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Pure Inspiration for Marine Hobbyists



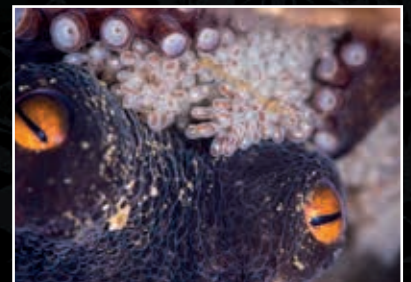
Top Tips For A New Tank

Richard Aspinall proves persuasive when it comes to procuring that critical upgrade



The Future of Reefs

Mike Paletta mulls the direction of the hobby with predictions for 2018... and beyond!



Investing in Youth

Chris Sargeant takes a look at how resourceful residents of the reef raise their young



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Welcome to Ultramarine



Seasonal greetings to you, Ultramarine reader!

So, the traditional time of festivity and celebration is upon us again. No, I'm not talking about Christmas... I'm talking about the recent 'Aqua' trade event in Telford of course!

Yes, back in late October, the great and the good of the aquatic world exhibited their latest wares, and Kumar and I attended as promised to catch up with the latest developments. I have to say it was a pretty exhausting day and writing the report was more challenging than it was back in 2015. Having attended the last 3 events, it seems like there was more diversity than ever this year and I'm sure this bodes well for the hobby. Have a read through the report anyway as I'm sure there will be something that interests even the most seasoned reefers this time around.

As far as the other articles go, in addition to the 'usual suspects', we welcome a new contributor this issue. Chris Sargeant brings us a fascinating piece on how marine organisms raise their young on the reef. You can read Chris's bio, plus that of all of our other contributors, on the website by the way. I'll be continuing my own series on the 'digital-reefer' in coming issues. It's coming along! As ever, keep an eye on the website and Facebook pages for periodic updates between issues... to tide you over.

From all the team, have a great Christmas and New Year!

John

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Cover Image: Common Clownfish, J Clipperton



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Kenneth Wingerter continues his series and in this instalment we get up close and personal with a veritable zoo of mini-beasts... you may know them as the zooplankton.

76 Close up on Corals

You may have seen them with common names like boulder, finger, jewel or even mustard hill corals (or even more obscurely, 'worm rocks'); James Fatheree introduces the corals of the *Porites* genus and talks us through their captive care.

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Science & Conservation

Clever Clams Are Masters Of Sunlight

Giant clams of the *Tridacna* genus can grow to up to three-feet long and weigh hundreds of pounds, but their size isn't the only thing that makes them unique. In addition, iridescent cells in the surface layer of their mantle tissues not only scatter potentially damaging intense sunlight, but also efficiently convert this sunlight into energy. When the light is distributed evenly among the thick layer of symbiotic algae living inside the clam, the algae more quickly converts the light into fuel for growth.

Using what they learned from these giant clams, researchers at the University of Pennsylvania are aiming to adapt the process to the production of biofuel. These natural "solar transformer" iridocyte cells are of particular interest because they are capable of absorbing bright sunlight at a very high rate and scattering it over a large surface area.

As part of their research, Alison Sweeney (an assistant professor of physics in the Penn School of Arts and Sciences), and her collaborator Shu Yang,

(a professor of materials science and engineering in the School of Engineering and Applied Science) devised a method of synthesising nanoparticles and adding them to an emulsion to form microbeads mimicking the iridocytes. Sweeney compared the process to 'making a salad vinaigrette' where the more a person shakes it, the smaller the oil droplets in the dressing. If one were to take nanoparticles, add them to the oil-water emulsion and shake it at the right speed, the droplet size can be controlled. After performing an optical characterisation of the beads, the researchers found that they function very similarly to the clam cells.

The team's next step is to try to mimic the organisation of the algae within the clams by getting algae to grow in 'gel pillars'. Once they figure out how to do this, they hope to marry their artificial iridocytes and the algae and measure the system to see if it can produce fuel to the same high efficiencies as the giant clam. If successful, the method could be used for photosynthesis to enhance the efficiency of biofuel production. It can also be used in solar panels for generating, storing or preventing heat to allow for better temperature control in buildings.



Clam mantle close-up (Image J Clipperton)

Some Corals Like it Hot

A new paper has poured cold-water over the commonly held idea that elevated sea surface temperatures are always a stressor for coral species, and has suggested that there can actually be a positive correlation between coral calcification rates and warmer summer ocean temperatures at least with certain species, and in certain geographic areas.

Scripps chemical oceanographer Andreas Andersson, his graduate student Travis Courtney, and an international team of collaborators from the Bermuda Institute for Ocean Sciences and Christian-Albrecht University in Germany, among others, were involved in the two-year study funded by the National Science Foundation. During the study, the researchers collected temperature, light, and pH readings from two coral reefs and at the same time, they measured the calcification and growth rates of coral samples placed on each of the reefs, as

well as seawater chemistry.

All of this information was then analysed to identify the relationships between different factors to show which environmental variable affected calcification the most.

“The biggest result was that temperature is the only environmental driver that has significant results for calcification by both coral species at both reef sites and for reef-scale calcification,” Courtney said. “It was the only significant environmental parameter for all calcification measurements that we looked at in this study.”



Diploria labyrinthiformis and *Porites astreoides* coral colonies growing on tiles to measure in situ coral colony calcification rates in Bermuda. Photo: Andrew Collins of BIOS

They found that in Bermuda, coral calcification in two coral species; *Diploria labyrinthiformis* and *Porites astreoides* was relatively insensitive to changes in the seawater pH, but very sensitive to changes in temperature. Furthermore, the observed relationship between temperature and calcification was a positive one—as the

seawater got warmer, coral growth sped up.

The team found that even peak summer seawater temperatures of 30°C (86°F) were not limiting calcification via thermal stress and, instead, that calcification rates are actually more strongly limited by cooler winter seawater temperatures.



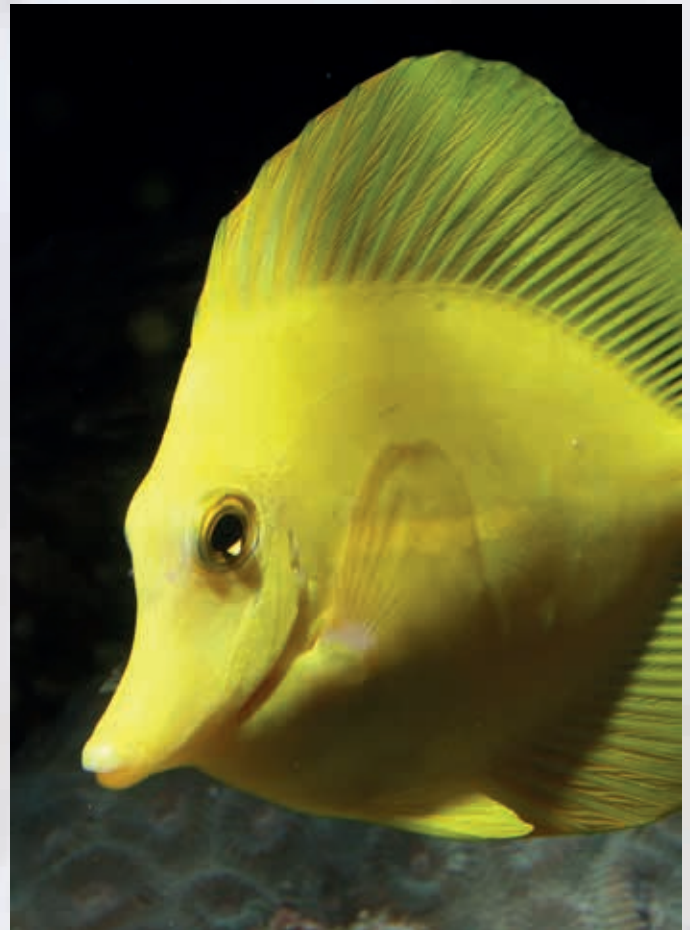
A colony of the soft coral known as the “bent sea rod” stands bleached on a reef off of Islamorada, Florida. Photo credit: Kelsey Roberts, USGS. CC by 2.0

Hawaii Ban Extended To Existing Permits

Further to our lead story in the last issue in which we reported on restrictions imposed on Hawaii's ornamental fishery industry, late October saw a development in the situation which has now effectively closed the fishery completely, adding a ban on existing collection permits to the cessation of new permit approval. The First Circuit Court (sitting as the Environmental Court) ruled that "any and all existing aquarium fish permits issued to commercial collectors to date are illegal and invalid." Hawaii's DLNR is now forced to

undertake a potentially lengthy environmental impact study of the fishery, and there is no timeline for if, or when, the fishery could be reopened.

Given that certain UK stores had already begun raising prices of Hawaiian species by mid-October, it looks likely that, at least for the time being, if you are in the market for a Yellow Tang or other Hawaiian sourced livestock, you may struggle to find it, or have to pay a premium when you do. Keep an eye on our FaceBook page for news on this issue, as it breaks.



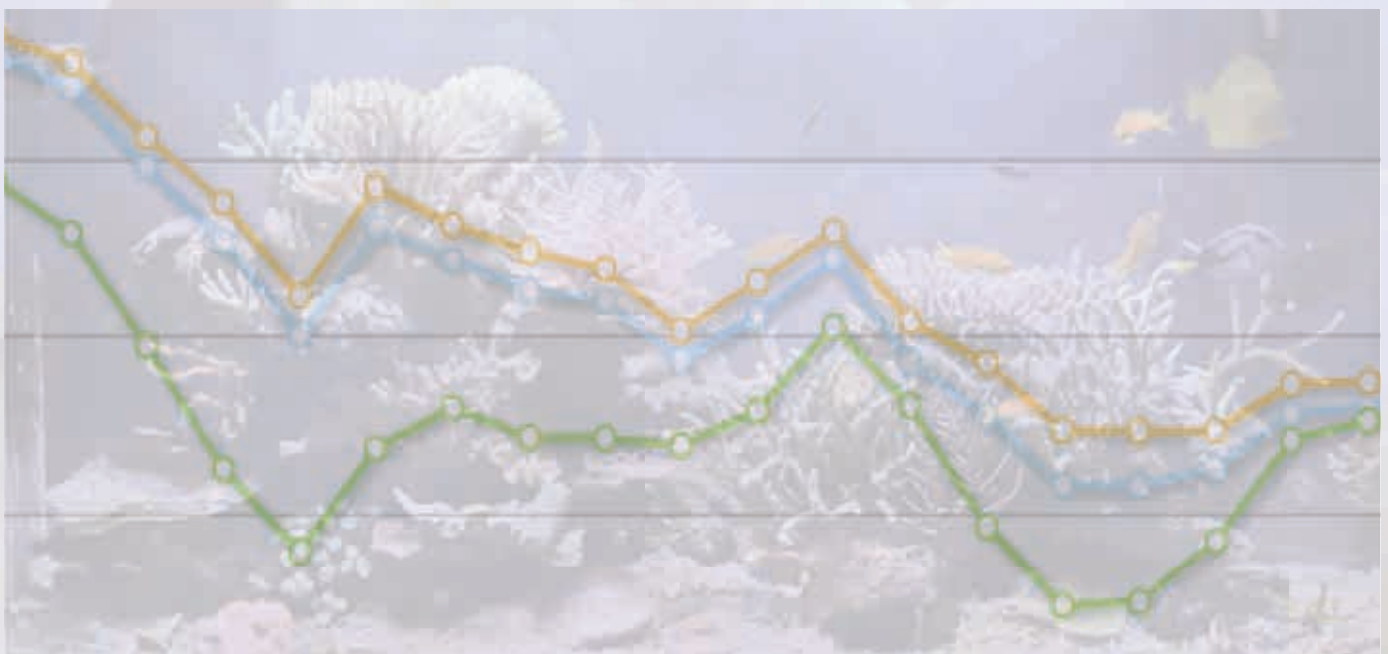
Should UK Poll Be Taken With A Pinch Of Salt?

A recent poll conducted by Mintel has concluded that overall pet ownership by UK household fell from 63% in 2012 to around 56% this year. Furthermore, gloom was cast over the ownership of 'tropical fish including goldfish' which supposedly fell from 17% down

from 10% during the same period. The report speculates that economic pressures and home ownership trends could be in part responsible for the apparent decline. Interestingly though, in the US, while the 2011-2012 APPA National Pet Owners Survey

showed that there were 11.9 million US households with freshwater aquariums and 700,000 US households with saltwater aquariums, 2017-2018 survey data showed the number freshwater households marginally increased to 12.5 million while

saltwater hobbyists increased significantly to around 2.5 million US households. Given the conflicting results, we reached out to Mintel to see if saltwater livestock was definitely included in their UK study but, as of the date of writing, we've had no response.



Reefing Round-Up - October/November 2017

Friday November 24th saw Mexican President Nieto sign a decree to create the Revillagigedo Archipelago National Park in a region of the Pacific Ocean that surrounds the four volcanic islands of Clarion, Roca Partida, Socorro and San Benedicto. These uninhabited islands are located about 240 miles (390 km) to the southwest of the southern tip of the Baja California peninsula and are home to four species of sea turtles, more than 37 species of sharks and rays, and at least 366 species of fish, dozens of which are found nowhere else on Earth (including the Clarion Angelfish *Holacanthus clarionensis*).

New research has found that, despite the extensive damage to coral in recent events, there are still 100 reefs on the Great Barrier Reef that are well sited to promote the regional recovery of the ecosystem after major disturbances. These reefs appear to be less at risk of being exposed to damaging effects of bleaching and starfish predation, but are also well-connected to other downstream reefs by ocean currents, and therefore may provide larvae to support the recovery of other reefs.

To keep up with the latest developments in 'real time', don't forget to follow our social media channels where we bring you the latest reef news and discoveries as they happen!



Holacanthus clarionensis Image J Clipperton



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Questions & Answers

with David Wolfenden

Choosing Wisely Is Key To Coral Success

Q My 350L tank has been established for approximately four months and all would appear to be progressing well. My intention is to introduce (slowly) a number of easy corals when the tank has been running for a year or so, and I have a better appreciation of the importance of water parameters. What are the main principles that I will need to bear in mind to ensure good corals care? Also, could you please recommend suitable corals for a beginner?
John Gonzalez, Ipswich.

A Hi John, The main principles of keeping corals, in a nutshell, are achieving stability (and this is where your approach of waiting until stocking with corals will pay dividends), and meeting the needs of the corals you want to care for. That sounds like a cop-out, but I think it's an important consideration when you're deciding which corals you want to keep – some are more demanding than others and various types of coral require different levels of nutrients, flow intensity or lighting. This feeds into the question of which are the best beginner corals.



Bubble corals are undemanding and make a good 'starter' LPS.

I personally feel that it's best to work out what kind of system you're looking to be running in the long term and plan around this. This is because different broad groups of coral have different requirements, and a mix-and-match approach as you progress is often challenging to implement. For example, photosynthetic soft corals are amongst the most straightforward to keep, being relatively forgiving in terms of water quality, flow and lighting. LPS (large polyp stony) corals are generally a bit more challenging, requiring more attention to parameters such as calcium, strontium,

magnesium and alkalinity than softies, but they can be kept in relatively low-energy systems (i.e. flow can be moderate) and they tend not to demand very intense lighting. Reef-building SPS (small polyp stony) corals tend to be the most demanding and require the most commitment in terms of equipment and care; they can grow rapidly and may require dosing equipment as they deplete elements. They also demand very high flow and the most intense lighting, plus the very best water quality. This means that SPS systems may require considerable investment in life support. To be fair, this is a bit of a

generalisation (and bear in mind that terms such as LPS and SPS are really used for convenience to describe the morphology of corals and don't reflect a valid taxonomic division), but you get where I'm going with this. The problem is that many folks start with, say, LPS corals then decide to (air quotes) 'upgrade' to keep SPS – and in these cases, it can be tricky to keep a balance where everything thrives. Many SPS require water virtually devoid of nutrients for optimal growth and health, whereas LPS don't tend to do well in the most pristine conditions, and the demands of SPS for high flow and lighting means it's tricky

to accommodate a mixed LPS/SPS population. It is possible, especially in larger tanks where specific microhabitats can be created (i.e. shadier, low-flow zones for LPS, with more dynamic intensely-lit upper zones for SPS, to keep both, but on balance it's preferable to keep either one kind or the other. There are also issues with compatibility. This is related to how the corals engage in turf warfare for the limited real estate on the reef. Soft corals engage in chemical warfare, emitting toxins into the water which can hamper stony coral growth; LPS use potent sweeper tentacles to sting neighbours; SPS tend not to sting, and are not great at defending themselves from attack from the more aggressive LPS. Mixed tanks can be done.

This really comes down to personal preference, and what kind of corals interest you. If you're most interested in a softie-dominated system, there's plenty of choice – consider *Sarcophyton* species as good go-to beginner corals. These can be successfully kept with various mushrooms and zoanths which are equally forgiving, and you can build from there. If LPS are more your thing, then bubble corals (*Plerogyra spp.*) are a good bet, as are colourful *Trachyphyllia* brain corals, and *Euphyllia* species which can add amazing movement. Even some SPS are accessible as first corals, such as plating *Monitpora capricornis* and branching *Seriatopora hystrix*. These species do tend to be forgiving as far as SPS go, but you'll need to provide optimal conditions from the get-go and over time, you might need to pimp the system's life support and/or invest in additional equipment to maintain ideal parameters as they grow (these corals will grow quickly!) and if you aim to keep some of the more demanding species.

Noticeable Nutrient Levels Not Always A Negative

Q I have a consistent 'problem' with phosphate and nitrate levels at zero in my reef tank. I currently run no phosphate reducing media and my nitrate is cycled using only my live rock filled sump and a Deltac skimmer. I am aware through lots of reading that the sweet spot level for phosphate is 0.03 and for nitrate 3. I have managed to increase my phosphate slightly by increasing feeding to all of the inhabitants. This seems a bit unscientific though! I have also read that nitrate can be increased by adding potassium nitrate but cannot find a reef ready product to do this. Can you give me some tips on improving these levels in a controlled way and what products I could use to do this?
Scott Taviner

A Hi Scott, Firstly, the low phosphate is a bit puzzling, as elevated phosphate levels are one of the main problems facing reef-keepers, even for some folks running GFO and other phosphate-adsorbing media. I would start by double-checking your results, as there could be some measurement error involved. Some test kits will read zero even when levels of around 0.03ppm are present so before embarking on any drastic measures, I would strongly recommend verifying your levels. If you've checked that the results are accurate, the easiest way to increase phosphate is to simply feed more. There's nothing unscientific about this, and it really is the best way to increase levels. Many aquarists find that increasing the density of fish stocking helps here – more fish, more food needed, and more phosphate added to the system.

I would also check your nitrate levels, and make sure you're using a high-sensitivity test kit. Again, if you're happy that the results are accurate you

might find that simply feeding more will increase levels. Dialling down the skimmer to reduce the quantity of organics exported is also an easy fix which should help to gradually raise levels. If you do want to start dosing, potassium nitrate is widely used in the planted tank world to add nitrate, and any product for planted aquariums should be safe for reef tank use. You'll need to dose carefully according to the concentration of the product, and aim to ramp levels up slowly.

Ultimately, however, there may be no reason to worry about this. It depends on which corals you're keeping, for a start. SPS tend to do best in very nutrient-poor water if they're fed adequately, whereas LPS will require some phosphate and nitrate for optimal health and growth. If the corals are looking healthy and growing well, there's likely no need to start changing parameters. If the system is in balance and you're happy with it, chasing ideal parameters could end being an unnecessary hassle.



Increased feeding will boost phosphate, and dialling down skimmer production will reduce organic export, helping to boost both nitrate and phosphate levels.

What's All The Hullabaloo With Hawaii?

Q I've heard that there are restrictions in place with collection of Hawaiian fish. What are the implications of this and will it have any effect on the hobby in the UK?

A The Hawaiian Supreme Court recently ruled that all commercial aquarium fish collection in the state's waters should be halted, with concerns over the use of fine mesh net capture methods and the effect of fish collection on the health of the region's reefs. Permits for collectors have been suspended, pending a review of the environmental impact of collection, which will be ruled by lower courts. Those courts need to be satisfied that future collection will comply with Hawaii's Hawaii Environmental Policy Act. One of the main complaints appears to be that the Department of Land and Natural Resources (DLNR) has historically granted unlimited collector permits leading to accusations that aquarium fish collection is an unregulated free-for-all.

This is obviously quite a blow for Hawaii's fish collectors, and it's not clear how this will pan out. Any required environmental assessments will cost a lot of money to implement and take a lot of time to undertake. There may be alternative capture methods other than fine mesh nets that could be deemed acceptable, but these will almost certainly limit the species which can be collected and drive prices up as collection becomes less efficient.

The bottom line is that you can expect Hawaiian fish to virtually disappear from the trade for the foreseeable future,

and possibly for good unless solutions can be found. This includes some of the hobby's most popular fish such as the yellow tang (*Zebrasoma*

flavescens), and many other species which are more-or-less endemic to Hawaii. A worry for the aquarium trade in general is that other regions may follow

suit, but we'll have to see what happens. Hopefully, solutions can be found to this issue soon – watch this space.



Expect yellow tangs to become scarce for the foreseeable future as a result of restrictions on the aquarium fish trade in Hawaii.

Puffer In A Reef? Be Prepared For Predation.

Q I love puffers, and would like one in my reef, but I'm concerned it will eat my corals. I have heard conflicting reports that puffers can be kept in a reef; are there any reef-safe species?

