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Disclaimer:

On a recent shoot to document the daily migration patterns of Mastigas Jellyfish in Palau's World famous Jellyfish Lake, underwater camera operators John Friday and Mark Thorpe had the opportunity to appraise the field effectiveness of three independent underwater housing offerings for the RED One Digital Cinema Camera. Neither author of this paper were asked to provide the information in the following pages by any of the housing manufacturers. Neither author stands to gain in any way from the provision of the following information to those with a vested interest in underwater cinematography and the materials required to effect underwater imagery.

Intro:

Amongst others, one of the major banes of most camera operators is the fact that as technology races forward camera technology also forces us to continually update our

equipment. To an extent where almost every year we would sweep out the old and welcome in the new. Well that is all about to change. The advent of one particular camera system in recent years, apart from leaving most of us salivating, has defied the major camera manufacturers with its sheer audacity, its amazing price point and its incredible appeal. We are talking about the RED One Digital Cinema Camera, a system delivering uncompressed high definition footage at a price point previously reserved for the mid range of semi professional camera systems. Developed by the 4K Digital Cinema Company who adopt the slogan ‘Obsolescence Obsolete’. The ever-developing systems are certainly making their mark on the movie making industry. Without going into all the technological aspects of the camera, we are here to talk underwater housings not codecs and Bayer mosaics, the first thing we thought about when we first heard about the development of this system way back in 2006 was – “this camera underwater is going to be sensational”. We have not been disappointed.

As part of a team recently contracted by an eminent north American production entity to shoot the daily trials of life in a lake populated with some fifteen million stingless Jellyfish in the Republic of Palau. We headed to the Western Pacific for the shoot where along with our fellow shooters we would get the chance to get to grips with three different underwater housing options.

The three units, as shown below, are built by the following manufacturers from left to right, AquaVideo, Gates, and an AquaVideo base housing refitted by Joe Ortega from SL Cine in LA and father of Hector Ortega, co founder of Element Technica.



Housing contenders: L to R, AquaVideo, Gates Underwater Housings, Element Technica

We opted to use differing lenses with the different rigs. The AquaVideo was normally fitted with the 18-50mm zoom lens from RED. The Gates, or ‘Deep Red’, was fitted with a Carl Zeiss 14mm standard prime lens as well as the RED 18-50 . The third system, the AquaVideo / Element Technica housing was fitted for the most part with the extraordinarily wide Zeiss Ultra Prime 8R, an incredible piece of glass, with an equally impressive price tag. We were also looking to see what kind of results we would get from using a selection of wide lenses behind one dome in the Gates housing.

With differing construction parameters it would be interesting to see if the nodal point of the dome, developed around the RED 18-50mm, would create image degradation due to the physical characteristic differences of the lenses being placed behind the same dome port.

Each system was targeting specific tasks. The AquaVideo was primarily used for wide establishing shots and a variety of fill shots. Fitted with the 18-50mm zoom it could, and was, at times used for macro work by adding a 2 or a 4 diopter with pleasing results at the 50mm end.

‘Deep Red’ was our day-to-day workhorse, which we shot most of the underwater segments. Shots varied from wide establishing shots on the Zeiss 14mm T2.1 standard prime as well as a number of macro sequences using the RED 18-50mm at the 50mm end with a 2 or 4 diopter screwed onto the lens. John Ellerbrock of Gates knowledge of the sweet spot on the Zeiss 14mm Primes gave back great results and allowed us to really work the system to the best of its ability. The third housing is the base element of a 1st generation AquaVideo system. With additional gearing and a lengthening of the body to accommodate two RED batteries the system slides into the elongated underwater housing that was re-engineered for gearing by Element Technica out of Los Angeles, California. This system due to its increased run time was to be used, in part for our planned underwater time-lapse sequences. This would also be a great test of the heating issue (due to its three hour run time) experienced on many underwater shoots with RED, a concern from the beginning of discussions on taking this system underwater. So how was the handling of all three housings?

