



JUNE 2019

Ecological Impacts of Artificial Marine Structures

By
Brenton Smith



Like it or not, all persons who use boats, and particularly cruisers who tend to have larger boats, are intimately involved with artificial marine structures, including of course, the boats we cruise in, and where we moor them.

At the May Cruising Group dinner, Dr Martino Malerba enlightened 47 of us about our marine environment in a very entertaining presentation. Martino is a post-graduate marine biologist at Monash University who stood in at the last moment for the leader of the marine biology team, Professor Dustin Marshall.

Increasing population pressure from the global movement of people towards the cities on the coastlines of world continues to put pressure on the marine environment. Currently 40% of the world's population lives within 100km of the coast, and in developed countries up to half of the waterfront has been modified.

Martino showed us two graphic photos representing cause and effect in the marine environment. The cause photo showed some of the massive ports that are an essential part of the globalisation of trade; and the effect photo showed the steadily decreasing volume and size of the fish caught in fishing competitions off the coast of Florida during the preceding decades.

The research work of the marine biology team is focused on Port Phillip Bay, which is compared with the results from work previously done by Prof. Marshall in Moreton Bay. The concepts being explored in these two locations easily extend to a global scale as shown by Martino as he explained the changes that are being observed on a global scale.

At the base of the marine eco-system is the source of all marine life – phytoplankton, which are tiny multi-cell organisms that absorb CO₂ from the water (and ultimately the air) and through that wonderful process of photosynthesis can use the carbon to create cellular mass, i.e. survive and reproduce. The oxygen from the photosynthesis is liberated into the water and eventually into the air. In fact, due to the vast size of the oceans relative to the land mass, the CO₂ absorption and O₂ liberation by the phytoplankton is essential for all organisms on earth that cannot use photosynthesis to fix carbon.

This process of absorbing sunlight and converting CO₂ is how energy is added to the marine environment from sunlight. The marine biologists call it bioenergy and more is better for the health of the marine eco-system. As shown on the diagram below, all the parts of the marine environment that we like to see, appreciate and sometimes eat, rely on the bioenergy that is delivered by the photosynthesis in the phytoplankton .

When we build marine structures, and our very own pier is an excellent example, two negative effects occur. First is the shading that reduces the area of photosynthesis thereby reducing the production of bioenergy by phytoplankton, and second is that the columns of the piers provide the perfect place for various molluscs to proliferate, which otherwise would not exist. The molluscs, in turn, consume the phytoplankton, which is then not available for other marine organisms to use, organisms that have otherwise evolved to have this source available – think fish.