A No puffers can be certified 100% reef safe, but it is possible to maintain the smaller sharpnosed puffers (*Canthigaster spp.*) in a reef aquarium, although it can be risky and you'll definitely want to be careful with existing and future tankmates. Sharpnosed puffers will attack and kill just about any small mobile invertebrate, so ornamental shrimp, small hermits and snails are pretty much a no-no which has implications for maintaining

your clean-up crew. As far as sessile invertebrates are concerned, it's less clear-cut. Some puffers will munch at mushrooms, corals or the mantles of clams, whereas others don't seem bothered (or at least they don't cause too much mayhem). There doesn't seem to be any consensus on which species are more likely to nip at corals – it just appears to be down to the individual temperament of the fish. They are also fin-nippers, so you'd need to watch out for fishy tankmates with longer, flowing fins. It may be possible to limit

undesirable nipping of corals and fish through very frequent feeding, but it's not guaranteed. Some folks manage to keep them without apparent issue in reef systems (having said that, some don't!). They're certainly cute with bags of personality but they're an iffy choice for a reef. The best system for these fish is a fish only with live rock (FOWLR) system, but they could work in a larger system with fast-growing SPS corals where the occasional nip will make little impact. In nano systems, and those with slower-growing LPS, they can cause havoc.



Sharpnosed puffers are cute, but make a risky addition to a reef.

Anemones That Won't Make Enemies?

Q Which, if any, anemone species are a good choice for a reef system?

A Anemones tend to do best in dedicated systems which can cater to their needs rather than as additions to an existing mixed reef setup. There are several reasons for this, including their tendency to wander round and to potentially sting sessile inverts (carpet anemones, for example, have very potent

stings). Many species are very demanding in terms of water quality and lighting, and a lot of reef systems can't provide the stable, optimal conditions they require. Additionally, many anemone species aren't typically found on the reef itself (they often inhabit sand zones or regions on the reef edge), so trying to maintain them with corals isn't a particularly natural arrangement.

The bubble tip anemone (*Entacmaea quadricolor*), however, is one species which could be considered an option. This anemone is relatively hardy, although it still demands high intensity lighting and very good water quality. Do be aware that they will move

around and could potentially sting corals. Bubble tips aren't particularly potent, but SPS corals with weak defence mechanisms may be damaged. It's also not uncommon for them to reproduce through binary fission in the aquarium. They may actually do as a stress response rather than because they're 'happy' – either way, they can reproduce to the point that they start to compete with other invertebrates. In a mixed reef this can be a problem, but in a dedicated tank the effect can be amazing and it's well worth considering these animals for a species-only system.

“Anemones tend to do best in dedicated systems which can cater to their needs”



Anemones can be challenging and often fare badly in mixed reef systems.

David Wolfenden



As Curator at the Blue Planet Aquarium (UK), Dave has been working in the aquatics industry since 1994. He is interested in all aspects of the aquarium world, with a particular focus on marine life and life support systems. On a daily basis, he looks after an amazing range of weird and wonderful animals, from corals to sharks. Read more of Dave's bio at:

ultramarinemagazine.co.uk/contributors

Send us your questions!

Bewildered by bubble corals or pensive over plumbing parts? Have your burning questions answered by one of the finest minds in the field. Submit your query via:

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and we'll pass it on!

Feel free to include photos with your question if it will help.

Note: due to the publishing schedule we can not guarantee to answer questions immediately.

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Close Look: TUNZE Smartcontroller 7000 Aquarium Controller



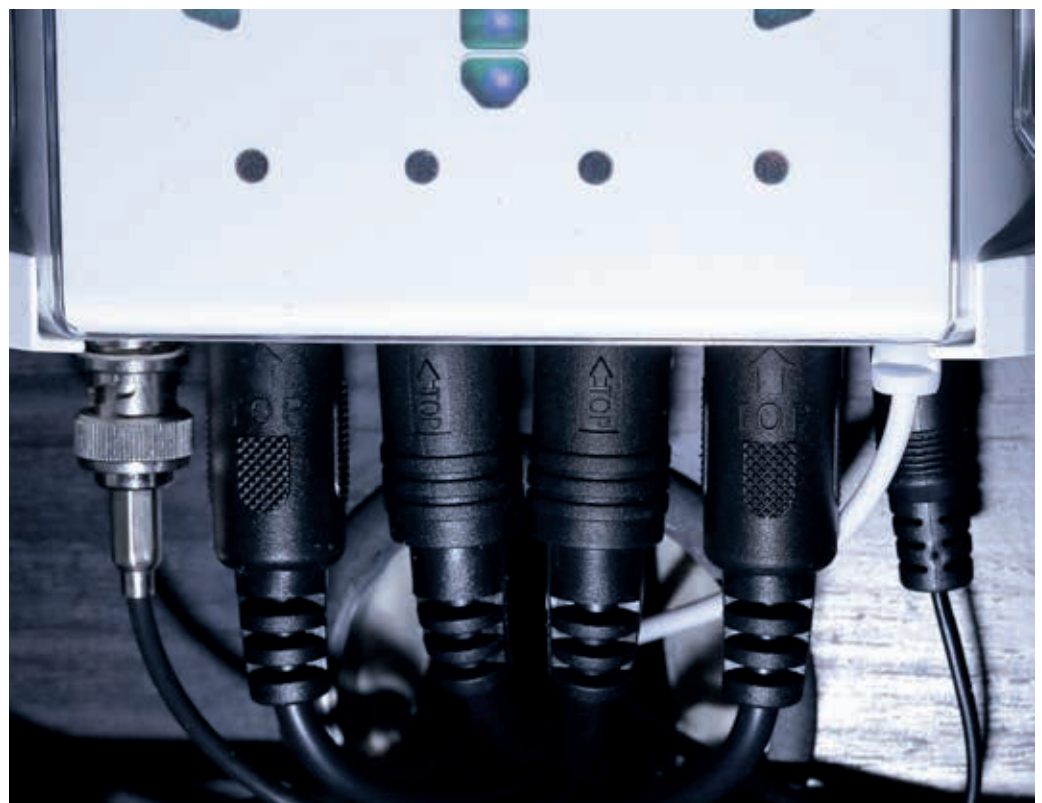
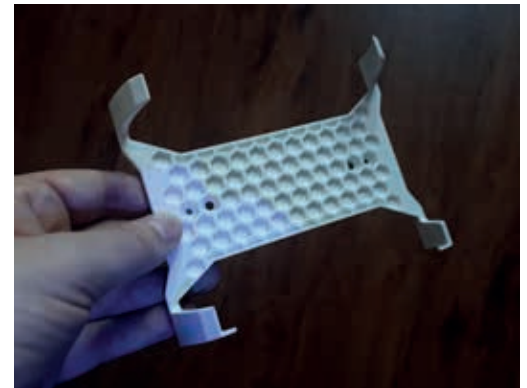
For a large part of the reef-keeping community, time is probably the single largest 'limiting factor' when it comes to running a reef tank. For many, this means that managing time effectively becomes critical in maintaining a successful system, and automating the most repetitive and tiresome tasks has been shown to assist in this process. Enter aquarium controllers, and the rise in popularity of these devices over the last few years is perhaps unsurprising given the demand for tank automation and increasing system complexity. A common theme of such controllers is that they consolidate control of the core life support systems of a reef aquarium, and through providing a single control interface, simplify management which in turn allows for the focus to move to actually enjoying a system rather than maintaining it. Of course, the failsafe systems and remote monitoring capacity offered by such devices also give the owner peace of mind and can reduce the likelihood of catastrophic failure. The TUNZE® Smartcontroller, 7000 is a relatively newcomer on the controller scene and, if TUNZE®'s pedigree is anything to go by, it should be worthy of consideration.

Taking the product at face value, out of the box it oozes high quality construction, appearing compact (133 x 33 x 116mm) and durable, yet very attractive. The gloss white casing and blue-lit touch controls really do look lovely and are securely ensconced in a thick polycarbonate shell which bodes well for use with salty fingers! The fixing bracket is also both effective and versatile. Beyond the aesthetics, one's first question is likely to be, "what does it do?". Well, each of the 4 ports that run along the underside of the unit can perform an individual or combined role, either having a specific device or switching socket/valve attached. By devices we are of course talking about TUNZE®'s range of highly renowned Turbelle stream pumps and LED lights. Switching sockets are add-on devices; essentially plug sockets to which heating or cooling devices, calcium reactors etc. can be attached. Electrically operated valves allow for control of CO2 and/or Ozone. In addition to the 4 sockets, the 7000 also has a built in BNC connector port for attachment of either a temperature or ORP probes, and a temperature probe. Furthermore, as said, each Port can perform a combined role through the addition of an optional 'Y cable' which allows say two pumps to be controlled through a single port. In short, to answer the original question, this unit can control a large number of the core functions of a modern, large reef system, and of course

multiple controllers can cover much more.

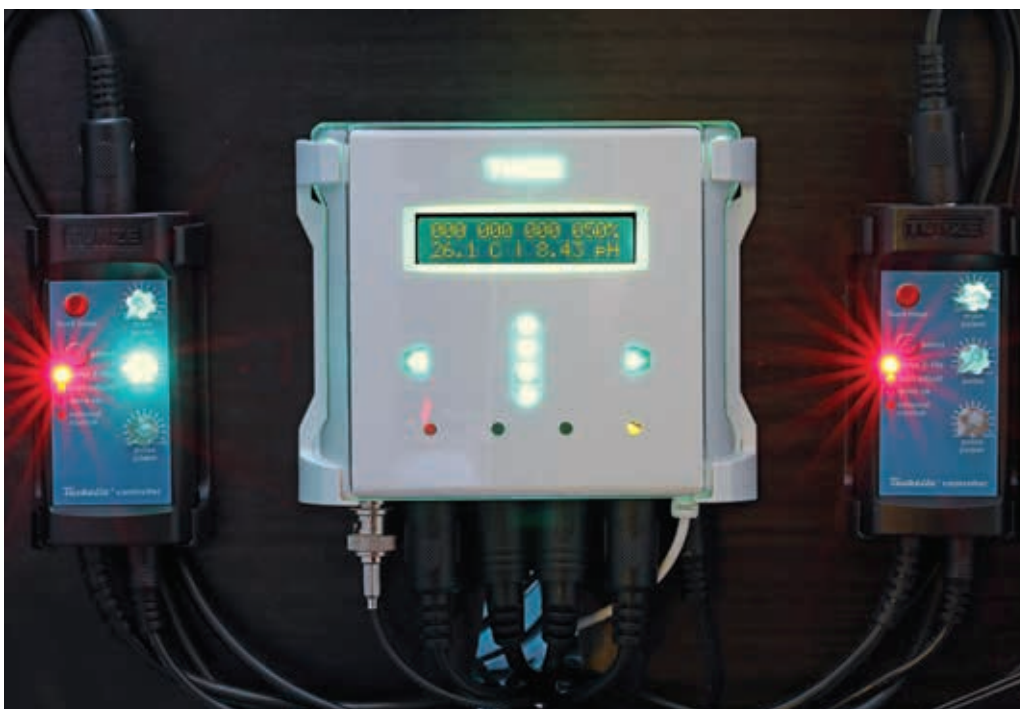
In order to directly evaluate the operation of this unit in the field, we installed a single unit on our test system, a Red Sea Reefer XXL 625. We attached two Turbelle 6155 streams via a Y cable to Port 1, a switching socket to Port 2 (to control two Hydor Theo 200watt heaters running off a two-gang plug extension), another switching socket to Port 3 (running a USB fan via a USB plug), and off Port 4, we attached a TUNZE® 8850 LED light for our refugium. Furthermore, we added one of TUNZE®'s lab-grade pH probes on the connector. We also added TUNZE® safety connectors in case of power outage, one to run the 7000 itself, and one to power the two 6155s. Programming the unit via the controller itself is relatively straightforward although we did need to carefully read the instructions more than once, and the button presses and menu system do take a little getting used to. Setting the heating and cooling was straightforward once we had worked out the exact meanings of the terminology used and once set at 26c, these functions worked perfectly to maintain a consistent 26 - 26.3c. In terms of the pumps and lights, again it took a while to work out the interface but once we had, it worked perfectly. As said before, there is definitely scope for TUNZE® to improve the translation of their instruction documentation here. The pH probe was very simple to attach and calibrate and the accuracy (checked against reference solutions) held well for the several-week period of the review. The temperature probe was already attached and so also very simple to install and accuracy looked to be fine being within 1 degree C of a calibrated alcohol thermometer.

Beyond the control and operation detailed above, a



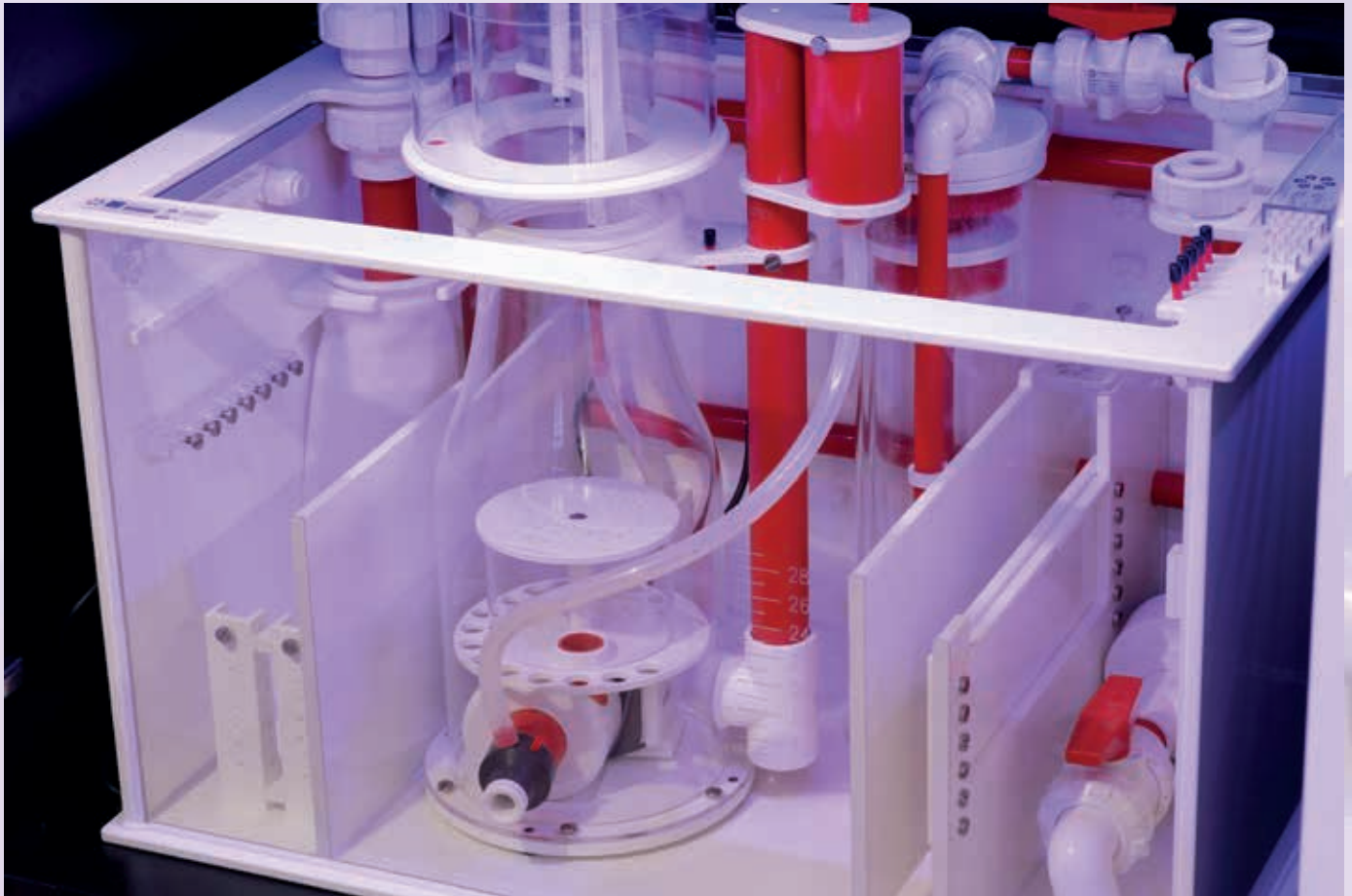


key feature of the 7000 is its ability to be controlled not just through the controller device itself, but also wirelessly via a website interface. To enable this feature, we either connected directly to the hotspot created by the unit itself at home (this proved exceptionally easy with the unit appearing in our network list as soon as powered-up), or connected it to our home network for remote use. The website interface is functional but it looks to be some improvements that could be made here. Due to the translation mainly, it took a bit of playing around to work out the exact purpose of the available settings. Another issue was that even when selecting English as the language we still had status notifications appearing in German which was rather confusing and necessitated copying and pasting into Google translate to see what they actually meant. Once done though, the functions did work very well and there is a myriad of options particularly for flow which could provide for highly naturalistic flow schemes. It was also great to be able to look at graphical readouts of both temperature and Ph over the last 22 hours.



In conclusion, the Smartcontroller certainly lives up to TUNZE's reputation for quality, reliability, durability and functionality. For those who don't have a high level of technical competence it may represent a fairly steep learning curve given the less than friendly instructions but once configured it succeeds in consolidating numerous systems into one compact, attractive and easy to manage package. It's certainly something that you could buy in basic format and then gradually add devices as your tank grows in complexity. The unit retails for a very reasonable £240 and is available now from selected UK retailers.

Close Look: VERTEX I-Supra C+ Aquarium Filtration System



Often described in aquarium literature as a 'place to store unsightly aquarium equipment', sumps have something of a reputation for being objects to hide behind closed cabinet doors, being displeasing to look at and perhaps chaotic and unclean. This actually doesn't have to be the case though, indeed many items of aquarium equipment now available to reef-keepers verge on being 'works of art' in their own right and can elicit interest and admiration equally as much as the living contents of a reef system. The sump itself though has seemed mired in the past to some degree, overlooked in favour of fancy protein skimmers and reactors. Slowly however more and more specialist providers are offering sumps that not only fulfil their function in the most effective manner possible, but also visually embellish a reef system rather than detract from it. The I-Supra from Vertex is one such option.

The Supra may look a little OTT at first glance but once you've owned a few systems you start to appreciate that it is the fine detail that really makes the difference here. In terms of that detail, this sump sure does deliver on paper, so let's take a look at exactly what you get. Overall, the Supra is 31.5"x19.75"x19" (LxWxH) in size and is constructed from 10-15mm thick saltwater and ozone safe clear acrylic and white PVC, with plastic welded seams and braced rim for strength and durability. As well as coming with a vast array of rigid and soft plumbing including unions, valves, pipes, tubes, clamps all of which are colour-coded (and which you'll be hard pressed to source beyond Vertex), the Supra boasts an attractive featureset. Working from left to right (inflow to outflow), first we have the 4" filter sock which clips into an integral holder. Also in this section there is a 7 slot multiple diameter probe holder (grade II titanium screws) to house a variety of different diameter probes neatly and securely. Moving down we have two integrated ceramic bio-media slots, say for marinepure plates for example. Moving into the next chamber, the central and largest section, this houses the skimmer (either a Vertex Omega 180i or 200i) and is spacious enough to also include Rx-U+ 2.0 universal media reactor. You could even include an optional Rx-Z+ 2.0 zeolite reactor to augment the already potent nutrient management combination. Furthermore, this central section includes a small Eheim C1000 pump milled into the rear corner which allows the central section to be completely drained independent of the running of the system for cleaning. The height of the water is set by an adjustable baffle which leads into the return chamber and is secured again with multiple



7 port probe holder array with titanium screws



5 port dosing array with cable routing in background

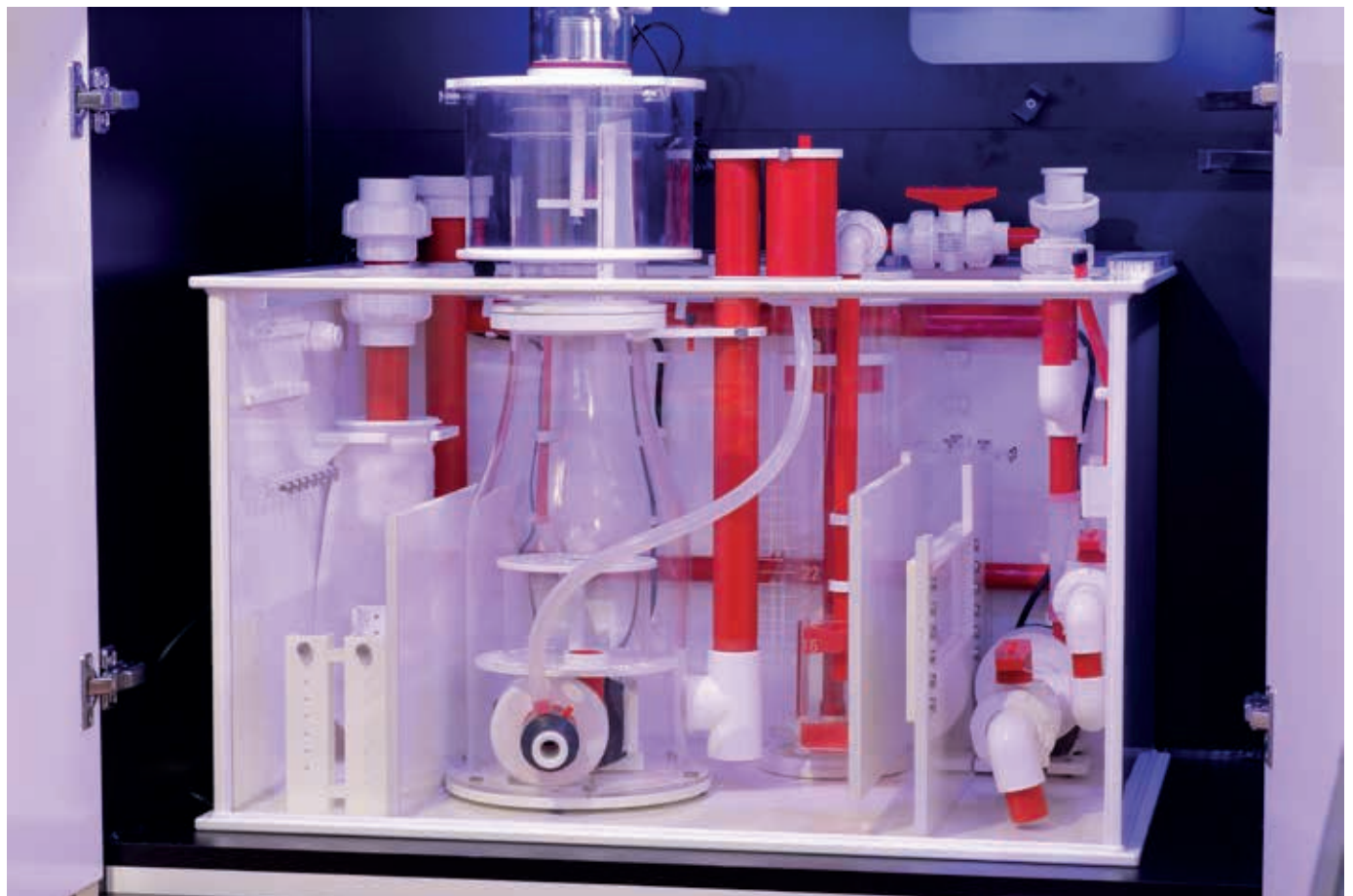
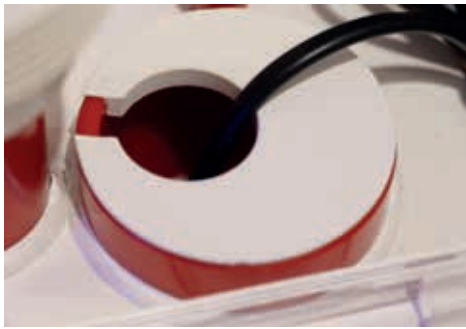
titanium screws. The main chamber also features a depth scale so it is easy to fine tune to match optimal skimmer depth. Talking of skimmers, the skimmer effluent line can be neatly run through a gland to an external container and the same thought has been applied to power cables which all have special routing guides on the tank walls to keep them out of sight. There's even a special rotating power cord port akin to something you'd find on a computer desk on the left rear. Moving on to the final chamber, there is a built in dosing array with 5 ports

to which you can connect the supplied red, white or red Vertex tubing. Again, this tubing is routed neatly around the rear rim of the sump and this is in turn covered with an acrylic sleeve which looks fantastic. We've seen Vertex's V6 pump before and take note that this system is powered by a slightly smaller but equally gorgeous V4 which has been selected to provide the ideal throughput to maximise filtration performance. One of the key features of this sump is that it has a manifold system included and, controlled by red and white ball valves, it is

therefore possible to channel flow back to the media reactor in the centre section without the need for additional pumps. In this area, the Supra also boasts a feature connected to the Eheim pump we mentioned previously. By the turn of two valves it is possible to completely bypass the central section for cleaning and this can be completely emptied and cleaned at the flick of a switch.

