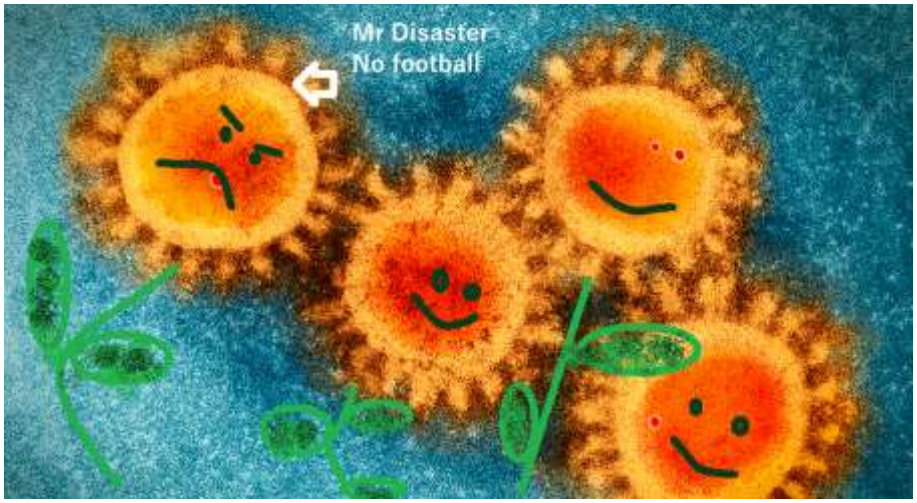
MARINE *Life*

Winter 2020

Cover photo: Fitzgerald Bay mangroves Whyalla. M.Jacques. Spring water seeps from the foreshore rocks so kangaroos at the beach are common.

Editorial – Blue Seas Thinking



Marine Life Magazine, might be the only published information source in the world that isn't 100% totally devoted to that 'thing'. You know the rough looking spiky thing. The critter that looks like a Mattel toy that got withdrawn as a kid's choking hazard. But let's not bore you with more about the northern rockhopper penguin being on the verge of extinction.

The other news pickings were slim. Might have something to do with that disease stuff that's been happening. The Royal Society for the Protection of Birds accused British government agencies of being "…completely disinterested." I suppose that if you weren't interested, and the media weren't interested, they felt no need to be either.

Closer to home than the South Atlantic, the yellow-eyed penguin, the white-flippered penguin, the Fiordland crested penguin and the erect-crested penguin, all from New Zealand are being listed on the 'soon to be a bag of bones' register too.

I've been very lucky to have seen a Fjordland Crested penguin in the wild, but the rest of you might have to put up with a motheaten piece of taxidermy in a museum. Just because they have a head like Covid virus cell, doesn't mean we have to be hellbent on eradicating these things at the same time as the virus.

Our once in a hundred year special event continues. Isn't reading history a lot more fun than living in it! That's why we will pop in some vague relaxing stuff about old seadogs and dramatic shipwrecks. That can't get any worse at least, as its already happened and a shipwreck can't have a version 2.0.

This edition we have lots more exciting things that you can get anxious about not being able to do, even though many of you previously wouldn't have bothered doing them, even if you could and when you were able to you didn't. So look at all those lovely pictures of beautiful blue oceans and feel no guilt about drinking on the couch instead, as usual.

We also have some more doomsaying, but don't stress, it is only about s##t that won't happen until your grandchildren are 20, and you were planning on squandering your legacy before they got a chance to anyway. They are a bit annoyed about it, so never let a good crisis go to waste. Here is your chance to have a meaningful conversation with the teenager-cum-house guest in the contaminated site called the downstairs room, while they can't get away.

Here's hoping you are staying safe and having no football is as bad as it gets for you. You might feel like a NZ penguin, but things aren't as bad as that.

Diving and Touring South Island NZ

If you are travelling to NZ for work, family, or a bit of sightseeing, have a go at the diving, snorkelling, kayaking.

My thing is diving so I try out every spot I go to, even if it isn't such an obvious dive location. Every dive location is unique and different, only the divers are the same keen types you find everywhere. I only saw the West and far South of the South Island (Westland, Fjiordland, Southland, Otago, Canterbury regions), leaving out the northern coast (Kaikoura, Marlborough, Nelson).

The above water coastal scenery, NZ Alps and Westland forests are magnificent. The big scenic limitation underwater is low visibility. Christchurch waters were like milk and in other places NZ divers were chuffed with 5 metres of green, dark viz. The better viz is in Kaikoura and Stewart Island. Stewart Is has approx. 10 metre viz, and the last big kelp forests in NZ.

South Island isn't dived too much, 90% of the diving in NZ is done in the North Island near Auckland (Poor Knights, etc). The coast there is bathed by clear Pacific currents. The poor viz elsewhere is caused by the huge rainfall, huge sediment-filled rivers, nutrient upwellings and the high energy coastline of NZ.

A dive tourist is limited to places where you can hire tanks/weights, boat charters and then get an air fill, and dive shops are closing all over the world. In South Island you are bound to Kaikoura/ Christchurch/Dunedin in the southern regions and Blenheim/ Nelson/ Picton in the north. The only regular tourist diving charters in the south are at Milford Sound ($370 for 2 dives) and the white pointer shark cage dives at Bluff ($600+ a day). Message the local dive clubs and shops before you go to see what they have on, weekender dive shop charters are sporadic. Boat and fishing stores (such as the "Hunting and Fishing" franchise) also may do fills. Pleasure and Marine in Invercargill can rent Scuba gear to take to Stewart Island. Forget about dive services on the beautiful West Coast. The diving conditions are often terrible anyway.

South Island NZ is generally a challenging area to dive, mainly due to the poor visibility and exposed sites. The equivalent of your local training site in Dunedin is Okatou, a reef just inside the harbour. This training site has 2m viz often as well as a strong current! You have to be keen. It has good smaller fish life as well as plenty of nudibranchs and a small kelp garden. It was a worthwhile challenge and the other divers were great company. Thanks to Tom (DO) and Gary (buddy from Timaru).

Just because the viz is poor, doesn't mean there is nothing to see, or no spectacular things to check out underwater. The wrecks at Aramoana mole in Dunedin are worthwhile for wreck enthusiasts and they even have a sparse kelp forest still trying to hang on there. There are heaps of nudibranchs. Every dive just about is buzzed by sea mammals, fur seals, rare Hookers sea lions, and sometimes even dolphins. They have plenty of odd fish and invertebrates. The difficult conditions also make it a place for the keenest divers, so its all very friendly and engaging out of the water too, if you don't mind divers 'trade talk'.

Above water, the south side of the Otago Peninsula is worth a long explore, sea lions on the public beach, vast tidal inlets with plenty of shorebirds, little cafes, sheep (if you are in to that), albatross colonies, small kelp forests, weird little tideswept islands, penguins, and historic sites.

Milford Sound NZ is a fjord, a long glacier scoured drowned valley blocked near the sea by a bank of stones dropped from the ice 15000 years ago. Its a bit like highland lake diving. Its green and 150 metres deep, has plenty of mud, but its blown with sea creatures, including deepwater species that come up into the shallows. Some species are similar to or identical to the ones in Tasmania. It reminded me of one of the darker channel dives like Roberts Point but in scenery more reminiscent of a mountain lake. On the north side there is a marine protected area blown with crays and fish, and on the south side nothing much in the fishing zone, sound familiar? The trip was worthwhile but pricey, a bit like any of the more touristy things you can do across the ditch.

The fjord is very atmospheric including heaps of waterfalls coming off misty cliffs, rare animals, and hordes of biting sandflies. You obviously can sell dark deep muddy diving, but with the razzamatazz that NZ throws onto things we do every day here for free without realising that they are unique and spectacular.

Other activities are available like kayaking, but watch out for boats 7500 people drive down for a day tripper photos or scenic cruise.

The lack of organised dives and adverse weather gives you plenty of family time to explore the coast. Sea kayaking is very worthwhile to get close to nature above water. There are plenty of other adventure options, someone in NZ will soon find a way to make a pricey adventure tour out of cooking toast.

You won't get a lot of on-line site information about dive sites. Listed sites often note the ones that can be dived once every 3 years, or that require a 3km walk over a mountain in full gear, or being pummelled against cliffs by the prevailing swell. A good guide book to NZ is Spot X https://www.epicscuba.co.nz/product-page/spot-x-diving-new-zealand.

Dry Highlights – Westland rainforest walks, Arthur Pass, The Catlins, Otago Peninsula (south side)

Regrets - , Stewart Is trip killed by last minute booking problems ("Real Journeys" are real a***holes).

Missed seeing a kia parrot in the Alps, the world's naughtiest bird, recently their numbers have plummeted

NZ Biodiversity – Declining Uniqueness

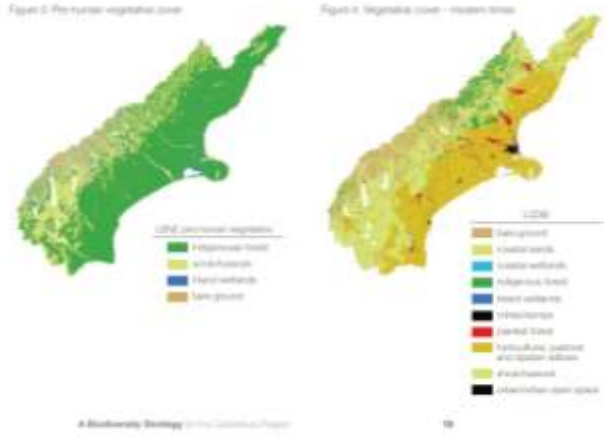
Behind the postcards the South Island of NZ is the same as everywhere else, overfished, warming up due to climate change and losing its unique fauna and flora, such as giant kelp. The process on land is even worse. NZ never had a lot of big species variety but what they still have is pretty amazing, kakapo parrots, flightless kiwis, naughty kea parrots, giant weta crickets that eat meat, tuatara lizards, rare penguins, rare albatross and rare seals, all quite bizarre. Now 99% of all the animals you see are feral, with possums, stoats, cats and rats destroying the land like a huge biodiversity eating plague. They eat or out-compete everything else. NZ has gorgeous mountain rainforests, huge waterfalls, and amazing alpine valleys, all silent.

