

MARINE *Life*

Feb March 2018



Our Goal

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

The Crew

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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, *The Tamar*. Mike Jacques



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Contact us: marinelifetassie@gmail.com

Big Summer for Ocean Events

Phil's Dive for a Cure 28 January

This Sunday be at Bicheno to support Phil's Dive for a Cure. It's fun and all proceeds go to help the fight against cancer.

Launceston is a centre for oceans activity (it's actually 40 km inland) with several big events on.

World Wetlands Day 2 February

There are lots of free activities at the Tamar Wetlands Centre until 2.30pm, it's free!

Big Blue 11 February

The following Sunday there will be heaps of talks and exhibits about everything to do with the ocean environment, marine science and just having fun while getting wet. Albert Hall Launceston from 10am-4pm

Ocean Film Festival, 16 March

Two hours (in total) of sublime underwater footage from around the world. Tramsheds Inveresk 7pm

<https://www.eventbrite.com.au/e/ocean-film-festival-world-tour-launceston-16-march-2018-tickets-40999547751>

There is also a couple of Beach Festivals

Mooloolaba Beach Festival 18 Feb

Big Swim and lots of beach activities

There are probably plenty of other events near your place. It'll be some poor volunteers plugging away trying to bring you something fascinating, usually something inexpensive or free. Get searching.

Oceans on Show at Big Blue



EVERYTHING to do with the oceans will be on offer at the Big Blue marine community expo next month in Launceston.

Organised by Seadragons Dive group the expo at the Albert Hall on February 11 includes discussions and displays ranging from plankton, southern ocean predators, seahorses, cold water corals, maritime heritage, cuttlefish and robots.

There has been a lot of controversy in Launceston about mud raking, sewerage pollution and environmental water flows in the Tamar River.

The Tamar River has some of the most damaged places in Australia, but many people care about this river and you will find out what is being done to help it, he said.

The expo will have tanks showing the special bottom dwelling marine life of the Tamar Heads.

Big Blue also explores rest of the Tasmanian coast. This is a unique habitat with huge numbers of marine plants and rare animals not found anywhere else.

Australia's temperate coast is isolated from the rest of the Pacific and Indian Oceans, and Tasmania even more so. There are hundreds of species of rare seaweeds and animal species that are relics of prehistoric times like handfish and Maugean skates.

Mr Jacques said people will learn about ocean species in Tasmania and the Southern Ocean.

We have lots of information on the tiny and colourful creatures that are often forgotten, but vital to the survival of marine life. Research is helping these animals to survive our changing times.

All the major scientific and management bodies will be there including the Queen Victoria Museum and Art Gallery, Institute for Marine and Antarctic Studies (IMAS), Natural Resource Management North Department of Primary Industries, Parks, Water and Environment and the Commonwealth Scientific and Industrial Research Organisation (CSIRO).

I'd say it's the biggest ocean environment festival ever to have hit Tassie and it's one of the largest marine science events in the country. It's inaugural and might not be repeated if it isn't supported.

More information visit their Facebook page or www.marinelife.org.au. Entry by donation.

Senate calls for new research funding and more voyages for the CSIRO's research vessel.



Senate Reports don't always have a lot of political impact, but a recent one has highlighted the issues with the oceans, and decided we need more research resources.

https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Environment_and_Communications/ClimateChangeOceans/Report

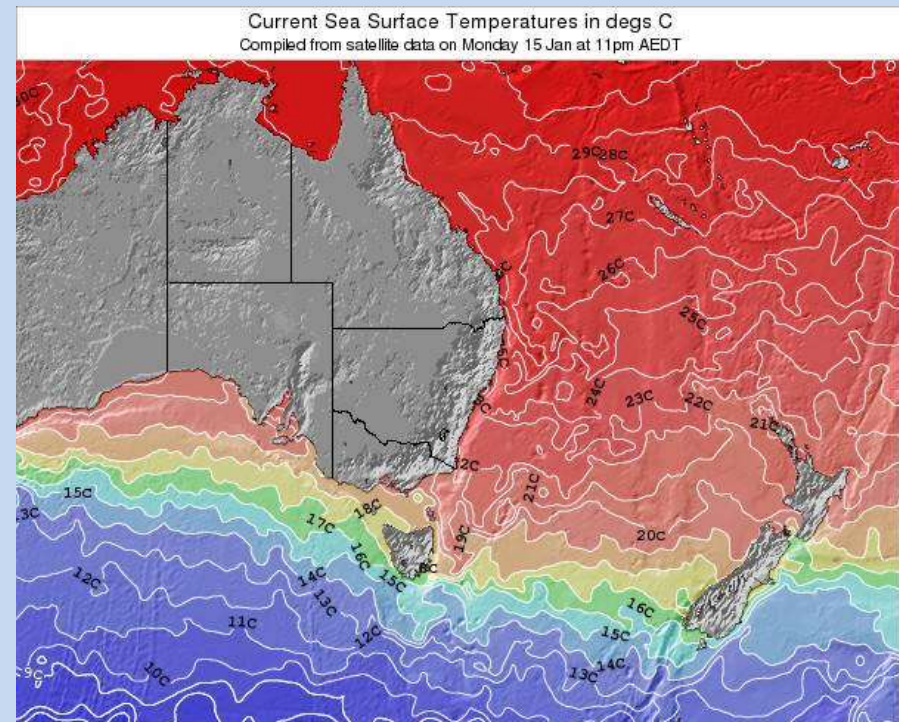
Rising ocean temperatures

The Institute for Marine and Antarctic Studies (IMAS) appeared and advised that sea-surface temperature trends for the period 1901 to 2012 are rising everywhere except in the northern Atlantic. Since 1901, a global average temperature change has been recorded as approximately 0.89°C [0.69–1.08°C]. The Bureau of Meteorology has reported that surface temperatures were the highest on record in 2016 both globally and in the oceans around Australia. For the oceans around Australia, the

Bureau reported that the annual mean sea surface temperatures were 0.73°C above average (records date back to 1910). The previous record of 0.64°C above average occurred in 2010.

IMAS explained that the largest temperature changes have been recorded in the surface ocean, with smaller changes occurring in deeper layers. Available evidence includes the following:

- the top 75 metres of the ocean has warmed at the rate of global average surface temperature warming; and
- below the top 75 metres, '[t]here is good evidence that the deep ocean below 3000 metres has warmed, and that the mid-depth ocean (between 2000 to 3000 metres) has not warmed, consistent with our understanding of global ocean circulation'.



South east Australia is one of the fastest warming regions globally. Evidence supporting this includes:

- direct observations since the 1940s indicating that warming in this region 'is approximately 3.8 times the global average'; and
- sea surface temperatures over a 50-year period indicating that this region 'is warming faster than 90% of the ocean.

One of the few long-term datasets we have is off Maria Island in Tasmania. The consistent trend since the 1940s is that the water temperature that was off Eden in southern New South Wales in the 1940s is now equivalent to what we see off Maria Island. Climate predictions are that the climate will be the same as Batemans Bay in New South Wales by 2060- 2100.

Marine heat wave events were recorded in Western Australia (2011) and the Great Barrier Reef (2016).

The peak anomaly at Ningaloo was 3 °C in January, and there were even higher peaks between Shark Bay and the Abrolhos Islands in February. Down at Cape Leeuwin, the peak temperature was about 2.5 °C and occurred in March. These elevated temperatures gradually decayed to more typical levels between April and July.

The frequency of these marine heat wave events is increasing. Core records based on isotopes in coral skeletons indicate that recent warm events 'are exceptional, going back to at least...about 1600'.¹³

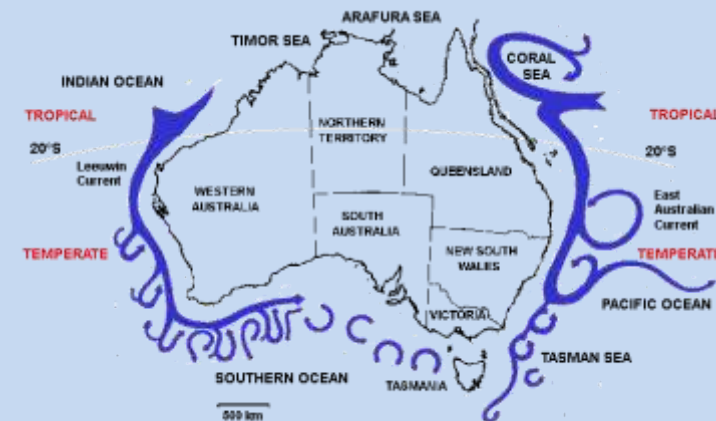
Changing ocean currents

The East Australian Current is the largest ocean current close to the Australian coastline. The current flows southward after crossing the Coral Sea. It has a significant influence on the marine environment off the east coast of Australia due to the warmer ocean water it carries southward. The current is around

100 kilometres wide and transports 40 million cubic metres of water southward each second at up to 3 kilometres per hour.

The warming observed off Maria Island, Tasmania, since the 1940s is related to the increased strength of the East Australian Current. CSIRO advised that climate models suggest that, a strengthening East Australian Current will have an increased southwards reach. Changes in the formation of eddies are also of concern to scientists. An increased frequency of sudden warming events off Tasmania's east coast could occur as a result of increases in eddy activity. Increased eddy formation in this region is expected to have implications for fish stocks.

The Leeuwin Current sweeps down Australia's west coast, from about the North West Cape and can extend as far as the Great Australian Bight and the southwest of Tasmania. The current brings warm, low-salinity tropical waters southwards and then eastwards along the south coast of the continent'. CSIRO explained that, unlike the East Australian Current, the Leeuwin Current has weakened in strength over the past 50 years by 10–30 per cent. The current is predicted to weaken further by 15 per cent by 2060.