AquaVideo™

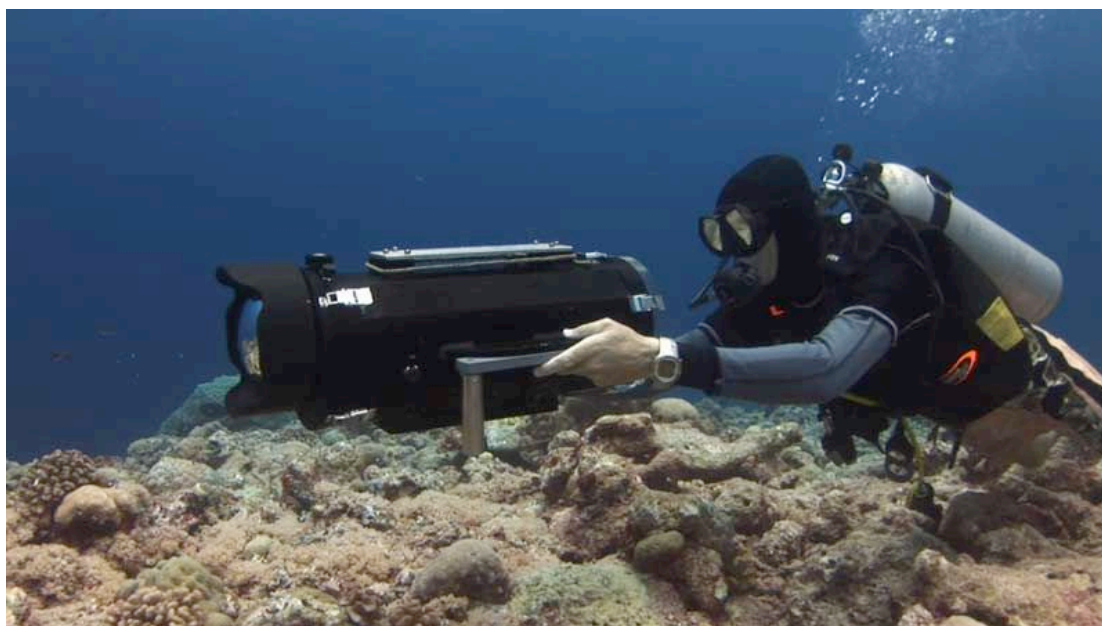


The tubular design of the AquaVideo housing makes handling simple, once one gets used to the control mechanics. With a red colored and ergonomic record lever on the right hand side (an Element Technica addition) and then Iris and Focus knobs located at the top and front end of the housing and finally White Balance control at left fingertip the user has basic control over the camera. Control over these features is basic in design and requires little getting used to. . That is not to say that it can be at times frustrating trying to manipulate the rudimentary Focus and Iris controls. To manipulate Focus and Iris with the AquaVideo system one must line up a control rod with the lens gears that has a bend at the end of each rod and then gently

pull up, rotate the knob in the desired direction, then push down and pull over the Focus or Iris gears. A very simple, yet crude method of manipulating the lens gearing that takes time getting used to. We generally found ourselves battling, as conditions

underwater changed, to attempt to reset Focus and Iris and having to juggle to get to the control, then check the image, then juggle the control again as to see if the setting was correct as we aimed to nail the setting. This is fine if you are in a stable position filming a controlled situation or scene and have adequate time to adjust settings. In the event of a Whaleshark giving birth, I kinda think one would be weeping at the thought of missing that million dollar shot, unless of course you were set up to film birthing Whalesharks!!

The housing as featured is really setup for a shooter to set a hyper-focal setting on the focus ring and then manipulate Iris only when necessary. Sounds good, but in reality we found ourselves needing to change Focus and Iris settings more often than we had originally planned. To clarify in defense of the housing though, the two used on this trip were the two first ever RED housing options from AquaVideo and the first two RED housings ever built. Since these prototypes hit the streets, AquaVideo may have made changes to their control features. Heat was never really an issue with this system. We did get a temperature warning on one occasion but that was during a Jellyfish snorkel filming session in 88 degree waters and after a solid hour of use. The system is made from aluminum with a plexi-glass back plate to allow for viewing of the RED LCD.