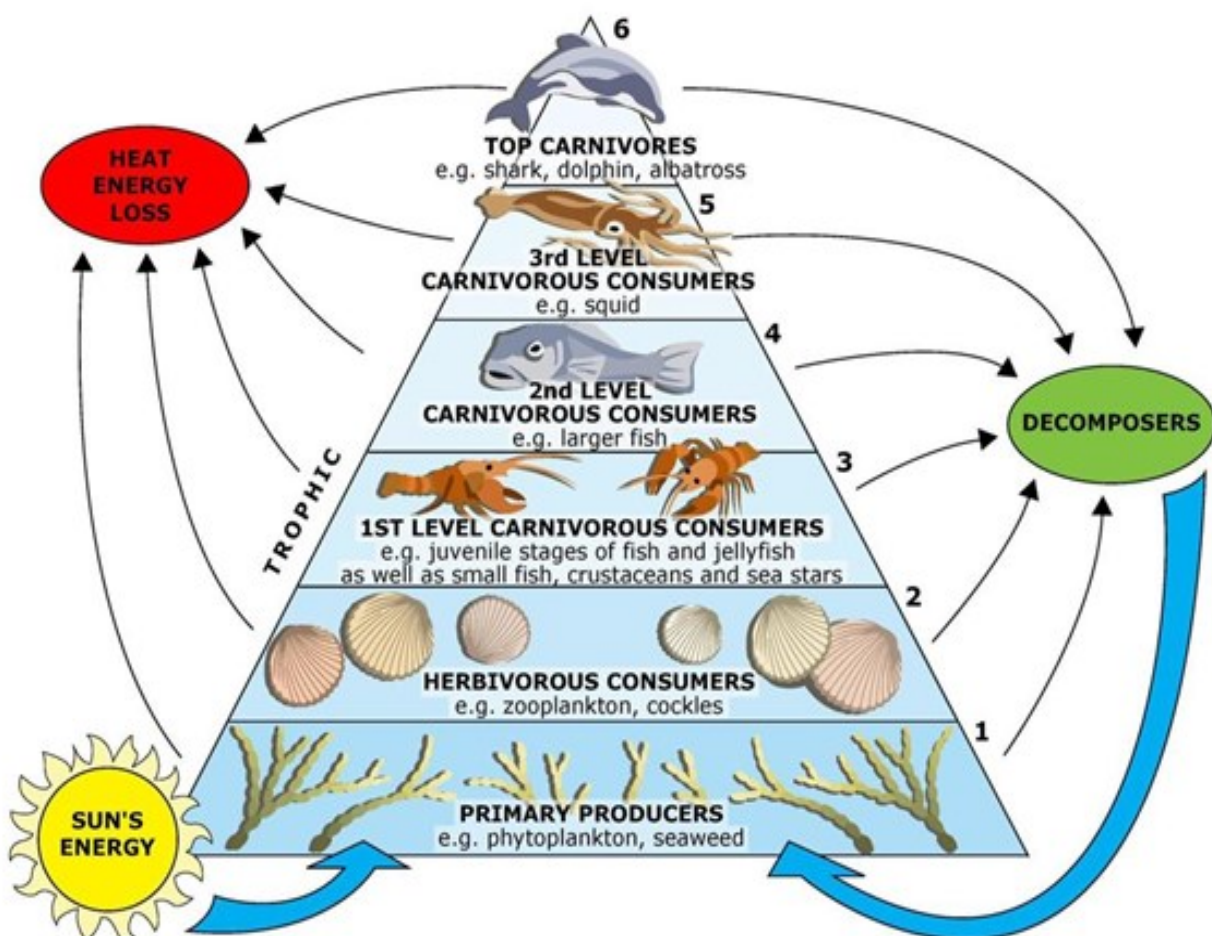
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However, as always in complex eco-systems, it is not all bad. The molluscs, including the vast mussel farms that we have in the bay, act to soak up enormous amounts of nutrient pollution that flow into the bay every time it rains. This is the run-off of the fertilizers that we add to the gardens and farmlands around Melbourne, and the detritus of the innumerable dogs that live with us. The presence of the nutrients prompts rapid reproduction of the phytoplankton, and without out the molluscs thriving on the marine structures, the bay would be one massive algal bloom .

The power of microbiology was something that I did not appreciate before Martino's presentation. The life of a microbe, the phytoplankton, is typically a day, which means that within a week it renews itself seven times. The rapid adaptability of the phytoplankton courtesy of the short lifespan ensures that they can keep up with the changes in their, and our, environment. But they do need sunlight, and the organisms further up the marine eco-system do need less competition from the voracious molluscs so that they can flourish. After all, we would rather eat fish and admire manta rays than eat the ubiquitous Cirreperia, otherwise known as barnacles, and I have yet to meet a boatie that admires them.

An inevitable conclusion – we do need more research into the impact of our structures on the incredibly complex marine eco-system that is so much of our cruising lifestyle. If you are on the marina on a Monday you may see one of Professor Marshall's team collecting samples as part of their ongoing research. RBYC is a strong supporter of the work and we look forward to hearing more about it in the future.