Rising sea levels

Globally, the average sea level has risen by 0.19 metres between 1901 and 2010. Furthermore, the rate of sea level rise has increased: for the period 1901–2010 it was measured at 1.7 millimetres per year whereas over the period 1993–2010 the rate was 3.2 millimetres per year. By 2100, it is projected that sea levels could have risen by up to 0.8 metres.

Rates of sea level rise that are greater than the global average have been observed in and near Australian waters. In the Torres Strait, research published in 2010 indicated that the sea level had risen at approximately six millimetres per year. In waters near Papua New Guinea, an annual average increase of seven millimetres since 1993 has been measured.



80 metres sea level change per Pangloss, quite a way away, but you get the point

Changing ocean chemistry

Rising carbon dioxide levels in the atmosphere has caused the surface ocean to acidify and this trend is expected to continue. About 25% of the extra CO₂ added to the atmosphere is being absorbed by the oceans.

This forms carbonic acid and triggers a cascade of other chemical changes. The concentrations of hydrogen ions have already increased by 30% in the seawater compared with preindustrial times.

This acidification of the ocean reduces the ability of marine organisms such as corals to calcify and may also 'lead to behavioural changes in fishes and invertebrates'.

IMAS also noted that the 'concentration of oxygen in the oceans is changing'. IMAS explained. The FRDC submitted that changes to ocean chemistry are 'the less understood' of the changes to physical attributes of oceans.

Extreme weather events

In tropical Australia, coastal areas are projected 'to experience more intense storms and severe weather events'. An increase in average cyclone intensity is also projected as the climate warms. Incidences of strong tropical cyclones are expected to increase for particular regions as follows:

- southern Great Barrier Reef—from one every 25 or more years at present to one every 6–12 years; and
- Western Australian coast (Pilbara to southern Kimberley)—from one every 10 years to one every 7.5 years.

Among other things, the increased frequency and intensity of severe weather events are expected to have implications for fish stocks and the health of coral reefs.

More exciting finds from the CSIRO's MV "Investigator"

Source CSIRO



Dendrogramma enigmatica. Image: Karen Gowlett-Holmes/CSIRO

A systematic study of the deep-sea floor of the Great Australian Bight has revealed some cool facts and photos

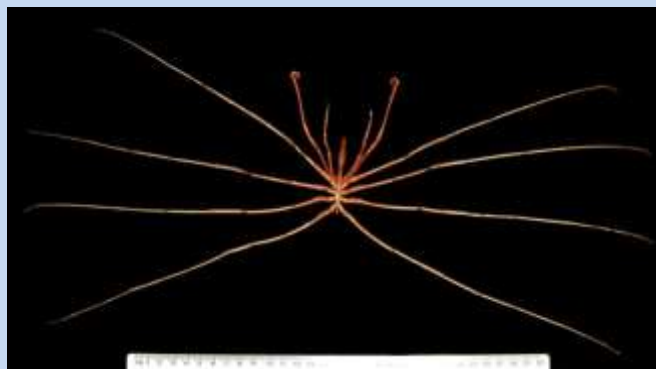
It takes scientists 5 hours to get a sampling net to the bottom of the Great Australian Bight. Then it is towed along at 5000 metres depth to see if any strange critters are living there. You might think of it as a deep dark desert, but it is teeming with animals especially adapted to this environment.

Recently, 40 scientists collected more than 63,000 specimens, representing 1073 species—including 277 species new to science. Of the known species, one third of all species were until then known only from single specimens

Dr Alan Williams says, "From a benthic [sea floor] ecology perspective, this research has transformed the Bight from one of

Australia's most poorly known deep-sea regions to the best known."

The samples come up with mostly small animals—food is generally scarce in the deep sea. You will see only the occasional large scavenging fish that feeds on the carcasses of large fish or mammals that fall rapidly from surface waters.



Colossendeis spicula – or giant sea spider. Image: Karen Gowlett-Holmes/CSIRO

Some species are huge compared to their cousins in the shallows. The giant sea spiders are 60cm across and are capable swimmers, treading water so that they are carried across the bottom by slow-moving currents.



Histioteuthis miranda – or cock-eyed squid. Image: Karen Gowlett-Holmes/CSIRO

Despite living in total darkness, the cock-eyed squid (*Histioteuthis miranda*), has a giant left eye. Gazing upwards, it can see its prey silhouetted against the faint light from above.”

Thousands of gelatinous, purple blobs swimming sedately just above the sea floor turned out to be swimming sea cucumbers (*Enypniastes eximia*). They were seen in clusters 5 metres off the seabed, swimming along to catch phytoplankton.



Concentration of swimming seacucumbers at 3000 m.

Unlike most jellyfish, colonial rhodalid jellyfish live on the seafloor. Colonial rhodalid jellyfish are anchored on the bottom and parts of ‘bracts’ of the creature, like this *Dendrogramma enigmatica*, are attached by threads.

“*Dendrogramma* is a siphonophore—a kind of jellyfish but attached to the seabed, like a parachute held down with numerous ripcords. The pieces we collected are like protective discs. It’s soft and delicate...”



Image: Karen Gowlett-Holmes/CSIRO

Figuring out what species have been collected in the samples is a starts on board the ship. The scientists worked daily 12-hour shifts.

All the specimens are preserved onboard, in alcohol or formaldehyde. Back ashore, they were taken to the lab and those needing formal identification were sent to a network of specialist taxonomists, mostly associated with museums, who provide identification.

It typically takes weeks to months for a specimen to be formally identified. The current haul has taken 18 months to sort out.

IF YOU WANT MORE INFO, THE “BIG BLUE” EXPO IN LAUNCESTON ON 11 FEB WILL BE LINKING UP WITH THE MV “INVESTIGATOR” AT SEA.

Postcard from Behind the Redwood Curtain

Text and By Nick Perkins (unless stated otherwise)



Nick is a sometimes photographer for Marine Life [attracted by the fantastic pay] and is sharing his experiences of Northern California's marine (and other) wilderness.

2017 was a year of adventure and craziness for our small family. We up and moved to the USA

in February so I could undertake a postdoc position working on California's Marine Protected Area network. It was the prefect job at the perfect time for me, and it landed us back in the small town of Eureka, where I came on exchange in 2011.

We fell in love with this part of the world last time we were here. Humboldt County, Nor Nor Cal (to separate us from those San Francisco people who think of themselves as Northern Californians) is a wild area about 5 hours north of SF, and a couple of hours south of the Oregon border. The area is "behind the redwood curtain": wild, remote, sparsely populated with rugged windswept coastlines and towering snow capped mountains inland. The capital, Eureka, where we live has a population of about 30,000. The local economy is primarily driven by the cultivation of marijuana, which just became legal on January 1st. There are huge grow

operations in the mountains inland, with "growdozers" (large trucks to cart growing supplies) traversing the mountain roads, and "trimigrants" (people employed to trim leaves off the flowers) flooding into the area at harvest time. To say that this leads to a colourful array of local culture would be an understatement! There are lots of cool artsy folks and heaps of great concerts and festivals happening all the time. For example, there is an annual kinetic sculpture race, where teams construct crazy mobile artworks that have to navigate sand dunes, beaches, death-drops, and traverse a river.



For outdoor adventurers there is an amazing array of activities and destinations. Leo (my 5 yo son) and I have been bike riding through some of the tallest redwood forests in the world, swimming in remote swimming holes and hiking into remote parts of the Trinity Alps which are about

3 hours drive inland. We managed to see two bears in the wild on our first two hikes!

As I'm in based in a California department of Fish and Wildlife office, which manages recreational hunting and fishing along with environmental issues, I get to see some interesting things. A guy brought in a red abalone for record verification the other day. This is the biggest abalone species in the world, and this specimen was the second biggest on record at 12.3 inches (around 31 cm). It was a monster!



Ocean Defenders.org

Red abalone (the largest species of abalone) is abundant, but can only be taken by freediving. Starfish wasting disease across the coast in 2016 resulted in a boom in sea urchin numbers and a major loss in cover of kelp. There are major concerns regarding

the effects on abalone populations, and so the recreational fishery has been closed for 2018.

One of the guys I work with lectures in fish biology at the local uni, and he has a deal with the local trawl fishermen to get specimens for class. I've seen some cool fish ranging from a blue lingcod, an electric ray, through to a deep sea rag fish.

I managed to pick up a wetsuit from a retired abalone diver and cobbled together some other gear from the Department of Wildlife dive locker in the basement of where I work. Local conditions are rarely optimal here (summer max