All-in-all, the Supra really is a thing of beauty but it perhaps takes the most demanding and well-heeled hobbyists to appreciate it. Truly, this is a piece of aquarium equipment

that deserves to be brought out from the cabinet and exhibited in its own right as an example of superb engineering. The only minor comment we'd have is that the height means that accessing the skimmer cup is a little tricky if you are thinking of installing it on a typical 'off the shelf' system. Frankly though, if you are looking to buy this sump you are far more likely to be having it standing alone, perhaps in a dedicated fish room. At the time of writing, the Supra is available in the UK to buy new for a shade over £2000 from selected suppliers and it comes with a 2 year warranty.



CARE PANES

You will never want to make do with home-made solutions in the future!

Whether it's routine spillages from tank maintenance or the attentions of greasy-fingered children that you are struggling to remove, this new TUNZE® product to clean the outside of your aquarium glass offers some unique benefits. Care Panes effectively cleans the outer aquarium glass panes and all smooth surfaces made of glass, plexiglas, plastic, metal, painted wood, and many more. Care Panes consists of a combination of organic surfactants with an ethereal oil, and can be used to easily and effectively clean aquariums, aquarium cabinets and the lighting. Thanks to its gentle ingredients Care Panes is safe for aquatic life and is already being used successfully in medical areas, public buildings and schools.



CARE BACTER

A miracle solution for your aquarium?

We have used it in our own aquaria, and we are now convinced! After long-term testing in an array of different systems, CareBacter has proved itself to be an exceptionally effective blend of bioactive filtering organisms. It is specially formulated to clean both saltwater and freshwater aquariums, and to ensure optimal microbial balance. CareBacter is a powerful TUNZE® tool to assist today's high-tech filtration and skimming.

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AQUA

2017 SHOW REPORT

Growing in standing at each event, this year's AQUA trade show, held at the Telford International Centre, attracted a total of over 1,600 visitors and more than 100 exhibitors from across the aquatics sector. This figure is not only the highest in the show's history, but also makes it the largest show of its kind in the UK. Although trade-only, for reef-keepers in the UK, this is perhaps the key event to see the latest products heading our way... and that's where our report comes in! We compiled the following information through attending a single day of the event during which we 'interrogated' a variety of providers for the lowdown on their latest reef-related products. Inevitably, we couldn't chat to every single organisation so instead we focussed on those with products which we gauged to be of the greatest interest and potential use to readers. In short, our report doesn't claim to be exhaustive, instead we suggest you use it as a 'jumping-off' point for further research on products that pique your interest. We've provided weblinks to assist!



Tropical Marine Centre (TMC)

It was hard to imagine how TMC could top its huge Reefscape model made from Lego from Aqua 2015 but a tropical paradise theme proved equally impressive and eye-catching, and certainly livened-up proceedings with cocktails being served to fuel the crowds of prospective customers and a live steel band!

TMC had come prepared with no less than 101 new products and a small army of staff (decked out in Hawaiian shirts for good measure!) so it was difficult to know what to look at first!

The first item to pique our interest was the REEF-Roller and REEF Roller Compact Automatic Roller Filters. Coming this winter, these advanced automatic mechanical roller filters are available in a standard or compact size, and both filter aquarium water down to 50 microns, thus replacing the need for high maintenance filter bag/filter sock systems. They also include integrated water sensors which ensure that, as the filter roll material becomes clogged with detritus and waste, new filter material is automatically replaced, ensuring constant removal of waste and fuss free operation. In terms of pricing you are looking at RRP's of £169.99 to £189.99 depending on the model, with replacement 45m long 50 micron rolls retailing at £19.99.

Moving on, we noticed some REEF BIO-Gro Algae reactors. These compact reactors are specifically designed to grow macro-algae which can be used to reduce unwanted nutrients in your reef aquarium to help improve water quality. They incorporate a custom-engineered light spectrum developed to promote optimum algal growth inside the reactor. Coming this winter, these reactors should retail for

around £169.99 or £219.99 (for model including a REEF-Pump 2000).

Next, a large section of the exhibit was dedicated to Tropic Marin's REEF-Salt which is manufactured exclusively for TMC and is marketed as the ideal foundation for the care and optimum growth of fish, corals and other aquatic invertebrates in modern reef aquariums. Laboratory-manufactured to the usual, exacting standards of Tropic Marin's other salts, and designed to naturally replicate reef environments whilst being very cost effective, REEF-Salt is suitable for ALL marine aquariums from fish only to full hard coral reefs. Typical mix values are: KH: approx. 7-8, Calcium: approx. 410-440

ppm, Magnesium: approx. 1250 - 1350 ppm (depending on salinity etc). In terms of pricing expect 10kg to go for around £26.99 and 20kg for £48.99.

Last but not least, a towering display showcased the vast array of Gamma feeding products offered by TMC and this year there has clearly been significant research and development with a new, improved range of liquid feeds plus a whole new dry feeds concept. Gamma NutraShots looked particularly interesting and we were interested to learn that these pre-mixed, ready to use food balls are designed to both enrich the animal's environment and stimulate natural grazing and feeding responses. Sticking easily to the side of the tank

or rockwork they allow your fish to graze whilst giving you a close-up view of feeding. Manufactured in the UK and both used and tested by TMC to feed 100s of different species, this is likely one of the most comprehensive ranges of feeds by a long way. In addition to the Nutrashots, we also noted new variations to cover both fish and invertebrate nutrition, including NutraPellets, NutraPlus Naturals, Blends or Mixed Feed Suspensions, as well as NutraSpray, a feed-enhancing spray. As I said, this is just a small selection of the new products TMC launched at the show, so head over to their website if you fancy finding out more!

tropicalmarinecentre.co.uk



Red Sea

After doing several fly-bys of the Red Sea booth, which was always packed with customers, we finally managed to muscle-in and get a quick run-down on the latest developments.

This year has already seen the launch of four large new models to the REEFER range of aquariums; the Peninsula 500, 650, and XXL 625 and 750. As such, it was no surprise that Red Sea were using a stunning, fully-stocked Peninsula 500 Deluxe in ultra-gloss white as their show tank this year. We also noted a slick looking MAX E-260 and a Max-Nano sporting a new, Marble cabinet finish. The Max-E range is the latest Plug & Play complete system from Red Sea and is supplied with all the REEF-SPEC life support systems neatly hidden in a compartment behind the rear wall of the tank. Uniquely, it also offers the ability to easily add an in-cabinet sump without stripping down the aquarium, for those hobbyists wishing to expand their system. We are no strangers to Red Sea tanks so the evident high quality of build and attention to detail we noted here was perhaps a foregone conclusion. We understand the Marble cabinet finish will be available from January in limited numbers and initially for the Reefer 170 & 250 only.

The varied components of the Reef Care Program (RCP) were also on show and this comprehensive suite of supplements and test kits really do look to offer perhaps the most well thought-out and cohesive option for reef tank supplementation in a sometimes confusing marketplace. The slick packaging and presentation is backed up by strong web-based resources and we highly recommend watching their YouTube video series on the system.



All of the aquariums on display showcased Red Sea's new DIY tank cover kit which allows for the creation of a neat mesh cover for virtually any open-topped aquarium. Red Sea's kits include cut-out options and additional cut-outs are available to purchase. Clearly having been custom-designed by Red Sea

the net covers sit beautifully flush on the aquarium and are very unobtrusive. All-in-all it looks very neat and having mentioned this not too long ago, it's nice to see Red Sea taking on board user feedback. We'd recommend anyone running an open top system gets hold of one as soon as possible to cut down

on needless losses through fish jumping out. The net covers had all been snapped up by eager retailers by the time we passed by and will be available from selected Red Sea dealers before Christmas. For more details head to:

www.redseafish.com

Colombo

Having received a sample box from Dutch brand Colombo several months ago, we've been most impressed after gradually working our way through the various supplements, test kits, additives and treatments included.

In case you didn't know, as a European leader in their field, Colombo offer over 30 years of experience in the development of water treatments and fish medications and have the strong R&D capability to support their operation. They offer a full range of marine water care products from a salt mix made from natural

D-D the Aquarium Solution

There was a distinctly business-like feel to the D-D presence and, following the buy-out of Simply Aquaria earlier this year, we noted a number of new products on show bearing the prestigious D-D branding. The first to draw our eye was a ClariSea Fleece Roll-Filter set-up and running on a test system. Coming in two sizes rated for either 3000 or 5000lph maximum through-flow, these high efficiency water filtration systems effectively capture suspended particles such as micro algae, detritus, food, organic waste and gravel dust from the water column and thus remove the need for filter socks (and all the associated mess and effort involved). Sold flat-packed for self-assembly, we were struck by the compact size of the ClariSea display unit and amazed how the 17 micron pore size could handle around 5000lph flow, while remaining almost dead silent. Encouraged by David Saxby to 'have a sniff', we can also confirm that the used roll seemed to emit no odour thanks to the unique drying process that takes place! With the 3000 available in both manual and automatic versions,

seawater, right through to substrates, reef safe medicaments, coral nutrition, test kits etc, and you will find their products competitively priced too. On the subject of test kits, perhaps the most interesting product to us on the Colombo stand was the 7 in 1 master test kit for freshwater. The kit itself consists of tests for pH, General Hardness (GH), Carbonate Hardness (KH), Nitrite (NO₂), Nitrate (NO₃), Ammonia (NH₄) and Phosphate (PO₄) together with an extensive, easy to follow, user friendly manual and online instruction videos as back-up.

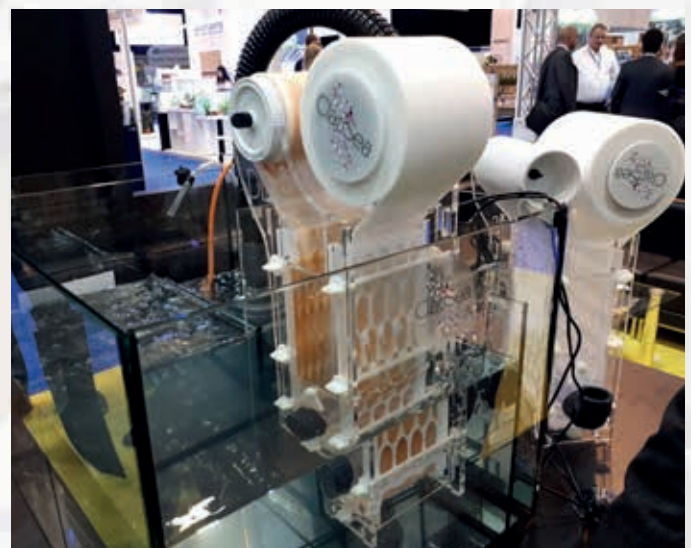
www.colombo.nl

the ClariSea not only promises to make your water column crystal clear but also offers significant nutrient removal capabilities. Take note that an auto advance unit is also available as an upgrade to the 3000 manual model, while the larger 5000 model is automatic as standard. Another proven product revamped by D-D is the JumpGuard DIY aquarium cover which comes as a kit consisting of aluminium frame, netting, corner pieces and tools to put them together. Coming in a variety of sizes from 60x60cm up to 180x90cm, this is a simple yet neat and effective way to cover those rimless aquaria and to prevent the senseless loss of 'jumpy' fish species. Finally, we were most impressed by a REEFER-PRO 1500s aquarium on a beautiful wood gloss finish cabinet. We've sung the praises of this system before, but just to recap some of the highlights, this package distinguishes itself with a unique and thoughtful weir design, innovative sump layout, extra height to the cabinet and Hydra 52HD lighting, and that's just for starters. As a major distributor for other brands, there were also a vast array of top quality high-end products on show here from the likes of AI, Deltec,



Rowa, Abyzz and Polyplab, and given the recent developments, D-D also added Autoaqua,

Jecod, Kamoer, KH Guardian, Fli!ppper and Schego to the list this year.



www.theaquariumsolution.com

Reef Octopus

Exhibiting for the first time, we were immediately drawn by the ranks of shiny 'Octo' branded acrylic equipment on show. A brand of Chinese company Honya Co. Ltd, Octo products are already globally respected and take note that this outfit specialises in designs that are elegant in appearance yet highly efficient and reliable. Constructed from quality materials, and professionally manufactured they are also renowned for innovative features. This was exemplified perfectly by their BioReact biopellet reactor line which gets around the problem of clogging sponges by simply allowing water to spill out over the top of the reactor through

a rigid sieve and into your sump. Genius! Alongside the reactors, numerous skimmers were exhibited including the impressive Regal 300-S (shown opposite). This unit features the VarioS controllable DC pump which is also available in non-skimmer format for return pump duties. Beyond this, we were particularly impressed with the Cleaner-200 neck cleaner and WC (waste collector) products. Overall this brand is clear choice in the specialist skimmer market and we'd dearly love to get our hands on some of this kit to give it a real world test at some point. For further information including details on where to buy in the UK head to:

www.reefoctopus.com



Tunze

We can rely on Tunze to have an interesting display and this year proved no different with their comprehensive range of reef lighting, flow, control and care products on show. The Smartcontroller 7000 is obviously a big development this year and take note that we have a full in-depth review this issue so head there for a detailed low-down on this unit. Beyond this, we were perhaps most impressed with Tunze's flow pumps which are world-renowned for their reliability, efficiency and quality. The Stream 3 is a particularly interesting option. Pushing a respectable 15,000lph, this innovative water-moving device features magnets that are so precisely aligned that they eliminate contact between the pump's primary moving parts, leaving only a diamond-hard zirconium oxide as a contact surface. This not only makes them extremely durable but also virtually silent running. Consuming up to 50 watts, this controllable pump comes with a 5 year warranty to underline the reliability factor. Also on

show we noticed 'Care Panes' which is a solution for cleaning the outside of your aquarium (actually all smooth surfaces made of glass, plexiglas, plastic, metal, painted wood, and many more materials). Having had to deal with 'little hands' and the associated smears they leave on tank glass ourselves, this is a really useful product that does the job quickly and will leave your glass smear free in no time. With gentle ingredients, it isn't going to harm sensitive organisms in your aquarium either. For the inside of your glass you aren't going to find a better algae magnet scraper than Tunze's Care Magnets. Ranging in size from 'Pico' up to 'Strong +', this scraper features a clever, twin-bladed design that is able to remove even hard algae deposits yet remains gentle on silicone seams with its rounded edges. Able to be used as a hand-held scraper internally also, the main draw is likely to be the scratch-minimising design of this scraper which makes it suitable for use on glass or acrylic, and even on curved tanks.

www.tunze.com



EvolutionAqua

New for 2018 from EA is the eaReefPro600sCube, a 600x600x600mm cube tank with all the popular features including ProSump with twin moveable baffles, central weir and removable weir comb. This increases the Pro range to five models, all available in Evolution Aqua's 16 pre-assembled cabinet finishes. With a strong presence at the show EA pushed the boat out again this year and showcased their stunning range of aquaria with not one but two fully stocked reef systems with aquascaping and stock provided by top UK shop Burscough Aquatics. The first of these was an eaReefPro 1500s on a gorgeous textured 'Natural Halifax Oak' finish cabinet. This LPS dominated display contained some lovely Acans in particular, and the two flagship Kessil AP700s showcased these beautifully with a perfect combination of spread and shimmer. Waveline pucks provided the flow while, within the cabinet, EA showcased the new eaProSump system with adjustable baffles. As exclusive UK distributor for AquaForest, this system was running with purple-accented AquaForest AF skimmer, reactor and a Kessil H80 Tuna Flora macro algae grow light. Moving on, the second system demonstrating the potential of the EA range was an eaReefPro 1200 which featured a soft coral orientated display and was lit by two Kessil A360s. Sitting on a Bronze cabinet, this system again featured the ProSump (which can be bought separately by the way), with AquaForest skimmer, reactor and Kessil H80 grow light – a potent combination clearly able to support heavily stocked systems. Backing onto the EA area, we also had chance for a quick chat with AquaForest directly and got chance to examine the AF skimmers up



close. Of course, AquaForest are also highly regarded for their range of salts, probiotics,

supplements, additives, feeds, filtration media and test kits. Head to:

www.evolutionaqua.com and www.aquaforest.eu for more information.

EasyReefs

For some time EasyReefs has been lighting-up the internet with videos of its unique Masstick food which seemingly 'feeds the impossible'. It is now a well-established brand of high-end reef foods that offers a full line-up including EasyBooster (phytoplankton gel), DKi (mellow pellets) but until now no specific coral food. Enter the NEW EasySPS; a natural food created specifically for SPS-type hard corals, although due to its composition it can be used in aquariums in which the SPS are not the predominant corals. Its composition is based on lyophilized marine shrimp (*Palaemonetes varians*), three different types of marine phytoplankton (*Phaeodactylum tricornutum*, *Isochrysis galbana* and *Tetraselmis chuii*), fish oil (sardine) and tocopherols (vitamin E). The ingredients of food offer a high percentage of proteins, fatty acids and carbohydrates; except fatty

Sicce

Italian brand Sicce are renowned for the quality of their products (particularly their SYNCRA line of water pumps) and, rating the show as one of the most professional in Europe, were pleased to participate at Aqua once again this year. This was a great opportunity for them to display their new HI TECH pumps, designed and made in Italy, in what they consider a leading market, and to receive encouraging feedback on their technical solutions and improvements. They rated the show as a positive experience particularly in developing professional connections between the industry and the trading channel. In terms of our own feedback, we couldn't help noticing the full line-up of SDC pumps (of which we reviewed the 7.0 in the last issue). Take

acids its nutritional profile is very similar to the percentages present in coral tissues. The difference in percentages between the fatty acids of the EasySPS and the values present in coral is because the zooxanthellae produce these. During manufacture a unique process of lyophilization, agglomeration and shear milling, a product with an ideal particle size of around the 60 microns size (55% of the particles @ 60 micron) is made; great for polyp feeding your SPS. EasySPS therefore provides an ideal food composition for corals with minimal pollution. A new EasyBooster product has also joined the phytoplankton range which is more diluted allowing easier control with dosing pumps that struggle with 1ml accuracy. It uses the same dosing connector as the existing EasyBooster range. Perfect for boosting critter colonies, feeding clams and soft corals.

www.easyreefs.com/en/

note that the smallest model in the range, the 6.0, should also be out now.

www.sicce.com



ITC Aquatics

With a gigantic XXXL Algae Light Reactor towering over their stand, we couldn't miss ITC. Actually, we can always rely on Jez to spare us a few minutes and we were very grateful that he could take time this year to show us some of the new kit coming our way. Firstly, we were excited to be shown EcoTech's new diffuser attachment for the Radion LED range. A relatively simple add-on, these units nonetheless appear to be of the same high quality as the fixture to which they attach, and they don't detract from the class-leading design of the Radion in our eyes. The simple magnetic mounting system looked like a doddle to operate and we were interested to hear that one can change even the grade of the diffuser plate to fine tune the amount of diffusion. EcoTech may not be the first to adopt diffusers but the Radion range, including the G4 Pro which we reviewed back in issue 63), really is truly formidable, and likely needs no introduction. As usual, ITC had one of the best reef displays fully stocked and running so we could see items of equipment in operation. This set-up included the Neptune Systems ATK which Keith Moyle reviewed in issue 66, and one of the smaller Nyos Quantum skimmers which we've been big fans of for a while. Perhaps the most interesting product in the sump was an ALR 1 light reactor, baby to the XXXL towering over us. Although it's been available for a few months now, the ALR1 even won the award for 'best new marine product' at this year's show... it really is that good! Available in 3 sizes, ALR1/2/3, prices start from £199 and the unit is available at any reef store worth it's salt. If you want the natural nutrient export of marine macroalgae without the mess then this is product is the cream

of the crop. Finally, Jez was keen to show us some new backlit LED Refractometers. A new take on an old idea, the addition of the light makes these a really easy way to read your salinity and mean the days of going

goggle-eyed should be a thing of the past. RRP on these is £39.99 so they compare very favorable to non-lit models. Of course, ITC distribute a wide range of other products including Korallen-Zucht, Nyos,

Dr Tims, Rossmont, Real Reefs and Aquatronica. Drop them a note via the ITC website for more info.

www.itcaquatics.co.uk



Seneye

Seneye seem to have gone from strength to strength during the last couple of years and we were intrigued by many new products which look to be variations on the successful Seneye Reef system but tailored towards segments of the market. Specifically, their Coral unit looks particularly interesting to reef-keepers and tantalisingly promises KH along with pH, temp, water level and PAR monitoring at a sub £150 price point. We believe such measurements would be achieved through a formula applied to the temp, pH and CO2 readings that the unit can perform and, while we can't comment on the accuracy just yet, the ability to see real time trends in KH use really does get our attention. Again, a monthly sensor is replaced, meaning that although convenient there is an on-going cost; although being fair all other KH measurements methods will require calibration fluids and probe replacement to maintain accuracy. Beta trial is expected Q1 2018.

