

Things that glow in the dark

by Alex Tyrrell

The term 'boys and their toys' spring to mind when I think about my underwater photography equipment. We all love new camera gear to play with, whether it's a lens with a different perspective, snoots on our strobes, or even a completely new camera system. I am certainly no different when it comes to new gadgets! As I do nearly all of my photography where I work, which happens to be the beautiful location of Dauin just outside the town of Dumaguete, on Oriental Negros in the Philippines, my portfolio is not quite as varied as a travelling photographer. Mind you, the diving here is superb with an abundance of macro critters that will appear on most underwater photographers wish list. But I am always looking to try something different to give my shots some variety from the normal images that you get from the standard macro lenses. This is my justification to myself (and my long-suffering girlfriend) for the need to continually purchase new 'toys' for my camera. In reality, this is a fairly poor excuse, but it's lots of fun trying out new gear and techniques!

My most recent venture into

the 'something different', has been capturing images of marine creatures that fluoresce at night when illuminated by the correct type of light. The 'correct' type of light being either Ultra Violet, also known as 'Black Light' as humans do not see this wavelength, or a specially blue-filtered light developed by Dr. Charlie Mazel. Charlie originally began building underwater ultraviolet lights in the mid-70's as a hobby and it eventually turned into research and the founding of NightSea (www.nightsea.com) who are now the leader in scientific study into underwater fluorescence. Over the years Charlie developed his fluoro-lights, moving away from UV and onto a specially filtered blue light, which

All shots taken with Nikon D200 in Subal ND20 housing with twin Inon Z240 strobes set to full power. Nightsea BE3 Excitation Filters used on both strobes and BB62 Barrier Filter used on lens. Custom Excitation Filter on LMI Sola focus light.

Lisa's Mantis Shrimp- Nikon 60mm ED, f/6.3, 1/250th, ISO 400

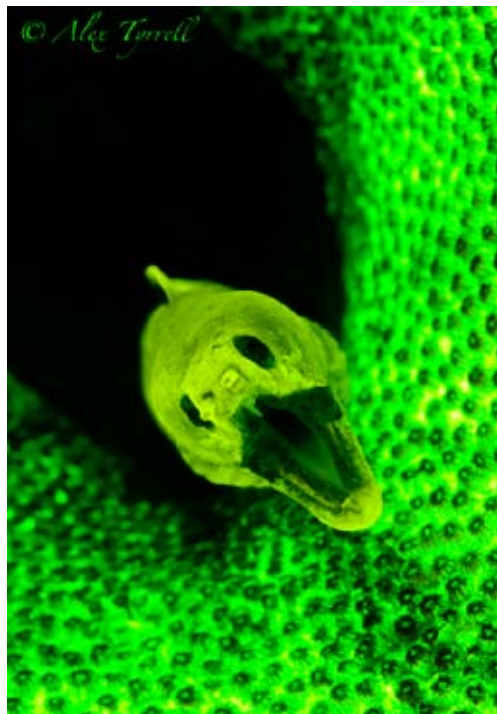


gives a much-enhanced fluorescent experience. I have tried both the Nightsea and UV lights side-by-side and can honestly say the Nightsea Light is the superior.

What is Fluorescence?

So I am guessing you are wondering exactly what fluorescence is and how it occurs? Well, fluorescence is the name for the absorption of light at one wavelength and its re-emission at a different wavelength. Therefore, some things will glow when you shine the right light on them. When we view a marine creature that fluoresces, it usually emits only a narrow range of colours so it appears to glow. This is in contrast to viewing a marine creature illuminated by white light, which contains all the colours of the spectrum.

You may well have seen things glow on previous night dives you have done, however this is normally from single-celled organisms called Dinoflagellates. There are however a number of other marine critters that can make their own glow, such as Lanternfishes. The light is produced by a chemical reaction called bioluminescence, the same way that Fireflies and Glow-Worms light up. Most organisms emit light when physically disturbed, so the motion of a diver through the water can set them



Fimbriated Moray Eel - Nikon 60mm ED, f/6.3, 1/250th, ISO 400

off. Bioluminescence and fluorescence are both forms of luminescence; the big difference between them is that with bioluminescence everything needed to glow is already contained in the organism, whereas for fluorescence, you have to stimulate them by shining the right type of light on the subject.

History of Underwater Fluorescence

Underwater Fluorescence is not a new discovery. The first printed



Golden Mantis Shrimp- Nikon 60mm ED, f/11, 1/250th, ISO 640

record found of an observation of fluorescence of a marine organism dates back to 1927. Mr. C. E. S. Phillips was walking along the shore in Torbay, England, and noticed that the anemones in a tide-pool seemed to be an especially bright green. He collected several specimens and used a light with a Wood's glass filter (a filter that absorbs visible light and transmits ultraviolet) to confirm that it fluoresced under ultraviolet light. Further discoveries of Fluorescence were made through the 50's and

60's and even the legendary Captain Jacques-Yves Cousteau mentions the use of ultraviolet light underwater in *The Silent World*.

