Ratio Deco – Poor Knights: 2nd September 2010

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Dive planning is an integral part of being a successful technical diver. Calculating how much gas is required to complete a dive, how large a reserve is required, what mix to use, what deco gases to use, how long you can spend at depth – and importantly what to do if the worst happens. But what do you do if you don't know what dive site you'll be doing and therefore how deep you will be going? Can you plan for such uncertainty? This is the situation James and I faced when we decided to do a couple of trimix dives at the Poor Knights, in preparation for our forthcoming GUE Tech 2 class.

The Poor Knights is a great place to build your technical diving experience. Good visibility, relatively warm water, sheltered dive sites in almost all weather, lots of life and of course big walls and drop offs – down to 100m or more – no matter what your experience there is something for everyone. For deep diving wall dives are particularly appealing, as they provide plenty of entertainment to help you pass the time away during long decompression stops. The only downside of a day at the PKs is that with so many possible dive sites you never know which one you might end up at.

Given such uncertainly you have several options as a technical diver. You could just trust in your computer (if you have one which is trimix capable e.g. VR3) but as a team this requires everyone to have the same computer and leaves you stranded if the computer fails. You could plan dozens of different profiles in advance of the dive and have each written out on a slate with associated 'bail out' options – but this is time consuming, tedious and could still leave you without the exact plan you require. Or you can adopt standard gases and use ratio deco, which makes everything easy. Oddly enough we opted for the latter.

To cover the approximate range of depths we expected (40m – 50m) we chose to use 21/35 as our backgas (21% oxygen, 35% helium) and EANx50 as our deco gas (50% oxygen, 50% nitrogen). To give us plenty of gas for the dive and a good reserve we had double 12s and a 40cf deco bottle. To calculate our deco we used a 1:1 ratio based on an average depth of 45m. Is that clear enough? Probably not for most people. Let me explain in more detail.

Gas choice: In order to select a backgas two factors are considered – max PP02 and END (equivalent narcotic depth). Our choice of 21/35 was based on limiting PP02 for the working section of the dive to a maximum of approx 1.2 and limiting our END to approx 30m to avoid narcosis. EANx50 was chosen so we could switch from 21m upwards and off-gas as efficiently as possible.

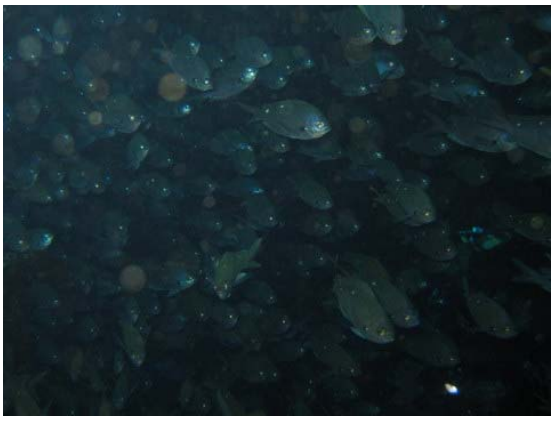
Tank sizes & minimum gas: Choosing tank sizes is always hard when you don't have a depth to work with, so instead we calculated what volume of gas we would require to bring us both safely back to 21m (our switch depth) based on one of us having a catastrophic gas failure on the bottom. By calculating this for 40m, 45m and 50m we had fixed limits for when we would call the dive. This is known as 'minimum gas'. Running these minimum gas volumes against different tank configurations makes it clear how much gas is then available for diving, which is easily converted into a time if you know your Surface Consumption Rate. If you don't know your SCR then use 20L/min as a pretty good starting point.

Set points: To manage our deco obligations we used a 1:1 ratio based on 45m. By this I mean that for every minute spent at an average depth of 45m we planned to do 1min of decompression. Therefore 20mins at 45m would require 20mins of decompression. For every 3m deeper we would add 5mins to our total decompression time. For every 3m shallower we would subtract 5mins from our deco time. If you are wondering how close this is to actual dive plans provided by computer models then simply run a variety of different simulations to compare – you'll find the results remarkably close, until you start to move significantly away from the 45m average.

To manage deco stop depths we simply spread half our deco time equally over the intermediate stops (21m, 18m, 15m, 12m and 9m) and did the rest at 6m. E.g. To do 10mins of deco we would have done 1min at 21m, 1min at 18m, 1min at 15m, 1min at 12m, 1min at 9m and 5mins at 6m.

Average depth: The reason we use average depth is that it is simple for calculation purposes whilst also being reasonably accurate. E.g. If we did 5mins at 48m, 10mins at 45m and 5mins at 42m we'd simplify this to 20mins at an average of 45m. (NB: You cannot extrapolate this idea indefinitely – e.g. 10mins at 80m and 10mins at 10m is not the same as 20mins at 45m!)

Back to the diving



So if you're still awake after all those numbers let me go back to our actual dive. We moored close to Magic Wall in South Harbour, with a plan to swim out to the drop off behind Ngaio Rock. From where we were anchored it took about 5mins of swimming to get out to the drop off, from where we descended to a max depth of 48m. Immediately a small School Shark cruised up to take a good look at us – there's always more about as you get deeper. My can light scared him away at first, but he returned again twice more before getting bored and disappearing into the blue. Following the reef wall we zigzagged southwards, rising gently as the wall disappeared into a sandy bottom. After a little over 10 mins we turned around and cruised back along the wall, this time a

bit higher, passing an abandoned anchor and several lengths of forgotten mooring line. After 30mins at an average depth of 39m (still within our minimum gas requirements) we started our ascent. So, what deco would we be required to do? OK, time for more numbers:

39m is 6m shallower than the 45m set point, so taking 10mins off our total bottom time gave us a total deco of 20mins. This was split as 2mins at each of the 21, 18, 15, 12 and 9m stops followed by 10mins at 6m. End of the numbers!!!! Having completed our deco we swam lazily back to the boat, following the top of Magic Wall. So much for uncertainty – this was easy.

OK so it all sounds a bit overwhelming at first, but trust me - if you follow some simple guidelines at the start you'll find the numbers surprisingly manageable. Most importantly by using ratio deco you can concentrate on enjoying the dive rather than finding yourself following rigid plans which don't fit the dive site you're diving. After all it's about what you see underwater isn't it? (Hopefully the pictures give you a good idea of what we saw.) And because we weren't narc'd we even remembered everything we saw – amazing.