Everywhere you go except the Alps is cleared grasslands. Everything in the lowlands is dominated by sheep and feral animals. Most of the indigenous habitat and biodiversity have gone. Around 90% of the indigenous vegetation in these areas has been lost, and in some parts less than 1% remains. Lowland forests, shrublands, and indigenous grasslands have been reduced to small, scattered fragments, which are threatened by changing land use, browsing pressure, weeds and pests.

Coastal wetlands

Many freshwater and coastal wetlands have been drained and reclaimed, and many remaining wetlands are under threat from land use change and intensification, grazing, recreational impacts, and coastal erosion. Most of the remaining indigenous biodiversity is at severe risk of further loss.

Along the coast, marine animals have managed to hang on better than most, but many of those are on the verge of extinction. The Canterbury coast is home to some of the world's rarest bird species, Huttons shearwater, orange-fronted parakeet/kakariki, black stilt , white-flippered penguin/korora, yellowhead/mohua, great spotted kiwi/roroa).



South Island NZ's forests before humans arrived, and now

Like everyone else, NZ now has silent tourists resorts as well as silent forests. From a bizarrely overheated adventure tourism sausage factory that sees 3.3 million people processed in Queenstown each year (a town the size of Devonport in Tasmania), everything is now quiet.

Post Covid might be a great time to visit and check out the rural folk talking in a weebut of a funny South Island ik-sint, obsessing about the next match of the Wiatomato junior reserves nitball team. You might need to rush and see some amazing species - before its too late.

Westland Forests, the way NZ used to be

Payback for the shooting of 150,000 kea parrots between 1860 and 1970 by farmers

The NZ Government's Biodiversity Strategy is partly to: "Protect and enhance populations of marine and coastal species threatened with extinction, and prevent additional species and ecological communities from becoming threatened". NZ isn't flushed with excess resources though, and there are lots of pressures.

NZ Dolphins

Hector's dolphins are found only in New Zealand waters and are New Zealand's only endemic dolphin species. Because of this and their status as one of the world's rarest dolphins, in 1999Hector's dolphins were declared a "threatened species" by the Minister of Conservation. With a New Zealand population of less than 250 breeding adults, Maui's dolphin is classified as "nationally critical", (the highest risk-ranking possible). Hector's dolphin is classified as "nationally endangered" (the second highest risk-ranking).

Hector's dolphins are revered as a taonga by Maori. Tutumairekurai is the most common of the Maori names for Hector's dolphin, meaning ocean dweller. Some Maori believe that the spirits of the dead become tutumairekurai.

Hector's dolphins have therefore become a symbol of marine species conservation in New Zealand. Marine mammal tourism in New Zealand has increased over recent years and boat excursions involving viewing or swimming with dolphins, including Hector's dolphins, are now popular with tourists. Around 20 permits have been issued for viewing or swimming with Hector's dolphins, but swim-with-dolphin ventures have been limited to Banks Peninsula near Christchurch.

Hector's dolphins are short lived (about 20 years), have a low reproduction rate (a female has a single calf every 2-3 years) and become sexually mature at a relatively late age (about 7-9 years). Hector's dolphins do not appear to make large scale movements. The furthest distance between two sightings is 106km, and a satellite tagging study has indicated that their average activity radius is between 10 and 14km. As such, Hector's dolphins are generally restricted to local areas with little movement between areas.

There are a number of actual and potential threats facing Hector's dolphins, including fishing related mortality (e.g. through net entanglement), boat strike, pollution, disease, mining and tourism impacts. Some of these threats are a direct cause of dolphin mortality, whereas others may impact on the population through sub-lethal impacts (e.g. reducing reproductive success).

You shouldn't think New Zealanders are slack species killers, you will find similar issues in highly altered agricultural regions of Australia like Victoria. NZ is particularly vulnerable because is has a sensitive ecosystem that was long isolated from other invasive species until the arrival of humans. They have the same primitive debates about "jobs vs environment" that we have, and are hampered in what they can do by limited resources. We probably need to fix our own performance before being critical.

Pohatu (Flea Bay) Marine Reserve

Established: 1999

Size: 215 hectares on the eastern side of the outer bays of Banks Peninsula in Canterbury NZ.

Population centres: The Reserve is 15 km via a steep road and 11 nautical miles from Akaroa, a tourist town south of Christchurch, [similar to Hobart in size]

The process to establish a Marine Reserve on the Banks Peninsula near Christchurch was very contentious. The first effort was for a marine reserve near the big tourist drawcard of Akaroa, where there are popular Hector's dolphin swim cruises.

It was blocked by recreational fishers, commercial fishers, and local Maori. It is a natural seafood collecting place for the marae in Akaroa as stocks are good, and the sheltered position of the cove makes it safe for fishing. The relatively remote Pohatu reserve was nominated because it was a less contentious site. This has been a common practice in Australia too in an effort to avoid controversy.

At first blush it looked like a mistake, a small site down an appallingly steep access road. The location is remote and easily overlooked. But MPAs are for tourism?, no they are for animals including humans. The result is a spot where NZs easily disturbed seals and penguins can get on with living without having to put up with too many tourists. If you want to make the effort you can

also get a beach to yourself in close enough to seclusion. That is a rare experience in a country that has more tourists than citizens.

When I arrived, the beach was covered in attractive wild geese. 'Gee they look like Canada geese'. Yes, the feral animal plague in NZ extends to nuisance swarms of Canada geese. A snorkel in the milky waters reveals a fairly sparse reef, but soon a seal comes over for a look, a common encounter in NZ. I also encounter a giant moon jellyfish.

You might also see some walkers on the Banks Peninsula walking track, a long walk around the predominantly cleared sheep country that connects with the bay.

On the northern side of the bay is the site of a low key tourist penguin adventure which sees vans going into the reserve several times a day to disgorge European backpackers for a short stopover.

The little blue penguin (Eudyptula minor) is in decline throughout much of its range in New Zealand, largely due to introduced predators and human disturbance. The white-flippered penguin is variant of the blue penguin, (Eudyptula minor albosignata), and is found only on Banks Peninsula and Motunau Island in Canterbury, New Zealand. .

About 2,600 korora (white flippered penguins) and some very rare yellow-eyed penguins breed at Pohatu – the largest little penguin colony on the NZ mainland. They can be seen clustered in the undergrowth of the surrounding hills, up to 700 m from the shore. They also swim out in the bay in large coordinated groups.

Stoats and rats are trapped here (using Canada Geese meat as bait), to try and slow down the loss of eggs and young to feral animals.

It's a great spot to bring a kayak as it allows you to see the big sea cliffs and see some of the larger animals that tend to aggregate at the remote opening of the bay.

There is a seal colony in the outer reserve, Hector's dolphins often visit.

Albatrosses cruise these waters and are most likely to be seen from the headlands.

Its also a good spot for a chat, everyone is on holidays, doing interesting things, and happy to talk. More of a postcard NZ travel experience than any of the 'postcard' spots.

It's lovely, peaceful, so shhhh, keep it a secret.

The Catlins – Necessary Hoo-ha about Hoiho

The Nuggets, Catlins

One of the tourism growth spots in South Island NZ is the Catlins. It's a coastline boasting spectacular waterfalls, great coastal scenery, quaint hamlets, wildlife encounters, walks and nice beaches. While Queenstown and Wanaka are blown with millions of visitors, coastal towns like Dunedin and Invercargill are stagnant and struggling to get a share of the tourist dollar. The Catlins fall nicely in the middle of all these ambitions, with the petrified forests and wildlife encounters of Curio Bay one of the highlights of the Catlins. Lately tourist numbers have been rising and threatening the areas tourists have come to enjoy.

In 2002, the South Catlins Charitable Trust was formed by the community in order to preserve the area's natural environment. They started on replanting, walkways and restoration of the endangered yellow-eyed penguin habitat. They then got funding to create an interpretive centre and café called the Tumu Toka Curioscape, it was professionally designed to be a slick and spotless tourist photo stop for day trippers. Nothing like the local Landcare outfit at home.

Curio Bay is a popular holiday destination, with more glitzy accommodation going up, and new roads. Despite the stream of cars, the local rural hamlets still have some charm.

The tourists come for overpriced tat (I bought a T-shirt) a small café, and a rather expensive small static display which would be free in Australia, but here you buy tickets.

The tourists first started coming to see the petrified forest that conveniently is also a rookery for the world's rarest penguin. The outgoing tide reveals a 180 million year old Jurassic fossil forest – one of only three such accessible fossil forests in the world. The forest was destroyed multiple times by massive floods of volcanic debris; growing back only to be covered again. Erosion has exposed tree stumps, logs and other fossils. Most tourists take a couple of snaps or walk by without noticing.

These days they are here for the hoiho or Yellow-eyed penguin. Everyone lines up at dusk to see the penguins either on the clifftop lookouts or behind the roped off area on the sea terrace. The view is of the back of someone's head. There is no avalanche of penguins coming ashore like in the documentaries. Then someone mentions this might be because there are only two pairs left. Just as everyone sighs in disappointment, they appear in the distance.

I was too far away, but I was sure one had a look on his face like "WTF!, what are all these humans doing here?" A good question, as we needed to be so far away from these very timid animals that it all seemed a bit pointless.

The Curioscope is a well-intentioned, well-executed but unsurprisingly imperfect answer to the very large problems caused by declining habitats and ecosystems. It's a valiant attempt to try and balance human needs, including tourist pressure from a growing number of world travellers, with the declining fortunes of our often sparse and easily disturbed wildlife. I acknowledge the hard yakka that went into it and it has made things better, but it's a reminder to the rest of us that now we have to reinforce this with more changes on a larger local and global scale.

Hoiho are undergoing a serious decline. By the breeding season of 1990/91 only an estimated 150 pairs were left on the South Island of New Zealand. However, through conservation work to reduce predators, numbers increased to a high of about 600 pairs in 1996/97. Then they dropped again to 225 pairs in 2018/19. Hard to compensate for that grim statistic only with tourist infrastructure.

NZ or Hookers sealion

The bay is also home to a resident pod of rare Hector's Dolphin (Upokohue) according to the brochures, but they aren't that commonly seen from what I could see.

It's a nice place and definitely worth a look. The depressingly small remnant forest they are ridding of weeds is also quite lovely for a short walk. As the forest is not a 'must do' brochure spot, the walk is pleasingly calm and relaxing.