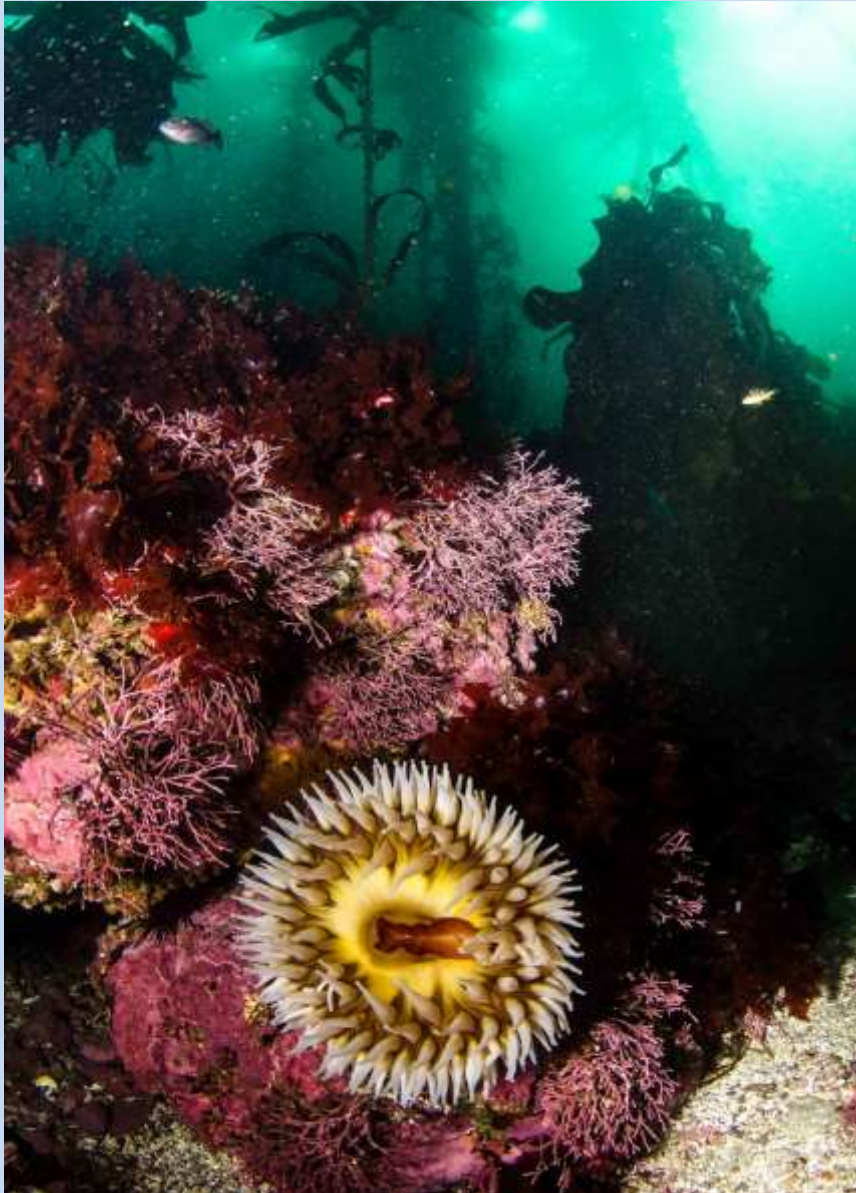
of somewhere around 13C and vis typically in the 1-3 m range).



About a 2 hour drive south however, conditions are a little better and you can dive in bull kelp forests (a little different to what we call bull kelp in Tasmania - this is nereocystis, which has a single gas filled pneumatocyst at the top).

Heading even further south, around Monterey, macrocystis forests become the norm. I have managed to squeeze in a couple of sneaky dives on work trips south. A real highlight was Whaler's Cove at Point Lobos State Reserve. For a modest fee (about \$25) you can shore dive off the boat ramp straight into an amazing kelp forest. I imagine it's something like parts of Tasmania were 50 years ago. On one of my dives I was bumped by something on my surface swim out. I looked down to see a harbor seal which popped up and said hello. During the dive, he revisited us. I tried to get a pic, but he swam away. I thought he was gone, and a couple of minutes later was taking a picture when all of

sudden he came up from underneath, over my dome port and gave me a hug! A magical experience.



There are plenty of otters in the rivers and the bay here, and I would love to get an underwater pic of one. Things are gradually warming here. I'm planning on doing some river photography over summer.



See you all later
Nick



Natureworld.com

Liberty Ship Wrecks

Multiple-expansion steam engine manufacture continued well into the 20th century. The standardised ship designs of World War II were the swansong of steam-driven vessels.



The Liberty ship was one of the standardised classes of cargo ship built in the United States during World War II. The class was developed to quickly replace ships torpedoed by German U-boats. Between 1939 and 1945, 3,500 Allied merchant ships were sunk and some 72,200 Allied naval and

merchant seamen lost their lives. In the dark early days of the war they were being sunk faster than they could be replaced, threatening to starve Britain in to submission.

A British ship design was adapted by the United States and it proved to be very uncomplicated, low-cost and easy to build. Liberty ships were powered by old triple-expansion steam engine designs that were more quickly available. In 1941, the manufacturers of steam turbines could not keep up with demand. They did use more modern oil fired water-tube boilers. Overall Libertys were antiquated for the era and built as 'throwaways', designed to survive for only five-years. By then they were likely to be torpedoed anyway. Liberty ships were nicknamed "ugly ducklings" by President Roosevelt.

Eighteen American shipyards built 2,710 Liberty ships between 1941 and 1945, easily the largest number of ships produced to a single design. The Liberty ship came to symbolize U.S. wartime industrial output. The vital role played by female workers in their



construction make them the subject of much continued interest. "The man-hours [actually mostly woman hours] requirements to build a ship of that size were reduced by one-third". From 1941 to 1945, the United

States increased its shipbuilding capacity by more than 1,200%.

The first Liberty ship was the SS "Patrick Henry", launched on Sept. 27, 1941. The 250,000 parts were pre-fabricated throughout the country in 250-ton sections. She was welded together in about 70 days. One Liberty ship, the SS Robert E. Peary was built in four and a half days. A Liberty cost under \$2,000,000. Any community group that raised \$2 million dollars in War Bonds could suggest a name for a Liberty ship.

The Liberty was 441 feet long and had a speed of 11 knots. She could carry over 9,000 tons of cargo, plus airplanes, tanks, and locomotives lashed to its deck. A Liberty could carry 2,840 jeeps, 440 tanks, or 230 million rounds of rifle ammunition.

The Germans failed to stop the flow of strategic supplies to Britain. This failure resulted in the build-up of troops and supplies needed for the D-Day landings. The defeat of the U-boat (including outbuilding their ability to sink cargo vessels) ensured the Nazi defeat.

More than 2,400 Liberty ships survived the war. Of these, 835 made up the postwar cargo fleet. Greek entrepreneurs bought 526 ships and Italians bought 98. They were run on a shoestring and shuffled around the oceans, often rusty and weakened by war service. Many were wrecked before they were scrapped.

Liberty Ship Wrecks NSW

S.S. William Dawes (1942)

Japanese (and to a lesser extent German) submarines operated along the east coast of Australia. The 'Liberty' ship *William Dawes* was one of 19 submarine victims in NSW coastal waters. Divers from the recreational diving group, "The Sydney Project" conducted visited the 135-metre deep site in October 2004.



The vessel *William Dawes* was built in Portland, Oregon, USA. She was laid down on 26 October 1942 and completed in three months and 12 days. *William Dawes* was a revolutionary patriot in the American War of Independence.

The *William Dawes* was on US wartime convoy duty operating alone along the New South Wales south coast when it was struck

by a torpedo near Tathra. The cargo included ammunition, army stores, 82 quarter-ton jeeps, 72 half-ton pickups, 60 one-ton trailers, 14 cargo trucks, 12 ambulances, 12 half-track vehicles and 33 half-ton CPR's.

The attack occurred at 5.30 am on 22 July 1942 about 12-miles out to sea. The attacking submarine was a Japanese Imperial Navy submarine known as I-11. It had already torpedoed the "George S. Livanos" (20 July 1942) and the "Coast Farmer" (21 July), near Jervis Bay.

The first torpedo struck the stern. A second torpedo slammed into the hull amidships and started fires that eventually raged throughout the entire hull. 'Abandon ship' was ordered. The *William Dawes* finally broke in two and sank at about 4.30 p.m., stern first. Five lives were lost in the action.

The I-11 left the burning "*William Dawes*" and unsuccessfully attacked the steamer "*Collana*" on 26 July. On 29 July, I-11 was caught on the surface about 22 miles north east of Gabo Island and bombed by Beaufort bombers from 100 Squadron RAAF, but the submarine escaped. On 17 February 1944, the "I-11" was sunk by the destroyer USS "*Nicholas*" in the Marshall Islands.

The "*William Dawes*" is the only located wreck of four Liberty ships sunk in NSW waters. Others include the "*Starr King*", torpedoed off Port Macquarie on 10 February 1943. The "*Lydia M. Child*" was torpedoed 145 kilometres east of Newcastle on 27 April 1943. The "*Robert J Walker*" was torpedoed off Bermagui on 24 December 1944.

Liberty Ship Wrecks WA

Alkimos



The ship was built during World War II and served as *Viggo Hansteen*. She saw war service for about 18 months, primarily in the Mediterranean. After the war it was sold to

a Greek shipping company and renamed *Alkimos*, after a Greek god.

In March 1963, the vessel was on a voyage from Jakarta to Bunbury when it struck a reef near Beagle Island. It was salvaged and towed to Fremantle, where it underwent repairs for two months. After settlement of a dispute about payment the *Alkimos* left Fremantle under tow. The tow line gave way and the *Alkimos* was driven onto the shore.

In January 1964, the ship was refloated but broke anchor again and was driven onto the Eglinton Rocks near present-day Yanchep, Western Australia. On this occasion, it was more severely damaged, and all thought of refloating it was abandoned.

She was later sold for scrap. However, in 1969, salvage workers were driven off the wreck by a fire. After that time, the partly dismantled remains of the ship sat in several metres of water, visible to visitors, before gradually disintegrating.

She was intact for many years and it was claimed she was haunted.

The wreckage of the submerged bow section is a popular dive site. The wreck is well-lit but very surgy and stirred up after rough weather. This site is a disappointment for those expecting massive upright structures as she has been basically flattened. Her lines are also partly obscured by a thick covering of short kelp. However, the wreck is huge and in very calm weather is a rewarding experience for those with the imagination to make out the various parts of this old war horse. It takes approximately 20 minutes by boat to reach the wreck from Mindarie Keys.



Liberty Ship Wrecks QLD

Wreck of the Marietta Dal

12 - 14M



The Marietta Dal was originally a "liberty" ship design quickly built in 1944 as "Sam Gallion". She struck Smith Rock while entering Moreton Bay. By 8.30pm she had broken in two. A barge was brought alongside in an attempt to salvage the cargo, but the seas increased and salvage work was abandoned.