Above: Mark Thorpe lines up a shot on an out of frame Green Sea Turtle. An external monitor would certainly round this system off nicely. Yes, that's the Titanium D9 too!!

Mark's Verdict:

I found the layout with having the RED LCD located behind plexi-glass at the rear plate of the housing caused me some concerns, and muted profanities underwater. The reason being I have, of late, and at 43 years of age, started experiencing the need for an arms length to focus on an LCD that when positioned in it's correct position within this housing as it rests a matter of inches away from ones eyes. The simple solution of course would be to have an external monitor placed at the top and front end of the housing.

- A nicely balanced and thought out system that allows users to take their RED cameras underwater at a relatively economic price point.
- The main issue for me was the shuffling back and forth between controls for Iris and Focus if need be and the monitor. The other main issue for me was the very real issue with dome ports. Using the Acrylic ports we suffered three ‘dings’ in the field rendering all but one dome useless. Aquatica no longer constructs these ports meaning that one-day replacement ports, or lack thereof, will become an issue.

What would make it better?

A bulkhead connection so as to be able to use an external monitor.

Gearing toward the work end of the housing with a geared ‘shaft’ along the inside of the housing to operate the lens gears at the business end.

John’s Verdict:

- A quick and easy system to get you working in the field right now.
- All and all what most impressed me with the system was how well balanced it was and neutrally balanced with the RED 18-50mm lens. This was not just luck.
- I lost a great many of shots while shooting fast moving/changing wildlife scenes underwater because of the difficulty in manipulating the lens controls.
- Basically a very simple system that can be used out of the box and upgraded as you find the time and funds to do so.
- User should consider upgrading the push/pull lens controls to gears. It takes a tremendous amount of patience to change Focus and Iris on the current system.

What would make it better?

This system is a good starter and basic workhorse out of the box. However the user will find themselves slightly frustrated over the current lens controls and want to upgrade those as quickly as possible. Also as Mark mentioned, a bulkhead connector for an external LCD would greatly improve the ease of use and basic handling of the housing and allow for three point contact by positioning the back end of the housing on the user’s shoulder – where the current LCD is located. An externally mounted LCD on a sliding rail or cheese plate so as to move the LCD to the user’s desired location based on each user’s eyesight or lack thereof would see a massive improvement of this ready to use system.



Above: Deep Red gets ready to do battle in Palau's Jellyfish Lake.

John Ellerbrock at Gates Underwater Products loaned us a prototype of his new housing known as 'Deep Red' for our shoot. With strict instructions to put it through its paces, I love it when people say that, we did just that. In keeping with the Gates tradition, the housing is made from aluminum and uses 100% manual controls. The one electronic feature on this housing is a manual control lever that presses against a smart little servo motor that operates the zoom of non-prime glass. This gearing and motor can be disconnected when not required. The housing itself is very much stouter and shorter than that of the AquaVideo.

The 'Dumpy' appearance of the system is due to the design of the saddled assembly for the hard drive and battery over the camera, it gives the aesthetic of an engine when sitting inside the housing.



Above: Batteries and HDD's saddle the Camera in Deep Red

The real key of functionality with this housing is the revolutionary adjustability of the gearing for Focus, Iris and Zoom. Each gear has its own shaft that protrudes from a bulkhead located just parallel to the PL mount and the user can adjust each gear to a desired location forward of the PL mount in order to accommodate a multitude of different lenses. It's truly a genius idea and there are only three small setscrews that the user needs to tighten in order to adjust the gears either forward, backward or up and down in order to mate with the gear rings of the desired lens. After using this feature we were duly impressed. However by accident we found out that

Gates went even further with their Focus and Iris knobs located at fingertips length from the left side handle. These knobs can be manipulated by removing your hand and turning them the traditional way between your thumb and index finger or you can merely stick out your index finger and slide it into one of the many ergonomically designed holes of each of the knobs and make quick and highly accurate adjustments to Focus or Iris without removing your entire hand from the housing handle and thereby not losing contact from the housing.