NZ Penguin Report Card

Eastern Rockhopper Penguin 	decreased by as much as 94% on Campbell Island and possibly also on Antipodes Island
Southern Rockhopper Penguins 	breeding population in 1984 2.5M pairs, now numbers 700 000 pairs.
Fiordland Crested Penguins 	2500–3000 Declining 33% over 7 years at Open Bay Island. Predation by Weka, human disturbance, introduced predators, decline in prey species, fisheries activities.
Yellow-eyed Penguins/ hoiho. 	1000–2000 Declining. 650 on mainland. A decline of 36% between 1988 and 1992 for the population on Campbell Island followed by what appears to be a slow recovery
Erect Crested Penguin 	170 000 Declining 50% over 20 years on the Antipodes Island, 100% over 20 years on Campbell Island. Changes in the marine environment, fisheries activities.
White-flippered Penguin 	2200, Declining 65% over 13 years on Banks Peninsula. Predation by introduced ferrets, fisheries.

Business is adjusting to climate change risk

(Source Minter Ellison)

Business is changing and doesn't want to buy from or trade with high carbon businesses or economies.

Goldman Sachs has estimated the impacts of the recent bushfires could reduce Australia's GDP by 0.4% [sounds small now next to Covid?], with significant longer term risks. Sceptics argue that dealing with climate change is too costly, but the economic and social cost of inaction is much greater.

An increasing number of corporations, are adopting new governance strategies for the management of climate risks and opportunities. Some of the specific actions that have been taken recently include:

- The Australian Securities and Investment Commission (ASIC) has published regulatory guidance on market disclosures, asking firms to identify climate-related financial risks.
- The Reserve Bank of Australia has incorporated climate risk into its macroeconomic modelling and monetary policy.
- The accounting standards are also set to change in similar ways. These risks are likely to soon be required disclosures in prospectuses (RG228) and annual report Operating & Financial Reviews (RG247).
- Pundits expect votes against director appointments or remuneration by institutional investors concerned about climate risk management.
- The $US80 trillion+ signatories to the UN Principles of Responsible Investment (PRI) are beginning to question investee companies on their strategy.
- 50 central banks, including the RBA, joined the Network for Greening the Financial System (NGFS), issuing a call to incorporate climate risk into prudential regulation and supervision.
- the International Monetary Fund (IMF) announced it will incorporate climate risk into its country risk assessments. In January 2020 they updated the World Economic Outlook and nominated climate change as a key handbrake on global economic growth.
- Funds and banks are likely to limit their exposure to municipal and sub-national bonds if they are particularly vulnerable to climate risk or lacking adequate climate policies. In November, the Swedish Central Bank got rid of bonds issued by WA, and Queensland due to their 'climate footprints'.
- Sustainability-linked loans are now worth US$120 billion and banks give a 'green discount' or 'brown penalty' in interest charges.
- The EU signalled its intention to impose border carbon adjustments on imports from countries which do not have ambitious carbon pricing policies. Basically, a type of trade sanction.

The COP26 conference in Glasgow in December 2020, apparently still going ahead, may be the most important international climate change conference for many years. Governments with ambitious climate policies are expected to put pressure on "laggard countries". There is the prospect of more trade levers on the horizon.

Its not all risk, but also opportunities. If rules for a global carbon market can be agreed at COP26, this will further drive an investment opportunities in providing carbon offsets.

Law firm Minter Ellison asked of boards if they were keeping up with this change, "Do they understand the heightened regulatory and investor expectations around climate risk assessment and disclosure?" [Do we even have a government that does that?]

Climate inaction excuses from the experts

If you feel like ducking responsibility for the impacts of climate change, why not try these well-used excuses.

1. Blame the kids –For being too frightened

"She seems like a very happy young girl looking forward to a bright and wonderful future. So nice to see!" US President Trump, commenting sarcastically about a tearful young activist leader Greta Thunberg.

2. Blame the parents – for making the kids too frightened

"We should let our kids be kids – teenagers be teenagers – while we work positively together to deliver practical solutions for them and their future".

"I want children growing up in Australia to feel positive about their future, and I think it is important we give them that confidence that they will not only have a wonderful country and pristine environment to live in, that they will also have an economy to live in as well". Prime Minister Scott Morrison

3. Blame millennials for being inactive and disengaged– then blame them for being too active and engaged

"What we want is more learning in schools and less activism in schools." "… we do not support our schools being turned into parliaments," Prime Minister Scott Morrison.

4. Distractions – Spruik another unrelated, safer issue that makes you look green

"Recently, I announced that Australia will ban exports of waste plastic, paper, glass and tyres, starting in 2020. That's about 1.4m tonnes of potent recyclable material". Prime Minister Scott Morrison [actually other countries won't take it, that is what sparked the 'ban']

5. If you can't fault the science, blame the scientist

"Look, scientists also have a political agenda." "a lot of these scientists are driven by the money". US President Donald Trump [Scientists often volunteer their time to write climate change reports. Both statements appear truer of Trump's motivations]

6. Straight denial (this is getting less popular and more subtle as the evidence is pretty compelling)

"I don't think there's a hoax. I do think there's probably a difference. But I don't know that it's man-made." US President Trump. *"I don't know if climate change is man-made."* David Littleproud Australian Minister for Water Resources, Drought, Natural Disaster, and Emergency Management.

7. Say you aren't denying it, but then water down the seriousness

"I think something's happening. Something's changing and it will change back again." US President Trump

8. Plain distort the facts

"Every single one of the signatories to the Paris climate accord lags behind America," US President Trump.

9. They are picking on us!

"We're doing a very tough job and not everybody knows it," said US President Trump (Prime Minister Morrison has stated basically the same thing)

10. Distort the facts and threaten your job

"Compliance with the terms of the Paris Accord ***…****could cost America as much as 2.7 million lost jobs by 2025****, according to the National Economic Research Associates. This includes 440,000 fewer manufacturing jobs (…), including automobile jobs and the further decimation of vital American industries on which countless communities rely. (…)* US President *Trump*

[According to IRENA, in 2016 the solar and wind industries employed around 777,000 people in the US, and more than 8 million globally. US Coal mining employed 130,000 in 2011 and it's falling rapidly]

11. Distort the facts and claim it will kill the economy

"The cost to the economy at this time would be close to three trillion dollars in lost GDP and 6.5 million industrial jobs, while households would have $7,000 less income and, in many cases, much worse than that." US President *Trump*

[Citibank estimates the costs of unchecked climate change at more than $40 trillion by 2060]. https://www.edf.org/climate/how-climate-change-plunders-planet/climate-facts

An OECD study for the G20, which found that G20 countries could benefit from a 5% boost to growth by 2050 if they pursue climate-resilient and low-carbon economic development.

12. Deny, Distract, Distort the facts, Water down the seriousness, Spruik an unrelated issue in one multi-function sentence.

"The United States right now has among the cleanest climates there are based on all statistics, and it's even getting better. Because I agree with that, I want the best water, the cleanest water". US President Trump

Recent gems in the public arena

There is a modern myth that you have to give crazy people a platform to speak in order to be fair…so here goes and what better examples than Covid myths, but it happens for global warming too.

Malaria treatments help stop Covid – Nope, World Health Organisation (WHO)

The prolonged use of medical masks causes CO2 intoxication or oxygen deficiency - NAH

Drinking alcohol protects you from Covid – NO, but it can be fun.

Pepper, temperature above 25 degrees (or the cold), internet home cures, rinsing your nose with saline fix it – sorry No

Its spread by houseflies, mosquitoes, 5G mobile networks - NO

Consume methanol, ethanol or bleach – Are you mad! That will fix all your problems when it kills you

You don't have Covid if you can hold your breath for 10 seconds without coughing - Wrong

Its not much worse than the Flu – wouldn't that be great if it was true but it isn't and myths can be harmful.

China did it (as stated in the US), the US did it (as stated in China), a military experiment gone wrong. Niet

Bill Gates did it, African migrants or maybe it was Bugs Bunny if you hate him for some reason. NO

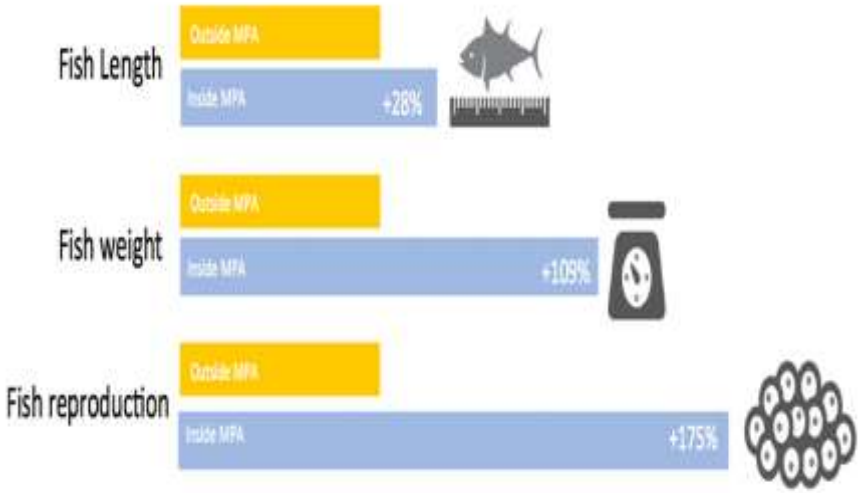
Newsguard states that there are 132 internet sites pedalling these types of myths regularly. They are all small and are doing it to lift circulation. They get picked up by other news sources and reported as fact, even being restated by national leaders, generally of a far right persuasion. A site called Great Game India published a headline "Coronavirus Bioweapon–How China Stole Coronavirus From Canada And Weaponized It." That got picked up by a Bulgarian site that in turn got picked up by a far right US site, then it got to Reddit, Facebook and Twitter. The only facts in the story are that two Chinese scientists were kicked out of Canada for slack safety procedures in a Winnipeg lab doing unrelated work.

People use to come up to you in a bar and tell a story, you laughed it off back then. Well they do it on the internet these days, you still need to laugh it off. The internet is full of any old nonsense that pops into people's heads.

VALUING WONDER – CONNECTION WITH THE OCEAN IS A VERY HUMAN THING

No-take marine areas good for fishermen

One hectare of ocean in which fishing is not allowed (a marine protected area) produces at least five times the amount of fish as an unprotected area.



Fish populations within these areas can grow without interference and "spill-over" to replenish fished populations outside.

Yet fishers remain sceptical that any spillover will make up for the loss of fishing grounds.