Energy Cycle in the Marine Eco-system



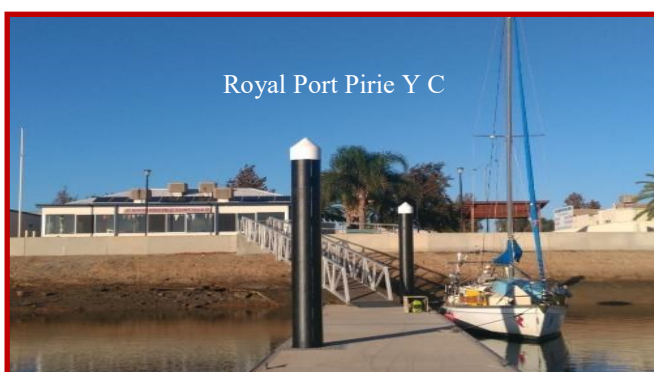
CRUISING NEWS JUNE 2019

HANGING ABOUT SA – PART 1 *- by Allan Haddow*

I spent two weeks in CYCSA marina organising a new No. 2 genoa for \$2k, replacing the original Bosch starter motor with a new Quantum Pro make (never heard of them before) for \$500 plus \$300 to install & meeting various cruisers & other senior members of the local community. The seniors meet each Friday lunch time for a sausage sizzle. Most have known each other since their school days. There are no females in the group which is just as well due to some language I had never heard of before. I was talked into a sail shape & am very annoyed with myself. The clew is way too high & makes it difficult to pole out. So middle of March I left for the 87nm motor sail past Glenelg, across Backstairs Passage & onto American River, K.I. arriving at 0815hr & picked up a mooring. When there was no wind it was very peaceful. Wind against tide is not so good the heavy mooring buoy always hit the boat until I found a way to lift it.

After a week it was time to move to Penneshaw marina to stock up on water & fuel & to shelter from some stronger northerly winds. This marina is very sheltered in most winds but has a shallow entrance of 2m at low tide. Staying for more than 8 days, the rate is \$20/day. I stayed 10 days then headed off to Kingscote where I anchored in front of the town centre, rather exposed from south to east to north so after 3 days moved into Bay of Shoals, again with tidal movements & wind, but no waves. After a month out from Adelaide I sailed to Port Lincoln where I picked up a free mooring. I like Port Lincoln, but after 4 days it was time to sail the 140nm to Whyalla arriving at exactly midnight Thursday 18-04-19. The cost is \$66/week with supplied water, electricity, and dust.

There was a yacht club many years ago, but no young people have kept it going. The 40y.o. floating pontoon is being demolished beginning of June this year to make way for a new one. There are 30 berths with 5 spare berths. Most vessels are derelict & have not moved for many to Port Pirie where I am currently tied to a new floating pontoon for free (with no water or electricity) in years. Brenton built one yacht which is still floating but derelict. The marina basin is very sheltered, although exposed to wind above the wall & dust. The steelworks are in operation & barges are used to transfer iron ore from shore to ship anchored some 2-3nm out in the Gulf. The ships draw too much to tie up to the wharves. I never had time to visit the Maritime Museum before heading front of Royal Port Pirie YC. I will exchange Burgee's. I will stay here for perhaps two weeks before heading to Port Augusta.



Cruising North. A brief guide to Moorings and Munchies

The Lakes, Eden, Port Hacking, Sydney, Broken Bay, Tuncurry and Pt Macquarie

John Walker

Of course, the Victorian and NSW coasts from Lakes Entrance to Pt. Macquarie is a path frequently sailed by cruisers and racers, and guides to ports of call along these sections of Australia's coast abound. This article seeks to provide up to date information as of mid 2019, on selected anchorages and ports and most importantly and as a point of differentiation, comment on the local eateries and dining spots. Of course, you will not have left Victorian waters without a copy of "Cruise Victoria" by CYAV and "Cruising the NSW Coast" by Alan Lucas – both indispensable. We sail a catamaran with 1.4m draft, so some areas will be tricky for monohull yachts with say a 2m draft or greater. We discovered some truly excellent cafes and restaurants, local gems, but also often found those that were judged mundane and such places were passed over. Prices were noted to increase gradually as we sailed up the coast, and from Sydney northwards a good restaurant will charge \$5-\$15 more for a main meal when compared to prices in Melbourne. It must be stated that no money changed hands for inclusion in this article, although that's not a bad idea! Happy sailing and spoil your self every once in a while with a memorable meal.