Above: The gearing system developed by the engineers at Gates. Each control mechanism has its own set screws which allow you to position iris and focus gearing at just the right spot. Well thought out and nicely put together.

The one aspect of this housing that stands it above other current options is the masterful work that went into the gearing mechanisms for the focus and iris control. Depending on which lens one decides to use though will dictate whether one has to commission a lens extension bracket to be constructed. The system itself was designed around the RED 18-50mm zoom lens so the user would have to discuss directly with the company should they wish to house other glass. We found that the extension for the 18-50mm zoom also allowed for use of the Zeiss 14mm T2.1 standard prime, which we used almost exclusively in 'Deep Red' for this shoot. Overall, working with this system was a breeze. A nice clear monitor sitting at the front of the housing with easy controls at hand which are well thought out. We did have an issue with overheating. We would generally get a temperature warning with the cameras after about an hour of use. Could this be due to the faster conductivity of heat in a vacuumed environment or just the fact that we were working in very shallow depths in strong sunlight with a black housing? The fact is that Gates is currently addressing this issue with a redesign to allow for better heat dissipation by use of cooling fans.

As with the Gates housings of late, the system is very modular. None of the current housing manufacturers on the market have tackled the EVF issue, that is to say that none have housed the Electronic Viewfinder and all tend to look at utilizing the RED 5" hi resolution LCD screens. This also bears true with the Gates system which houses the clients existing LCD monitor in their well thought out casing. Gates has taken it upon themselves to confront this tricky issue and built a housing for the RED 5" hi-resolution LCD screen that connects via a bulkhead connector on the right side of the housing that allows access to all of the LCD controls including full frame magnification which when used in conjunction with the 'Expanded Focus' feature can help tremendously with hitting focus on this camera. All of these controls are functional via magnetic switches at the top of the LCD housing. The unit we used was one of two prototypes and the LCD along with its bulkhead connector were first run prototypes and still under evaluation. We did experience a few minor technical difficulties whereby on occasion the LCD would show us a pixilated yet viewable screen. When this first occurred we were terrified that our images were blown, but upon playback and further evaluation we found that the images were in fact fine and no pixilation occurred on the actual r3d files. Gates recognizes this problem and is in fact working on a fix as of this writing as the issue seems to stem from the cables or LEMO connectors from a third party vendor.

Mounting and dismounting the camera from the housing is a straightforward affair. The housing itself is broken into three main sections, four if one counts the lens extension brackets. Starting from the front one has the Dome or Flat port assembly, then comes a lens extension bracket followed by the main body of the housing. This splits into two segments joined by four security snap clips. The rear of these two segments slides along a couple of rails so as to align perfectly each time of housing closure.

Full Menu Control

Another key feature of the 'Deep Red' is the fact that it allows you full control and manipulation of the menu underwater. By use of a small toggle-like switch, you can access any menu item from changing your ASA setting to over or under-cranking all while you are underwater. At first we thought this was not a very necessary function, but after hands on use, it became evident that this was in fact another home run by Gates. To go from shooting at your current frame rate and then switch to the over-cranking function is just one of the many possibilities that this little toggle switch allows.