However, that MPAs benefit fishing is clearer than before. Offspring from a fish increase exponentially as they grow larger, a disparity that had not been taken into account in earlier modelling.

Traditional models link fish output proportionally to total weight of fish in an area. This assumption is incorrect for 95% of fish species: larger fish actually have disproportionately higher reproductive outputs. That means doubling a fish's mass more than doubles its reproductive output.

Fish are, on average, 25% longer inside protected areas than outside. This doesn't sound like much, but it translates into a big difference in reproductive output – an MPA fish produces almost 3 times more offspring. Higher fish populations because of the no-take rule means MPAs produce between 5 and 200 times (depending on the species) more offspring per unit area than unprotected areas.

For protected areas to increase catches, offspring need to move to fished areas. To calculate fisheries yields, we need to model – among other things – larval dispersal between protected and unprotected areas. This information is only available for a few species, such as the coral trout on the Great Barrier Reef.

No-take protected areas increased the amount of common coral trout caught in nearby areas by 12%.

The smaller percentage benefit is because a fivefold increase in the production of eggs is affected by limited dispersal and higher death rates in the protected areas.

While MPAs restrict fishing of an entire population of fish, fishers overall still benefit from their beneficial effect on local fish numbers.

At the risk of getting totally shouted down as too optimistic, ridiculous, or even dangerous, can we restart the Tasmanian MPA process please? Nothing has been done about bioregions in the North coast and East coast. Are we happy about them being future factory sites for noxious industries with only the controls that politicians find convenient?

Source: The Conversation

Hydrozoans

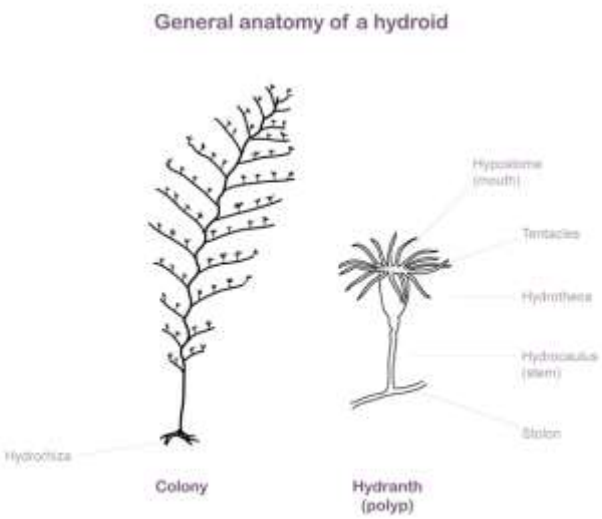
Animals of the class Hydrozoa are bewilderingly diverse. Nothing about them is very familiar or straightforward.

They don't follow the rules. Hydroids are mostly colonial except for the ones that aren't. They can take on several body shapes throughout their life cycle, except for the ones that don't.

They are reasonably well-studied because they are the simplest colonial marine animals and are useful study subjects for teaching and research.

Have trouble spotting hydroids – put your hand in this tropical stinging hydroid ("fire coral") and you will remember them from that day forward, Tulamben Bali - M.Jacques

The earliest Hydrozoans emerged more than 540 million years old. They have caused a lot of problems since for people trying to classify them, so the names of the orders changed regularly as better techniques emerged.



Hydroids are either solitary, or more commonly, a collection of animals (polyps) living in an interconnected colony. Most of the polyps are feeding polyps. Some species have specialised polyps that bud directly off a stolon (stem) and act to root the colony to the bottom. The polyps are connected by a skin-like membrane which makes a gastrovascular cavity (like a vein). The epidermis (skin) can also secrete a skeleton which supports the stem. In some hydroids, the skeleton even makes a cup shape protecting the polyp. The arrangement of polyps and the branching of the stem is different for each species of colonial hydrozoan.

Hydroids have a weird sex life. All colonial hydrozoans include some polyps specialized for reproduction. Most hydrozoan species have different body forms in their lifecycle, like butterflies. Solitary hydrozoan polyps produce buds, that detach and grow on as new individuals. In some colonial species the buds remain with the parent polyp and form into jellyfish-like animals.

These bell-shaped medusa float free. Most hydrozoan medusae "jellies" have just four tentacles, but as always with hydrozoans there are exceptions. The medusae of hydrozoans are smaller than those of typical jellyfish, and range from 0.5 to 6 cm in diameter. The larvae swim away and settle in a new area.

The nervous system of hydroids is unusually advanced for cnidarians. Two nerve rings lie close to the margin of the bell, and send fibres into the muscles and tentacles. Numerous sense organs are closely associated with the nerve rings. Mostly these are simple, but they include primitive light-sensitive organs.

The medusae are either male or female and can spawn. These small jellies don't live for long compared with true scyphozoan jellyfish.

A few colonial species have other specialized polyp forms. In some, defensive polyps have a large numbers of stinging cells. One polyp may develop as a large float, from which the other polyps hang down, allowing the colony to drift in open water, like the Portuguese Man O'War. These hydromedusae "invaded" Auckland beaches in 2014.

Gymnangium prolifer, colony of individuals. Image by: J. Watson,

Hydrodendron australe. Image by: J. Watson,

Living with hydroids

Hydroids grow fast and are very adaptable. Many species are capable of overgrowning and outcompeting other marine life. They can also have a mutually beneficial relationship with another animal and have learned to 'cooperate' in order to survive. These "symbiotic" associations occur especially between hydroids and octocorals. Twelve species are found growing with 'soft' corals.

The solitary hydroids of the *Ralpharia* family are almost always seen growing amongst octocoral mats, with two species living on soft corals and four on gorgonians.

The solitary hydroid *Ralpharia magnifica* is known only from Australia. Although it is common in temperate SE Australia it was only described from specimens taken from shallow water reefs of Western Port, Victoria in 1980. Later a second species was described, *Ralpharia coccinea* which is often found growing in the same host, the mat-like octocoral *Parerythropodium membranaceum*.

It is likely that the octocoral hosts do not suffer any particular damage. The octocoral mat may protect the hydroid from nudibranch attacks. The developing gonophore (head) of the hydroid grows up during the spring and as it matures, contains many small eggs during the summer. At release, these "babies" immediately settle on adjacent mat and within a few hours develop a short 'stalk'. The octocoral living tissue reacts by producing a kind of gall that envelops the base of the young polyp as it grows. The short-lived colony withers and dies after breeding.

Phil Watson – solitary hydroids growing from their soft coral mat

Photo John Smith - amphipods very often shelter in Ralpharia magnifica

WILD PLACES

Underwater Eyre Peninsula Pt 1

The Eyre Peninsula is a huge area full of lots of potential. It has 700 km of coastline and 50 offshore islands.

At first sight it seems deceptively sparse. The land can be arid and largely empty, there are few service centres. The population of the peninsula is relatively small, with the long drives broken by a sprinkling of small hamlets, some have seen more bust than boom, or are little more than half-empty summer shack settlements.

While most of the land has been tamed for wheat and livestock farming, this hasn't affected the wilderness feel of its coast. The west and south coast is often pounded by huge seas. Much of the foreshore can be off limits and deserted due to lack of shore access, big surf, soft cliffs, and boggy sand. In the sheltered areas it can often be shallow, silty, or covered in impenetrable stretches of mangroves. Its also arid, and in summer, piercing sun, lack of permanent water sources and scorching winds mean that sunstroke is never too far away for the unprepared. The south and west coasts are also well-known refuges for great white sharks. None of this is really selling it for diving.

You should make the effort anyway, because coastal Eyre Peninsula is an awesome wilderness. It is so awesome that the place is teeming with tourists in summer, sampling the gorgeous coastal scenery, good fishing and four wheel drive tracks to remote camping spots. The area offers unique encounters with sea lions, whales, caged tuna, sharks, seabirds, cuttlefish and a number of other rare species. Everyone is eager to race in for their short holidays and get their packaged sample of this 'wilderness'.

Most of the local population is concentrated in Port Augusta, Whyalla or Port Lincoln, with only Ceduna and Streaky Bay being able to boast supermarkets and other specialty stores. The low availability of dive services often limits diving adventures to sites near Whyalla and Pt Lincoln. Dive Charters services are limited to a few tourist attractions based on wildlife encounters, the explorer needs to take a boat on a very long tow, or be prepared to do some hard shore diving.

Eyre Peninsula is a niche refuge for the curious, hardy and adaptable, that applies to the humans and the animals. Take your time, outside of the packaged charters there is a wealth of adventure sites to explore. The diving may not be in areas with postcard visibility or a nearby cocktail lounge, or even a humble dive shop.

Many divers and snorkellers wait for calm seas to hunt crays and abalone off the west and south coast. Others take advantage of the more relaxed silty bays to spot rare creatures, usually with a camera. Either way, take a chance, take you time and explore.

Eastern side Eyre Peninsula - North Spencer Gulf

The north eastern side of the Eyre Peninsula is shallow and silty, ordinarily offering not much for recreational diving. It can also be very arid and some sites are hard to get to, distant from boat ramps, and far from major centres. In deeper areas there are potentially tricky currents. However, it has some awesome things to see for the nature lover, especially if you have planned ahead and know what you are looking for.

Spencer Gulf is a sheltered semi-enclosed sea approximately 60 km wide, separating the Eyre and Yorke Peninsulas. It is a natural anomaly, a salty, shallow warm water ecosystem located in the temperate zone. Its narrow and shallow seas, don't get the flushing effect from big rivers or ocean currents like a more open coastline. The hot sun warms up the surface layer and in the shallows, evaporation leads to high salinity. It is ringed with saltmarshes, mangrove forests, tidal flats, beaches and dense seagrass meadows. These areas are important nursery areas for fish and the unique conditions are great for some adapted rare local species and odd natural events. The seagrass has made the northern gulf area home to rare wrasse, seahorses and pipefish. There are also large beds of razorfish and hammer oysters, along with other unusual smaller creatures.

The Tiger Pipefish (Filicampus tigris), is usually found in tropical areas of Australia, but it is found here near the entrance of deeper estuaries, on rubble-sand or mud with sparse plant life. The secretive Deep-bodied Pipefish Kaupus costatus and Long-snout Pipefish Vanacampus poecilolaemus, are patchy across Australia but often like the quiet and, shallow eelgrass beds. They are choosy and only like silty bottoms but clear-water environments.