The Lakes

For those who haven't sailed the Gippsland Lakes, this large area of protected waters is a delight. In the past the entrance to the Lakes had a bar with a terrible reputation, although recent dredging and break-walls have modified that to some extent. Nevertheless, beware in rough weather, especially if from the SE through to SW, and if the Lakes are flooded so that there is an outflow at the entrance. Please refer to the excellent "Cruising Victoria" by CYAV and Andrew Garrett for very comprehensive charts, details and advice. It must be said that many of the channels in the Lakes have sections only 2.5m to 4m deep, but the bottom is usually sand and there are few real dangers. Jetties abound providing easy tie-ups and mooring, especially right in the towns. There is minimal less tide, less than on Pt Phillip bay, so life is easy tying up to a fixed jetty.

Eateries: There are three that stand out, and in no particular order:

1. The Metung Pub – that provides a large jetty for use by its clientele, average to good pub grub and often has live bands especially on weekends.
2. Sardine at Paynesville, now this is a smart restaurant that does very good food for lunch and it works even better at dinner.
3. The trawler at Lakes Entrance – direct from the boat, purveyors of lovely fresh unfrozen Lakes prawns.

They may not be as big, but are sweet and fresh the equal of most available in Queensland

Eden

Twofold Bay is quite large and a rather busy fishing port and a common stop off for cruisers from the south after rounding Gabo Is. It has basic on shore amenities at the wharf and compared to other ports it isn't that user friendly with only 1 pier of 3 recommended for use by cruisers. Eden is installing mooring for cruise ships, to which the pier to the South East is dedicated and 2 or 3 tugs take up room on the other 2 piers. Of these, the one to the NW (port side coming in) is for casuals, but this pier is high, the piles are barnacle encrusted and ladders are few, necessitating a possible climb and scramble onto the pier.

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Eden

Tides are over 1m so at low tide it can be tricky if not next to a ladder. If possible, raft up to a trawler, another yacht, or easiest of all, anchor out beyond the boats on swing moorings. Dinghy access from anchoring is easy via a low landing close to shore on the NW side of the pier. The main street and town are a pleasant 1 Km walk on a path, although be warned it is partly uphill.

Eateries: Those in the town itself are middling but try Sprout for coffee or brunch at the far end of the town. If live music is your thing, the Fisherman's Club may be worth a visit on weekends. By the docks the pick for food for dinner is Drift, located upstairs. It is fully licensed and does good cocktails and recommended is the better than average smoked meats and smoked seafood platter – smoked local mussels and gravlax were excellent, as was carpaccio of tuna on soba noodles. In calm weather or from the S, you could anchor off Boyd Town on the other side of the bay to Eden town and dinghy ashore and try the Seahorse Inn – apparently with 2 notable restaurants specialising in local seafood.

Pt Hacking

Further up the NSW coast and a favourite of ours, with a great sheltered anchorage just inside the Pt Hacking entrance at the lovely Gibbon Beach. Here there are some public moorings provided, but it's a popular spot and they're rarely vacant. Anchoring is easy in clean sand. However, beware weekends in swimming weather, when Gibbon beach is overrun by the plastic fantastics from the Pt Hacking inlets. Alternatively, marina facilities and comprehensive shopping are close at hand accessed via the narrow but deep channel and up the first arm to starboard, the Gunnamatta Arm. At the head of the arm, 1nM north is the friendly Cronulla marina. This has a superb location, being 200m from Cronulla station and 250m from a full range of shops and restaurants.