We also noticed the Seneye Spectra which is a new dedicated underwater light meter which not only measures light in terms of PAR and Kelvin but gives a nano metre precision of spectrum between 400nm and 700nm. Seneye has been making affordable PAR meters for some time (indeed we used the Seneye Reef in our evaluation of the Philips Coralcare LED in the last issue) but the new Spectra is specially tuned to be even more accurate in its sensitivity to all bands of the visible light spectrum. As we all know the light values hitting Coral can be very different over a tank and that also different corals have different lighting requires, so the one size fits all approach does not work for reef lighting. A cool feature of the Seneye Spectra is the

ability to download databases of specific corals, plants and zooxanthellae clades which are plotted on the spectrum meter screen and allow you match up both intensity and spectrum to a known coral action spectrum.

And finally, 2 types of leak detection units that attach to the auxiliary ports in your Seneye Web Server. The first type is designed to go under cabinets and a second weighted type is designed to be used directly on floors. It's an obvious but essential add-on; after all a tank leak can do more damage than just kill all your fish. These products are expected to fully launch in Q2 2018.

www.seneye.com

Fritz

Influential brands are seldom new to a market however, it's great to see Fritz now available in the UK. Market leaders in the US with their revolutionary nitrifying bacterial products for over 30 years, the innovation has continued with the creation of the unique Turbo Start 900 which contains an unprecedented concentration of live Nitrosococcus and Nitrococcus bacteria that's uniquely kept chilled to ensure maximum bacteria survival. This means that water quality problems should be a thing of the past and being able to speedily mature or recharge a crashed aquarium has reached a new level. Many factors change the bio-loading of an aquarium system, whether it be new, or have had new livestock added or a medication has been required to be used, all can affect the biological capacity of the life support bacteria. Turbo Start ensures these problems do not cause lasting damage in the aquarium and are a must for any serious fish and reef keeper. The Turbo start product sits alongside the more dilute, but easier to store Fritzyme 9 product, which

again carries live nitrifying Nitrosococcus and Nitrococcus bacteria and Fritzyme 460 a heterotrophic bacterial product that works actively to remove organics and sludge from an aquarium system. Fritz have also launched a hugely successful synthetic salt in the US and this is now available in the UK as well. The Fritz Pro Aquatics Reef Pro Mix (RPM) is manufactured using only the highest quality raw materials. Formulated by researchers and marine scientists, RPM contains all of the necessary major and minor elements of natural sea water that are utilised by living marine and reef animals. Correct pH and buffering capacity, essential minerals and trace elements have been added in precise ratios to ensure a correctly blended mix for the health and longevity of your livestock. Available in both a 6.36kg (14lb) bag and a 25 kg (55lb) box the RPM salt undergoes rigorous QC testing before leaving Fritz,

ensuring consistency for your livestock every time. The 25kg box contains 4 separate bags making the product easy to use and handle. To complement the RPM salt the RPM Elements range of additives ensures your coral stays healthy and is made up of 3 easy to use products; a two-part Calcium/Buffer system firstly the Alkalinity product and backed by the second, Calcium product. To compliment these the third product is a Magnesium additive. The Fritz pure reef elements do not come with a laundry list of untested, unqualified "trace" elements and metals that can eventually lead to a toxic breakdown in your reef. Fritz Pure Reef Elements along with Fritz Reef Pro Complete Salt mix are the key to a beautiful, healthy and long-lasting reef tank. For more information head over to the Fritz website to learn more about these influential and successful products:

www.fritzaquatics.com



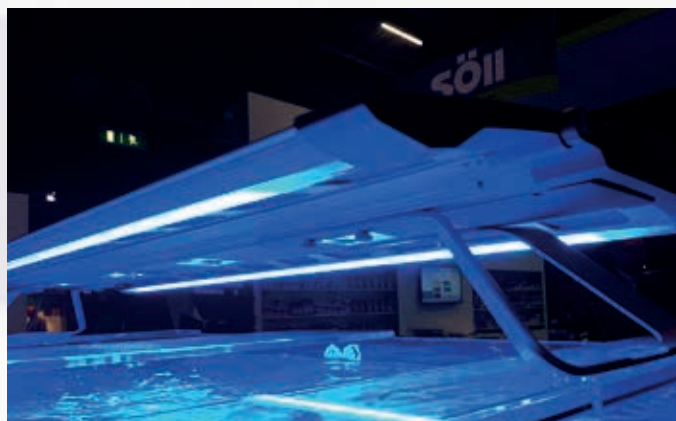
Vitalis

With quite the range of new foods on show this year, it was interesting to chat to World Feeds Managing Director Peter Kersh who emphasized the pedigree of the Vitalis range built from a combination of specialist manufacturing techniques, quality control and a wealth of experience in the industry, particularly in working with public aquaria across the globe. There's clearly a huge variety of foods available in the Vitalis range, from tiny 1mm pellets up to much larger sizes, plus flake foods (in either standard or 'Platinum' form), enrichment solutions, and most recently, a range of invertebrate foods have also been added.

Of definite interest to reef-keepers, this range consists of tailored pellets for anemones and LPS corals, and micronized foods for soft and sps corals. In the 100 – 400um range, the latter two mimic particulate matter consumed by coral species in the wild and, having taken home some samples, we can attest to the claim that they promote excellent polyp extension. Don't forget that Vitalis are also a member of, and work closely with, the Pet Food Manufacturers Association to promote high quality nutrition for your fish in line with E.U. regulations and are also members of OATA both supporting their work and promoting and protecting the UK ornamental aquatic trade.



www.vitalisaquatic.uk



BCUK

As ever the BCUK stand proved to be exceptionally busy and this year and we even had 'Youtubers' to contend with as we attempted to discuss the latest developments. Perhaps the most striking offering was the recently launched Recurve LED fixture which was set-up in full demonstration mode. This exciting stealth-like unit comes in three sizes ranging from 2 to 4 feet long. With variable geometry 'wings' that can be adjusted up to 30 degrees, the key USP of this unit is that the wings allow it to be optimised either for depth penetration of a wider spread of light. The 3 different models feature 2, 3, or 4 LED clusters respectively with these aligned along the central spine of the unit and nestled in hexagonal recesses behind high clarity 'nano blend' crystal lenses. Each central cluster contains a range of Cree and Luxeon LEDs in different shades of blue and white. Along the wings of the unit there are additional Epiled LED arrays in strips that offer additional colours consisting of red, cyan, blue, deep blue and violet colours. These sit behind haze rendering covers to blend the colours evenly. The unit can be controlled 'out

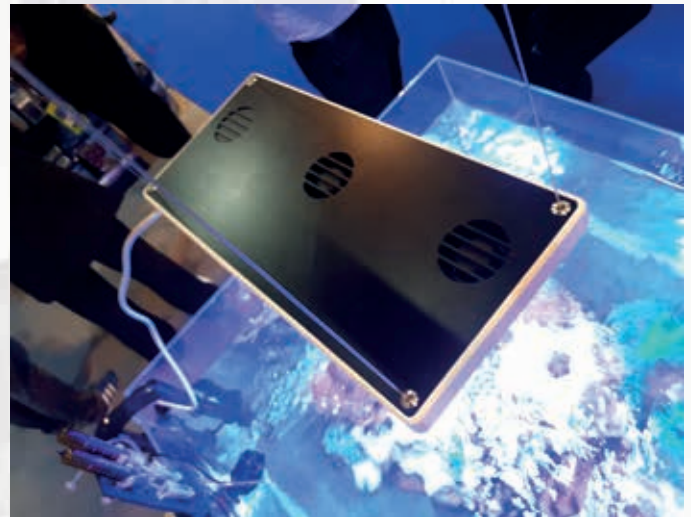
of the box' using the onboard control interface or wirelessly through Maxspect's ICV6 hub (not included). This bleeding edge technology is available now and retails from £700 to £1150 depending on the unit. Maxspect's DUO pump was also immediately noticeable and this radically new design features a centrally mounted motor with 2 separate volutes and centrifugal impellers. With an output of up to 9500lph and a frugal power consumption of just 8-65w this pump is for internal use only. At an RRP of £299.99, the Duo was launched mid-September and take note that it also comes with an array of fittings to suit most applications. On show was also the RSX LED light system. This is the predecessor to the Maxspect Razor with four channels of control it offers more variation and blend to the colours, and can be manually programmed via the onboard controller or wirelessly with the App and additional ICV6. The RSX is available in four sizes with pricing from £399.99 to £749.99. BCUK also had on display their range of quality feeds and some prototype paste feeds due for release in the new year!

www.food4fish.co.uk

Hydor, Prodigio

With the Aqamai range of smart devices now available in the market place we were keen to examine the Aqamai LRM light fixture up-close and in operation, and a working display system gave us the chance to do just this. The first thing that struck us about this unit beyond the amazingly compact size and slim-line design, was the quality of construction. This fixture puts many of the key players to shame with its metal and carbon fibre effect housing. On the underside, there are 2 clusters of LEDs, with each consisting of an array of 8 colours controllable across 6 channels. With a total output that comes in at 100 watts this unit features 90 degree

lenses and is controllable via Smartphone using the Aqamai app. Illuminating the test aquarium, the quality of light produced looked to be excellent at first glance and the fixture itself is right up there with the market leaders in terms of appearance in our opinion. Also on this test tank we noted the tiny Aqamai KPS pumps which are also fully controllable and programmable via the Aqamai app. These pumps really are miniscule at just 2.5x1.8 inches but don't be fooled as they still output an impressive 1400 - 4150lph while consuming just 4-10 watts. Rated for 40 – 200 litre tanks and mountable on up to 15mm glass these pumps incorporate the tried and tested magnet/suction mounting system from the Koralia G3.



For those running reefs at the smaller end of the size scale, the Aqamai range is definitely worth investigating. Exhibiting alongside Hydor, it was also great to catch up with French operation Prodigio. We've been impressed with their recent

offerings (see our detailed review of their Pure Ocean salt in issue 65) and the range of probiotic supplements on show here was also extensive as ever.

www.hydor.com
www.prodigio.com



So that's it for another 2 years! Our take home from this years event was, overall, that key areas of competition at the moment definitely seem to be in Alkalinity/KH monitoring/control, algae reactors, roll filters, and LED lighting. In addition, the battle of the tanks continues as it also does in the supplementation system market. This year 'press on' foods also seemed to be gaining popularity with a number of providers offering such products. We'd like to thank all the representatives who spared time to talk to us and no doubt we'll be catching up with some of them again soon as it isn't too long until Interzoo in May 2018. We are certainly looking forward to revisiting many of these products at this event and no doubt getting to see a lot of others that weren't represented at Aqua.

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Featuring adjustable LED wings which allow users to concentrate light towards the centre of the tank for better depth penetration or to widen the spread of light on larger aquariums. This ground-breaking innovation in aquarium lighting is unique to the Recurve.

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BCUK Aquatics



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August 2017

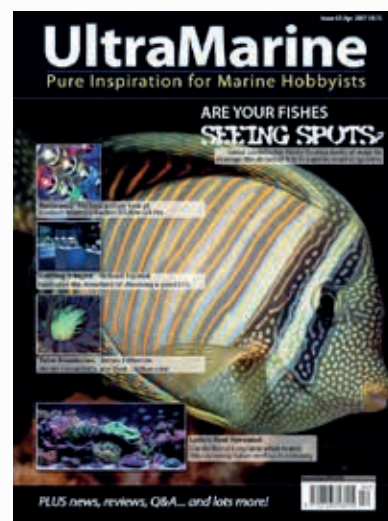


Did You Know?

The Coral-banded or Boxing Shrimp *Stenopus hispidus* is a cleaning shrimp and individuals have been seen to remove and consume parasites, injured tissue and rejected food particles from certain coral reef organisms. Often living in bonded pairs, *S. hispidus* typically perch near the opening of the cave or ledge and wave their antennae to attract fish. Individuals have the freedom to enter the mouth and gill cavities of host organisms without being eaten, but usually remain in contact with the substrate when cleaning. Species that *S. hispidus* has been known to clean include morays, tangs, grunts and groupers (Limbaugh et al., 1961).

A Closer Look at UltraMarine Magazine 63

- Close Look – EcoTech Marine Radion XR30w Pro G4
- Close Look: Revisit – John Clipperton follows-up his 2016 review with a look at how his Red Sea Max Nano is coming along.
- Reflections (Part 1) – Seasoned UK hobbyist Keith Moyle proffers some pertinent perspective by taking us way back to the early days of reefing in this first nostalgic journey, which focuses on the 70s and 80s.
- Getting it Right – Ex-Editor Richard Aspinall explores how to avoid the ‘sharks’ and get the right fish by being discerning in your decision-making, and choosing your marine retailer wisely.
- Definitive Guide: Blue Planet Aquarium Curator Dave Wolfenden dishes the dirt on refugium design
- Meet the Inverts: Tube Anemones – Get ready for fireworks as veteran US aquatics expert James Fatherree investigates these superficially delicate, cryptic Cerianthids who pack an unexpected punch. There’s definitely a sting in this tale!
- Seeing Spots: New contributor Kirsty Youngs dons her medical scrubs and suggests ways to combat the dreaded ‘ich’.
- Tank feature – Danilo Ronchi introduces another stunning system from his home county of Italy
- Cardinalfishes for Small Aquariums – veteran ichthyologist Bob Fenner suggests some stunning species of these naturally nocturnal schoolers that are at home in even nano reef tanks.



Plus the latest marine and product news, and the ever-useful Q+A with Dave Wolfenden answering your marine queries

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A Closer Look at UltraMarine Magazine 64

- Close Look: Vertex Aquaristik Omega 200i Protein Skimmer
- Reflections (Part 2): Keith Moyle reverses out of memory lane and on the way points out the key developments that have affected the hobby from the 90s to the present day.
- Definitive Guide to: Ozone and UV: Dave Wolfenden turns his attention to these initially mysterious methods of marine water management
- Anatomy of an Atoll: Richard Aspinall makes us moist with a report from the Maldives in which he details some unique habitats
- Trans-Atlantic Reefing: Mike Paletta highlights the different approaches adopted by European and American hobbyists as he find it’s “different strokes for different folks” on either side of the pond.
- An Enduring Commitment: Flamboyant doesn’t even come close to describing the Harlequin shrimp. Ken Wingerter puts their beauty into words and tells us more about these incredible crustacean
- Maxwell’s SPS Heaven: John Clipperton visits a Bolton-based reef-keeper who has created a stunning collection of SPS corals in truly inspirational display.
- Hammer Time: James Fatherree focuses on two species of a well known and commonly available Euphyllid coral in this article with a raft of useful tips and observations for their successful care in captivity.




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INVESTING IN *YOUTH*



Female Octopus guarding her developing eggs. Image: divedog/Shutterstock.com.



For the species that don't feature at the top of the food chain, the aquatic world can be one fraught with danger at every turn, and animals are never more vulnerable than during their early life history stage. At this point in their development, larval animals need all the help they can get to make it to adulthood, and for many species, the fight for their survival starts at home, in the form of their parents.

by
Chris Sargeant

Parental care typically consists of behaviours undertaken by the parents, post-fertilisation, that increase the hatching success and survival of their young, and with numerous such examples found across the animal kingdom, life under water is no different. From male sea spiders, *Parapallene australiensis*, carrying their babies on that back to grey whale, *Eschrichtius robustus*, mothers escorting and protecting their calves as they swim the gauntlet of Monterey bay, a whole array of aquatic animals invest everything they can to try to ensure the survival of their offspring. In some cases, even if it means them paying the ultimate price.

In 2014, a species of deep-sea octopus, *Graneledone boreopacifica*, hit the headlines after the Monterey Bay Aquarium Research Institute (MBARI) recorded a female protecting her eggs over a period of 4½ years. First noted in 2007, the same octopus, identified by her distinctive scars, was observed on the next 18 dives over that period, in the same position, continuously aerating her eggs and keeping them free from debris. During this period, the octopus showed no interest in food, and her condition gradually deteriorated with time, until on the final dive researchers found only the empty shells left, with the mother assumed to have

died. This remarkable show of maternal care occurs amongst a number of other cephalopod species too, with females laying only one set of eggs in their lifetime, and dying around the time they hatch.

It was the length of time invested in this case that caught the researcher's attention, rather than the act of maternal care itself. The upshot of this prolonged brooding event means that the young hatch out as fully developed and independent little octopuses, increasing their chances of survival. In the case of *Graneledone boreopacifica*, this strategy appears to be successful, as they rank as one of the most common species of octopuses in the Northeast Pacific. Fish incubation rates can vary between species, starting with a few days up until a couple of weeks. The Magellan plunderfish, *Harpagifer bispinis*, holds the record in terms of guarded incubation, and has been observed caring for its eggs over the course of four to five months.

Whilst these are extreme examples of the lengths some species will go to care for their eggs, there are numerous others ways in which aquatic animals care for their developing young. Perhaps the most bizarre method has to go to the hydrozoan, *Ectopleura larynx*, which can be found



Golden Damselfish, *Amblyglyphidodon aureus* Image: Chris Sergeant

attached to buoys, rocks and seaweed at low tide around the UK. Related to corals and jellyfish in the phylum Cnidaria, these little hydrozoans form colonies, but using a different method to the usual asexual reproduction. First discovered by Paulyn Cartwright at the University of Kansas, female *Ectopleura larynx* brood their offspring in their pouch, or gonophore, and release their juvenile polyps to settle on a nearby surface. Only that surface tends to be the mother polyp itself. The juvenile polyps fuse to the mother, and as their tissues join up to form one colony, the colony shares a digestive system, meaning that the juvenile polyps can access nutrients from food caught by the mother polyp. Competition for food and space in the benthic area they call home means that it pays to stay close to mum.

With conscientious parents, care starts straight after fertilisation, and a good nesting spot goes a long way to help safeguard unhatched eggs, as well as increase the chances of attracting a member of the opposite sex. Nests can

be simple, such as those favoured by damselfish in the Pomacentridae family. Species such as the golden damselfish, *Amblyglyphidodon aureus*, clear algae and debris from a patch of rock or coral and defend their brood from all on-comers. In home aquariums, clownfish will select a nesting spot close to their host site, or anemone if available.

Others will use whatever materials or objects they can find in their local environment. The common goby, *Pomatoschistus microps*, will nest underneath discarded shells, while corkwing wrasse, *Symphodus melops*, build more elaborate structures from seaweed and rocks. The spotted handfish, *Brachionichthys hirsutus*, has even been recorded using sunken beer bottles in the River Derwent, Tasmania, as an artificial spawning site. These bottle reefs coincide with mooring grounds, and provide a secure place to deposit their eggs, hidden away from the clutches of predatory sea-stars, with their natural breeding grounds either destroyed or taken over by invasive species.

Without question though, the most impressive nest belongs to the white-spotted pufferfish, *Torquigener albomaculosus*. For years, intricate, circular designs had been observed sculpted in the sand off the Ryuku Islands, Japan, with no explanation as to how or why they got there. Finally attributed to the diminutive white-spotted puffer, these elaborate nests, some reaching 2m across, are created by the males, and decorated with shells around the edges as a final artistic flourish, to entice in nearby females. The peaks and troughs are created by the body of the pufferfish digging in the sand to form irregular patterns around a fine sandy centrepiece. More impressively, once a male has finished guarding his eggs in the nest, he heads straight off to build a new nest to start the courtship process once more.

Other fish have more of an affinity to a particular nesting site, so much so that they will return year on year. The shanny, *Lipophrys pholis*, is a common species across the rocky shorelines of the North Atlantic, frequently inhabiting rockpools

and nesting amongst the rocks and shells. A study led by Paulo Esteves Jorge at the Marine and Environmental Sciences Centre in Lisbon, Portugal, tracked the males, who defend the eggs, when they left the nesting grounds to head offshore to feed. These tracked individuals would return year on year to the same site, and often to the same exact nesting spot they used previously.

One fish even uses his parental skills as a way to entice members of the opposite sex. In a study at the University of Helsinki, researchers showed that male sand gobies, *Pomatoschistus minutus*, increase their level of parental care when in the presence of females. As with a number of smaller, tide pool species, sand gobies lay their eggs underneath rocks and shells and it is the male who stands guard, continually fanning the eggs. When males who were guarding their clutch of fertilised eggs were exposed to another female, they were observed actively increasing their rate of fanning and nest maintenance, rather than reducing parental effort

in favour of mate attraction. Termed 'courtship parental care', this is the first time any species has used care related behaviour in an experimental setting to attract a mate.