In the rare rocky foreshore the seaweed is low growing browns like Scaberia aghardii (corkweed). In shallow waters; delicate species of Sargassum and Cystophora are mixed with red algae including Osmundaria, with the turfing brown Lobophora in the understorey.

The prepared and lucky may find the little-seen Orange-barred Pufferfish (Polyspina piosae), Scarlet Cardinalfish (Vincentia badia) and Orange Cardinalfish (V. punctata). Lace Bottletail Squid Sepiadarum occur in Northern Spencer Gulf. The sub-tropical goby species Bathygobius kreffti is seen here, when normally it is only found in southern Queensland and New South Wales. Many other small species common only in tropical areas, have remnant populations here in the temperate Spencer Gulf.

Whyalla Area

The shallow seagrass and sand flats of the Northern Gulf deepen towards Whyalla, but the northern gulf rarely exceeds 20 metres

in depth. The low tufty seaweed along the silty shore might not look like much at first but they draw in animals from the surrounding areas. Reef areas like Point Lowly are not common so they are important breeding habitats. The giant Australian cuttlefish (Sepia apama), aggregates annually to breed and spawn, at times hundreds of thousands of cuttlefish can be seen in small areas of reef. In winter it causes tourists to flock to the spectacle, but few stay to sample the areas other attractions.

Unnoticed amongst the rocks is the rare flatworm Ancoratheca australiensis, the nudibranch Discodoris, the uncommon brittle star Amphiura trisacantha, two new species of intertidal barnacle, the tropical phoronid horseshoe worms Phoronis albomaculata and P. psammophila. The reality is that you may not recognise them even if you found them, but it is important to value this area for all its wonders, and its worth logging a dive or two away from the tourist platform, just to chalk up a unique area in your dive log.

Offshore tidal channels provide some deeper and more challenging diving on silty shell-rock, for boat owners happy about diving in currents. These channels thread around popular fishing spots like the Middle Bank area, Fitzgerald Bay and Cowleds Landing. There are also a number of artificial reefs to provide structure.

The channel banks include rare sponge, gorgonian and soft coral communities. There you may find Sarcoptilus grandis, the largest Sea Pen in Australia. Unusually in such shallow shelly/sandy areas, beautiful sprays of carijoa soft coral, gorgonian sea fans, ascidian species, sponges and bryozoans can be seen. Some of these types of animals are usually only found in tropical areas such as the soft corals Euplexaura and Echinogorgia, and strap-like gorgonian coral Clathraria. Look out for an endemic species of Egg Cowrie Primovula cruenta, that feeds on the gorgonian coral Echinogorgia.

Even on the tide swept and bare areas of shifting sand waves, the usually unseen stalked bryozoan Lanceopora obliqua lives, the sea pen Virgularia gustaviana is a "tropical relic". Two species of solitary ascidian are also unique and can handle the unstable bottom. The sea pen Virgularia mirabilis, is only recorded in the sandwave field near Middle Bank.

If you have no boat, some of the species can be seen on the old Whyalla jetty piles, and hopefully on the new jetty once it is recolonised.

You may not fill up your dive book with deep dives and big ocean vistas in the Spencer Gulf, but it is a place for oddities and things you may not have seen before. The dives may not have great visibility, but inshore sites are usually sheltered and aren't dangerous with suitable precautions.

Whyalla Point Lowly

The Point Lowly area is a rare area of rocky reef in the upper Spencer Gulf, and it is also located close to deep channels that are the super highways for migrating fish species. The currents also transport nutrients from the upper gulf into the mouths of filter feeding animals. It is no surprise that it's the focus for recreational diving in the upper gulf.

Apart from the world's biggest aggregation of the world's biggest cuttlefish during winter, the area has a number of rare species and other natural events. Divers tend to be fixated with the cuttlefish aggregation, but there are lots of other things there to that are worth valuing and protecting. Pterothamnion flexile, a rare species of red macroalgae is found nearby. The deep-water Elephant Shark Callorhynchus milii, also migrates into shallow waters during spawning season.

The Point Lowly/Whyalla area supports a population of small specimens of the cowrie Zoila friendii thersites, a species of conservation concern. Species in Northern Spencer Gulf endemic to South Australia include another Sea Pen Scytalium sp., which has only been found in Northern Spencer Gulf at 10m depth on sandy or silty bottom, the endemic gorgonian coral Echinogorgia sp. is common in northern Spencer Gulf. Deltocyathus vincentinus,

solitary hard coral, previously abundant in both Spencer Gulf and Gulf St Vincent may also be seen.

Pt Lowly Artificial Reefs

approx 18M

Point Lowly is marked by a prominent lighthouse. The water around the point drops into deep water within 200M of shore. Tyre reefs have been established around the point and surrounding areas. They are visited by lots of fish but can be silty. The area is renowned for strong tides. Better done as a boat dive with a local guide if that can be organised.

Sea Terrace, Pt Lowly

2 to 5 metres

Despite the gas refinery built nearby, Pt Lowly area is still attractive. On one side of the Point there is a secluded bay lined with mangroves. On the point a rustic old lighthouse and cottages give it a heritage feel. On a 40 degree summer day the sheltered bay near the lighthouse offers an easy but cloudy snorkel, with a few interesting things to see. In the water there are low sections of sea terrace with low bushy weed and a few passing fish. Sausage zoanthids are found in big fields with crabs scurrying about as well as lots of nudibranchs. Stingrays and schools of whiting pass by from time to time. Enough to fill up a card full of photos without much effort.

Cuttlefish Aggregation, Stony Point

4-5M

WGS 84 - S' 32' 59.34 E' 137' 45.49

From May to August thousands of cuttlefish gather on the eastern Eyre Peninsula to breed. Cuttlefish usually start appearing at Black Point and Stony Point reefs when the water temperature drops to

17 degrees Celsius. One of the more popular and reliable places to find giant cuttlefish aggregations is near Whyalla. The access point, next to the Santos petroleum processing plant, 25km north of Whyalla. A boardwalk, toilets and sun shelter have been built to allow for easy access for divers. Here the cuttlefish have been found in vast schools, one diver reporting 15 to the square metre. The bottom is otherwise covered in low rocky reef and short algae with only low species diversity. A dive at slack water will bring 20 metres plus visibility and cold but easy diving conditions. It can become murkier and more challenging when the tide is running. The area is also home to squid aggregations later in the year. The site can get stirred up by strong winds which are common at that time of year. The 2011 season showed only 20% of the normal cuttlefish numbers and numbers kept falling. Some blamed fishing, others said it was the natural population recovery of cuttlefish predators like seals. Since then the population has seems bounced back, and may have partly been just a natural cycle, but commercial fishing exclusion zones may also have done the trick.

Whyalla

Old Iron Ore Jetty, Whyalla

4-11 metres

The jetty pylons at the iron ore jetty at Whyalla is recognised for the abundance and diversity of its invertebrates. These include soft corals such as Carijoa multiflora, bryozoans, sponges, compound ascidians, and other bottom dwelling animals. The jetty is also reported to attract snapper, magpie perch, moonlighters, leatherjackets, and many other reef fish of interest to divers.

The old jetty was originally built in 1901 and had an important place in Whyalla's history. For 80 years it supported the steelworks before becoming a disused fishing spot and occasional dive spot. The old jetty had to be demolished in 2020 but it has been rebuilt as a recreation pier. The old jetty remains were dropped onto the bottom, still covered in marine life. The new pylons are expected to be quickly recolonised with marine species.

Entry is from the beach next to the yacht club and involves an energetic surface swim. The area is covered in debris piles from the old jetty. Fish life includes tommy ruff (Australian herring), garfish, squid, Port Jackson sharks, seahorses, pipefish and a variety of other fish species. Invertebrates include jellyfish, cuttlefish, a range of crabs, and nudibranchs. It's a great night dive as well. The wharf is very popular with fishermen so watch out for fishing line.

Wreck of the "Leeton"

22 M

WGS84 - 33.09.668 137.38.570

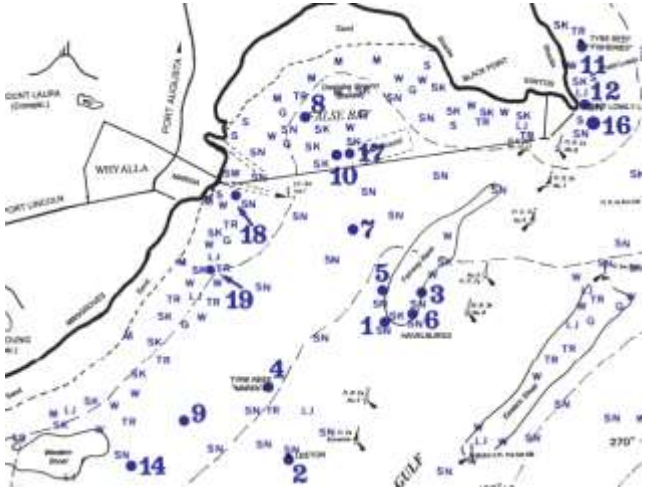
The 45 foot long tow boat Leeton was scuttled 12 kilometres SSE of Whyalla in the main shipping channel. It is a small but well-known dive occasionally visited by local divers. The superstructure has been torn off and the hull is draped with prawn nets which can be dangerous. The forward hatch is open and filled with silt. The wreck is subject to extremely strong tidal movement and can only be dived on slack tides. Whiting and snapper can be found over the wreck.

Mareks artificial reef

12 metres

WGS84 S 33 05 722 E 137 36 394

The Whyalla area has a large number of artificial reefs, all affected by the strong currents and silt that is a feature of the area. An extensive artificial reef, consisting of car bodies, old boilers, gantries, tyre pyramids, washing machines, stoves and refrigerators can be found near the "Leeton" wreck. Most other reefs consist of the usual series of tyre pyramids. It can have thick growths of sponges, ascidians and soft coral and is a haven for schools of whiting, snapper and many other fish.



Franklin Harbor Marine Park, Cowell

Shoalwater Point

2m-10m

Large, mixed red macroalgae are dominant on some reefs in the Shoalwater Point area, which is an uncommon feature in the mid western Spencer Gulf region. The offshore seagrass beds are easier to reach by boat and large sandflats make it a chore to reach the sea from the shore. Southwards currents can be strong offshore adjacent to Franklin Harbour, such as at Shoalwater Point and Lucky Bay.

