reabsorbing all the CO₂ we have been putting into the atmosphere. The size of the iron particles is critical, small is good as it doesn't sink quickly and it's easier for tiny animals and plants to eat. Creating phytoplankton blooms has been claimed to be like watering the desert, but it changes one type of ecosystem into another. The side effects of artificial iron fertilization are not yet known. Despite warnings to wait for better science, in 2012 a Californian businessman Russ George dumped 100 tonnes of iron sulfate off the coast of Canada and created an algal bloom of up to 10,000 square kilometres.



But research by Sydney University and the Sydney Institute of Marine Science found that large-scale iron fertilisation would be a waste of time and money. "It is possible to do iron fertilisation efficiently but the perfect conditions you would need are so rare that it would be a very limited contribution to the problem." Storing carbon dioxide in the ocean would cost about \$433 per tonne, while the Australian carbon price is \$23 per tonne. Fertilising a square kilometre of the Southern Ocean would only store about 10 kilograms of carbon dioxide - about as much as a car emits from four litres of petrol.

On 16th May the Environment Minister announced that Australia was seeking to amend the London Protocol and ban ocean fertilisation other than for research.

News from Darwin Sub-Aqua Club

by Grant Treloar

The club has run its second trip to the Philippines this time to Coron. The area is renowned for the Japanese WWII wrecks. As far as bang for buck goes it can't be beaten. A great weeks diving (10 dives), accommodation was excellent and food was very nice and only came out to \$1600.00 ex Manila. From Darwin we managed to get return flights to Manila for \$300.00 so it was pretty cheap weeks diving.

Below is the sketch of a Japanese seaplane tender - this is one of the most interesting dives in Coron. The large crane, its cables, cogs and winches, along with the communications mast make this a very good wreck dive.



As far as the dive club's local operations go, we have been advised that the land where our shed is located is being sold. While we have been notified that we have to be out within 6 months the NT Government has stated that they will help relocate tenants. We're not sure exactly what that means and we are meeting with the government next week to look alternatives for our club. We have also lost our treasurer due to a work move, so we are on the lookout for a replacement. All in all our little club is still ticking along with about 70 members, with up to 20 visiting the dive shed on Thursday evening social days.

We are just getting ready to dive the dry season. The Inpex dredging associated with Darwin's new LNG plant should now be finished and visibility improving. Over the last couple of neaps there has been up to 10m vis on some of the outer harbour sites.



We're on Facebook!

Check out our "Marine Life Magazine" page on Facebook to interact directly with us famous people, and to hear the latest news and updates.

Back Issues

We have been gathering together a lot of information and stories since November 2009, so if you are new and interested, please log on our back issues page which has been generously hosted by the Tasmanian University Dive Club, <http://www.tudc.org.au/news/marinelife.php>