For some animals, guarding a nest just isn't an efficient enough method, as it can limit other behaviours until the eggs hatch, particularly an issue if you are sizing up to being a single parent. So, the other alternative is to bring the eggs along for the ride, and this behaviour occurs all over the marine world. The female of the minute copepod, *Corycaeus anglicus*, carry their eggs behind them until they hatch, while larger, familiar reef crustaceans such as boxer crabs, *Lybia tessellata*, or sexy shrimp, *Thor amboinensis*, carry their eggs under their abdomen. Brooding cushion stars, *Pteraster capensis*, found around the South African

coastline store their eggs in a specialised brooding chamber. They possess two layers of skin, with the eggs stored between these two layers until they hatch, upon which the young sea stars emerge through the female's ventilation hole. Prior to hatching the eggs are cleaned and aerated by the female sucking in and ejecting water through the ventilation hole.

Fish carry their eggs in a number of different ways too, and perhaps the most well-known of these is the pouch-brooding seahorse, with the males of the species carrying the eggs. Pairs engage in an elaborate courtship ritual, after which the female deposits the eggs into a brooding pouch on the male's stomach. As the eggs develop, the pouch swells, giving the impression the male is pregnant, before he releases them from his care after 2-4



Shanny, *Lipophrys pholis* Image: Chris Sergeant



Boxer crab, *Lybia tessellata*, carrying her egg mass. Image: Luca Vaime/Shutterstock.com

weeks to fend for themselves. In the aquarium trade, the most commonly occurring species is the common or spotted seahorse, *Hippocampus kuda*, although these fish should not be considered suitable for beginners. They require a low rate of flow to stave of the risk of gas bubble disease, and can be finicky eaters, requiring regular meals due to their lack of a stomach. Other syngnathids, such as the weedy seadragon, *Phyllopteryx taeniolatus*, and the leafy seadragon, *Phycodurus eques*, also retain their eggs, but rather than a brooding pouch, the male sticks the eggs to the underside of his tail instead.

A number of mouth brooding cardinalfish are seen in the trade, but two of the most commonly encountered are the pajama cardinalfish, *Sphaeramia nematoptera*,

and the Bangaii cardinalfish, *Pterapogon kauderni*. Pajama cardinalfish hail from the Western Pacific, and are found from the Ryuku Islands in Japan, down to the Great Barrier Reef, while Bangaii Cardinalfish are naturally only found the Bangaii Islands of Indonesia, although small isolated populations have been noted elsewhere across Indonesia, probably as a result of aquarium collecting.

In terms of habitat preference, Pajama cardinalfish prefer to swim amongst branching coral outcrops, while Bangaii cardinalfish can often be found sheltering between the spines of long-spined sea urchins, *Diadema setosum*, although they are not obligate symbionts. Both species engage in a degree of parental care, with the males incubating the fertilised eggs within their mouths, slowly rotating them to

increase aeration and ceasing to feed until his brood hatches.

In the wild, aggressive collecting of the Bangaii cardinalfish using unsustainable and damaging harvesting methods have seen wild numbers plummet to the point they are now considered endangered, and wild sourced animals should be avoided. Both of these species readily breed in captivity, with aquacultured specimens already acclimated to aquarium life. Ensuring you have a pair isn't always immediately obvious, but females tend to have rounder bodies whilst males have longer second dorsal fins. Sexing can also be done via the 'vent method' in plump, well-fed fish, with males displaying two conical shaped vents between their ventral and anal fins while females have just one. Prior to spawning,

pairs will separate from a main group to establish a spawning site and start to defend their territories. When kept in groups, housing should include multiple overhangs to aid the shoals feeling of security, and potential provisions need to be made if intraspecific aggression becomes too much. A high-quality diet and enriched diet of live and frozen foods will help condition would be parents.

As with the cardinalfish species above, it is the male jawfish who shoulders the responsibility of carrying his eggs in his mouth too. Aquarium jawfish species, such as the dusky jawfish, *Opistognathus whitehurstii*, blue dot jawfish, *Opistognathus rosenblatti*, and the yellowhead jawfish, *Opistognathus aurifrons*, dig burrows in the substrate within which they spend the majority of their time. The male



Leafy Seadragon, *Phycodurus eques*. Image: Michael Warwick/Shutterstock.com



Pajama Cardinalfish, *Sphaeramia nematoptera*. Image: Chris Sergeant



Bangaii Cardinalfish, *Pterapogon kauderni*. Image: Chris Sergeant

entices the female into his burrow using a variety of 'dance moves,' including pectoral fin and back-arching displays,, and once an egg mass has been laid, he fertilises and incubates the eggs in his mouth for the duration of their development. During this period he restricts his activities to primarily just aerating the eggs, with only the occasional forage for food. The reasoning behind this type of paternal care is not well understood, but by splitting the roles of eggs production and egg care between the pair, neither individual is over-exerted, meaning multiple matings can occur and serve to boost the likelihood of fry survival.

As with most marine species, jawfish need security, coming in the form of a burrow, so require a deep sand bed containing small pieces of rock rubble and shells within which to dig and reinforce their burrows. As a final flourish, they will often select a suitable sized piece of rubble or shell to act as a 'roof', drawing it over the burrow for extra security. Aquarists should be aware that these species are very adept at moving and relocating the sand bed and smaller parts of rockwork to



Male jawfish incubating his eggs at the entrance to his burrow. Image: zaferkizilkaya/shutterstock.com

suit their needs, rather than considering tank aesthetics.

Clownfish are another group of fish well known among aquarists for their levels of parental care. This instinct can be so strong in some males that they will even care for unrelated eggs. Like the 'love' hormone oxytocin in humans, ocellaris clownfish, *Amphiprion ocellaris*, have a similar type hormone, isotocin, which regulates their paternal care drive. Under regular conditions, attentive dads fan their eggs to aid aeration, and pick away at debris or dead eggs that could impact egg development. When this hormone was blocked in a lab study, males would stop aerating their eggs and neglected their parental duties altogether, highlighting the important

role isotocin plays in regulating paternal behaviour.

We have much to discover in terms of understanding parental roles in marine life, with previously unknown species and behaviours still being discovered. The newly described Alelia's damselfish, *Altrichthys alelia*, is one of only four known brood-guarding damselfish species, and was discovered by Giacomo Bernardi and his team from UC Santa Cruz in the Philippines. Whereas the total number of larvae from a broadcast spawning species settling back into a reef is less than 1%, with the additional parental care the survival rate can be as high as 35% instead. However, although survival rates might be high, it does mean a reduced dispersal range with restricted movement, leaving them vulnerable to extinction risks

should localised conditions deteriorate. While the Alelia's damselfish was only described in May of this year, and is consequently not found in the aquarium trade, it shares its brooding behaviour with the similar spiny damselfish, *Acanthochromis polyacanthus*, which are available to aquarists.

Whilst we seek to document these new species, human based factors can also negatively influence parental success in the ocean, causing headaches for doting parents. Anthropogenic noise pollution on coral reefs, from sources like running motors, can affect parental behaviour. Spiny damselfish, *Acanthochromis polyacanthus*, exhibit parental care and protection of their eggs and young, as well as supplying them with mucus food source. When the males, who undertake the majority

of the care, where exposed to motorboat noise on their reef patch, they displayed a heightened sense of stress, and spent more time chasing non-threatening intruders. In doing so, they neglected their parental responsibilities and this lead to reduced levels of offspring survival, and in some nests, complete brood mortality.

Playing happy families in your tank can be both educational and rewarding, but remember to consider the outcome of the success – a lot more hungry mouths to feed. If you are planning on housing species with the goal of breeding them, be sure to be prepared in terms of first foods and grow out tanks before you start, as this will save you the hassle when things get going, and allow you to enjoy nature at work.



Devoted male clownfish cleaning his eggs. Image: Jenny Lord/Shutterstock.com



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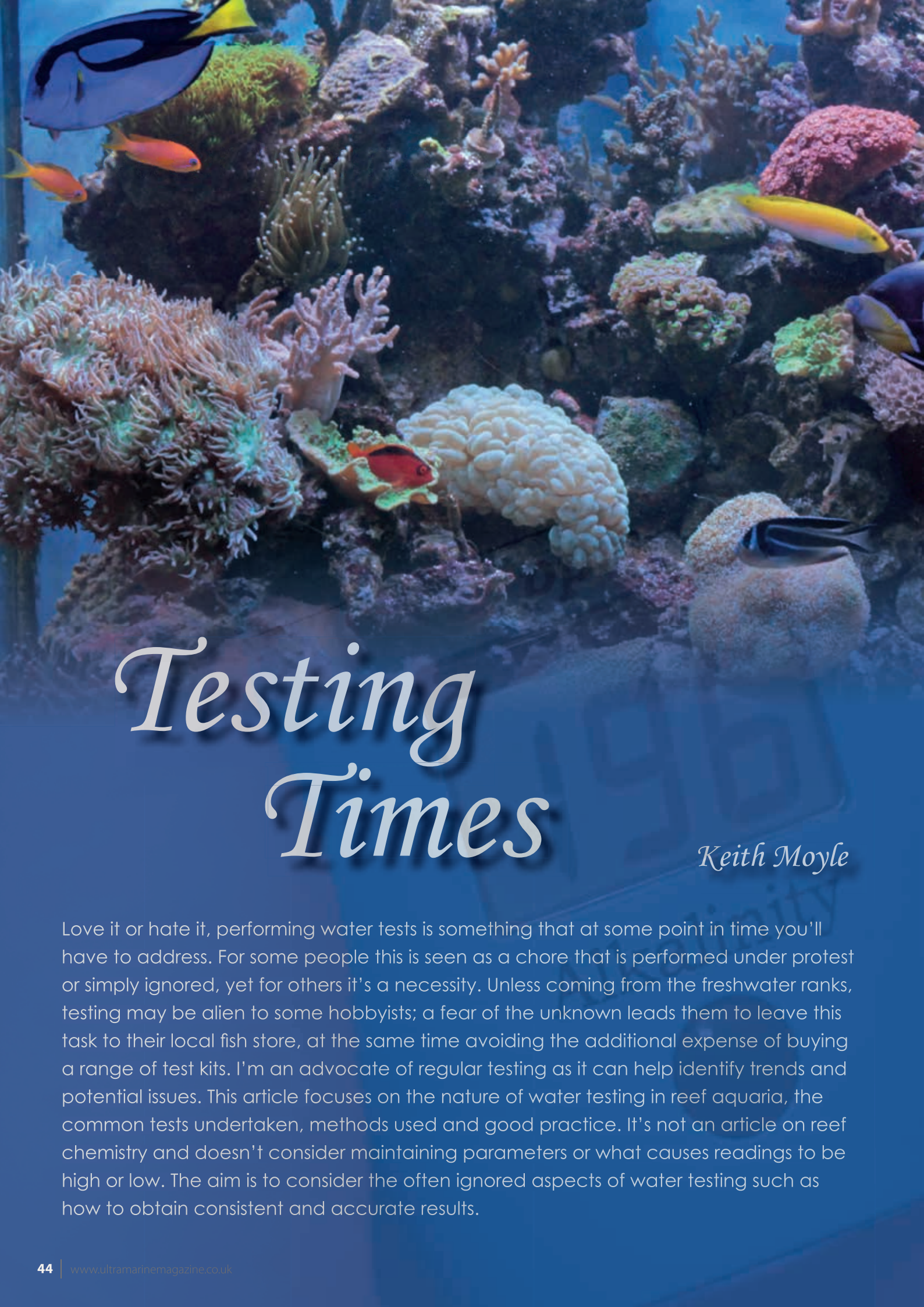
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Testing Times

Keith Moyle

Love it or hate it, performing water tests is something that at some point in time you'll have to address. For some people this is seen as a chore that is performed under protest or simply ignored, yet for others it's a necessity. Unless coming from the freshwater ranks, testing may be alien to some hobbyists; a fear of the unknown leads them to leave this task to their local fish store, at the same time avoiding the additional expense of buying a range of test kits. I'm an advocate of regular testing as it can help identify trends and potential issues. This article focuses on the nature of water testing in reef aquaria, the common tests undertaken, methods used and good practice. It's not an article on reef chemistry and doesn't consider maintaining parameters or what causes readings to be high or low. The aim is to consider the often ignored aspects of water testing such as how to obtain consistent and accurate results.



Purpose

Testing can tell us many things about an aquarium. Has it cycled, is phosphate at an acceptable level, is alkalinity at the desired value or indeed is there a chemical balance between calcium, alkalinity and magnesium? It's also key in understanding the rate of depletion of elements so we can calculate the volumes of additives required to maintain stable conditions. If test results are recorded they provide an invaluable insight into the health of the aquarium and highlight any deterioration in the chemical make-up of the water.

What tests are available?

There are dozens of test kits on the market covering the basics of ammonia, nitrite, nitrate

and pH as well as phosphate, calcium and magnesium. These are probably the most common ones used. For the advanced reefer potassium, strontium, iodine and iron are often measured especially when seeking to enhance certain colouration in SPS corals.

Accuracy

Before considering accuracy some context is essential. We have to accept that hobbyist test kits are a compromise between cost and accuracy. Kits that offer greater accuracy may well be more desirable but there is a point at which the additional cost of the kit overshadows this improvement. For our purposes it doesn't matter if a test reads 455 ppm calcium when the true



"Test tubes and other recipients in chemistry lab" by Horia Varlan CC BY 2.0

concentration is 450 ppm as long as the kit produces consistent results as we are more interested in stable conditions. Perhaps this was the reason why certain manufacturers discontinued production of their professional range of test kits in favour of standard kits which are considerably cheaper.

Notwithstanding this, the accuracy of the different kits available inevitably varies and even the stated accuracy

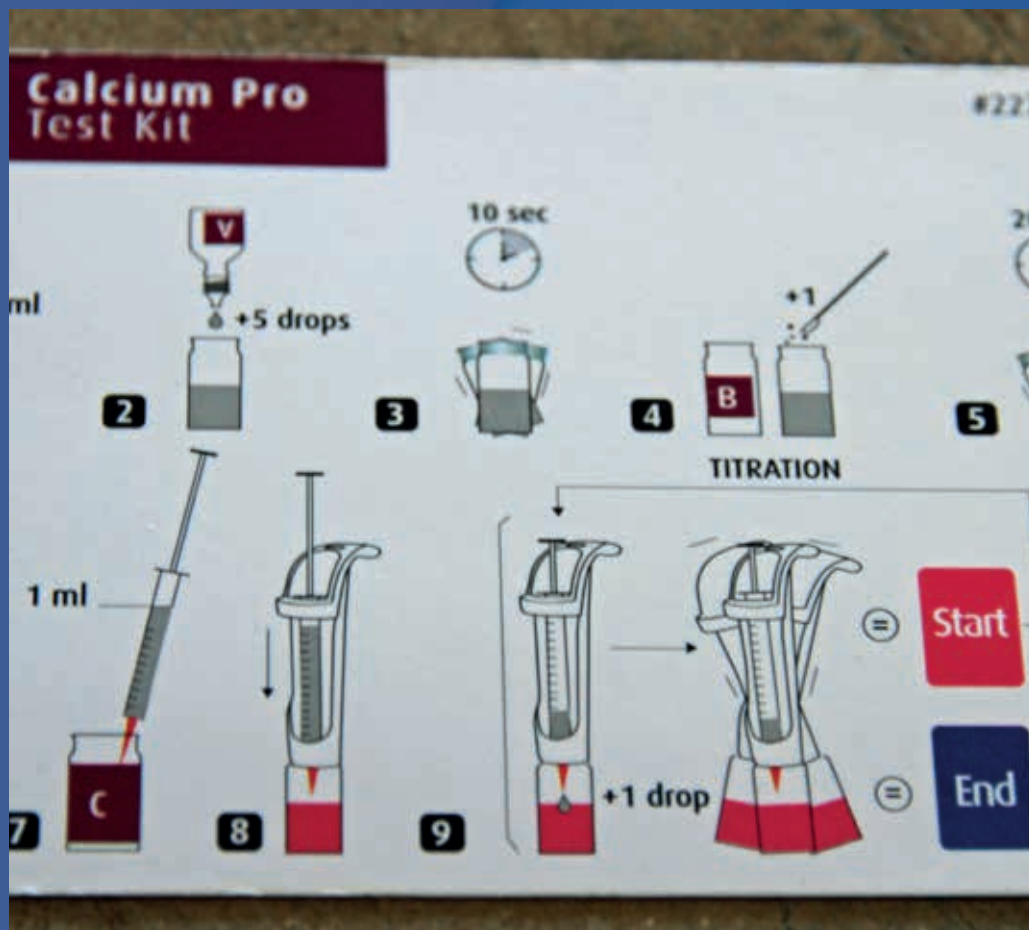
range is based on precisely following the instructions. All things being equal tests on the same sample of water should produce the same result (within the quoted accuracy). However there are many variables in the process which can lead to different results being obtained from the same sample, such as accurate measurement of test samples and chemical reagents, water clarity, ambient lighting, eyesight and colour recognition.

Reagents once opened will deteriorate over time especially if exposed to the air and all test kits should have an expiry date on the box or bottles and the accuracy will be compromised if these dates are exceeded.

Types of test

The titration method is the most common type of test used in the hobby. Titrimetry and volumetric analysis as its also known is used to find the concentration of a chemical in a solution, in our case sea water. A measured water sample is taken from the aquarium to which liquid or powdered chemicals (titrants) are added and mixed producing a colour change. This is then used to identify the concentration of the chemical being tested. In some cases the resultant colour of the test sample is compared to a colour chart to provide the reading. In other cases the amount of titrant used to produce the colour change is noted and a reference chart used to find the corresponding level which gives the reading. These kits have been the mainstay of the hobbyist for a number of years though can be prone to user error resulting in inaccurate readings. The main areas for error are incorrect measurement of water samples or reagents or colour recognition of final samples.

A relatively new introduction to the hobby is Hanna's range of digital checkers. Despite their name they are still based on a titration test and rely on accurate measurement of samples and titrants. Though more expensive they are gaining popularity however they address the issues associated with colour recognition by carrying out this process electronically producing a digital readout. If you want ultimate accuracy and don't mind paying a premium then laboratory testing is the way forward.



"PaCES" by Bytemarks is licensed under CC BY 2.0

There's a lot of sense in the adage 'we keep water – the corals and fish look after themselves.'



Inductively Coupled Plasma - Optical Emission Spectrometry (ICP – OES) testing is available from a number of labs and offers not only high accuracy but an unprecedented range of elemental analysis. Unless running a system such as Triton which relies on ICP analysis to identify elemental deficiency and dosing requirements, ICP testing may not be for you.

Good practice

The majority of what follows is based on what I have learned over the years going back to my freshwater days and even chemistry lessons at school. Most of it is nothing more than following instructions, ensuring accuracy and applying common sense.

The published accuracy of any test kit is based on following instructions to the letter so read them first to ensure you understand them. It's surprising how many people ignore this important step, even if you've used the kit previously as the process may have changed. Preparation is as important as the test itself. Before starting have everything to hand needed to complete the test and lay out the reagents in the order they are required. All test vials should be clean and ready for use. It is good practice to rinse test vials (including caps) two or three times with tank water before use to prevent any potential contamination from residual traces of either tap or RO water.

Accurate measurement of reagents is essential. Measure chemicals precisely using the scoops or syringes provided and ensure you use the correct ones at each stage of the test. Generally a measured scoop will be level not heaped and hold reagent bottles vertically to ensure drops are fully formed and don't contain air, as often happens with the first drop. The water sample used for the test should also be accurately





Image J Clipperton

measured using the vial or syringe provided.

Ensure you know where to take the reading from on the syringes and test vials. The plunger used in the syringes of test kits vary so ensure you know which precise point on the end of the plunger is the reference for one you are using. When measuring amounts in a test vial ensure that you fill to the correct level using the correct point of the meniscus as the reference.

The meniscus can be either concave or convex depending on the liquid in question and for our purposes water (salt and fresh) has a concave meniscus meaning you take the level at the bottom level in centre of

the vial.

Timings given in test kit instructions are critical for the chemical reactions that take place in the test. Failure to observe the times for mixing reagents, waiting between additions or to read the results can also lead to inaccurate results. Don't guess timings; use a watch or the timer on your mobile.

If it's necessary to shake the vial to mix chemicals and reagents ensure they are fully dissolved and no sediment remains.

If more than one syringe is used for chemicals ensure you don't cross contaminate by using the wrong one. Ensure no air bubbles are

present in syringes as this will mean the volume is incorrect. In some kits there may be air present in the tip of the syringe, this is normal and the syringe should not be overfilled to compensate. This is usually referenced in the instructions.

Be aware that some kits measure the test result based on titrant remaining in the syringe after completing the test, whilst others base readings on the amount used. Try to use natural sunlight when reading results or a lighting source as close to it as possible.

When observing a colour make sure you take the reading in the correct way. Do you need to look down the tube or

through the side? Observe the colour using a piece of white card either behind or under the test tube and ensure that there is nothing in the vicinity that could cause reflections and alter the appearance of the sample.

Bear in mind that water discolouration can affect the colour of the sample leading to an incorrect reading. Running carbon or ozone will remove yellow tinges and help keep your water crystal clear.

When using electronic checkers ensure no air bubbles are present in the vial and that it is wiped clean prior to testing. Keep test equipment clean to avoid contamination that can lead to testing errors and



don't leave test samples in the vials which can cause tainting of the glass. After each test thoroughly clean all vials and spoons/spatulas etc. using RO water, dry and store safely so they are ready for use. In some cases the chemicals used cause discolouration of vials that RO rinsing won't remove and the use of white vinegar may be necessary. Once cleaned with vinegar the tubes will need to be rinsed in RO to remove any traces. This cleaning method should be used on all vials periodically to ensure they are completely clean.

the other filled with tank water. When reading the test you view the colour chart through the vial containing tank water and compare this to the test solution. This method ensures any water discolouration affecting the test sample is negated.

You can often save money by buying a range of tests as a package or refills for the chemicals used rather than a complete replacement.