The area contains large colonies of the green stony colonial coral Plesiastrea versipora, in waters less than 10m, which can grow to 3 meters in diameter and up to 1.5m high. Massive colonies such as those at Shoalwater Point can be centuries old and are now uncommon in the gulf regions, possibly because of past trawling activity. The Tiger Pipefish Filicampus tigris has also been recorded Shoalwater Point area.

Franklin Harbour

2-4 M

Franklin Harbour is a shallow, tide-dominated (range 1.5m), semi-enclosed bay. This area offers many shallow reefs and seagrass beds that offer easy snorkelling. There are abundant razorfish and scallops in the sand and seagrass. The sheltered waters of Franklin Harbor are an important nursery area for many juvenile fish. Snorkelers can find eagle rays, Port Jackson sharks and many other species on substantial and varied sea grass beds (including the rare seagrass Zostera mucronata). The beaches are important habitat for many internationally protected bird species.

At Point Germein Peninsula, near the entrance to Franklin Harbor also has rare stromatolites, formations made by the blue-green algae Oscillatoria and represent some of the oldest examples of life on earth. The Franklin Harbour entrance channel has big patches of sponge, hydroids, tube worms, echinoderms, and ascidians. Dive on slack water.

Flat Rocks/The Knob.

2-10m

The coast south-west of Franklin Harbour is dominated by exposed cliffs, moderately high energy beaches and rocky outcrops like Flat Rocks and The Knob. It is an easy place for a snorkel along more open sandy coast, although the coastline is slightly exposed to the prevailing SW winds and swell. You may see sea dragons and plenty of other fish in the seagrass which comes close to the shore and persist right out into 10 metres of water. Seadragons are commonly seen in many places along this coastline, although not usually much further north. They are most often seen in 4-18m depth, behind reefs and in overhangs. Offshore patch reefs also support giant cuttlefish and southern calamari. Blue swimmer crabs and razorfish are common on the sediments.

Wreck of the "Lady Kinnaird", Port Neill

2-6 Metres

In January 1880, the 680 ton iron barque went ashore in a storm on her way down the gulf from Port Pirie laden with grain. The "Lady Kinnaird" broke offshore from the present day Port Neill Golf Club. All on board managed to survive but the ship became a total wreck. Salvageable parts of her were used in the district for years in shearing sheds and for the roof of the Kinnaird Tanks.

The wreck now consists of extensive iron plating, chain, masts, winches and an anchor. There are wrasse , moonlighters, sea sweep schools of drummer, leatherjackets on a bottom of short weed. The Lady Kinnaird Walking Trail at Port Neill follows the coastline, south from the jetty over headlands and beaches to the edge of the golf course where a seat overlooks the site of the wreck, a 700 metre swim offshore if you are keen, but a boat sounds easier.

South-Eastern Spencer Gulf and Port Lincoln

The further south you travel, the more the warm and saline waters of the gulf are flushed with cooler blue ocean water flowing up the gulf coast. The sea is more influenced by the big swells that sometimes lash the Peninsula. The diving gets gradually more like other parts of temperate South Australia.Mangroves and dense seagrass meadows become less dominant. On rocky reef low and more delicate green and red seaweed is replaced by larger and tougher seaweed species, including large brown algae like Scaberia, Cystophora or Ecklonia radiata. There is also the hardy red Osmundaria prolifera with green Caulerpa growing in the understorey. The geology also gets more massive with limestone shallow reef often capped by big patches of granite formations. Offshore islands start to appear on the horizon.

Tumby Bay and the Sir Joseph Banks area is a transition zone between the Spencer Gulf and Eyre bioregions. Tumby Bay is generally a region of low wave energy with prevailing offshore winds, and low exposure to swells. Further offshore the conditions are variable, but with occasional strong spring currents. Sir Joseph Banks Group, area is exposed or sheltered according its openness to the prevailing strong southerly weather.

Port Lincoln has dive shops and an all weather ramp. Port Lincoln is also close to the attractions of Lincoln National Park. Excitement is provided by sea lion and shark encounter cruises and if you have a yacht or large motorboat, a wide array of other more remote offshore islands.

The southern coast along Whalers Way is high energy rocky reef, lashed by huge waves. A 4wd adventure opens up spots far away from human pressure, with big fish and wild beaches and coastal cliffs.

Tumby Bay Jetty

2-4M

This easy and shallow shore dive has the usual colourful pile growth with lots of crabs, The bottom is principally seagrass and the visibility can vary from 5-7 metres. The seabed is covered in fine sediment and easily stirred up. It is being sold hard as the spot to find leafy seadragons and they are often there but not always easy to see. Bring an experienced local if you can.

The pylons and surrounding seagrass are home to lots of leatherjackets, schools of old wife fish, moonlighters, southern cardinalfish, leafy sea dragons, short-headed seahorses, cowfish, pufferfish, cowfish, magpie perch, sculptured sea moth and stargazers. The pylons are covered in invertebrates as well as octopus species, red bait crabs, and mantis shrimps, nudibranchs, sea cucumbers, blue throated ascidians, and many other species.

The small spotted snake-blenny, Ophiclinops pardalis, has been seen in the area and may be endemic to South Australia.

Louth Bay Jetty

4 M

This jetty makes for an easy shallow shore dive with some hard foreshore reef and a good variety of small marine life.

South end Louth Bay

15M

The foreshore offers some moderate depth diving among rocky boulders and crevasses.

Rabbit Island

7m

This site at the northern end of Point Bolingbrooke is a shore dive off the rocks. The boulders and crevices are home to some interesting marine life.

MANAGING DEVELOPMENT

Competition for minerals on the Ocean Floor

The ocean floor is rich in minerals prized by the modern world

Scattered across the seabed are compounds that contain rare earth elements — they're the building blocks of our modern world, and are used to make smartphones, electric cars, advanced medicines and missiles. The world's is reliant on China for rare earth elements.

A number of countries and companies are sending vessels to scour the sea floor to assess whether deep-sea mining is commercially viable. Only 9 per cent of the seabed is mapped in high resolution but they are already finding new sources in ocean nodules.

These polymetallic nodules carry multiple metals like cobalt, nickel and copper in the one deposit — and they also have the potential to contain rare earth elements.

However, "One of these potato-sized nodules can maybe take 30 million years to form, so if you mine an area, the deposit isn't coming back," Professor Exon said.

For deep sea miners, there are two other options.

One is relatively easy: fissures on the seafloor, known as hydrothermal vents, can spew out mineral-rich deposits which end up landing on the seabed nearby, meaning a mining company would just need to design the right tools to pick them up (and avoid damaging the unique ecosystem there). The other is more complex (and possibly even more environmentally damaging) scrape the crusts off underwater volcanic mountains.

So far, there are two commercially viable locations for mining nodules with rare earth elements. One is found off India's southern coast, and the other is in the north-eastern Pacific at depths of up to 5,000 metres, known as the Clarion Clipperton Zone.

A recent find is the Manus Basin in the Bismarck Sea between the Papua New Guinean islands of New Britain and New Ireland.

The vents in the Manus Basin formed mineral-rich deposits incredibly quickly. A piece of equipment was dropped, "They found it about three years later with a thick crust with a high level of gold in it — it only formed in a couple of years," Professor Exon said.

Compared to the potato-like, high-grade manganese nodules, he said this kind of deep sea mineral deposit could be seen as "renewable in a way".

Currently, China has five deep sea mining leases it may soon become an area of geopolitical competition.

Miners are administered by the UN's International Seabed Authority, but the rules defining how this exploration is conducted are adhered to on a voluntary basis.

ISSUE IN FOCUS – MANAGING DEVELOPMENT

Salmon Aquaculture in Tasmania PtII

Marine farming areas and expansion proposals, is there going to be a farm near you?

Future Grow areas

Storm Bay-Eastern side of Bruny and Tasman Peninsula

This is an area for significant future growth. A growing number of storm-resistant pens are being trialled off Trumpeter Bay. On the other side of the bay there are extensive finfish farming leases in the Nubeena area. There have attracted a lot of adverse public comment mainly from local residents. This is a significant area of planned further expansion.

The Huon Aquaculture Company has recently received an environmental monitoring permit to explore the potential for Atlantic salmon farming on the east coast of South Bruny Island.

NW coast

Primarily focussed on oyster growing in the shallow areas adjacent to the Duck River near Woolnorth, Montagu and Smithon.

The area has also recently been announced as a salmon grow zone. The permit has been issued to Petuna Aquaculture Pty Ltd.

Bass Strait Islands

King Island has recently been announced as a salmon grow zone.

To these future grow areas you need to add aquaculture lease areas that were proclaimed previously but have lain dormant, like Okehampton and Norfolk Bay, or are shellfish and other kinds of leases that can be bought and converted to salmon farming.

West Coast

The waterway is a key fishfish farming area, as low salinity in Macquarie Harbour makes fish disease management cheaper. The pens are located near aggregations of the threatened Maugean Skate. Attempts to double fish numbers have failed after crashed in oxygen levels causing large fish kills. These issues have attracted a lot of media attention and public criticism and appears to have damaged the reputation of the industry as a relatively environmentally benign "clean green" industry.

Huon and Channel

One of the more established finfish farming areas. The leases are widespread now and are centred on North West Bay, Huon River mouth, Dover, Simpsons Bay and Alonnah. The area has most likely reached its maximum potential for further expansion.

Norfolk Bay

Mainly focussed on shellfish at the Dunalley end of the bay, there are also finfish leases near Slopin Island, close to Marine Protected Areas and the habitat of critically endangered red handfish.

Tamar

Aquaculture is presently based around shellfish leases in the lower reaches of the river.

East Coast

This is presently limited to a new farm at Okehampton. Coming after the Macquarie Harbour issues, this represented a break from the past. Usually, new marine farm proposals rarely attracted widespread opposition. This farm proposal attracted strong opposition from residents and became a rallying point for some environmental groups.

I looked and looked but couldn't find any "no-grow" areas. It makes more protected zone (rec fishing allowed or not) just to keep these impacts away from areas that might have some other values. I don't know, maybe the marine environment has its own intrinsic value as an unmodified environment, or even for other recreational activities, especially in closed waterways?