While diving Smith Rock you may see machinery spilled from the wreck of the Marietta Dal. She hit Smith Rock and sank in 1950 with a cargo of oils, chemicals, machinery and 76 tractors. Farm machinery and the giant prop shaft (almost 50m long) can still be identified on the site.



Wreck of the Rufus King



On the 7th July 1942, SS "Rufus King" ran aground off Amity Bar and broke in two. She mistook the South Passage below Moreton Island for the North West Channel at the northern end of Moreton Island. She was inward bound to Brisbane from Los Angeles with military equipment including nine

Mitchell bombers in crates, aviation fuel and medical supplies. Most of the cargo from the wreck was salvaged, including the machinery. There were no casualties among the crew. The forward section was refloated, converted into a lighter. The bow was then used as a workshop at Finschaven, New Guinea, where she was renamed "Rufus Half".

Now she attracts fish and is visited by spearos fairly regularly. The tangle of debris also makes for an interesting shallow dive in good weather. The stern lies on the western side of the South Passage Bar between Moreton and North Stradbroke Islands just outside the breakers. The tide here is one and a half hours before the Brisbane bar tide time.



The stern is still visible at low water and is a navigation hazard at certain tides. Look out for a dark patch in the water.

Wreck of SS Francis Preston Blair, Saumarez Reef

21°55'S., 153°35'E.



The "Francis Preston Blair" was an American Liberty ship standard design, 422.8 foot long and 7196 tons. She was built in 1943 by the Marin Ship Corporation Yard at Sausalito, San Francisco Bay. On 15 July 1945 she came ashore during a cyclone on the Saumarez Reefs.

The South East Elbow is located about 36 km SSW of Northeast Cay, forms the South Eastern extremity of Saumarez Reefs. She is easily identified by the massive rusting hulk of this wartime freighter high and dry about 9.4 km North East of South east Elbow, on the eastern edge of the Saumarez Reef. She was used on occasions as a target by the RAAF, which dropped practice and live bombs. The wreck is high and dry and is worth a non-diving inspection. Be cautious, as the wreck is now potentially dangerous as the rusted structure is becoming ever more fragile.

Western Australian Shore Diving

With dive shops shutting across Australia, you sometimes need to plan to do your own thing to dive Australia's interesting coastlines.

Arriving in Perth after a few years away, you can instantly see the huge influx of money that came with the mining boom. The airport has tripled in size, but is now mostly empty. The airport is surrounded by extravagantly large motorways left incomplete when the money ran out.

It looks like the aftermath of a big party. Everyone over-imbibed in a spectacular way, blew the monthly budget in one go and now there is tidying up to be done while everyone is still recovering from the hangover.

Multi-million dollar houses can't be sold, car yards are full of Porsches that former mining FIFO workers can't pay for. Everyone is crying poor. I meet up with my sister, who isn't worried. She didn't have a mining job and just had to live through escalating prices but never got to drive that Porsche. I'm not alarmed either. As a Tasmanian, overwhelming economic recession is so commonplace we mistake it for a lifestyle.

I'm here to see my sister and go for a dive. She has plans for a drive up the coast and see how far we get.

The first thing is to try out some metro Perth diving...wrong. I've arrived on a weekday and no-one is much going out on charter trips mid week. The tourist divers stopped coming after the recent shark attack scares and the FIFO workers would fly to Bangkok for their recreation. The regular schedule of diving I saw here in the 1990s has dried up. There is no dive shop on Rottenest Island anymore and only a few of the larger dive centres are still active in charters.

As I was living on the north side of the Swan River, I headed down to Hillary's Boat Harbour to get shore diving information.

The shop workers were very helpful with info and rented me gear. I was advised to go diving in the morning and only after a few days of calmer weather. I tried that and had about the cloudiest and most surgy dive I've ever done off the MAAC reef in the Marmion Marine Park.



The entry is near an aquatic club clubrooms and the water was glass calm as I crossed the beach and in to the water. Despite the media reports of numerous shark attacks, I wasn't instantly eaten whole, but boy was it cloudy. Even the tiniest swell whips up the fine limestone sand. I could see why sharks patrolling the surf line might easily mistake humans for seals.

The dive was on low reef covered in weed. Even in the low swell the surge around the rocks propelled me across the bottom. I was about to get out and rate this as the world's worst dive until I found a crack in the reef and descended in to the shelter of a line of limestone gutters. On the sheltered underside of the reef there was quite a few colourful invertebrates and some of the more common WA reef fish. In the end, I had a nice dive despite

feeling a bit seasick in the surge. The wind had come up (which it always does in the afternoon of even the calmest day). That was the end of diving for today



Apparently, the north shore is a lot more exposed than the coast south of the Swan River. You have to have long periods of calm weather before the swell drops out.

In the south, you can try to get in behind the shelter of Garden Island and even dive on relatively windy days. I resolved to try out the Rockingham Wreck Trail. Again, I couldn't fault the hospitality at the local dive shop. I was aware the visibility was supposed to be poor, but compared to the north, it was great. On entering I was



greeted by a school of pelagic fish, probably encouraged to hang around for titbits given away by divers. Despite the water having a greenish tinge and the structures being draped in green algae it was a fun dive.

The dive site is an artificial reef created by deliberately scuttled boats, aircraft and even a commercial chicken coop. They are all connected by ropes and it's an easy and safe dive. It's highly recommended as your first dive in WA as it allows you to familiarise yourself with new gear and new conditions in relative safety. You also get to see a few unique WA fish species. There were lots of strange leatherjackets, cowfish, nudibranchs and even a pineapple fish. The most photogenic spot was the strangest one. The commercial chicken coop has made a surprisingly good fish habitat.



The next dive was up the coast at Jurien Bay. Here the locals

have made another artificial reef out of concrete reef balls near an old jetty. Unfortunately, the site was being buried by shifting sands and weed when I was there, but it was still a nice enough dive with quite a few inquisitive fish coming over to be photographed. Once more, a late start was rewarded by a strong breeze that instantly reduced the visibility. If you would like to remain here for a VERY long dive, if you buy a reefball they will inter your ashes in the concrete. It is both artificial reef and an aquatic cemetery.

Jurien use to be a mecca for local diving, with most of the tourist trade coming to snorkel with sea lions at a nearby reef. When the local environmental department stopped these up close interactions, the local charter service closed. Now there are no regular dive charters between Perth and Kalbarri, as a result very little diving occurs now in this area, especially for tourists.

We did a lot of sightseeing, battled some flies at Cervantes (there is always a plague in high summer), and tried a snorkel in the very photogenic Dynamite Bay at Green Head. This dive was thwarted by the breeze which made the shoreline dark and cloudy with white sand and pulverised seaweed debris. Some lovely beaches were laid on, especially Sandy Bay, where there was even a coffee van in the middle of nowhere. There were also some nice shallow family snorkelling spots, but the wind again made the coastal reef too tricky.

The next dive spot was in Geraldton. Again, the dive shop was outstanding in terms of information and friendliness. I'd heard it was windy in Geraldton, either windy or very windy, but I was in luck, it was one of their less windy years. I dived near the lighthouse at Point Moore. I made the effort to get in early and it was glass calm. After a long swim over sand, I came across a reef running parallel to the shore. The long reef boasted very large plate corals, lots of crays (I guess it doesn't get dived too often) and quite a few fish. The reef all along the WA western coastline is dominated by limestone. It readily weathers in to crazy shapes with lots of crevices, tunnels and swim-throughs.



On the downside it's shallow, and the limestone sand is very fine and easily mobilised. At a few spots along the reef it had eroded through in to a tunnel exposed to the ocean swell. The surge through these tunnels was whipping up the sand like a massive blower fan. As soon as the breeze and swell got up in the late morning the visibility declined and it was time to get out.

Despite being a little grubby and industrial on the outside, Geraldton is pretty friendly. Even the rough looking fishos driving their 4wds up the beach were cheery and helpful.

Then there was the highlight of the trip. I had always wanted to get to the Abrohlos Islands from childhood days when I had read about famous wrecks like the "Batavia". Once again diving it was near impossible and limited to a scenic flight and a snorkel in a shallow bay, or a very expensive eco-liveaboard where diving is advertised on the itinerary but not really encouraged. I took the flight.

I thought this might have been a mistake when I saw the single-engined 1950s model Cessna. I seemed to be getting a heritage

flight in with the price, however it worked out fine and I was later assured that the aircraft design is old but ultra-reliable.



If

The weather hadn't been perfect before, now it really put on a show. It was cloudless and glassy calm. We could see for miles and I didn't need to dive, I could see down the reef slope in to 20 metres from the low-flying aircraft. The island chain is very impressive. We flew over the sites of famous shipwrecks (not quite as good as actually diving them though).

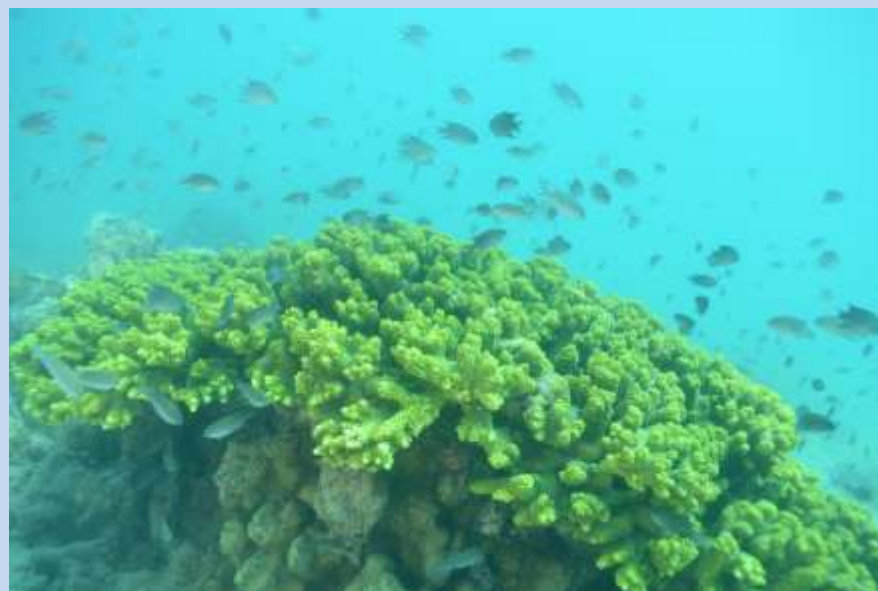
Despite it frequently appearing in magazines and documentaries this area is very remote and relatively rarely visited. We landed on a dirt strip on East Wallabi Island. It had



everything you would expect from an outback strip, hot, waterless, flat, deserted, friendly lizards, and thankfully not too many flies.