More recently David Doubilet published an article with excellent fluorescence photographs of corals in *National Geographic* magazine in 1997. Doubilet used a high-powered underwater light that required surface power, so he worked off the pier in Eilat, Israel, and photographed specimens that had been collected from various depths and assembled for



Nightsea Filters: BE3 Excitation Filter fitted to Inon Z240 (side view), BB62 Barrier Filter & Custom Sola Excitation Filter.

his camera. Subsequently, in the April 1999 issue of Skin Diver magazine, Jack and Sue Drafa published an article on underwater fluorescence. They photographed corals that were naturally fluorescent in daytime, and did not use any special lights for either observation or photography. To get the proper effect on the film they scanned the images into a computer and adjusted the colors with image processing software.

Fluorescent Equipment

Some specialist equipment is required to view and photograph fluorescence. First of all, you will need either a UV light or a Nightsea Light that has their special blue-filtered LED's. Using just the blue light however, will give an overly-blue cast to everything, so this is counteracted by using a 'blue-block mask visor', which is a yellow filter that fits over your mask. This filter strips out the blue leaving only the true fluorescence of the creatures



Cuthona yamasui Nudibranch Comparison - Nikon 60mm ED, f/11, 1/250th, ISO 640 (Fluro) & Nikon 60mm ED, f/11, 1/250th, ISO 640 (normal)

visible. Without the yellow filter, you will not see the true fluorescent effect.

The same is true for photographing fluorescence; you need a source of UV or specially filtered blue light to illuminate your subject and a yellow filter for the camera. The obvious choice is to use filters for your strobes, which is what I have been using and are manufactured by Nightsea. These are available in various different sizes to fit different strobes. The ones I have for my Inon Z240's fit very snugly, so will not

slip off even without the use of the bungee cord provided to secure them to the strobes. As a secondary benefit, this tighter fit ensures no leakage of 'white light' that can interfere with the fluorescent effect. Nightsea recommend internal filters for the camera, and like their strobe filters, make them in a variety of sizes, which fit directly to the screw mount at the front of your lens. This means there is no way of accidentally knocking it off during a dive, which would be possible for an externally mounted

filter. This does mean you are then locked into fluro-photography for the whole dive, but my personal opinion is dedicating yourself to fluro-photography for the whole dive is preferable to aid concentration and should lead to getting better results.

Camera & Strobe Settings

Fluorescence can be a fairly weak effect and once the excitation filters have been put onto your strobes, it dramatically reduces the light output. I found that I leave my strobes on full power all the time and adjust my aperture if I get over-exposure. Backscatter, the nemesis of underwater photographers, is thankfully not something you really need to worry about in fluro-photography, so direct lighting is the way to go. Edge lighting simply does not provide enough power.

Our mantra of 'get close to your subject' is vitally important to utilise every bit of light coming from your strobes. If I need to back off a little to fit my subject into frame, I will push my strobes out in front of the port to cut the strobe to subject distance down as much as possible.

A high ISO is also preferable. I have been using ISO 800 on my Nikon D200, as if pushed any further the noise is unacceptable. Newer cameras with better noise suppression will allow you to set the ISO higher with acceptable noise levels (I'm looking forward to getting my new D7000 in the water for this when my housing arrives!). I have found the Noise Reduction Tool in Lightroom to be great for lowering the noise levels in my fluro-photos.

As would be expected, based on the previous three paragraphs, shooting with a fairly wide aperture is required to make the most of the limited light. If you can set your ISO higher than I can, this



Orangutan Crab- Nikon 60mm ED, f/8, 1/250th, ISO 400

will allow you the use of a smaller f-stop to gain more depth-of-field. This will be advantageous for fluro-macro imaging.

As our sole light source is the (filtered) strobes, shutter speed is not so important as your strobes will fire quicker than most shutter speeds that you will use.

Subjects

Macro photography will give you the best chance of decent results, as the area to be illuminated by your strobes is much smaller than in a wide-angle shot. I have yet to try lighting for wide-angle, mainly due to only having two excitation filters for my strobes and I think I will need a couple of off-camera strobes to adequately light a reef scene for fluro. Plus being able to use a higher ISO than what my D200 allows would really benefit for wide-angle. Lenses I have successfully used so far are the Nikon 60mm and the Sigma 28-70mm, but I have plans to try the Nikon 105mm VR



Hermit Crab - Nikon 60mm ED, f/9, 1/250th, ISO 800

and the Tokina 35mm Macro soon, which should both work very well.

Subjects are not too hard to find for fluro photography, as when a creature fluoresces, it generally stands out from its environment in quite an obvious manner. This makes finding the smallest of Nudibranch's possible, even to the untrained eye! My favourite subjects so far have been Mantis Shrimps (*Lysioquillidae maculate, lisa and mapia*) and Fimbriated Moray Eels (*Gymnothorax fimbriatus*), but there are many other subjects from tiny Nudibranchs through to Magnifica Anemones and huge colonies of Hard Corals, where nice abstracts in psychedelic colours can be found. In a tropical environment you will not be short of subjects. Even on muck dives there are numerous Sand Anemones, Hermit Crabs, Shrimp and Nudibranch's that fluoresce, however, initially you will find a reef environment more rewarding.