Current active expansion proposals (per DPIPWE website)

Storm Bay

aspirations for a total production from Storm Bay of 80,000 tonnes per annum. [I suspect this is a media driven Government target and I wonder if the companies even think this is achievable. Looks like think of a figure then double it media headline approach]

"robust scientific information is not currently available to predict the environmental effects of this level of production"

40,000 tonnes per annum is being considered instead in the environmental impact statements that support planning processes. "This is similar to the level of production achieved from the Huon River and Port Esperance, and D'Entrecasteaux Channel marine farming development plan areas combined".

The Government's intention is that the proposed developments would be managed under an adaptive management framework (figure 2), underpinned by:

A staged development approach, with an initial limit on feed input[1] that would provide for approximately 30,000 tonnes of production

A comprehensive environmental monitoring program

The development of a biogeochemical model, to help to understand the information provided by the environmental monitoring and the effects of any changes to farming operations in the region.

[IMHO this is a 'suck it and see' approach, or less generously a 'stock it until it breaks' model, similar to the one that failed at Macquarie Hbr, although Storm Bay is a much less sensitive system]

The Environment Protection Authority has indicated that, should the proposed developments proceed, feed inputs will initially be limited to provide for approximately 30,000 tonnes of production annually. This staged approach towards 40,000 tonnes of annual production would provide the opportunity for assessment of environmental responses.

An increase in production within the proposed areas beyond 40,000 tonnes would be subject to a separate assessment process. This would be informed by the proposed environmental monitoring program, which will collect data on environmental performance indicators to provide an understanding of interactions between salmonid farming and the receiving environment. This information will provide a robust framework to detect localised, intermediate and ecosystem level changes, enabling appropriate regulatory responses.

In addition, the monitoring program will provide for the development and validation of a biogeochemical model for Storm Bay. [shouldn't this happen first or at least we need a lot of baseline info, including on hydrodynamics, sensitive species, etc.]. The model will estimate natural assimilation of salmonid derived nutrients at varying spatial and temporal scales relative to specific biomass output. This will inform adaptive management by forecasting the potential environmental impacts of salmonid farming in Storm Bay. The model will be developed in collaboration with CSIRO and the University of Tasmania's Institute for Marine and Antarctic Studies (IMAS). Development of the model is expected to commence in conjunction with monitoring. [is that after pens are in place and the cost of rolling back approvals is higher]

ACTING ON AND ADAPTING TO A DEGRADING ENVIRONMENT

Oceans for the Gardening person

If all that is left to do these days is short walks with your partner, reading and garden appreciation, a variation is to go over to the 'wet side' and try to get some appreciation for plants by reading about their role in the natural (marine) world.

Seaweed researchers plant kelp tolerant of warmer waters

Source UTas

Five hundred kelp plants have been transplanted to 28 artificial patch reefs at seven metres depth in Mercury Passage between Maria Island and the Tasmanian mainland, in an experiment to test the resilience of kelp to global warming are flourishing after almost five months in the water.

It is thought to be the first time an experiment of this size has been conducted anywhere in the world.

The kelp, *Ecklonia radiata*, occurs throughout the cooler waters of Australia and the underwater forests it creates support highly productive and bio-diverse ecosystems.

"*Despite winter being the time when everything slows down in the water, the reefs are teeming with life*," researcher Cayne Layton reports.

A healthy understorey environment is important because it is habitat for smaller animals like shrimps, molluscs and juvenile fishes and crayfish. The understorey is also where juvenile kelp spores settle and spend the first part of their lives.

The project will also assess whether remaining individual healthy giant kelp plants along Tasmania's East Coast have survived due to greater thermal tolerance and, if so, whether they can form the basis for both restoration.

More than 95 per cent of the giant kelp forests that once dominated Tasmania's East Coast have been lost as a result of climate change.

"The primary driver of the decline in our giant kelp forests has been the extension of the East Australian Current (EAC) into Tasmanian waters as the ocean climate in eastern Tasmania warmed," Professor Johnson said.

"Giant kelp has suffered due to both the higher sea temperature and the nutrient-poor water that the EAC has delivered.

"Over just a few decades the extensive, rich and dense kelp forests that were once an iconic feature of the east coast have been reduced to a few isolated patches.

"our study aims to establish whether there's any chance of restoring these important marine communities by identifying individual giant kelp plants that may be genetically better adapted to warmer sea temperatures," Professor Johnson said.

"Giant kelp were the foundation for marine communities along much of Tasmania's East Coast, creating complex habitats that

once supported key species of conservation or commercial value, from weedy sea dragons to rock lobsters and abalone," Dr Layton said.

"Active restoration of these now degraded and disappearing habitats represents a potential approach for conservation of giant kelp forests while at the same time offering new commercial possibilities.

"This study is essentially a pilot project that could lead to a much larger piece of work if we establish that there is the potential for restoring giant kelp," Dr Layton said*.*

Researchers believe the surviving 5 per cent of kelp is tolerant to warmer waters.

Salmon producer Huon Aquaculture has joined the campaign and marine manager Adam Smark helped build some small trial platforms for the kelp in southern Tasmania.

"While the kelp hasn't yet been in the water long enough for really significant growth to have occurred, we are looking forward to the day when hopefully the giant kelp finally reaches the surface at our Storm Bay lease," he said.

Crowdfunding for the project has been organised by The Climate Foundation together with sustainable travel company, the Intrepid Foundation, and the documentary 2040. The crowdfunding exercise, reached its first goal of $350,000 in four months. "To continue the project's success, we set a new goal to raise an additional $250,000 to scale the project, continue restoration research, and to trial marine permaculture systems offshore in Tasmania's Storm Bay.

Fish farm seaweed farming

This project has come at the same time as new seaweed aquaculture discoveries that allow kelp seedlings to be reliably produced in hatcheries. Tassal, is investigating native kelp plantations on its aquaculture leases, to help to offset increased nutrients in the water as a result of Atlantic Salmon production. Craig Sanderson says it is the lack of biologically available nitrogen that most commonly limits the growth of kelps and seaweeds in general. His earlier research indicated that nitrogen originating from fish pens is quickly dispersed in the water column. It is difficult to detect any elevation in nitrogen levels more than 100 metres down-current of fish pens. *"So if kelp is grown next to pens, the front few rows might benefit from additional nitrogen, but as you move further away there would be less benefit,"* he says.

Of more than 1000 seaweed species native to Tasmania, just three have been identified as potential candidates for Tassal production: Giant Kelp (Macrocystis pyrifera), Golden Kelp (Ecklonia radiata) and Tasmanian Kombu (Lessonia corrugata).

Kelps have a microscopic stage in their life cycle, known as the gametophyte. Gametophytes can be grown in the laboratory under red lights. Culturing provides an ongoing supply of seed stock, instead of removing plants from the wild.

Blue light or white light can be used to trigger reproduction.

The kelp is seeded onto either one-millimetre or three-millimetre twine on rope. The ropes are set into the water similar to that used in mussel production. For the past three years, kelp has been set out on longlines at sites including Okehampton Bay, D'Entrecasteaux Channel, Port Arthur and Dover.

Currently March and April appear to be the best times to take advantage of winter and spring growth. Summer planting trials demonstrated minimal production and were subject to fouling and nutrient stress. Craig Harvesting is expected to occur in October when the plants are at their peak. The 2018 trial mostly used two different subspecies of Giant Kelp. One has come from northern Tasmanian waters, which Craig Sanderson may indicate it is more tolerant of warmer water conditions. Both subspecies successfully produced a harvestable quantity of seaweed. Tasmanian Kombu was also successfully cultivated "We're now at the stage of

managing the crop to optimise growth and the quality of the product."

The seaweeds are closely related to the Japanese species widely cultivated throughout Asia, usually on longlines

Giant Kelp is the most easily cultivated and fastest growing of the three species. It has existing markets for human consumption, for the production of alginates, in fertilisers and in aquaculture feeds. It is also being assessed as a potential source of fucoidan – an antioxidant and anti-inflammatory chemical extracted for use in nutraceutical products.

Among the problems have been warm water temperatures, big swells, and flushes of freshwater affecting growth. Wild mussels and other epiphytes have colonised some of the kelp longlines, smothering the plants.

A farm-scale trial designed to produce commercial quantities of seaweed for specific markets is now proposed for 2019. "Nitrogen uptake is one benefit for Tassal, but the seaweed will also need to pay for itself as a crop," Craig Sanderson says.

Heavy metal content will be determined, as well as naturally occurring iodine and inorganic arsenic; two elements of particular concern in seaweeds generally.

While developing propagation techniques, more plants have been produced than are needed for the trials. The excess Giant Kelp seedlings in particular have been made available to see if the species can be re-established in areas where it has disappeared.

Life without kelp in a warming world

Source: ABC news

In the past, Giant Kelp forests on the Tasman Peninsula rose 20 metres or more from the ocean floor. Eaglehawk Dive Centre at Eaglehawk Neck on the Tasman Peninsula once did brisk business showcasing the spectacular sight to visiting divers. But the forests have disappeared from the peninsula over the past decade, largely as a result of warm waters from the southward extension of the East Australian Current. Giant Kelp is now listed as a threatened species. Dive centre owner Michael Baron has secured some experimental permits and replanted two sites where the kelp forests were once thick. Seeded twine obtained through the Tassal program is wrapped around bricks, which form a substrate for the growing plants. With plantings in three consecutive years, some Giant Kelp has already reached up to six metres, offering positive signs that replanting of some areas may be possible.

"When we first started [the dive centre], giant kelp was everywhere, all along here, in any little alcove [it] was so thick, you had to part it with your hands as you were swimming," Baron says.

"We still get calls [from people saying], 'oh. I'd like to come down and [see the kelp forests]'."[We say] 'well sorry, it's all over'. "It's gone effectively forever … it's pretty depressing to say the least."

"In December of 2015 the temperatures along here were about 14.5 degrees [Celsius], within two weeks, its hard to believe, it jumped to over 17 degrees," Baron says. In the ocean that's a massive change, it was a shock to the system." By April there was nothing left. Nothing. Not a single strand of kelp was left."

Canadian marine biologist Kira Krumhansl *"What's happening in Tasmania is a demonstration of what the future of kelp forests might be in other regions that may not have warmed quite as fast or to the extent that Tasmania has."*

According to scientists the sea surface temperature off Tasmania's east coast is warming at a rate of 2.3C per century —four times the global average.