Summary

Water testing has an important role to play in our hobby and the ability to accurately monitor parameters is paramount in maintaining the stable conditions we aim for. Whilst the purchase of kits may seem like an unnecessary expense especially when many LFS offer the service, performing your own tests can work out cheaper in the long run. More importantly performing your own tests will not only allow you to monitor trends but also help you understand the chemistry behind the tests and how any corrective action you make effect tank parameters. Providing you read and follow the instructions and apply good practice in performing the tests you'll soon have confidence in the readings you obtain and have peace of mind that all is well in your aquarium. There is no need to spend a fortune on test kits and the majority of brands are more than capable of providing acceptable results. If you are keeping fish only or soft and LPS corals then you'll probably never need kits such as iron, strontium or potassium. Remember that kits have a shelf life and their accuracy likely compromised when it's expired. Don't see testing as a chore but as an important aspect of the hobby and use the results to gain a better understanding of the conditions in your aquarium. Keep on testing... you know it makes sense!

Choosing your kits

As with all things in this hobby research is important and time spent on line looking for comments on kits and brands will be helpful. You will see regular references to the most commonly used kits such as Salifert, Red Sea, Hanna and Nyos. Bear in mind that whilst one manufacturer produces what is reported to be the best calcium kit they may not produce the best alkalinity kit. Some kits are pretty basic with a test vial and colour chart for interpreting readings; others are more sophisticated with designs to aid interpreting the best colour match and also devices that hold the test vial and syringe make adding titrants a simple process.

Ensure that you obtain the kit with the correct range for your needs as some manufacturers produce high and low range kits. Check the increments of the colour chart provided to make sure they are suitable for your needs as this makes it easier to obtain accurate readings instead of deciding if the reading lies between two colours. Some kits are easier to use than others, use less steps and have shorter waiting times resulting in quicker testing. Some kits provide two vials; one is used for the test solution



THE FUTURE



OF REEFS

by Mike Palleta

As we approach the end of the year I thought, rather than looking back on last year or covering a common topic, I would answer one of the questions I often get asked: What do you see as the future of the hobby, where do you think this hobby is going? In most regards I think the hobby is in great shape as indicated by the unprecedented success that is occurring in it as well as there being more people involved than ever. However, I must also admit that there are some potential issues that could slow the growth and progress of the hobby significantly, but for the most part what we have learned and where this hobby is going is amazing considering where it has come from. Knowing that just a couple of decades ago, there were only a couple of hundred individuals doing this, and that we were happy just to keep anything alive (even if it was macroalgae or Aiptasia), to now where there are over a million hobbyists worldwide and we not only can keep just about anything alive but also get it to grow and often times reproduce, things have improved dramatically.

So, considering the huge strides we have made, especially in the last decade, I really only see incremental improvements in things individually, but when added together I think these small leaps will add even more the success of the hobby. The first step I see in the near future is an improvement in the monitoring of our tanks. And rather than it just being a number popping up on a screen, or on a phone app, I see it being interactive monitoring. By that I mean that instead of just being able to see say temperature or salinity on a phone or computer screen, I see us being able to check on every parameter that is important in real time, and being able to adjust things when we are not present in the room. Considering how much traveling many of us do, as well as how long our hours of work away from home are, being able to monitor and adjust things as needed will go a long way in adding to our overall success, not to mention our peace of mind.

Personally, I think that having these features on a monitor are way overdue considering all of the advances that have been

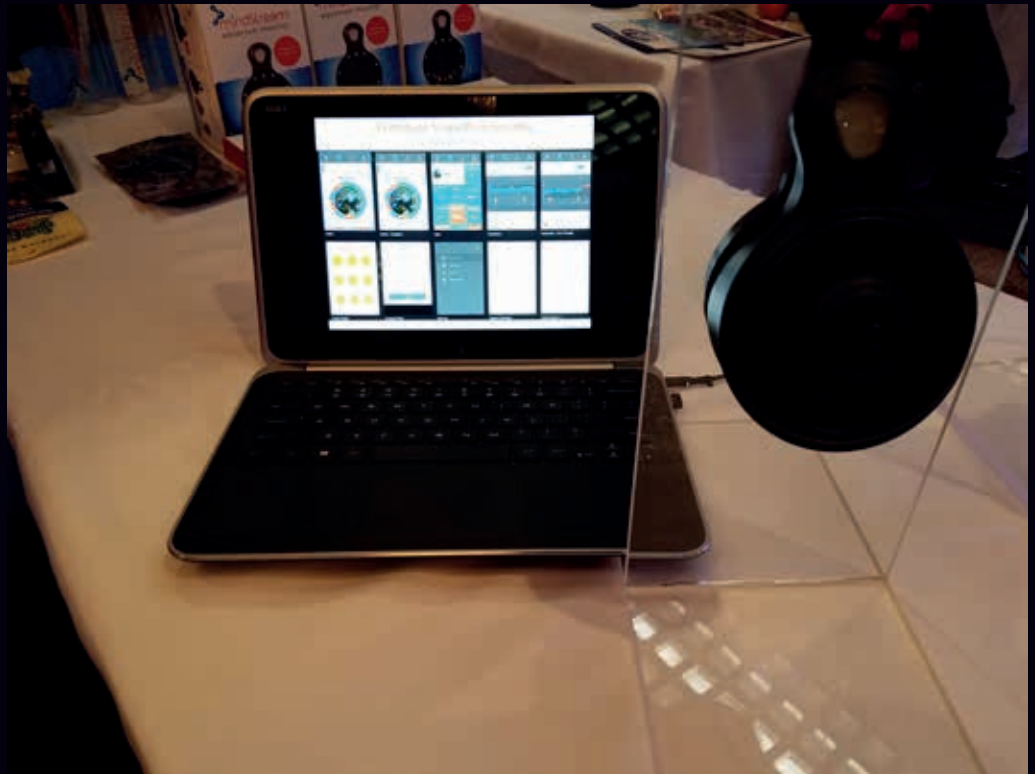
made in technology just over the past decade. Our monitors have just not kept up and are way behind technology in other fields. So what I see happening in the future, and I mean in the near future, is that monitoring systems designed for our tanks should not only be able to alert us when something is amiss, such as when alkalinity is dropping unexpectedly, or pollutants rising from the death of an organism, but we will also be able to make relevant equipment work to rectify the issue. I have heard numerous horror stories over the years about people losing their tanks for these reasons, so hopefully this will happen fairly soon for these big factors like temperature, salinity, pH or alkalinity. In a similar fashion, I expect the monitoring we get to not only get more precise, but to also be able to monitor more parameters. I know that MindStream, as well as several other monitoring companies are working on producing just such monitoring devices for the hobby. It is my hope that when an important element such as magnesium, or calcium or oxygen is not where it should be not only will be



The KH Guardian while only measuring one parameters shows that doing this will be more widely done in the future

alerted, but we will also be able to add it at the proper amount long before it becomes a problem. As I said, while this may not move our level of success up dramatically, I think it will significantly reduce the likelihood of failure by keeping levels more stable than is possible today. As a result, this will further our success so we can find other areas to improve in our tanks. Initially I think this technology will be fairly expensive, as is all new technology, but hopefully over time as more players get involved the price for this technology will become reasonable for all of us.

As this monitoring becomes widely available, I look for the next incremental change to be a better understanding of water chemistry. While our understanding of water chemistry is far greater than it was even 10 years ago, it is still rather rudimentary in terms of our understanding how all of the different cycles that occur within our tanks interact with one another and how these interactions effect how fast or slow various substances are consumed or produced. For example, currently something as simple and important as measuring and understanding the dissolved oxygen levels in our tanks is not done with any regularity, nor is this done for at least a dozen other elements and compounds in our tanks. Monitoring for these on a continuous basis should help improve our success even more and I think this type of continuous monitoring could go a long way in showing what happens to water chemistry during and after feeding. Are there ammonia, nitrite, nitrate or phosphate spikes, and if so for how long? Do different foods produce different levels? What is the optimal amount of food to be fed at once to keep these parameters from spiking yet keep the fish healthy? These are just some of the



The Mindstream Monitor may be the first step in monitoring a wide variety of parameters



Many hobbyists are now aquaculturing corals like this Leng Sy cap in their homes and this will likely become even more widespread in the future

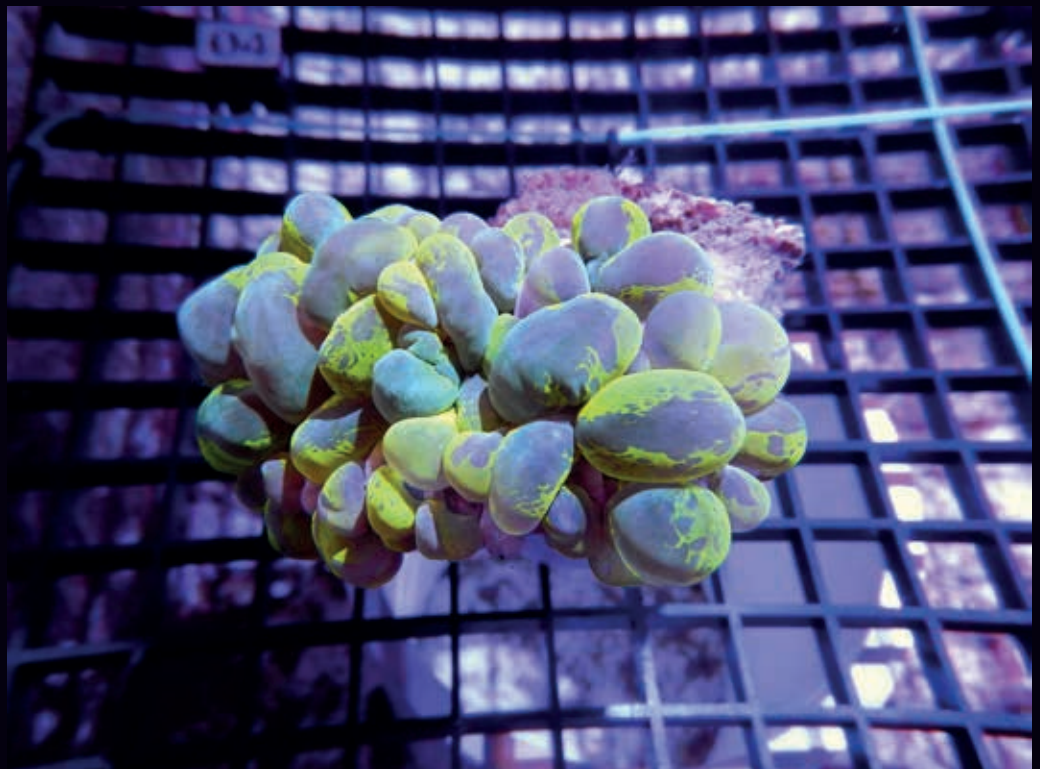
questions that I think this type of monitoring might help to answer. So, needless to say, I am quite excited to see these and many other questions answered when these devices come to fruition.

Improved understanding and monitoring of water chemistry could also allow for us to better determine exactly what our protein skimmers and other filtration devices are removing from our tanks so that we could replenish the key substances that are removed in a more precise manner. By the same token, it would also allow for it to be determined how efficient each type (as well as brand) of skimmer is, so that a more precise determination of which skimmer works best would be possible. That is, is a needle wheel more or less efficient than an air driven or Beckett type, and how do they differ. This would be much more effective than just looking at the gunk in a collection cup and trying to determine which is browner or smells worse than the gunk coming from another skimmer. Although truth be told it is my contention that just cleaning the scum cup regularly and frequently goes a long way in improving the efficiency of any skimmer.

To add to this, I look for continued improvement in skimmer design and efficiency to go along with this. The use of DC pumps has been the first step, and a relatively recent one, so now I look for the next step to be more efficient design so that skimmers will take up a smaller and smaller footprint. And as mentioned above, with improved measurement of water quality and a quantification of exactly each skimmer is removing and at what rate, we may find that with this improved efficiency it becomes less and less necessary to run a skimmer 24/7. We may find that it is only necessary to run them a few hours after feeding the



Aquaculturing frags like this Acropora will be done more widely in the future



LPS corals like this uniquely colored bubble coral will hopefully be maricultured more widely in the future

tank for a period of time and then shut them off so that plankton and other microfauna can reproduce without being removed from the system by their efficiency. This greater efficiency will also reduce the electricity used by our systems. This in fact is one of the biggest improvements I see coming in our hobby, more efficient use of electricity.

In addition to seeing it with protein skimmers, I also see it with the return pumps and devices used for creating flow in our tanks. In my own tank I recently switched over to Ecotech's Vectra pump from the Dart Hybrid I was running, and the efficiency has reduced the amount of electricity used by my pump as well as the amount of heat introduced into the tank from the pump. Both of which are factors that I believe will be improved upon even more so in the future with our water moving devices. In similar fashion the Gyre pump I am now using has allowed me to remove 4 other more traditional powerheads, while producing the same or better flow in my tank. While this product has been out for little more than a year, there have already been improvements in its design and efficiency. In the future, I expect there to be even greater efficiency in these pumps or some other water moving devices so that eventually most powerheads will not be used in our tanks.

Having coral spawning with regularity in our tanks in the future is not only a possibility but has already been shown to be possible due to the work of Jamie Craggs at the Horniman museum. This would help promote the hobby in a number of ways and also help to allow for the possibility of the hobby helping to repopulate damaged reefs. It would allow us to grow the corals we like on a large scale and we could do this without having to take any from the sea. What could be better



Keeping difficult to keep animals like this crinoid will hopefully be easier as we better understand the nutritional needs of these and other difficult to keep animals



Even corals like this beautifully colored chalice coral will be maricultured in the future on a large scale

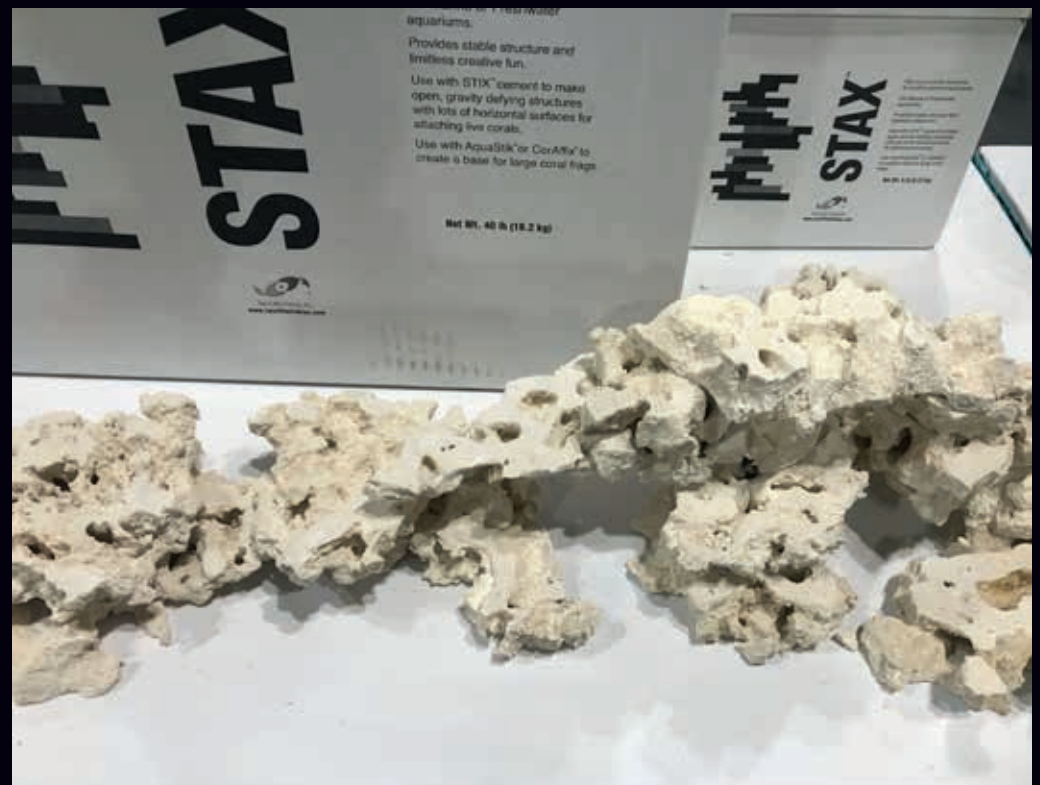
than to show regular spawning occurrences in hobbyists' tanks. Second, if (as is occurring now), when bleaching events occur, we could potentially help reintroduce millions of coral planulae back on to a reef that was injured and help it to come back much faster. Third it would be interesting to see how much hybridisation actually occurs during a coral spawning event in a closed system. While I realise to some that this may sound far-fetched, I think having captive coral spawning occur on a more frequent basis in our tanks will occur sooner than some of the other things I see occurring in the future.

One of the aspects of the hobby that will need to be improved upon in the future in order for this to occur is coral nutrition. While keeping corals in bright light and thinking that is all they need to sustain them is no longer the rule, there needs to be a better understanding of what foods corals need, both in terms of size and composition for our success with them to reach the next level. While there are myriad coral foods now on the market, none to my knowledge have done even a simple study to show that when two coral frags are grown in similar conditions and one is given product X and the other given nothing or a competitive product, the one given X grows, faster, more colourful, etc. Doing these types of studies is what will allow us to get to a better future of understanding exactly what our corals need nutritionally. Also, as mentioned above, better monitoring will also allow us to optimise feeding without diminishing water quality. So these things will go hand in hand for making the hobby more fun, easier and better managed.

A similar understanding also needs to be undertaken with the food we feed our fish, as with corals, understanding fish



Only by careful testing and monitoring can tanks like this be kept currently, technology in the future should make this easier



New innovative products like these frag holders which can also be used to aquascape a tank not just hold frags will keep the future interesting

nutrition is still in its infancy. While there have been major strides in providing our fish with better food, there still need to be studies done on what foods should be supplied for each fish in order to optimise not only its size, but also to maintain its colour and most importantly to help it survive even longer than it would in the wild. In addition, in the future this should happen as we move more and more towards captive breeding of a great many of the fish we keep rather than taking them from the wild. When looking at the success that facilities like Bali Aquarich or Dejonge Fish Farms are having as well as individual home breeders with fish that once were thought to be impossible to breed and raise in captivity like Tangs, Anthias and Angelfish, it is clear that the future will bring even more success. Think of the day when Debelius and King Angelfish are captive bred and raised and are readily available as are some of the rare deepwater fairy wrasses and anthias that we only can drool over in pictures. In the future I expect facilities to pop up and produce fish like these just as facilities now grow countless clown and other fish that are the bread and butter fish of the hobby.

With all of the success that has been achieved in the hobby it has also brought with it an unprecedented increase in new and problematic pests. Montipora eating nudibranchs, Acropora eating flatworms and red or black bugs are just a few of the pests we now unfortunately encounter with regularity. In the future I look forward to cures or treatments for these pests that we can do in our tanks, which we currently can't do. While I strongly advise everyone to dip and quarantine everything they add to their tanks, I realise that this still is not done as frequently as it should be. So while everything I have mentioned previously



The successfully breeding and rearing of fish like these Personatus angels will hopefully lead to the breeding of other rare angels and other fish in the future



Hopefully the future will lead to better full tank treatments for pests like these Montipora eating nudibranchs. Photo courtesy of Sanjay Joshi

will add to the success of the hobby, if we do not get better at managing and controlling these pests much of this success may be for naught.

The same can be said for managing fish diseases. As someone who has lost tanks full of fish and seen others do the same, I hope in the future the treatment and management of fish diseases becomes easier to do on a tank wide (and specifically a reef tank wide) basis. While providing better nutrition along with less stressful tanks has already gone a long way in reducing full tank wipe-outs, they still do occur all too frequently. So just as the frequency of many communicable disease outbreaks have been reduced in humans, I expect the future to allow the same to be the case in our tanks with the development of products to keep pests like Ich under control.

I know there are a lot of things I have failed to mention in this piece, but due to space limitations I have focused on my own vision of the future. As mentioned there are some things that could slow the hobby down, such as increased government intervention, regulation or even supervision as to who should keep tanks and how they should be run. Fortunately, I now think that there enough of us that at least we would make some noise if this were to happen. I will however point out my biggest concern about the future, and that is that I worry that not enough kids and teenagers are getting into the hobby due to its cost primarily. While the future is bright in terms of what are successes in the hobby and what innovations might occur, these would be wasted if new young hobbyists do not join our ranks. So as a post I recently read said, "get your kids into corals, that way when they get old enough they won't have money for drugs". Happy Holidays everyone.



In the future expensive angels like this Jocolator should be more widely available due to captive breeding



New fish like this wrasse are what will keep the future exciting we all still love to see new things



Until diseases are more easily managed all new introductions like this Magma wrasse still need to be quarantined

Top Tips

for getting a

NEW TANK

> Partner persuasion / advanced techniques in getting and keeping a new aquarium.

For the aquarist unencumbered by family, partner, spouse etc..., life, at least in terms of aquarium purchasing is limited to only one thing – the size of the pay cheque. The house, the tanks, the utility bills, the numbers of salt buckets required etc... They are all within this lucky person's control, if the cash is there. This singleton can march into any dealer's shop and walk away with whatever purchases they want, to dwell in whatever cavernous house-filling aquarium their imagination and wallet has the capacity to deal with.

This isn't the norm though, and many aquarists keen to further their interests and empty bank accounts, need to cajole, negotiate with, occasionally bribe and eventually find accommodation and hopefully harmony with their significant others. What follows is my tongue-in-cheek guide to aquatic harmony, inspired by

one of my favourite sayings: "Diplomacy is the art of letting someone else have your way." I always thought it was Churchill, but it was Italian diplomat and author Daniele Vare, who made this observation. A man who preferred more direct methods to dealing with problems, namely Joe Stalin, had another take on the subject:

"Sincere diplomacy is no more possible than dry water or wooden iron."

I think we should aim towards Vare as inspiration or, if we are feeling especially selfish, Sam Clements:

"The principle of give and take is the principle of diplomacy—give one and take ten"

Spouse, partner, lover?