Eateries: In Cronulla the C.C. Babcock restaurant is outstanding. Very very smart bistro food and a good wine list, at reasonable prices for what is a suburb of Sydney. Recommended is the slow cooked lamb and crispy crackling roast pork. Try one of the Hunter Valley semillons - we don't often see them in Melbourne

Sydney: Blackwattle and Rozelle Bays

Located on the west side of the Harbour Bridge, head down towards Darling Harbour but stay to starboard and motor under the spectacular Anzac bridge. What a place to anchor, but you must anchor in designated zones. If no room remains in Blackwattle Bay then consider anchoring around the corner in Rozelle Bay – it's only about 300m further from the fish markets. Rail stations can be accessed nearby – simply lock your dinghy to the public jetty near Blackwattle Bay point. Walk to Glebe Station, or Wentworth Park station in the suburb of Pyrmont.

Eateries: There are many in the area but of note are.

1. Sydney Fish Market – Food 6 stars – including a range of oysters, live southern lobster (cray?), live mud crabs live coral trout, a range of sashimi and a huge selection of fresh and cooked seafood. You can BYO wine and eat there, although the ambience is only maybe 3 stars. We found it far better to dinghy to the market and bring prize purchases back to the boat. Be warned, you are not supposed to moor dinghies at the market pontoons, only drop off.
2. Bellevue Cottage by Antoine. 5 stars. French bistro run by French owners, set in a heritage listed cottage located in Blackwattle Bay park, which is separating the 2 bays. To reach it, dinghy to the public jetty near the point. Superb food and wine list too – many French wines unusual to Australia. Very very good coffee and desserts.
3. The Boat House on Blackwattle Bay – superb views over the city and Blackwattle bay. We didn't eat there but it looked tranquil.

Broken Bay

Broken Bay is comprised of 3 main bodies of water – Pittwater, the Hawkesbury River, and Cowans Creek arm. Approaching from the south, on rounding Barrenjoey headland capped by the truly beautiful sandstone lighthouse circa 1880, one enters Broken Bay. The term Broken Bay is often thought to refer to 3 main arms – Pittwater running to the south, the Cowan Creek Arm that runs to the SW terminating in Bobbin Head marina and straight ahead to enter the Hawkesbury River arm. But there is a 4th arm, little used by cruising yachties. This is known as Brisbane Waters and extends from Broken Bay to Ettalong township and then up to Woy Woy and Gosford towns. Mast height usually restricts yachts past Ettalong village

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Pittwater - Palm Beach

Barrenjoey Head is a distinctive landmark going north and Pittwater is to port around the headland with Palm Beach at the northern end of Pittwater. Anchoring is easy off a gradually shoaling beach, outside the moored yachts and small boats on swing moorings, taking care to stay out of the ferry access channel. Access to the village is by dinghy to the beach. Palm Beach is one of the more upmarket areas of greater Sydney, it's similar to say Portsea if that genteel place was a suburb of Melbourne.

Eateries:

1. The Boathouse, Palm Beach. Next to the golf course, a casual place with good food and coffee. Also sells some produce. Either anchor at the very northern end of Pittwater or anchor off Palm Beach village – say just south of Observation Point and dinghy to the golf course and walk.
2. Barrenjoey House. This is a notable 4 star hotel with a top restaurant, set in a 100 year old Georgian listed building, the whole given a complete refurb in 2018. Worth a visit for lunch or dinner.
3. Pronto Creative Foods – 1095 Barrenjoey Rd. Really just a café but worth a short walk from the village, very good for lunch and great coffee

Brisbane Waters.

The entrance to Brisbane Waters is on the north side of Broken Bay, following the shore line north of Box Head and Little Box Head via a well-marked channel. Superb protection in N winds with multiple anchorages.

The channel at low tide has sections 2.2m to 2.5m deep – so enter on a rising tide is best, unless you have shallow draft or are a catamaran. This area is well described in the Alan Lucas bible. Now Pittwater has the same tide times as Sydney, but Brisbane waters are 1 or more hours later, with an overrun of 30 mins to 1 hour depending on local conditions. The current can run at 3-4 Kts in the channel.