We walked over to Turtle Bay where I expected a safe and thoroughly dull shallow snorkel. It was brilliant. The island offers a range of possibilities from a shallow swim with the kids, to a snorkel over some surprisingly pristine corals reefs loaded with fish. In the end, it was the afternoon breeze that ended the days aquatic adventures. This was a magic trip I would recommend to anyone in good weather. It was the highlight of the whole trip.

Travelling north from Kalbarri to Shark Bay is like going to a different country, maybe the Middle East. The air warms up very noticeably and the land is sandy, arid and covered in saltbush. In the water there is a noticeably larger proportion of tropical fish.



The main settlement in Shark Bay is Denham where the local aquarium business has branched out in to dive charters. The

Shark Bay area is fascinating with massive seagrass beds, dugongs, sharks, weird prehistoric stromatolite formations, dolphin interactions and vivid sunsets. Most of those attractions aren't near anything, not even Denham, and most of Shark Bay is shallow and inaccessible. The diving is a long boat ride away (about 1.5 hrs) out on the coast near Dirk Hartog Island, which would explain the relatively pricey charter fees. It's worth the effort with lovely coral reef dives blown with a diverse range of fish.



Due to the lack of divers visiting the area in the hot months of late Spring, I made do with a 45 minute ride to a shallow reef out in the bay called Bar Flats. This is the 'training site' and I had very low expectations. However, it was a really nice dive with very good fish life. Even if 80% of the fish were all blue damsels, there were so many fish that the reef is still teeming with a very diverse range of species. Apparently, the diving is way better out towards the ocean. Well-recommended in Winter, but a bit steamy for us pale Tasmanians in early Summer.

This was the end of our trip, and we ran out of time to get to Ningaloo and Exmouth, about the only dive service friendly area on the North West where you can get regular dive charters.

Recommendations? Unless you and a mate drive your boat across the Nullarbor you are tied to the areas of WA that offer regular charters. That is Perth and Bunbury/Dunsborough on a weekend, and heading north, the tourist focussed dive centres at Ningaloo/Exmouth and Denham. The other options are on the cooler South Coast, Albany, Bremer Bay and Esperance. From time to time you may see expeditions or new businesses trying out remoter spots. It's well worth making the effort to go on the trips as these spots aren't always accessible. When you do get there, get up early.

When diving in the north winter is very pleasant, but in the south nothing much happens outside of Summer in many areas, especially Perth.

Don't panic about sharks. Diving is still safer than driving on the local motorways. I mean it, those predators of the motorways are scary mad.

Australian Mud Whelk (*Batillaria australis*)

A normally harmless native snail has become a pest when introduced in the Swan estuary from the eastern States 60 years ago.

The mud whelk is found on the east coast from the Whitsunday Islands in Queensland through to Victoria and Tasmania.

The species died out in South Australia in the Pleistocene Era, and fossil shells are occasionally encountered there. In Western Australia, it occurs in the Swan River estuary and Cockburn Sound only.

It likes mangrove and estuary habitat, favouring the tidal flats above mid water. It can grow to 49mm but usually smaller at 30mm.

Breeding takes place in the summer with most snails breeding at the end of their second year. Life span was found to be around four years in total.

They have been shipped in, probably on vessels and have bred up big, 3.6 billion at an estimate. They have altered the seabed of this already disturbed waterway by littering it with their shells. They also move 450,000 m³ sediment/day and filter 3 billion litres of seawater per day. The shells build up the seafloor and are home to 130 million hermit crabs. They are also an attachment point for pest seaweeds that spread by shedding 433 million seaweed fragments per day.

This species is one of the hosts for the flatworm parasite *Austrobilharzia*, the larvae of which are discharged into surrounding waters. They then burrow into the legs of wading birds, and may burrow into the skin of humans, causing "bathers itch". The larvae completes its life cycle in birds but cannot survive in a human host.

When abundant, both drift algae and snails have substantial negative effects on seagrass health, due to light reduction, physical disturbance and the changes they cause to biogeochemical processes in the sediments. There are way too many to ever remove them, and only improving the health of the estuary will do any good.



Robots put eyes on Great Barrier Reef

The Australian Institute of Marine Science (AIMS) in partnership with Boeing, has demonstrated how a high-tech autonomous ocean vehicle can improve monitoring of the Great Barrier Reef and coastal waters.

A recent seven-day trial saw the vehicle cover 200 nautical miles of the central Great Barrier Reef.

The vehicle called Wave Glider, developed by Boeing subsidiary Liquid Robotics, was deployed at the Great Barrier Reef to help assess the health of the coral reefs and ecosystems. Powered by waves and sun, the vehicle provided continuous, real-time environmental ocean data using a suite of on-board sensors and software. As it travels along the ocean's surface, its measurements can include weather, wave heights, water salinity and pH levels, chlorophyll and more.



Esperance timber jetty damaged

ABC Esperance

In September 2017 a storm finally smashed Esperance's old tanker jetty. A six-metre stretch of the jetty has collapsed and it's closed to the public.

The 512-metre Esperance timber jetty is just one of three that remain in Western Australia, along with Carnarvon's One Mile Jetty and the refurbished Busselton Jetty. Just like the Busselton jetty, the Tanker Jetty has become a recreational asset and a popular safe dive site.

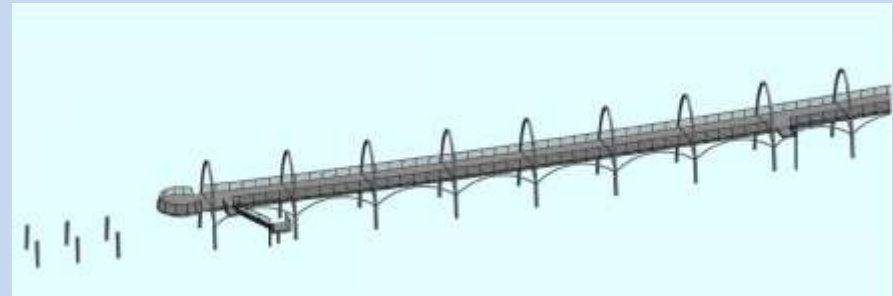


The Esperance shire wants to replace it with something more durable and affordable. Others want to see a wooden pier restored. Friends of the Esperance Tanker Jetty Chairman said "Our research has shown

that the methods and the cost of materials and the people who would be involved in doing it would lead to a much more reasonable result than what was previously projected," he said. The Shire believes those claims don't stack up.

The Shire of Esperance council is confident it can raise \$6 million to pay for its proposed replacement jetty, which will be 200-250m long. "We originally nominated 400m but the Heritage Council encouraged limiting the length to 200-250m to maximise the amount of original fabric that could remain in situ while still making a unique statement in the bay," she said.

The old wharf was closed to the public in 2015 and the Council voted to demolish it but a public outcry has delayed that until the recent storms intervened.



The existing piles beneath the new structure are to be retained but cut off below the waterline. The old jetty is retained beyond this (250 m plus) at the seaward end above the waterline in the form of the original piles.

The recreational function of the Tanker Jetty has been retained in the new design, which has dimensions adequate to provide the dual function of pedestrian and fishing activities. It is stated that leaving the piles in situ past the replacement structure will allow for the marine life attached to the piles to continue [except for the obvious loss of shading].

There are opportunities for dive operators to operate along the dive trail, with easy access being provided at the end of the detailed concept. This could also include opportunities to showcase the Leafy Sea Dragons, increase the tourism product available to visitors. Opportunities to preference local and WA based contractors in the detailed design and build of the new structure.

Shark Culling: Can warning technology replace the need for nets?

Source: Fairfax



A Senate committee report handed down this week has concluded shark nets are ineffective in stopping shark attacks and may lead beachgoers into a false sense of security.

"The committee is of the view that the available evidence about the effectiveness of lethal shark control measures used in New South Wales and Queensland does not warrant their continuation." Instead, the committee has pointed to emerging technologies being used in conjunction with shark alert apps as the future frontline in shark management.

Technology can at least help to alert the public to nearby sharks. Sarah and Allan Bennetto have created an app to provide a centralised platform for people to report shark sightings. Today the Dorsal app has about 250,000 users.

Apart from public reporting, when a scientifically tagged shark swims in range of a receiver tower, their location is communicated to Twitter and Facebook channels, which is then relayed to the app's users.

But there are noticeable gaps in shark tracking generally. Shark tag information is concentrated on the NSW and southern WA coasts.

This year, the New South Wales DPI has been running drone trials at beaches. The trials have involved training artificial intelligence software attached to drones to distinguish sharks from dolphins and other marine life, and to estimate size.

Surfer Daniel Webber said he doesn't want to know anyway, "...I do not have sharks on my mind," he said.

Although the ecological argument against nets is strong — dolphins, whales, dugong, turtles, and manta rays feature heavily in annual "non-target species" reports — their efficacy as a shark deterrent is still being debated.