I'll say right-off-the-bat that I am very lucky, Mrs Aspinall is a wonderful and supportive person who always loved our aquaria. She has little interest in sumps, flow rates, venturis, calcium reactors, Balling regimen and so forth, but what goes in the tanks - in terms



of fish and corals - she took a great interest in and often provided names for. We had a Dwarf Angel named Morris, for inexplicable (at least to me) reasons.

Not all aquarists are this fortunate; admittedly if I'd had my way I'd have knocked down walls, after all who needs a dining room anyway? But all

in all I am a lucky fellow. This is not always the case, some people are sceptical, doubtful and not at all well-disposed to the idea of a 'chunk of ocean' arriving in their house.

I should start by saying that I'm going to use the word 'partner' in this piece; yeah, most of the aquarists I know are male and most of the people you

see working at, shopping in and handing over cash at the fish shop are equally blessed with a Y chromosome, but this isn't always the case, and I don't want to offend anyone, so if you don't like 'partner' please mentally insert spouse, live-in-lover, wife, husband, polygamous horde, girlfriend, boyfriend, flatmates or

whatever you feel comfortable with.

Getting what you want
Securing your partner's support for a new tank or a larger replacement of an existing system can require as much planning and strategy as your average fish room. What follows are some basic techniques to help you on your

way to aquatic nirvana.

1 – The caring parent approach

No one likes to see children being used and exploited, however if you have decided to produce progeny its worth getting some payback, before they entirely bleed you dry and you can justify your actions by telling yourself “it’ll be for their own good anyway.”

This morally dubious, but highly successful technique is based on one perfected by many people who were children of the 1980s, when the home computer became the birthday present of choice for a whole generation: “but it will help me with my school work” and similar plaintive cries were heard across the land - even though you knew you were just going to play Asteroids and Chucky Egg for hours a day, games that somehow came on audio tapes – explain that to today’s youngsters.

Anyhow I digress, the thing is, this approach paid off when we were kids and can work again, and even better it has the ring of truth about it and for some people, I’m looking at you Mr Gates, it certainly worked.

What you need to do is link the care, maintenance and overall husbandry of a complicated ecosystem to the current academic successes (or failures – it depends on your tactics), of your offspring. If you have a budding biologist, this is a no-brainer, a chemist, well look at the water testing. A student with an aptitude for the creative arts may be inspired by the colours, shapes, sounds and textures of an aquarium and a future business studies graduate will certainly be impressed by the cash that changes hands. Should your future Nobel Prize winner be struggling a little, then a fish tank is ideal to help them on their way to academic prowess. In essence this technique is



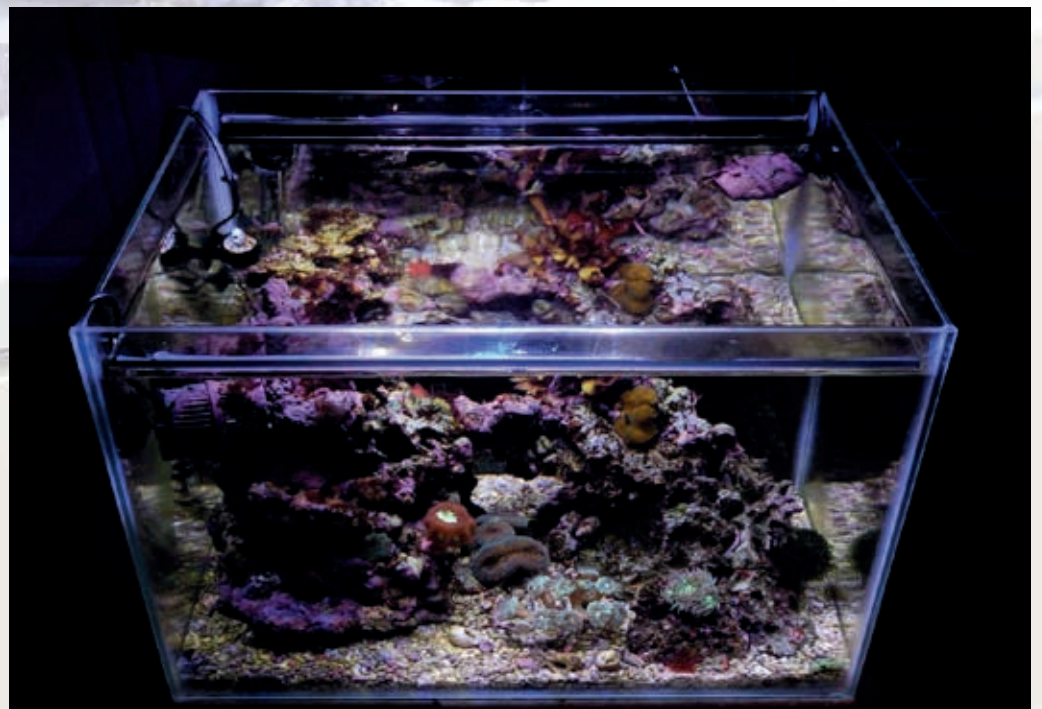
my second marine tank, I did everything I could top disguise the weir

a clear winner, but you must remember not to ‘over egg the pudding’ – your partner will ‘smell a rat’ if you seem too keen, let’s face it, if you don’t express a certain amount of ‘wanting one for yourself’ then you will fail – your partner knows you better than you think and any hint of insincerity

and your plans are scuppered. The other brilliant thing about this technique is that any child with an interest in science is going to benefit from helping you look after the family aquarium, though you may have to do the heavy lifting.

Advanced tips:

- Plan ahead – start off with a small system to ‘see how you go’, before constantly remarking on how well little Sam is doing in their science grades.
- Do your research, investigate forthcoming topics in the



there’s always room for a wee tank



a rather nice display tank at a shop

curriculum and adjust your plans accordingly

- Take child(ren) to visit fellow reefers and talk at length about how much the children got out of it, especially if they then start linking it to school science projects – if necessary do the work for them!

- Have children

2- The 'I could be a lot worse' approach (with reference to a disliked spouse of partner's friend/work colleague).

What you really need for this angle is to have someone in

mind, who drinks a lot, stays out late or is generally obnoxious to their other half, that your other half has identified as morally deficient based on what he or she hears from their friend. You know the person that you hear things like "well you'll never believe what that arse has done again..." Obviously if you suspect you are that person, you may want to consider another tactic.

Once you have your target person in mind you can try to drop in occasional reference to their inconsiderate and boorish behaviour and how they are remiss in tending to the kids, their spouse, the garden or

even their personal hygiene – use whatever you've got! And generally allow your partner to come to their own realisation that you are kind, considerate, loving and above all a deeply selfless individual. Once this has been achieved you can start on the mental manipulation! "I'm so grateful you let me enjoy my hobby darling", is a good phrase to drop into conversation when your partner is recounting a tale of bad behaviour from your 'target'. "They spent all day at the match and then did nothing all weekend, but drink beer", your scornful partner will recount. At this point you casually mention

that you've cleaned the house and how your only outlet is your hobby". Your partner will link your good behaviour with your hobby. You will need to hook up with your 'target' to replenish their beer supply and buy them more tickets – they were so grateful for the last ones.

Advanced tips:

- Again take your partner to meet another happy reefing couple and 'seed' the conversation towards how caring, attentive and nurturing aquarists are.
- You may want to cultivate friendships with 'targets' long in advance and help them in their downward spiral.

3 – The 'you get something/I get something' approach with a sliding scale of 'bribery'

This is perhaps the most honest, upfront and least mortally questionable tactic and perhaps ought to be number one on the list, but it may incur more cost and thus loss of ready cash for corals and equipment.

I can identify two main approaches here; the "you know darling, I know you don't want an aquarium but perhaps if you get something you want...you know that new car/extension/diamond ring/child/holiday etc..." Or try waiting – you may be more successful. If you wait until your loved one is expressing their sincere desire for something you may well find yourself in a happy position. Not only can you grant their wishes, but all you would like in exchange is that new tank and you'll be happy to compromise on the size (you initially suggested eight feet, even though you know you only want a six footer). What a kind individual you are.



full shot of the tank above

Advanced tips:

- Plan ahead to allow your partner room to 'explore' their own thoughts of purchases, experiences or home improvements. Should you end up passing the car show room (you determined which route you'd take by the way), casually drop into the conversation that "hey look they've got that funky little Mini you like." or "that truck sure is big" and then allow them to have a look-see with the appropriate amount of grumpiness. Oh what a curmudgeon you are, but is that a hint of a compromise your partner has detected!

- Just cut to the chase – ask your partner what it will take and have your chequebook ready.

4 – The 'really? You mean you don't want 500 litres of saltwater in your house, but why?' leading to the: 'well I just bought it and their shipping it over next week and I can't take it back!' approach.

Secretly you've been planning your bespoke system for months and if you go for this technique then prepare for the s***storm of anger that will be heading your way. And to be honest, you probably deserve it! You will need to hang your head in shame for quite some time and will need to work very hard to recover your previously good standing in your partner's eyes (assuming you ever had any).

Obviously, your partner may not mind you suddenly emptying the joint account without discussing it, but if it is your own money that you've worked hard for then you might find the future looks a little rosier. If you've bought your new system on credit then prepare to sleep outdoors. I have to say I don't recommend

this method, but some desperate folks rely on it and if it features in your future plans you can mitigate things with some pre-planning. I recommend, ensuring you can afford your purchases, being especially considerate for months previously – if this is not your first selfish purchase then discuss sofa surfing with friends, just in case. Clearly you need to pretend innocence that you are actually, truly surprised your partner doesn't think your 100 gallon, energy-hungry reef isn't to their liking. If this sort of thing is out of character then your partner may be more surprised and annoyed than if it is another example of your crass, yet consistent lack of consideration.

Advanced tips:

- Make sure your parents/friends or colleagues are pre-warned– you may need to move out for a while.

- Make sure you don't buy an off-the-shelf aquarium that you could return to the store - or if you are really cunning, buy one you can take back and then compromise with a pre-loved system you've bought substantially cheaper from one of your reefing buddies. This is really devious, but worth a try.

5 – The whiney, 'please, please, please' to wear down the partner approach

Ok, this won't be your finest hour and you may well end up losing a lot of self-respect, but it may be worth it. Maybe, like a kid at Christmas time, your partner equates just how long you whinge and moan and plaintively beg as an indication of your seriousness and potential commitment. If you need to deploy this tactic then 'suck it up' and go for it. Thing is – do you want to be that person? Yep, you do, if necessary!



my last tank. I was quite proud of it, even though it was only quite small



another option might be a 'plug 'n' play' type



possibly one of the best tanks I ever saw



...and drool

Advanced tips:

- Prepare the ground well in advance by being consistently self-less and allowing your partner to get their own way. You can cynically exploit this later and cash in your 'credit.'
- After six months of regular whining and begging with nothing forthcoming, try another technique or family, whichever is more achievable?

Top tips for increasing harmony and spousal support for your plans. These tips apply to any of us, whether we have our dream system or not.

- Let your partner choose your fish – you may need to co-ordinate this with the shop owner to ensure the fish you really want are available and the ones you don't want are met with a lot of "well, mmm... you could have that, but it's got really bad toilet habits" or whatever you think necessary. A plain old, "well...babes that is a cute fish, but it will eat all the other fish," usually suffices and is (far too often), frequently true.

- Be self sufficient - get your own sets of scourers, sponges, Tupperware, measuring scoops, spoons, towels and so forth, rather than raiding the kitchen for equipment that then never reemerges from your cabinet or fish room and if it does is generally distrusted by hygiene conscious partners. You can of course take this to the next level: "if I only I had my own fishroom, then I wouldn't keep needing to use the kitchen sink." Maybe a few well-planned salt soakings of the kitchen or bathroom may be called for?

- When planning your new system, build a mock up of your hoped-for new tank using

cardboard boxes with really pretty pictures stuck onto it – eliciting help from kids who will be definitely supportive, could be very useful. Secure a supply of sugary bribes.

- Use cash at the shop not your plastic. This is vital in order to keep those extravagant purchases under wraps. Personally I advocate honesty in all things and can't countenance 'domestic fraud'. However, we've all considered it on occasion whether we've actually done it or not.

- Be especially supportive of your spouse's interests for many weeks before mentioning the subject. To be honest if you're a halfway decent individual you should be doing this anyway. It costs nothing and it will pay off.

- Visit a reefing friend, but only if their partner is a fan of the hobby. Ignoring this simple advice will leave you facing near insurmountable problems. Visiting a family with 'aquarium issues' will not help your cause.

But seriously...

In reality and in just about every case the best way to get what you want with your partner, spouse, live in lover, wife, husband, polygamous horde or whatever is to be loving, caring, faithful, supportive and understanding and if you tick all of these boxes then you are well on your way to the aquarium of your dreams.

I'm only joking with this piece, though I bet many readers will chuckle at some of the tactics here and recognise a few they've employed over the years. The real issue though, the real point I want to make is that the best way towards getting your new system, new fish room or basement-based aquaculture operation is to be the best partner you can and recognise with





I expect there'll be fewer chromis in this tank within a matter of weeks, but they look good against a more neutral background of inverts.



genuine gratitude your family's willingness to accommodate your obsession.

The other thing to note is that your partner may be doing you (and your potential livestock) a favour. Acting as a brake on your latest crazy scheme (as they see it), will make you think longer and harder about whether you can achieve your ambitions and whether you have the time and the commitment to properly care for your aquaria.

What you'll be doing in this process, whether you realise it or not, is working out just what kind of an aquarist you will be (or are). If you are an impulsive 'buy it all now and to heck with the consequences', kind of person then you will be storing up a load of problems for yourself in the long run and your livestock will likely suffer. Talk to your family, think about what you're going to do and plan for the future welfare of yourselves and your livestock. Despite me making light of it, this is a serious business that should not be entered into lightly.

Obviously if none of this works and you've tried plain old bribery sell the lot of them for medical experiments and spend the money on a Clarion Angel. The author refuses to accept liability or responsibility for any breakups, bust-ups, moving outs, cat fights, fall-outs, fracas, maimings, trips to the ER or indeed any other kind of family or relationship trauma!

So there.

Open Ocean, Closed Aquarium



Crustaceans are the most abundant animalian group in most planktonic marine habitats. Photo by Matt Wilson/Jay Clark, NOAA NMFS AFSC.

Part Two: The Zooplankton

by Kenneth Wingerter

The primary aim of any marine aquarist could be (indeed, should be) to recreate as faithfully as possible the natural environment from which their captive animals originated. Aside from ensuring that the physiochemical environment is ideal (water movement, water chemistry, etc.), one might take measures to put all of the major ecological components in place. This could involve stocking the tank with herbivorous “clean-up crew” creatures such as hermit crabs. It could also involve the addition of deposit feeders such as sand-sifting sea cucumbers. It could involve inoculating the tank with a host of beneficial microscopic organisms. To the average hobbyist, benthic microorganisms (i.e. those residing in the sand bed, on the live rock or on the biofilter media) are slightly better understood and better attended to than are those that live freely in the water column. Nevertheless, the ecological workings of these organisms, the plankton, are not only interesting but are critical for the stability and painless maintenance of any reef aquarium.

Serious aquarists with complex reef systems will do themselves well to understand the interactions of these unseen life forms and the impact they have on the overall health of their captive ecosystems. This article discusses the ecology of zooplankton; a preceding article focused on the phytoplankton.

Starting small

The term plankton is conventionally used to describe pretty much any flora or fauna that are too small to swim against typical ocean currents. These organisms are carried from place to place mainly at the whim of winds and tidal action. While plankton are generally quite minute, some zoologists stretch the term to include creatures such as jellyfishes (they surely cannot swim very well, after all). Thus,

when discussing this extremely diverse group, it helps to break them down by size class. The smallest, usually being bacteria and archaea, are referred to as ultraplankton; these organisms are under two micrometres in size. Those plankters that range from 2-20 micrometers, often single-celled algae, are referred to as nanoplankton. Ranging from 20-200 micrometres, the microplankton include copepod larvae as well as many protists. The macroplankton range from 200-2,000 micrometres, with rotifers and fish larvae at the lower and upper ends respectively. Plankton that exceed 2,000 micrometers in size, such as salps and larvacea, are referred to as megaplankton.

Beyond this, biologists and aquarists alike divide the plankton into two major categories: the phytoplankton (tiny plants)

and the zooplankton (tiny animals). Though broad (and sometimes, as we shall see, a bit sketchy), this division is incredibly important from an ecological perspective. Phytoplankters are primary producers, utilising solar energy and inorganic substances from the surrounding waters to synthesise organic matter. Though some of this biomass may be consumed by relatively large, filter-feeding, phytoplanktivorous invertebrates (e.g. tunicates), it is for the most part grazed by the zooplankton. These smaller zooplankters, referred to as primary consumers, are subsequently eaten by larger zooplankters (e.g. larval fishes). Herbivorous zooplankton thus play a crucial, intermediary role in passing new production up the food chain. Other zooplankton, whose food primarily consists of particulate

and/or dissolved organic matter, recycle products of waste/decomposition and similarly pass these materials back up the food chain.

Bacteria and archaea are oftentimes assigned to their own group, namely the bacterioplankton. This group, perhaps the most diverse of all, includes both primary producers and consumers. For the purpose of simplification, we will here place autotrophic bacterioplankters (e.g. cyanobacteria) among the phytoplankton while placing heterotrophic bacterioplankters (e.g. *Bacillus*) among the zooplankton.

Climbing the Zooplanktonic Food Pyramid

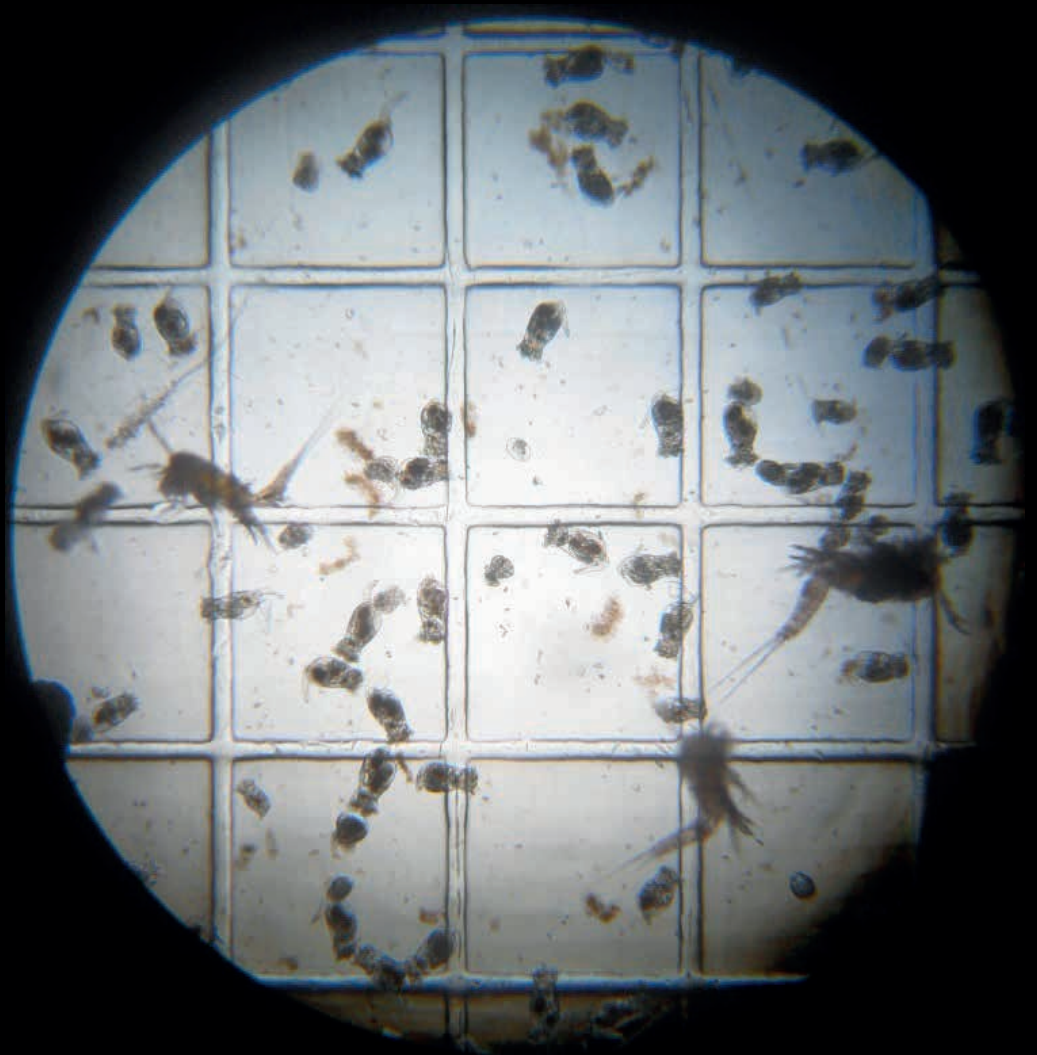
Due to their great variety of size, form and behavior, the zooplankton claim a large patch of the marine food web all to

themselves. This motley batch of organisms includes all sorts of consumers ranging from herbivores to carnivores to detritivores.

In any discussion about the trophic structure of planktonic consumers, it might be worthwhile to note that some primary producers are capable of facultative heterotrophy. That is, phytoplankton such as certain pennate and centric diatoms can directly take up sources of dissolved organic matter (alcohol, simple carbohydrates, peptides, lactic acid, a few amino acids, etc.). Some others such as certain dinoflagellates can even take up particulate organic matter by way of phagocytosis. While the uptake of this matter can enhance growth, these phytoplankters cannot survive on them alone over extended periods of darkness; in many cases, light actually inhibits heterotrophy. Even so, particularly in nearshore environments, phytoplankton can be responsible for the consumption of a significant portion of available dissolved organic matter. They may even compete aggressively with bacteria for these resources.

That being said, heterotrophic bacteria are the dominant planktonic consumers in most water columns. These organisms are able to break down hard-to-digest particulates such as bits of chitin and cellulose. Their miniscule bodies (i.e. high surface area to volume) allow for the efficient uptake of dissolved substances. Where their growth is especially prolific, they may even outcompete phytoplankton for dissolved nutrients such as nitrate and phosphate.