Motoring the short distance to Brisbane Waters gives access to Ettalong, Hardy Bay, Pretty beach and Kincare and up to the Rip Bridge. These provide superb all-weather protection. The well marked channel at low tide has sections that are 2.2 to 2.5 meters deep (lws) – so enter on a rising tide is best. While Pittwater has the same tide times as Sydney, Brisbane waters are 1 hour later, with an overrun depending on local conditions.

The cute village of Ettalong has no real attraction, except it makes a great place to anchor in a northerly blow, while waiting to proceed north. In hot weather swimming is safe here from bities, whereas Pittwater and the Hawkesbury are not, being bull-shark playgrounds. Ettalong has the usual supermarket, licensed grocer (old name for a purveyor of grog), baker and the typical NSW pie shop. Now if you have a deep keel vessel and don't want to try the channel, a visit from Palm Beach village is easy to arrange by taking the local Palm Beach to Ettalong ferry, which runs at 60 to 90 minute intervals day and night.

Eateries: The Box on the Water. This is a very nice restaurant for either lunch or dinner. It is in a purpose-built restaurant right on the water's edge, with great views back to Broken Bay. This place I would rate at 4 stars, with local seafood and meats, and is worth going out of your way to visit.

Also worth a mention is the Fat Goose at Kilcare, with good sour dough bread and pastries.

Tuncurry Forster

This makes a great stop off while cruising N or S, with no or little bar – usually the bane of NSW river entrances and can be entered at any tide. Head for the northern side and take the Tuncurry channel, which has all weather public moorings and shore side docking. 2 pink public mooring buoys are provided just before the bridge. Anchoring is possible out of the channel next to a sand bank which dries at low tide if the moorings are taken. Shore side mooring platforms can be booked at the Tuncurry Fish-Coop. Tidal flows can be 4 kts, with about a 2 hour overrun to the quoted tide times.

The town has a pleasant swimming beach off the entrance walls which is netted, whether to keep the bull sharks or the blue bottles out is not clear – perhaps both. There are the usual array of small town shops and even a cinema.

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Toncurry Forster

Eateries:

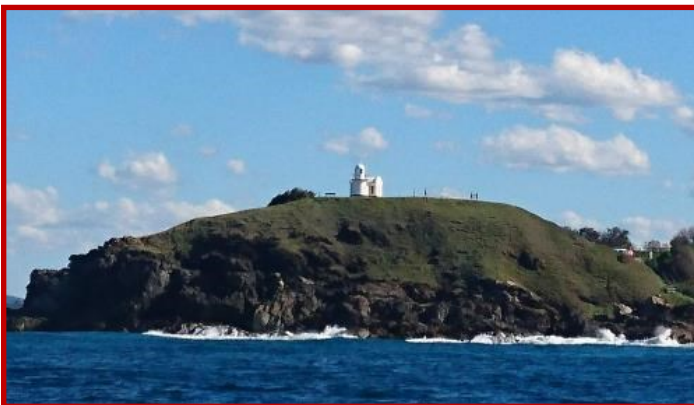
1. Hamiltons. This is a real find. On the Tuncurry side. If you are into oysters, then this is one to head for. Just under the bridge and arrived at by either walking along the pleasant path or a short dinghy ride to the public jetty just past Hamiltons. It has a licensed restaurant and take away of an array of seafood, with the emphasis on oysters from their leases next to the restaurant. There are good views from their deck out over the lake and when we visited in 2019 they had live music on Friday and Saturday nights. It is open late most nights.
2. There is also a very good café down the riverside walk next to the breakwall. Set overlooking the swimming beach and the entrance wall – good café food and coffee.

Port Macquarie.

A great stop-over, and the entrance bar is generally quiet and is nowhere near as volatile as say the Camden Haven bar which is located 10nm to the south. Pt Macq has extensive anchorage available at the mouth of the Hastings river inside the break walls to starboard. There are 3 pink public mooring buoys. Dinghy access ashore is easy by tying up to the side of the main town jetty although the landing is not that low. This provides access to the main town shopping centre. There is 24 hour fuel and water available at the marina up the channel to port on entering. Mooring buoys can be rented by the week (\$200) from the marina, which has a dinghy dock and good bathroom and laundry facilities ashore.