Despite the rapid advance in non-lethal technologies, the idea that nets provide a physical barrier between swimmers and sharks will be difficult for opposition groups to dismantle.

In response to the Senate committee recommendation to phase out nets in Queensland, the Palaszczuk Government released a statement saying doing so, "will place lives at risk". "It has undoubtedly saved lives. That's why it will continue."

I'm not convinced I need an app as I'm pretty certain there has always been a large shark within a few kilometres of where I have been swimming or diving for the whole of my life. We just have to adjust to them being there and learn more about their feeding behaviour and movements. I wouldn't mind knowing more about the riskiest places and the riskiest times for swimming. As for nets, we have managed in Tas without them, and yes we do swim here even though its cold.

Guano Islands - Great Barrier Reef and NT

Many 'pristine' GBR resort islands were once stripped of vegetation in the search for fertilisers.

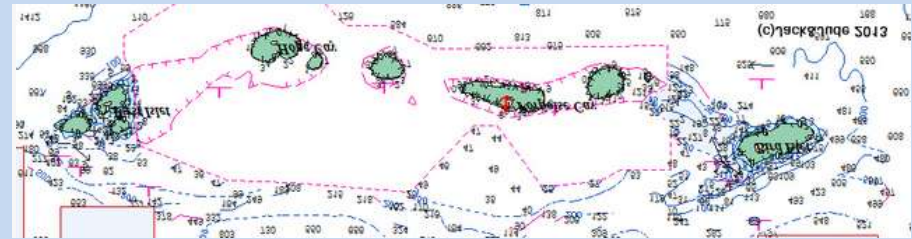
The early exploiters of GBR reef islands were Tasmanian whalers, looking for a new source of income after decimating the Southern Ocean whale herds. In 1864, guano mining shore parties from Tasmania were permanently established on Bird and Lady Elliot Islands, their services being for twelve months, with a relief at the end of that time. They worked on a wage, getting out the guano and bringing it in by hand trucks to sheds. Here it was bagged ready for transport to the vessels lying at anchor off shore. It was carried between the shore and the ships by whale boats.

This era has resulted in many shipwrecks. As the guano miners explored the local area, they began losing ships. In 1866, Briton's Queen (Schooner) and Cosmopolite (Brig.) went up on Masthead Island.

At Bird Island guano miners lost the Brigantine Lone Star in 1871. The Brig Wolverine went with all hands, in June, 1878, then the Schooner Annie in 1882. Dr Crowther lost the Isabella (Barque) at Cape Barren Is, when she was loaded with Bird Island guano for Hobart.

Wreck Reefs

These reefs are located 450 km East of Gladstone, and 250 km east of the Swain Reefs complex. They form a narrow chain of reefs with small cays that extends for around 25 km by 5 km in a west to east direction. It consists of patches of coral reef separated by navigable channels and is the home of seabirds and turtles. The sea always breaks over the cays. The islets along the reef include Bird Islet, West Islet and Porpoise Cay.



Bird Islet



Bird Island which is part of Wreck Reef is low, about one mile in circumference. The islet is a mound measuring some 500m by 250m and 6m high with a bare centre surrounded by a ring of herbage. It is an important seabird roost.

In 1803 the explorer Matthew Flinders left Port Jackson on his way home to England in H.M.S. *Porpoise* in company with the *Cato* and *Bridgewater*. The *Porpoise* and *Cato* hit Bird Islet. Three young lads were drowned. There the shipwrecked men found part of the stern-post of an even earlier wreck, a ship of about 400 tons. Flinders and thirteen others including Captain Parker,

rowed back to Sydney in the ship's cutter. Governor King dispatched ships and rescued the shipwrecked crews. In 1965 after extensive research and only fifteen minutes of actual diving Ben Cropp & Jiri Hrbac found the wreck sites.

Another larger wreck was the American whaler *Lion*, wrecked on 4 December 1856. They took to the boats and arrived safely at Maryborough on the mainland.

On 27 October 1862, an exclusive guano concession was granted to the Anglo-Australian Guano Company. They were active on Bird Islet, losing five ships at Bird Islet between 1861 and 1882. About 12 000 tons, or nearly 2 metres of soil was probably removed by teams of 20 to 30 men and taken to Tasmania.



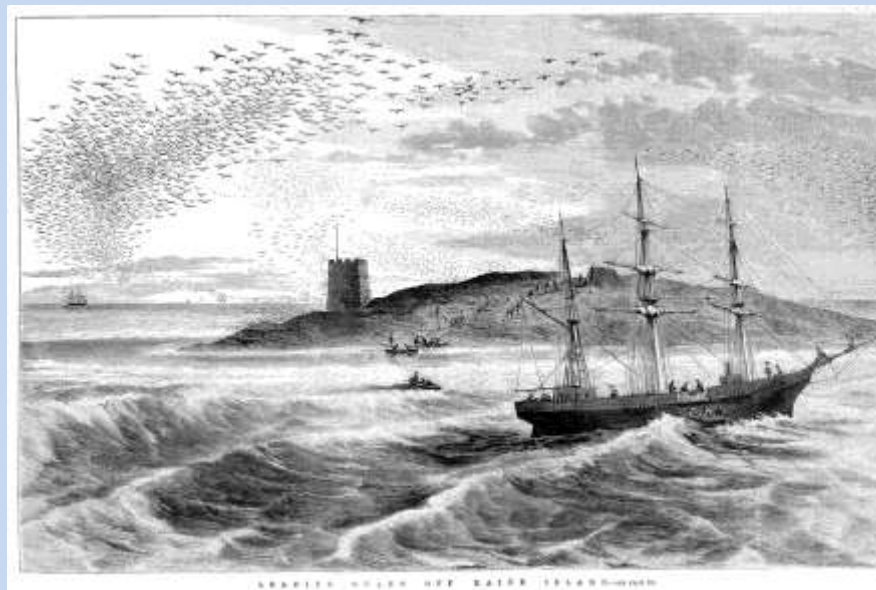
<http://www.silentworldfoundation.org.au/>

Most of the wreckage and many of the coral pinnacles in the lagoon are in snorkelling depths.

Less common in this region, the island also offers divers a deep drop-off on the northern side of Bird Island dropping from 10-

200 metres. The wall offers excellent corals, gorgonia, sea whips, sponges and smaller invertebrates. The wall is patrolled by sharks, school fish and turtles.

Raine Island, Arundels and full scale commercial mining

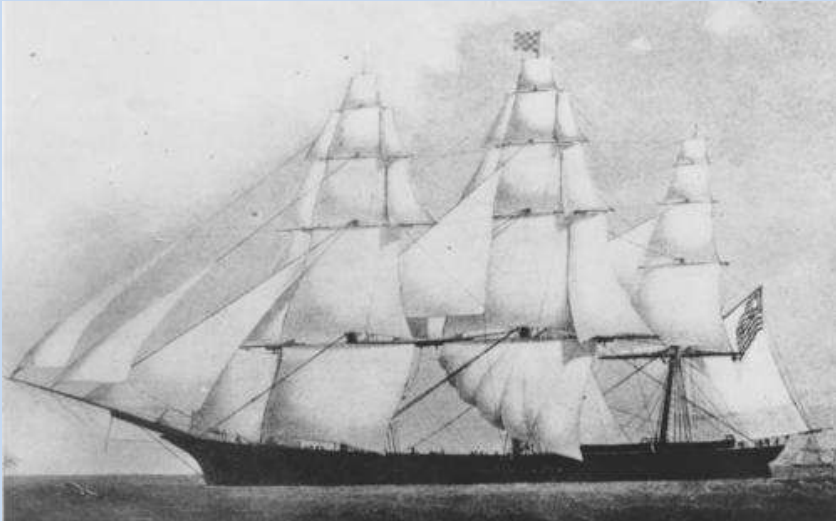


The most successful guano (phosphate) miners were from a British firm, John T. Arundel and Company. J. T. Arundel and Co. worked many pacific islands, including the Phoenix group (now Kiribati). For about 10 years Albert Ellis worked with the company, in its infant phosphate operations in the pacific. But, by 1890, the deposits were all-but worked out, so the company transferred its operations to Queensland.

Mining then started at Raine Island, in the far northern section of the Barrier Reef, This island is best known for its large convict constructed tower.

Lady Elliot Island

Lady Elliot was stripped by guano miners. We know they searched the island in the 1860s as the 'Golden City' was wrecked there on the 13th of July 1866 while loading guano for London. The vessel had been anchored there for three months and had loaded a total of 800 tons of guano. On the 12th of July the wind changed direction to the westward, blowing directly towards the shore, making it impossible to get the vessel underway. On the 13th the wind increased to a squall and the 'Golden City' began to drag its anchors. The vessel continued to drag until the evening of the 13th when the vessel struck the reef which surrounds Lady Elliot Island. The vessel bumped and sustained damage to the rudder and stern-frame; the vessel began to take on water, and heeled over. The captain and crew abandoned the vessel in the ship's lifeboat. No lives were lost. The vessel soon broke up.



Later miners focused a lot of attention on the Capricorn Bunker group of islands, off the Central Queensland coast.

In 1893, the J.T. Arundel Company established a large Lady Elliott operation that included constructing tram tracks, huts and a loading jetty. One hundred Japanese, Chinese and Malay labourers and ten European supervisors were employed. The best stuff – white guano – was exported to the US to be turned into explosives. By all reports, the island was an economic success.

Over the next decade, Lady Elliot was virtually denuded of all life. Trees, birds, plants were stripped as the Chinese labour gangs dug into centuries of accumulated bird droppings. Tens of thousands of tonnes of phosphate were exported, and the team of workers stripped almost all the vegetation. They took about one metre off the height of the island.