But it is their express uptake of dissolved organics that is of greatest ecological consequence; in so doing they convert these dissolved substances into food particles (i.e. their bodies) that may be



Zooplankton can serve as intermediary links within marine food chains. Photo by Kenneth Wingerter.



Copepod - photo by Uwe Kils - CC by SA 3.0



mysis zooplankton (Photo by Uwe Kils GFDL) - CC by SA 3.0

consumed by higher organisms. This transfer is not, however, entirely undeviating. Marine bacteria are highly susceptible to viral infection. Viruses, in fact, contribute significantly to bacterial mortality. Infection leads to cell rupture. Ruptured cells spill their contents into the water column. These bacterial innards are subsequently consumed by yet other bacteria. This conservation of organic matter within bacterial communities, referred to as the microbial loop, can lock up massive pools of carbon and nutrients at the lowest trophic levels.

Protists are the major consumers of planktonic bacteria. They additionally might consume phytoplankton and particulate organic matter. This group, which includes disparate organisms ranging from ciliates to free-living foraminifera, are themselves consumed by an equally wide range of animals such as larval fish and suspension-feeding invertebrates. Owing to this protistan intermediate trophic level, bacterial biomass is effectually transferred along the food chain.

The transfer of food energy from herbivory is just a bit more straightforward. Body sizes of phytoplankton are generally much greater than those of bacteria; body sizes of their consumers are correspondingly greater. This often results in a shorter food chain.

Copepods are the chief grazers of marine phytoplankton. In nearly every ocean, they are the most abundant animalian zooplankton; there may be more calanoid copepods (by weight) than any other zooplanktonic animal group. Copepods very efficiently pass on essential biocompounds (obtained from the algae they consume) to their predators. For this reason, they are an indispensable food source for fishes (especially during larval stages) as well as countless suspension-feeding

invertebrates. On coral reefs, where low dissolved nutrient concentrations support only sparse phytoplankton populations, copepods might also feed heavily on protists.

The biological communities that dwell in the water column over coral reefs differ remarkably from those that inhabit the surface of the reef structure itself. And they are equally diverse; under the microscope, just a few drops of water might reveal a mindboggling assortment of phyla. Though shambolically assorted at a glance, they indeed work closely together to form a world of their own. Nonetheless, their world is intricately connected to that of the reef bottoms. In these otherwise nutrient-poor waters, planktonic organisms very much depend upon detritus and exudates released from benthic communities (e.g. expelled coral mucus) for their sustenance. In return, they offer a highly varied collection of menu items for their benthic and demersal neighbors.

Striking the balance

Arguably, marine aquaria should be perceived as genuine ecosystems rather than containers used merely to showcase “ornamental” specimens. This certainly means that aquarists should, to whatever extent possible, ensure that a proper ecological balance is maintained within their planktonic communities. Thankfully, the industry has increasingly developed various packaged cultures and specialised foods/additives for this purpose.

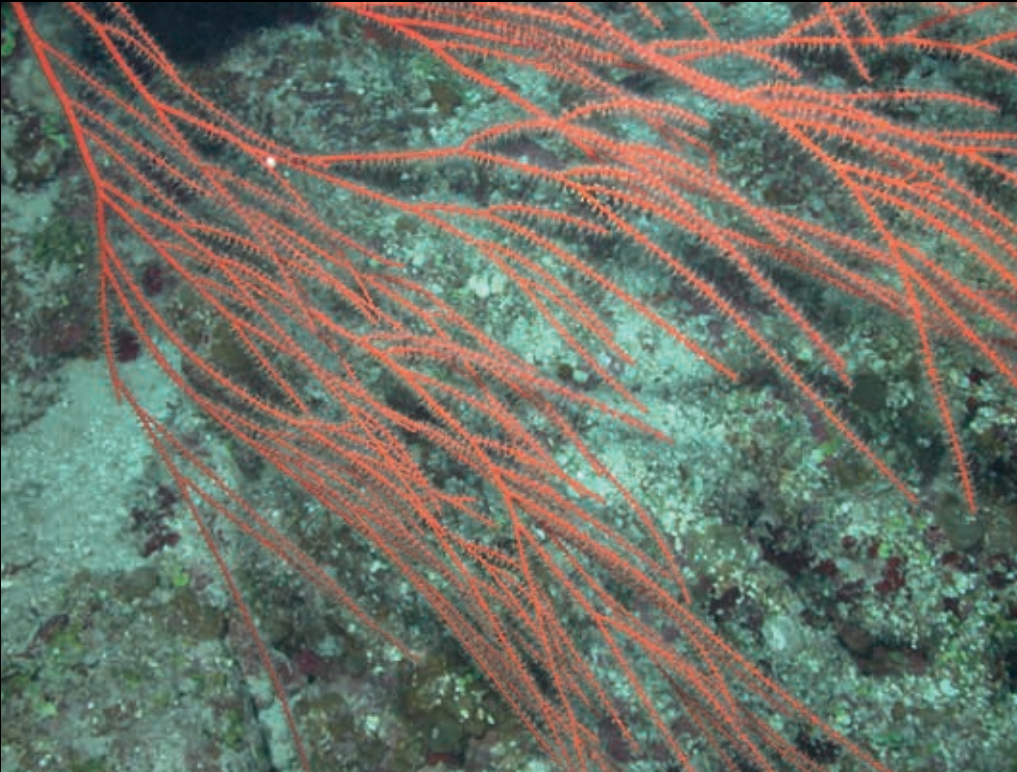
A good way to start is by heavily inoculating the system with heterotrophic bacteria. This is best done early in the system’s set-up. There absolutely will be all sorts of “good” bacteria that are introduced each time live rock, live sand or even animals



A rich zooplanktonic community can help to foster a healthy aquarium system. Photo by Dungodung.



Most zooplankton will pass harmlessly through coarse mechanical filters. Photo by Kenneth Wingerter.



The diets of many azooxanthellate corals consist primarily of zooplankton. Photo by Twilight Zone Expedition Team 2007, NOAA-OE.



Feedings of prepared microalgae may be used to sustain large populations of herbivorous zooplankton. Photo by Kenneth Wingerter.

are added to the system. Still, this helps to guarantee that a strong population of many strains are introduced from the get-go. One interesting group of microbes has recently been made available to hobbyists: purple non-sulfur photosynthetic bacteria (PSB). These organisms grow as chemotrophs, photoautotrophs or photoheterotrophs depending upon the availability of dissolved organic carbon. This group has already been used with reported success to maintain high water quality in food fish farming applications.

Protists, too, may be added. At this time, there are not a lot of protistan cultures directly available to marine aquarium hobbyists. Be that as it may, a handful of genera can be obtained through aquaculture/scientific supply companies. One promising protistan candidate is *Euplotes*; this little ciliate has much potential for eradicating cyanobacterial films and controlling detritus build-ups in marine aquaria.

Microcrustaceans, or "pods," are extremely useful in a number of ways. Many amphipods and (especially harpacticoid) copepods are now deliberately added to marine aquaria. Though generally benthic as adults, most have a planktonic larval stage. Larvae provide a valuable food source for zooplanktivorous invertebrates (including many corals). The larvae scour excesses of phytoplankton from the water column, transferring fatty acids, amino acids and vitamins to the creatures that prey on them. The adults scour the rock, sand and tank panels of detritus and nuisance algae. Moreover, the adults can provide nutrition to certain pod-eating fishes such as mandarin fish.

Rotifers are not particularly abundant in typical coral reef environments. As on the wild reefs, they are not likely to establish lasting populations in reef aquaria. Nevertheless,

they are simple to culture in specialized systems and can (if properly enriched just prior to feeding) be a great food source for many filter-feeders. Additionally, easy-to-use, concentrated/preserved rotifers are now widely obtainable.

Certain factors will influence the density and make-up of a marine aquarium system's planktonic community. Though hobbyists often worry that plankton can be killed in water pumps, most experts have assured us that this concern is unwarranted; these generally sturdy organisms are adapted to withstand the powerful wave action of shallow nearshore habitats. Similarly, normal mechanical filtration will not entrap/kill the majority of plankters; they are simply too small. Protein skimming can remove some plankton, though this reduction appears to be negligible.

Several other modes of water filtration, however, can decimate plankton. An obvious culprit here is ozone and ultraviolet sterilisation. Sterilisation is commonly used to control phytoplankton, but kills indiscriminately. As such, it can eliminate those organisms that might be best capable of outcompeting the "bad" algae. In fact, a bloom of planktonic microalgae is itself an indication that the ecological balance is off-kilter. Likewise, a need for heavy chemical filtration suggests (ruling out overfeeding) that the heterotrophic microbial community is lacking or overwhelmed.

Before resorting to aggressive filtration, one might consider boosting their populations of beneficial microbes. Rather than removing dissolved organic carbon by employing chemical filtrants, it may be added (via methanol, vinegar or certain specialised synthetic polymers) to promote heterotrophic bacterial growth. As these bacteria proliferate,



Flagellates are a common component of protistan planktonic communities. Photo by Dartmouth Electron Microscope Facility, Dartmouth College.



Larva of the shrimp *Lysmata amboinensis* on day 1 after hatching, referred to as zoea stage 1. Jim Welsh CC by SA 4.0

they can ultimately outcompete phytoplankton for dissolved nutrients (e.g. nitrate and phosphate).

Where benthic algae and/or detritus build-up has become problematic, introducing new pods can be helpful. Most aquarists will point out that various, unidentified pods (probably introduced along with live rock or sand) are already present in their systems. Even so, all pods are different. Simply adding highly useful harpacticoids (e.g. *Tisbe*) to enhance the richness of an existing pod community can be enough to offset imbalances in a detritivorous/herbivorous food web. And, of course, your filter-feeding animals will relish the additional zooplanktonic larvae that they will produce.

Conclusion

Though essentially invisible, a naturally balanced community of zooplankton can greatly improve the beauty and well-being of reef aquaria. More specifically, better nutrient management will lead to fewer struggles with undesirable algae; a rich source of zooplanktonic foods will supplement the nutrition of many prized invertebrates. What is more, the system might be far easier to maintain. In the very least, an awareness of - and control over - this aspect of your captive system's ecology can make the undertaking infinitely more fascinating and rewarding.



Rotifers easily can be cultured—on the side—to supplement the diet of many zooplanktivores. Photo by Kenneth Wingerter.



Synchronopos splendidus Image J Clipperton

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Close-up on Corals



Poritids

James Fatherree

There are quite a few species of stony coral in the genus *Porites*, several of are available to aquarists. In fact, according to the Integrated Taxonomic Information System (2017), there are 49 poritid species in all, which go by common names such as jewel corals, boulder corals, finger corals, the mustard hill coral, and 'worm rocks'. Many of these are also colourful and attractive, or at least very interesting for reasons that I'll get to below. So, I'll provide some basic information about poritid biology, and their aquarium husbandry.

Basic Information

The genus *Porites* is one of five genera within the Family Poritidae, and this family also includes numerous species of the popular genera *Goniopora* and *Alveopora*. These are easy to differentiate though, as gonioporids and alveoporids have relatively huge polyps while the polyps of poritids are especially small. Superficially, poritids also look a lot like many corals from the popular genus *Montipora*, but there are significant differences in their fine skeletal structures that warrant them being separated into different families.

Regardless, poritids' overall appearances can vary greatly, as some species or another can grow over surfaces in an encrusting fashion, while some form large plating colonies, some form boulder-like massive colonies, and some form branching, finger-like colonies. To add, some species may take on any or all of these growth forms depending on the environmental conditions they are subjected to.

Many colonies can start out as encrustations growing over the substrate, or with a plating form that produces large sheets of coral, but numerous branches may eventually emerge from these bases, growing upward and outward, and completely obscuring them at times. So, a single colony of a single species may take on more than one form as it grows. This isn't a unique characteristic of poritids though, as many corals will change form depending on current strength, wave activity, water depth, illumination, the nature of the substrate, etc.

Most of the specimens that I see for sale are branching though, and superficially look about the same as many other small-polyp stony corals, with branches growing up to the diameter of a finger. Under optimal conditions, some of these may grow relatively quickly, too.

However, some of those that form massive boulder-like colonies can reach exceptional sizes by forming large mounds that grow out in all directions. In fact, in the wild these

mounds sometimes grow to the size of a big room, being well over 6 metres tall and/or wide! These huge colonies, and massive/plating aquarium specimens, may grow only half an inch per year though, meaning that some of the largest colonies in the wild are over 1,000 years old. That makes them some of the oldest living things on Earth, too.

Anyway, whatever form they may be in, or what size and age they may be, poritids can also come in a wide range of colours. While many are rather plain, being cream to brown, many others may be green, blue, purple, or pink, and some are even bright yellow. Some have polyps that are one colour while the basal tissue covering the skeleton between the polyps may be another. And, the tips of the tiny tentacles that emerge from each polyp are oftentimes a lighter colour than the rest of the polyps too, making them look even better. So, while some specimens are nothing fancy to look at, others may be outstanding when looked at up close.

Identification

Again, there are 49 poritid species in all, and many of these are terribly difficult to tell apart. In fact, world-renowned coral expert J.E.N. Veron wrote in *Corals of the World* (2000) that "Porites species are the most difficult of all the major genera to identify..."

This is due to the fact that their growth form can be so variable and change within single colonies, that their colours can vary greatly within a single species and colony, and that their polyps and the openings in their skeletons that they emerge from are so small. Fine details in corals' skeletons are a commonly used means of species-level identification, but you'd need a big magnifying glass and some serious expertise to figure out what's



This is a nice specimen of the mustard hill coral, *Porites asteroides*, in the Bahamas. This one you can't have though, as it's illegal to collect/sell it.



This is *Porites furcata*, also seen in the Bahamas.

what when it comes to these. So, I stay away from trying to name many specimens at the species level.

Still, there are a few poritids that are identifiable, as they come from certain areas and/or have some distinction that sets them apart from their close cousins. For example, the mustard hill coral, *Porites asteroides*, is not found in the Pacific, but hails from the Gulf of Mexico, Caribbean, and Atlantic. It's also typically as yellow as can be, making it quite easy to spot. You can see plenty of the them at many dive sites on this side of the world, but that unfortunately means they are not available in the hobby.

Speaking of coming from certain areas, I didn't mention it above, but poritids are also some of the most geographically wide-spread of all the stony corals. In fact, the genus is one of the few truly circum-tropical ones, as some species or another can be found in the Red Sea, in the Indian Ocean from eastern Africa to Indonesia, in the Pacific from as far north as Japan down to the Great Barrier Reef in Australia and all the way across to Hawaii and western Mexico. As noted above, they're also found in the Gulf of Mexico, in the Caribbean, and in the Atlantic, from eastern North and South America across to western Africa. Thus, they're literally found in tropical waters around the world.

Worm Rocks

While they aren't as commonly seen as they used to be, you may also find a *Porites* specimen that's labeled as a worm rock. These most certainly aren't rocks, but are boulder-like or plating poritid specimens that are housing some number of colorful fan worms. Most commonly these are a boulder coral, *P. lobata*, that has become a



These images show boulder corals *Porites lobata*, with a good complement of Christmas tree worms living in/on them.



home for numerous Christmas tree worms, which are *Spirobranchus giganteus*. While the corals themselves aren't particularly fancy looking, the little worms can certainly make up for it. These offerings are quite interesting things to see, for sure.

Way, way back, when the reef hobby was still in its infancy, I think these were actually sold more for the worms than the coral, with people oftentimes buying the coral despite the lack of adequate lighting and water quality to keep it alive long-term. Unfortunately, when the corals died, the worms were usually smothered out by filamentous algae that would grow on the barren skeletal areas, or they just starved to death anyway, as they're filter-feeders that need plenty of plankton to stay alive for the long haul.

While some fan worms may get by just fine for years in aquariums, many others do not, and the Christmas tree worms tend to be some of those that do not. So, if you think you might want to buy one of these anyway, be aware that you'll very likely need to add lots of phytoplankton to your aquarium in order to keep the worms alive. And, of course, you'd need reef aquarium lighting and water quality to keep the coral alive, too.

Aquarium Care

When it comes to keeping various species of *Porites* alive and well in an aquarium, they're found on reefs alongside all the other corals we keep in our tanks, so there's nothing special to note about water quality. Of course, it should always be within the limits of what is considered appropriate for any reef aquarium, though. Being stony corals, you will need to make sure that alkalinity is maintained between 7 to 12dKH, while calcium should optimally be kept at 380 to



Many specimens lack fancy colours, but many others are very nice to look at. These unidentified aquarium specimens have light-colored tentacle tips too, making them look even better.



450ppm. But, that's about it.

When it comes to lighting, brighter is better. While many species are tolerant of moderate light, as best as I can tell they all do best under relatively intense lighting. This is especially so for more brightly-coloured specimens, which are prone to grow duller in colour under lower illumination, and sometimes turn rather brown and plain looking.

Keep in mind that many of these live in crystal clear waters right at the surface, so they can handle anything you want to give them. Do be sure to give any specimen some time to adapt to high-intensity lighting if it has been living under lower lighting, though. In such a case, you should initially place a specimen in an area where the lighting is dimmer, then slowly move it into brighter areas over a period of several days, or even a couple of weeks. Otherwise, they can suffer from "light shock".

It's also best to place a poritid specimen in an area where water motion is moderate to strong, with strong and turbulent being most desirable. Again, many of these corals live in shallow waters and are constantly subjected to strong currents and wave activity. So, they can handle it, and seem to thrive when currents are high and lighting is bright.

While a specimen is unlikely to outright die from a lack of strong water motion, they can run into trouble if flow is so low that detritus is able to settle on their surfaces between branches, and especially on or within the sheets of plating species. So, at the least, be sure to provide enough flow to keep them cleaned off as best as possible, as the accumulation of detritus in any area can lead to tissue loss and further health issues.

Also with respect to placement, note that poritids tend to lose any fight that they

may have with other types of corals. In fact, they may well be the least aggressive corals around. So, don't worry about a poritid bothering other corals, but do worry about anything else that's too close giving them a fight they might not be able to survive.

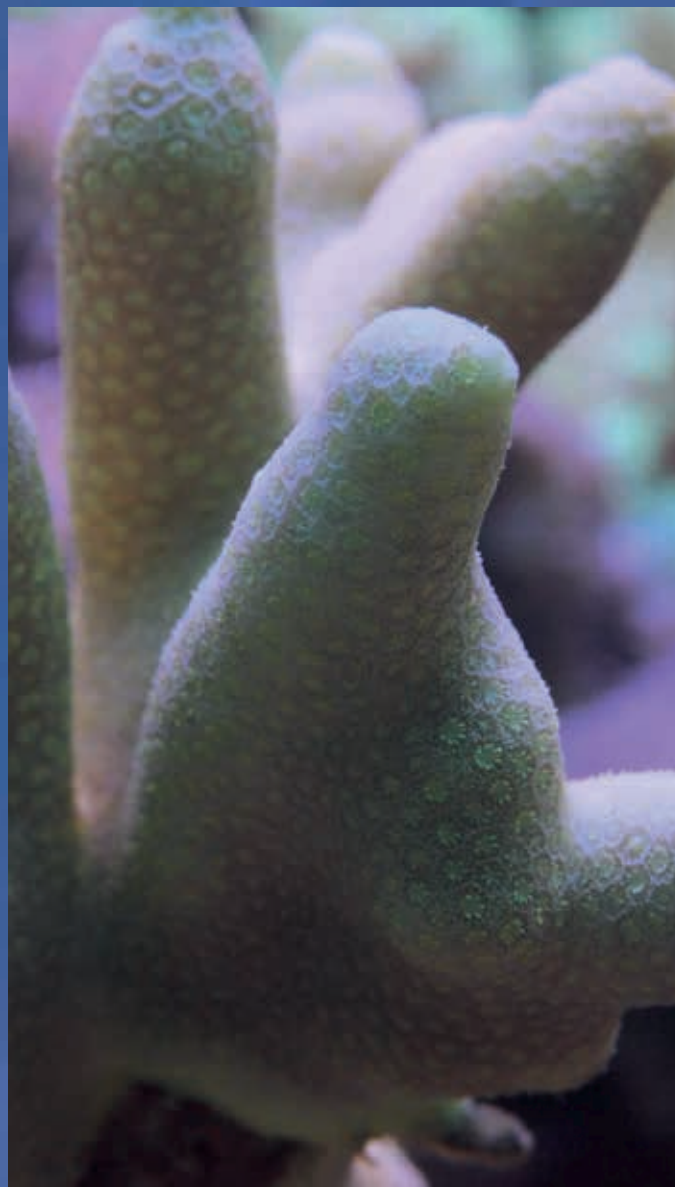
There have been various reports of poritids reproducing in aquariums with new colonies showing up seemingly from nowhere. However, I can't find any evidence of them actually spawning in a tank. To the contrary, it seems that they may be able to asexually produce larvae at times, which are then released into the aquarium.

Regardless, all of these corals are easy to propagate via fragmentation. Pieces and parts of any size can be broken away from an existing colony and used to start new ones, although the massive and plating species do tend to be relatively slow growers compared to many other stony corals. The branching species tend to be much faster growers, though. So, that's something to consider if you're thinking about cutting one up. Also, if for some reason you want to cut up a worm rock, be very careful that you don't cut up a worm or its tube. They can be longer than you might think, and they can meander under the coral's surface rather than going straight down into the skeleton.

Lastly, there's one more thing to point out about these corals, and it's a weird one. From time to time, they'll produce a clear waxy coating on themselves much like many leather corals do. It's probably nothing to worry about, as it'll be sloughed away, usually after a couple of days. It's thought that this helps them to clean themselves off though, so if a specimen is coating itself frequently, it may be due to a lack of current. That can be taken care of, of course. And, that's all the basic stuff you need to know.



Above: A branching finger coral on the Great Barrier Reef, most likely the common *Porites cylindrica*. Below: A yellowish *P. cylindrica* in captivity (Image J Clipperton)



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