Worth seeing is the heritage listed convict built St Thomas Anglican church, just next to Port Central shopping complex. The church was built 1823 to 1827 from convict made bricks, and its interior is well preserved. There is a good 6-8 Km walk south from the town, back along the river bank, continuing past Town beach, then take the coastal foot path to Flynn's beach, the main swimming beach and then on to Nobby's beach and Shelleys beach, the nudist beach at Miners, may be worth a look, and finishing at the lighthouse on Tacking Point. Allow 3 hours for the return walk.

Eateries: Restaurants abound in this tourist town. Worth trying are Mekong Thai down by the water front. The best restaurant in town is The Stunned Mullet, set up on the hill overlooking the Hastings River entrance and about 1 Km from the main town public moorings. The Seasalt café at the marina has good coffee and prawn salads – they get their prawns in fresh from Coffs Harbour.



Safety and Sea Survival Course.

By

Paul Jenkins - KathleenB

Many of our cruising members have or will at some stage venture out the heads and sail in the ocean. Whenever we sail, the importance of proper preparation and the safety of the yacht and crew should always be given high priority. Equally important is to have a number of Standard Operating Procedures and for the crew to be briefed and practiced in emergency procedures.

The ORCV (Ocean Racing Club of Victoria) run a number of courses and the Safety and Sea Survival Course is one I would highly recommend. It provides sailors with theory and practice to better prepare them for safety and survival at sea in the event of things going wrong!

I recently completed the SSSC course over the weekend 25 – 26 May, with Day 1 covering theory then Day 2 including practical wet drills from fitting and inflation of life vests, launching and inflating the life raft for abandoning ship, jumping overboard, and all things important to survival, including assisting other crew and life raft activities and rescue. This was followed by practical flare shoots and then an exam.

The course covers many aspects some of us may never consider and really makes you think seriously about MOB drills, preparation, Standard Operating Procedures for all forms of emergencies including Capsize, MOB, Abandoning Ship, Dismasting etc.

Some ocean races require a minimum of 50% of crew to have completed this course. The certificate is valid for 5 years after which a refresher must be completed to renew the qualification. Several RBYC members attended over the weekend either renewing or completing the full course.



MEMBERS NEWS

Congratulations to Stephen Etches (Favourite Child), Allison Hedger (Nimrod II) and Paul Jenkins (KathleenB) who each recently completed the ORCV Safety & Sea Survival Certificate Course.

Peter and Karen Johns, *Joie de Vivre*, crossed the channel to France in late May after a weather enforced delay. Seems it was worth the wait as they had a very smooth crossing with not much wind (not needed on this boat!) and a slight sea. If you want to follow their adventures google search yachtsandbarges.com and find Karen's Travel Blog.

Alan Sherrat and Maree Cox, *Folie A Deux* and have their new boat ***Here 'n Now*** back in the water at Lake

Macquarie after having some work done.

Paul Jenkins and Jane Cooper, Kathleen B, are on a delivery trip with **Grant Dunoon** on **Blue Water Tracks** sailing to Sydney for some work to be done on the boat before heading into the racing season at Hamilton Island and the Sydney to Hobart.

Jo and John Walker *Kirra Kirra* have left their boat at Manly RQYS to enjoy a boating holiday with friends.

Geoff and Barbara have left **Saffron** at RQYS for a month or so, as they are returning to Melbourne via a few weeks travelling through NSW.

FORTHCOMING EVENTS

FRIDAY 21st JUNE FORUM DINNER MEETING Guest Speaker: Grant Dunoon

Hear Grant recount his adventures on the Melbourne to Osaka yacht race and return and how within minutes after the starting gun, disaster struck, causing them to limp into Sydney for emergency repairs before they could continue their journey northwards.