Lady Musgrave and Fairfax Islands

Next in the island chain was Lady Musgrave Island. An extract from Albert Ellis' book "Adventuring in Coral Seas" best describes his early contact with the island. "We had a good run across, and pitched camp a short distance above the crown of the beach, the cutter anchoring in the capacious lagoon."

"Investigations at Lady Musgrave were completed in a couple of days. The phosphate-guano deposits proved very meagre. Taking the whale boat we then sailed down to Fairfax Island (Bunker No.2), only: four or five miles distant. Fairfax Island was a difficult place to work, particularly as to the shipping; tide work was necessary and a launch was used for the long tow out to the anchorage".

There was a well-fed flock of goats on Lady Musgrave Island, "These animals are the progeny of several we left there in 1898 - a few were also left at Fairfax Island."

These feral animals did more damage than the mining and the island was devoid of trees until well after they were removed in 1974.

Heron Is

John T. Arundel and Co. weren't hugely successful in the Central Queensland operations. The workers moved their way through the Capricorn-Bunker group, finding significant deposits only at Heron Island and North West Island (where they released chickens - now of great scientific interest, because they have reverted back to feral form). The Queensland income was barely keeping the company afloat.

Other Guano Islands - NT

Arundels also visited Rocky Island, in the Gulf of Carpentaria, where operations continued for several months.

We know that others mined the gulf, roughly 70 metres from the edge of Scott Reef, and visible at low tide, is the wreck of the Yarra, a 490-tonne iron barque built in 1870. The ship came to grief in January 1884, en route from Lakes Island in the Gulf of Carpentaria to England, with a cargo of guano. The vessel struck Scott Reef during a cyclone, and in the midst of the storm, all aboard had to abandon ship. Over the 120 years since the ship was wrecked, it has slowly rusted away and been broken apart by waves.

Soon Australia's guano islands were depleted and allowed to slowly recover. A hundred years later the effects were still visible, only recently have they again become verdant isles.

All eyes on the Great Barrier Reef

Source AIMS



Luckily, this year there is no repeat of the coral bleaching disasters of the last two summers.

"Corals are still dealing with residual stress from two years of mass bleaching and there's been above average summer and winter sea surface temperatures throughout the year," Dr Wachenfeld said.

The El Nino Southern Oscillation is currently neutral. If a La Niña does develop, it is likely to have no strong climate influence on the summer outlook for the Reef.

Coral-eating crown-of-thorns starfish continue to pose a high risk, according to Australia's leading marine experts and scientists.

Recent bleaching highlights the importance of global action to reduce greenhouse gas emissions and taking local and regional action to build Reef resilience."

Facts and Myths about the Great Barrier Reef

Source: GBRMPA and Reef Teach



It's Huge! TRUE

The Great Barrier Reef (GBR) stretches 2300 kilometres from the northern tip of Queensland near the Torres Strait to just north of Bundaberg.

It is between 60 and 250 kilometres in width and covers 348,000 square kms. It is the largest living structure on the planet and can be seen from outer space.

The Great Barrier Reef extends from shallow estuarine areas to deep oceanic waters. It includes some

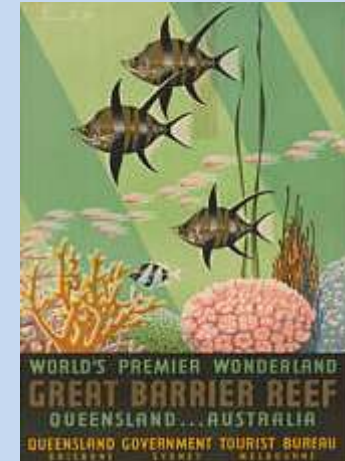
3500 coral reefs, 2900 lesser platforms and 600 continental islands. It also has 300 coral cays and about 150 inshore mangrove islands.

It's blown with varied marine life! TRUE

The GBR has 600 + types of soft and hard corals, 100 species of jellyfish, 3000 varieties of molluscs, 1500 species of sponge, 400-500 species of macroalgae, 330 species of tunicates, 500 species of worms, 1625 types of fish, 133 varieties of sharks and rays, and more than 30 species of whales and dolphins. Some of these, such as turtles and crocodiles, have been around since prehistoric times.

The marine species are really unique, FALSE

While the Great Barrier Reef has just about everything the Indo-Pacific region has to offer, more species than other places, it has low levels of species endemism (uniqueness). Most GBR species can be found in other localities, with the really "Australian" animals more likely to be found in temperate waters in the south. That doesn't mean that there aren't heaps of cool things to see, quite the reverse.



WORLD'S PREMIER WONDERLAND
GREAT BARRIER REEF
QUEENSLAND... AUSTRALIA
QUEENSLAND GOVERNMENT TOURIST BUREAU
ESTABLISHED 1975
Is that a cold water Old Wife fish and kelp? We really had no idea.

The marine park mostly protects coral reef, FALSE

Coral reefs only comprise about seven per cent of the Marine Park and the World Heritage Area. The rest of the Marine Park protects variety of interesting marine habitats, from seagrass, mangroves, sand, algal and sponge gardens, and deep oceanic areas more than 250km offshore. These non-reef areas are really important to many of the reefs animals from turtles to baby fish. When you want to tick "the reef" off your bucket list, you will also have to check out the mangroves and continental islands as well as the offshore corals.

The best coral reefs are located at Cairns, FALSE

Most of the GBR's tourist diving and snorkelling activity is centred on Cairns and Port Douglas because the international airport is located at Cairns. The closeness of the outer reef at Cairns and Port Douglas also allows for easier day trips to the

reef, making the reefs more accessible than locations further south.

Cairns does not have “all” the “best” coral reefs, the GBR is huge and there would be many contenders for that title, including many Cairns reefs.



The ‘nice’ tourist reef is close to the shore, FALSE

The Cairns town foreshore is estuarine mud flat and mangrove, as is much of the North Queensland coastline. The popular GBR tourism areas are quite remote from all towns and cities. The outer reef is at least 40 kms offshore or more from Cairns and Port Douglas. You need to use a big charter boat to get there and you may need seasick pills. There are still nice coral growths around the continental islands that are a bit more accessible if you don’t like a long boat trip. The water is a bit cloudier though.

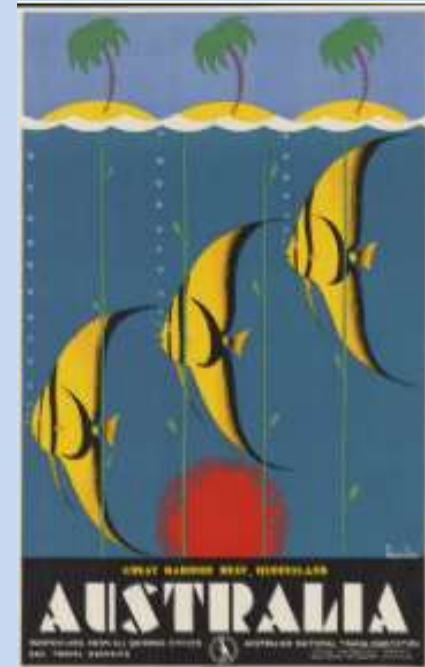
You can lie under a lonely coconut tree on an outer reef sandy cay, just like in a postcard, LARGELY FALSE

There are few vegetated islands on the outer reef in the areas frequently visited by tour boats. The reefs almost disappear at high tide. There are a few nice vegetated lagoons in the southern end of the reef, or you can try one of the inshore continental islands. There is vegetation at Lizard Island off Cooktown.

The GBR coral is very colourful. TRUE AND FALSE

Hard coral polyps are actually transparent, it’s the host algae in their bodies that give them their colours. Some are bright but not always. Corals don’t need to advertise themselves, they just sit there and collect sunlight for the algae that feeds them as ‘rent’ for providing such a safe home.

Soft corals are usually a lot more colourful. They use nasty chemicals to defend themselves against predators so they show bright vivid colours as a warning. They don’t need sunlight, so survive better in silty and deep areas where they don’t have to compete with hard corals. So, it could be argued that the silty inshore reef and mid shelf reef areas actually have the really colourful corals.



People come mainly to see the pretty coral, FALSE

Surveys have shown that while people come to see the whole reef in a healthy state, they especially want to see a few iconic species, the “Great 8”. This list changes and is affected by popular media, with the three most popular animals for now being sharks, turtles, anemone clownfish (“Nemo”). This is fine, except we also have to remember to love all the reef’s other species, especially the unglamorous or ugly ones that are under threat.

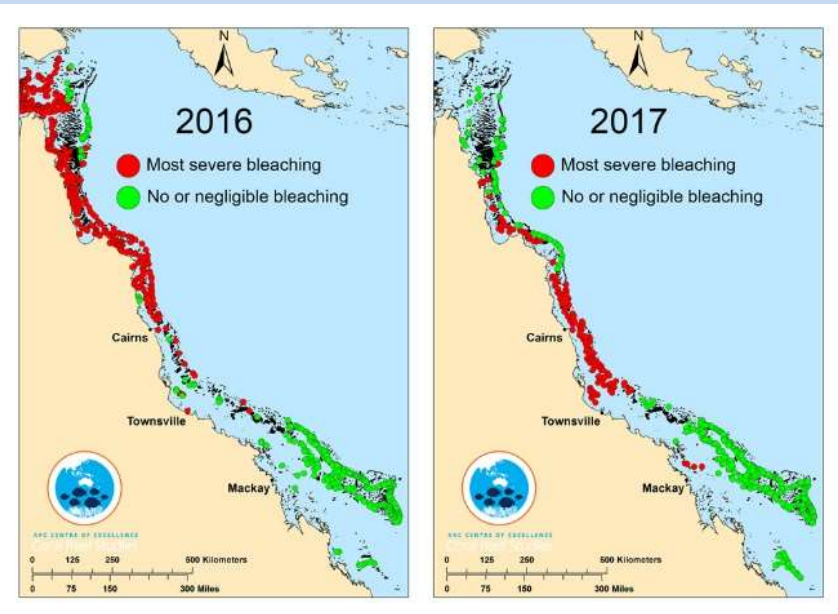
Recent warming events have badly damaged the reef, TRUE

There have been recent mass bleaching events at Cairns in 1997, 2002, 2016 and 2017, but old historical accounts show that coral bleaching to some extent is a natural occurrence on a coral reef.