24 regions in the world that are considered ocean "hotspots" — known as a body of water in the top 10 per cent of ocean warming. She says eastern Tasmania is "at the pointy end" of the scale, and says other hotspots include the waters off the south-west of Madagascar, the Galapagos Islands, the Arctic Circle and the south western tip of Australia.

reef ecologist with the Institute for Marine and Antarctic Studies Scott Ling says. *"People the world over are looking to Tasmania to understand the changes that may already be happening in their backyard."*

Despite being known as the gateway to Antarctica, Tasmania is now home to reef-building corals that have made a home in Bass Strait.

"What we're seeing is these really interesting changes that confirm our suspicions about how warming is going to completely transform temperate reef systems into something more like a coral reef," Ling says.

The warmer currents that have moved south from New South Wales have also caused long-spined sea urchin populations to explode on Tasmania's east coast.

The spiny creatures have wreaked havoc on the delicate underwater world, devouring kelp forests at a rapid rate and stripping the sea floor of any life — leaving desolate urchin barrens in their wake.

Scientists predict more than half of Tasmania's east coast will be nothing but bare rock in future years if climate change doesn't abate.

"It is a challenging time but a key message out of this is an ounce of prevention is worth a tone of cure," Ling says.

"Very small changes in temperature can have a massive impact on an ecosystem and as the temperature's been creeping up it's now crossed this critical threshold for the biology," Ling says.

Despite the outlook, Ling says he's hopeful that with careful, ongoing management, a resilient underwater landscape can be created.

"If we can better manage the habitats that underpin these fisheries and the biodiversity of these areas then we're doing what we can locally," he says.

"What we've learned here in Tasmania and the world over is we actually need to throw out the textbooks from back in the day and relearn these ecosystems." "Tasmania is certainly helping to lead the way in those efforts," Kira Krumhansl says.

"*There really is a huge powerhouse of research going out of Tasmania that has done a fabulous job of highlighting the mechanisms behind the losses and working to develop solutions."*

Billion-year-old seaweed fossil found

Virginia Tech

The Proterocladus antiquus seaweed lived about 1 billion years ago. Its remains were found in rock dug up near the Chinese city of Dalian. Proterocladus is 200 million years older than the previous earliest-known green seaweed.

The seaweed was about the size of a rice grain and grew in shallow water. It carpeted areas of the seafloor.

It engaged in photosynthesis, transforming energy from sunlight into chemical energy and producing oxygen just like modern plants. One of its modern relatives is the common Ulva, or sea lettuce.

There was an evolutionary shift on Earth perhaps 2 billion years ago, from simple bacteria-like cells to more complex fungi, plants and animals. *Proterocladus antiquus* is a close relative of the ancestor of all green plants alive today," lead report author Qing Tang, said.

The first land plants, were thought to be descendants of green seaweeds, appearing about 450 million years ago.

Multicellular plants like *Proterocladus* paved the way for the plants that have inhabited the world since.

Red seaweed and farting cows

South Australia plans to commercialise seaweed aquaculture as quickly as possible. South Australia wants to establish itself as the flatulence busting centre for the production of a red seaweed that helps to reduce methane emissions from cattle.

A pilot trial underway is focused on *Asparagopsis armata* and *Asparagopsis taxiformis*, both native to Australia (but from Queensland). *Asparagopsis* has methane-reducing properties. When included as 2% of the stock feed, seaweed has been found by the CSIRO to significantly reduce methane created during the digestion process. Chemicals in the algae diminished the microbes in cows stomachs, reducing the amount of the gas.

Associate Professor Nicholas Paul from the University of the Sunshine Coast said if enough of the algae was grown it could reduce greenhouse gas emissions in Australia by 10 per cent.

With 1.3 billion cows globally, even in full production, South Australia would meet only a small portion of the potential demand. The livestock farming sector is the third-largest source of greenhouse gas globally after the energy and transport sectors.

Project partner CH4 Global (a proponent) says red seaweed could be worth $140 million to SA within three years if commercial production systems and processes can be established. They say revenue from processing the seaweed could add a further $250 million per year to the state's economy and support 1200 jobs.

Strategic locations within existing underutilised aquaculture zones have been identified and approved for seaweed production. Farmed abalone and tuna operators have made lease space available for the first trial plots in the Port Lincoln area and the first seaweed-related infrastructure was installed in February. Mussel, oyster and kingfish farm operators are also considering how they might be involved.

Westland contacts

One thing that struck me in New Zealand were the reminders of past Trans Tasman contact. It was especially noted on the West Coast where the gold rushes saw a big transfer of population from the goldfields of SE Australia to NZ. I ran into a couple of people who wanted to tell me about their great grandfather, the Australian miner. Place names in NZ also pop up in Tasmania, and lots of the Tasmanian shipwrecks beloved of local divers are NZ vessels with evocative NZ names like Kawatiri and Karamu. I decided to rerun an old article on Tasman shipping connections with the West Coast.

The "Emma Kemp"

This small walnut-like vessel circled the globe under the command of Australia's least known and most adventurous captain

Early colonists in Australia began to build small wooden vessels from local timbers. Little cutter-rigged boats with bluff bows and square sterns were popular. They were cheap to build and could be crammed with a surprising amount of cargo.

The "Emma Kemp" was built in Sydney in Feb 1827 by shipwright Robert Dryborough Cunningham and a sailmaker and free settler named Richard Kemp. The cutter was named after Kemp's daughter.

The entrepreneurs loaded her up with whatever could be sold at a profit and traded around south east Australia, especially between the 'big' settlements of the time, Sydney and Hobart.

In July 1827, nine escaped convicts took to a small boat with the intention of seizing the "Emma Kemp" while at Hobart. In the meantime the alarm had sounded back at Hobart Goal. Soldiers guessed where the convicts were headed and as the escapees approached the cutter, they were challenged by an armed guard. The convicts fled and landed at Sandy Bay, robbed a hut, then proceeded to South Arm and robbed more settlers. They loaded up with guns and became bushrangers. It wasn't long before they were recaptured. Six hundred convicts were lined up to witness them being executed by hanging.

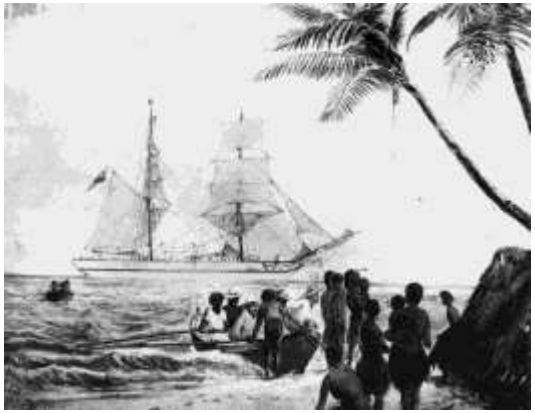
She traded with New Zealand. Seal skins from the southern coasts, spars from Hokianga, flax and pork and potatoes, she went wherever a few tons were offering. Kent shipped them across the Tasman for his Sydney employer, Francis Mitchell. He had a shore base at Koutu Point, Hokianga

The *Fairy* and the *Emma Kemp* sailed from Sydney in February, 1830 bound for Preservation Bay in N.Z. They returned to Sydney after four months seal hunting with a cargo of 113

seal skins, 8 tons of flax and 4 tons of pork.

Captain John Stein, was one of the "most romantic marine figures in the young Australasian colonies". He was born in Australia in 1810 and had taken command of his first vessel at only twenty. He had taken the brig "Dragon" over to N.Z. and picked up 100 barrels of oil.

In June 1832, he had taken the small Tasmanian barque "William IV" to New Zealand and explored between Queen Charlotte Sound and Cloudy Bay. He got on well with the Maoris and took Tamoc, Ahuda and Chewack, on a visit to Hobart Town. He later took them back home on another voyage.



About the end of 1832, Captain Stein, then a young man of only 22 years of age, embarked on his biggest adventure, as master of the "Emma Kemp". Perhaps desperate for a profitable voyage, Hobart merchant William Orr came up with the idea of a premium cargo of coffee and tobacco. Stein must have offered to go to Rio De Janiero, eager to make a name for himself despite the fact that the "Emma Kemp" was too small for such a hazardous voyage. He managed to find 5 young Tasmanian seamen who were crazy enough to go with him.

On his outward journey he called in at Cook Strait and met the Sydney cutter "Lord Liverpool" and then sailed to Rio de Janeiro round Cape Horn. The voyage would have involved a very long journey across the largest and emptiest expanse of water in the world. Starvation, scurvy and storms must have made it a grueling expedition, but no journal was kept by the captain.

At Rio the "Emma Kemp" took in a cargo. On 14th April 1833, the little craft left Rio on the return journey. Following the trade winds she returned to Hobart by way of the Cape of Good Hope. She reached Hobart on 12th August. The papers did not record any details of the voyage, perhaps trying not to encourage these young upstarts. It was only much later that the voyage was recognised as "probably the most daring circumnavigation of the Globe ever undertaken by an Australasian captain".

Stein moved on to bigger and better things as the captain of several different whaling vessels. On 12 December 1840, about thirty-five miles east of Woodlark Island, he ran into a huge cyclone that swept the helpless vessel on to a coral reef. Natives attacked the survivors, killing Captain Stein and his crew. Only one crewman survived.

Meanwhile, the cutter "Emma Kemp" was having a less adventurous career under several masters. As larger vessels became available for intercolonial trade, she was relegated to Tasmanian coastal waters, running supplies to outlying settlements.

By the end of her career, the "Emma Kemp" had been converted into a schooner of 67 tons. On 23 June 1840, the schooner anchored at Waubs Bay (Bicheno) on the Tasmanian east coast. While getting underway the following morning the wind died away, the anchor would not hold and the vessel drifted onto rocks and sank. The crew escaped with some difficulty.

So ended the career of one of the smallest, least remembered and most adventurous small vessel in Australian history.

Hokitika

Thousands of gold prospectors flocked to the West Coast of NZ in the 1860s. Unsuitable though it was, Hokitika was established as a port at the mouth of the Hokitika River. It imported miners from Australia and exported gold. Between 1865 and 1867 there were 108 strandings with 32 total losses as vessels attempted to navigate the hazardous river.

At one point Hokitika was described as 'a suburb of Melbourne', such was the level of migration from the Victorian goldfields.

A modern memorial to the shipwrecks of Hokitika is the only remaining visible sign of all those lost vessels.

The river still throws up thousands on tons of debris onto the beach, in the form of fallen trees, which the locals have transformed into a sculpture park.