The adventure crossed two hemispheres and six weather patterns from Bass Strait to the Tradewinds and into the doldrums, each bringing its own set of challenges. Grant's talk will also focus on the return, sailing through the remote areas of Micronesia, PNG and the Solomon Islands before landing back in Australia.

If you have ever dreamed of sailing off over the horizon to remote and distant shores, Grant's talk will cover what is need for an international voyage and what you can look forward to.

As usual, gather at the Club about 6.30pm, members draw at 7pm, followed by the meal and with the talk to follow.

Please book with Mandy in the office (95923092) no later than Wednesday June 19th. Bookings are essential. Please state any dietary requirements when booking

SUNDAY 7TH JULY ANNUAL YARRA RIVER FROSTBITE CRUISE

Winter is upon us again and we need a good social occasion to entice us out onto the water. Plus Melbourne City Marina has great facilities with lounge area to make a great escape from the cold. Not such a frostbite cruise!

So on Sunday 7th July we will leave the RBYC Marina at around 10am for a sail up the river aiming for a midday arrival at Melbourne City Marina. Meet at the marina lounge for a bbq lunch before heading home again.

Or make a weekend of it and head to Melbourne City Marina on Saturday. Pot luck dinner in the evening along with the camaraderie of fellow cruisers. We will miss the Firelight Festival at Docklands as it is the week before. You could always go up for two weekends!

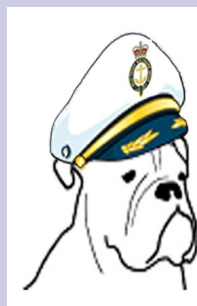
For Saturday night bookings please phone Matt at Melbourne City Marina (03 96588738) and quote the RBYC Cruising Group so we are berthed together.

Don't forget to wear your silly hat for the 'Best Silly Hat' prize.

Paul Jenkins (Kathleen B) is the coordinator of this weekend. Please email him your expression of interest in the cruise so that you can be kept updated with details. paul.jenkins8@bigpond.com

FRIDAY JULY 19th FORUM DINNER MEETING

Guest Speaker: Peter Hackett – Adventure in Tasmania sailing his trailer sailer



Captain Bully's Blog

Vigorous family discussions of the accuracy of weather forecasting, especially out on the water when conditions are not exactly what the first mate would ideally like, have suggested there should be an App for dialling up perfect gentle, warm, flat water on demand. Haven't those geniuses at Apple sorted that yet?? The result of these discussion lead us to enrol in the BOM Introduction to Weather Forecasting. Two days of intense study in the big smoke absolutely blew us away at the work these scientists do in our Government institution. There are seven global, numerical computer generated models of the earth's weather patterns. Two of these models are our own created and managed by the BOM called ACCESS. The major model covers the entire region with a resolution of approx. 25 square kilometres and the second a high resolution covering the major cities. Most yachties are familiar with the BOM website with Marine and Ocean section and in that, the Marine Wind Maps. This vector map forecast is the result of the fully computer generated ACCESS model. When we came around the coast about 10 years ago the model had just come out and was quite different from the written and broadcast forecast at the time. The computer was right. The other more recent model MetEye has human input and the input of the global numerical models. ECMWF (European), JMA (Japanese), US_GFS (USA). Interestingly our lecturers were very complimentary about the European model, less so about the US model. The course covered major events, fires and floods noting the BOM has daily contact with Canberra to advise Government of impending risks. Tropical Cyclones and severe storms, storm surges with incredible video footage of such events and how they can forecast and watch the development of such events with satellite and these models.

Susie and I highly recommend the course which occurs about twice a year in Melbourne.

REF: <https://bmtc.moodle.com.au/course/view.php?id=130>

Some interesting websites to peruse:

www.earth.nullschool.net American GFS model waves, currents and winds at differing altitudes.

<http://www.bom.gov.au/climate/about> Australian climate drivers (El Nino, La Nina)