Since December 2015, the Great Barrier Reef has been exposed to above average sea surface temperatures, and (according to GBRMPA) it's due to the combined effects of climate change and a strong El Niño weather pattern. We oddly had two events back-to-back, with the 2016 event being particularly severe. The rapid changes in sea temperature caused high coral mortality.

Winter sea surface temperatures in 2016 remained above average and, by the beginning of the 2016-17 summer, the accumulated heat stress on the Reef resulted in a second wave of mass bleaching.

The CRC Centre of Excellence's maps show the 2016 and 2017



bleaching footprint. It should be noted that bleaching isn't the same as coral mortality. Corals may spit out their algae that give them their colours, but many will recover.

The GBR is in fairly good shape if you look at the reef as a whole. There has been little damage to the popular tourism reefs off Cairns and Port Douglas and that damage is mainly confined to the top 6 metres of water.

However, there has been severe and widespread damage north of Cooktown, as well as smaller and more isolated pockets of damage further south.

This is a bad sign for the future as more frequent ups and downs in sea temperature from extreme weather events are likely to be a feature of a warming world. We need to act to slow down climate change.

The Reef is Dead and not worth visiting, FALSE

A visitor to most of the popular areas of the reef would notice no difference. Even the badly damaged areas have lots of remaining good reef. However, we need to get our skates on if we want to protect what is left from future severe damage.

The reef has beautiful clear water, TRUE AND FALSE

The GBR consists of a coastal area of forest and mangroves with some large rivers flowing in to the sea. It is an area of high rainfall, so after rain the inner reef areas get a lot of sediment. In some areas that has been made worse by land clearing for farms. The mainland coastline waters can be very silty and cloudy. As the inner part of the reef is quite shallow, averaging only 35 metres in depth, the waters don't clear quickly. The continental islands close to the coast often have slightly better underwater visibility than the foreshore, maybe 3-5 metres and this allows in enough light to support some nice shallow coral

patches. The mid shelf reef located many kilometres offshore is partly flushed by ocean waters and visibility averages about 10 metres. These areas are rarely visited by tourists although they have some very interesting marine life, like very brightly coloured soft corals. Only the locals go there and mainly for fishing. All the tourists want is the clear ocean reefs.

The outer reef is more flushed by clear ocean water and 20 metre visibility is common. It gets even clearer on the more remote reefs out in the Coral Sea.

Crown of Thorns damage is increasing, PROBABLY TRUE

The Great Barrier Reef receives the runoff from 38 major catchments which drain 424 000 km² of coastal Queensland.

Over the past 150 years sediment inflow onto the Great Barrier Reef has increased four to five times, and five to 10 fold for some catchments.

Inorganic nitrogen and phosphorous continue to enter the Great Barrier Reef at enhanced levels, two to five times for nitrogen and four to 10 times for phosphorous relative to pre-European settlement.

Scientists can now make a link between high nutrient levels and large outbreaks of Crown of thorns starfish (COTS). It seems that the nutrients cause algal blooms that are food for COTS larvae and help them to survive in huge numbers. The reef has been subject to waves of outbreaks that have caused significant damage to many reefs.

Cyclone damage is increasing, FALSE (so far)

Cyclones are a normal part of the ecology of the reef. They clear away old reef rubble and allow for recruitment of various different species. If they get too frequent the reef can't recover from one event before being hit by another. At present, there is

no clear evidence that the frequency of cyclones has changed, although this is anticipated if the earth continues to warm. All that extra energy in the atmosphere has to go somewhere.

An example of what happens is severe tropical cyclone Debbie, which crossed the coast at Airlie Beach on 28 March 2017. This was worse because it came on top of the recent bleaching damage. It is estimated approximately 28 per cent of the total reef area in the Marine Park was within the 'catastrophic damage zone' of the cyclone's path.

Some sites have suffered significant damage (up to 97 percent coral loss) and are down to very low coral cover, while others received less damage and still have moderate coral cover.

On becoming an ex-tropical cyclone, the system brought torrential rain to parts of the central and southern Great Barrier Reef catchment, which caused flooding of the Burdekin and Fitzroy Rivers, and resultant flood plumes that further stressed inshore corals and may cause COTS outbreaks.

Climate change is the main threat to the reef, MAYBE, BUT THERE'S MORE

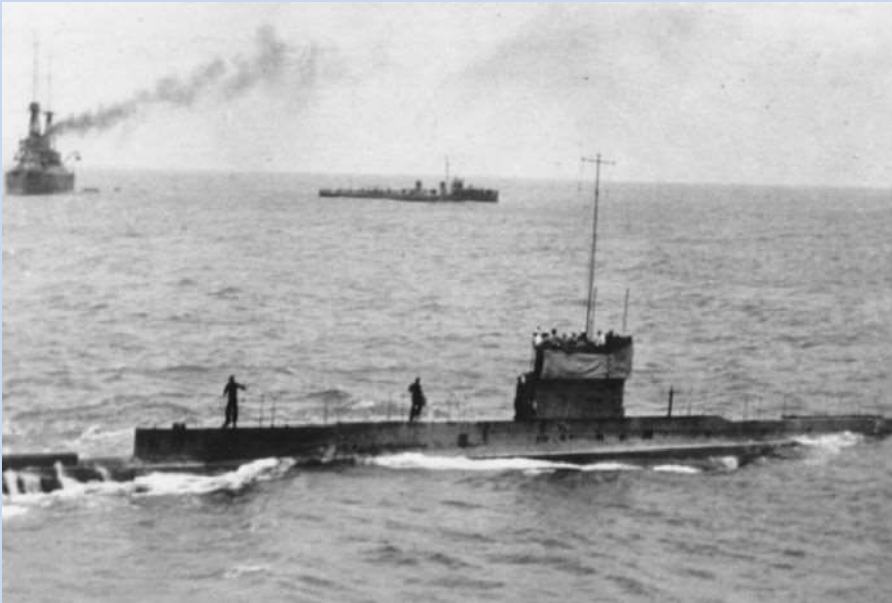
Climate change is a very significant threat to the GBR but it doesn't act alone. The reef is normally constantly battered by high sediments, cyclones, crown of thorns starfish and coral disease. It can shake off this damage provided it isn't too severe and frequent. The problem with threats like coral bleaching is that they are likely to become more frequent and severe with time. According to GRMPA, "The cumulative impact of these disturbances are affecting most of the Great Barrier Reef Marine Park, and it is likely the resilience of the majority of reefs north of Mackay has been severely diminished".

Its defenses are weak in many spots, the reef can't take constant and frequent extreme events forever. We need to act fast.

Lost Australian submarine found

Source: RAN, Submarine Association

After 13 attempts the missing Australian WWI submarine AE1 Has been found off the Duke of York Islands near Rabaul in Papua New Guinea. In December 2017 a voyage using new high tech search gear found the wreck in 300 metres of water.



The submarine AE1 was built in the UK in 1913. Subs were still largely top-secret experimental craft, with the need for constant attention to defective machinery. She was brand new when she came to Australia to form the RAN's first attempt at a submarine arm. There had been lots of teething troubles on the voyage out to Australia.

According to the Submarine Association, "after much technical and engineering experimentation, trial and error and some

notable disasters, the submarine was just beginning to become a serviceable weapon of war, even though few people had any idea how they might best be deployed".

In 1914 war broke out and AE1 headed to New Guinea as part of a fleet sent to capture the German outpost at Rabaul.

The 'invasion' of Rabaul went off without a hitch and she was sent on patrol off Cape Gazelle. By 8.00pm she hadn't returned as planned and was never heard from again. She had obviously suffered some accident, killing her crew of 35.

Everyone has a theory, but AE1 may have overtrimmed to counter the effect of one of her motors breaking down. This class of submarine was noted for being difficult to control on one motor. AE1 and AE2 experienced trimming problems at other times.



The inside of the subs was only 22 feet 6 inches wide and crammed with pipes, levers and torpedos. Officers and crews off watch lived cramped together, reading, playing on a couple of

concertina organs. In the tropics she was swelteringly hot inside and ordinarily closed hatchways may have been open.

She may have become unmanageable while on one engine and started to ship water. Once her buoyancy was lost the end would have come quickly with torrents of water trapping the men inside the narrow hull. As an experiment, the AE submarines were fitted with primitive Marconi wireless equipment, but the crew had no time to get off a signal. No wreckage was ever found.

The footage has shown an intact sub that hit the bottom hard due to a lack of buoyancy, "The submarine appears to have struck the bottom with sufficient force to dislodge the fin from its footing, forcing it to hinge forward on its leading edge, impacting the casing", the Navy said.

Another theory is that they were performing a test dive with diving valves left open causing her to fill with seawater and rapidly sink.

She was the Navy's first operational loss, and left the RAN with only the AEII, a sub that later went on to perform with distinction in the Dardanelles (Gallipoli) campaign.

The Navy has periodically looked for her while on patrol in the area, and several special attempts have been made to find her. It is a bad spot for underwater searching, deep, remote, with a bottom covered in magnetic anomalies.

She lies in a location that will remain secret in an effort to deter the South East Asian illegal salvors who have recently been destroying war wrecks in Indonesia. The government's position is that the wreck will be preserved as a war grave.