Problems & Solutions

Photographing fluorescence does take a bit of practice; so don't expect perfect results on the first dive! You will need to spend a bit of time getting used to this style of photography and work your subjects to get the best results. It's not simply a case of attaching the filters to your camera system and off you go! From personal experience, the following are problems that I have encountered and the solutions I have found to them:

Autofocus – with dramatically reduced light the autofocus on your camera can struggle to lock onto the subject. Newer camera models than my D200 should be much better at this, but your lens will still 'hunt' at times. Solutions I have found to this include getting a good fluoro-focus light (more on this next), use manual focus if your system allows this, or lock the focus at the required distance and then rock back-and-forth until the image is sharp in your viewfinder/LCD. Alternatively, you can set your focus with the subject illuminated by white light and then switch to 'fluoro' when shooting. Whichever way you choose, being patient and taking your time is also necessary.

Focus light – my initial set up was with a UV focus light, which certainly worked, but it had some shortcomings. The beam pattern is a tight spot, so every time you change

camera to subject distance you need to alter the angle of the focus light, which I found quite annoying. My solution to this was to have a special blue filter made for my LMI Sola 600P and then adapt a dive computer boot to hold it in place. This is a temporary measure until Nightsea send me the prototype of their LMI Sola Adapter, which I am planning on using with the Sola 1200 for additional power.

Colour Saturation – as previously mentioned fluorescence can be quite a weak effect in some marine creatures, so follow my advice for strobe positioning and make sure you are very close to your subject. Even taking these steps, I have found that a bit of help from Lightroom to boost saturation, increase the exposure a little and using the 'blacks slider' to darken the non-fluoro element of your image, will give a more dramatic effect.

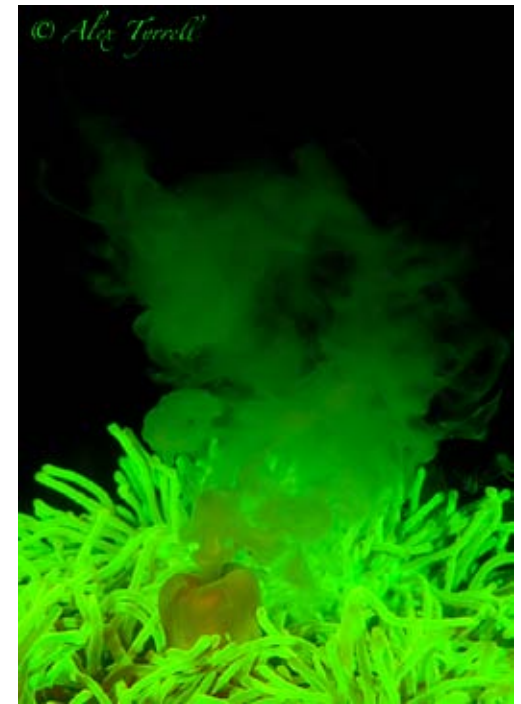
Mask Visor – for us to see fluorescence we need to use a yellow mask visor, but when looking through your viewfinder or reviewing your images on the LCD you need to take it off. Otherwise, it will look like you have underexposed the shot by quite a bit. So you have to use the mask visor when looking for subjects but remember to push it out of the way when shooting or reviewing. It's quite easy to forget you have the mask visor

on and then be left wondering what you have to do to your camera settings to get a decent exposure!

Summary

My ongoing experiments with fluorescent photography have all been in the tropical waters of the Philippines, but I am sure there are many other subjects that this technique will lend itself to in temperate waters. Being based in the Asia my access to temperate water means a long flight, so I'll leave someone else to look into this (plus I don't like the cold!).

If you are planning on trying this out for yourself, don't expect perfect results first time out. It is a little trickier than normal underwater photography and like anything in life, the more you practice, the better you will get. You need to be patient and able to spend time on a subject. You should be very familiar with your camera controls, as adjustments are normally made in very limited light conditions. Also, you need to be very comfortable in these low light conditions; this isn't for anyone afraid of the dark! Perfect buoyancy control is also a prerequisite to ensure you are not damaging the marine environment while diving with minimal light. So for an outlay of approx. \$500 you could be capturing some unique



Spawning Magnifica Anemone- Sigma 28-70mm at 28mm, f/6.3, 1/80th, ISO 500

photos to spice up your portfolio, and maybe even an image of fluorescence that is a new discovery!

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Alex Tyrrell is the Photo Pro/Dive Instructor at Atlantis Dive Resort in Dumaguete. Atlantis are the only dive operators in the Philippines that offer the Fluro Night Dive experience, which can be done at either the Dumaguete or Puerto Galera resort .

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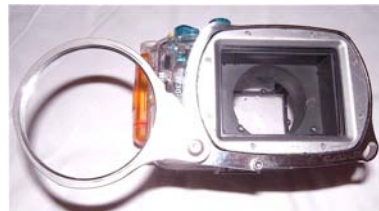
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