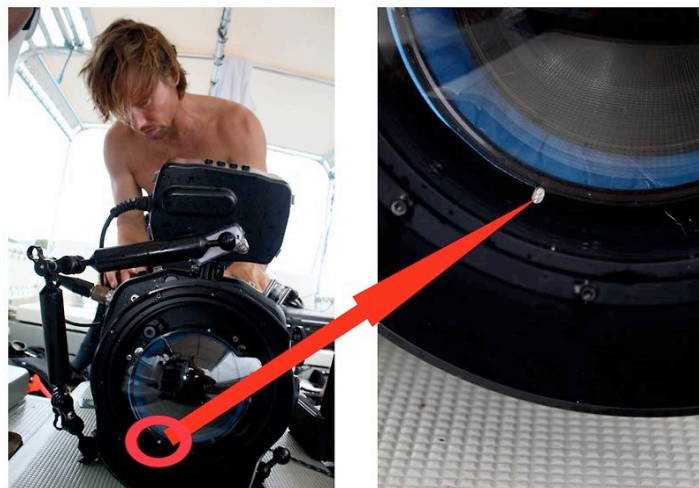


Above: The rear of Deep Red showing the menu access controls.

One major point of issue would be with the small grub screws used to keep the internal control elements in place. We had one potentially bad situation develop with the grub screw that holds the menu selection button at the rear of the housing in place and allowed for the screw to jump around in the housing until it finally became jammed between the ND filter and the dome port.

This we believed is due to the amount of transportation, and therefore vibration, the housing experienced during its voyage to Palau. This should not be an issue and in our opinion a locking mechanism for these controls should be found. Whether the threads are sunk into the shafts of the controls and then sealed with Loctite or something similar would certainly alleviate these issues. The fact that we were looking at a potentially scratched dome port exacerbates that requirement, this was secondary in our concern as the lens you can see being used below is a Carl Zeiss standard 14mm prime and not a cheap lens to repair scratch damage on. This time we were lucky.

Right: A very worrying time when we noticed the menu selection control grub screw had come loose and sat trapped between the dome and lens shade. Fortunately the lens was so snug inside the port that it didn't raise issues and the lens didn't get dinged. This is obviously something that really needs to be addressed. Always check after travels that your nuts are tightly secured and sitting well. Nothing worse than diving with loose screws in a housing.



Closing the Housing

Another safety aspect of the housing, above the use of the safety snap clips is the recommended option to pull a vacuum in the housing once the system has been built. This is done very simply by connecting a vacuum pump, available from Gates, to a Schrader valve screwed into the housing and then working to your desired vacuum setting. We would generally set our system to 5in Hg, inches Mercury or equivalent to 2.5psi. Once you have pulled your vacuum, you simply close a one-way valve and monitor the vacuum for a few minutes to see if it drops. If it is stable, you're ready to dive the unit. If you notice a drop in the vacuum, then it's time to open up the housing and re-seal the camera and look for possible areas where a seal may be broken. One point to remember though once disconnected is to refit the schrader nipple guard, as this could also be a potentially weak spot for water to enter into the housing.



Above: John Friday pulls a vacuum on Deep Red. Note the umbilical connection to the lower right of the housing. Remember to reconnect the valve cover once done!

Mark's verdict

- A well crafted and nicely tuned system. A serious contender for the RED underwater housing market.
- Great workmanship and overall aesthetic.

Contentious points:

- Grub screws working loose with vibrations, need to check all after boat trips, airplane transport etc. Any way to lock them down?
- The heat issue needs to be addressed; at the time of going to press I was informed that this is actually in process at the Gates factory.
- Price*

*In today's economy the bottom line is often the deal maker or breaker. Whilst the price tag for Deep Red does seem steep one has to also understand the level of client care that comes when dealing with Gates, which is never held in any measure of doubt.

John's verdict:

- Definitely a Ferrari of underwater housings. One can see and feel the craftsmanship as well as R&D that has gone into this housing.
- Well-balanced and just down right nice fingertip controls that allow for ease of use
- Not for the Sunday user. This is a serious housing that carries a serious price-tag.

Contentious points:

- Overheating, and Gates seems to be addressing this issue now
- Pixilation on the LCD screen. Although not a game stopper it is something to be addressed and Gates informs us that they are currently testing new cables and LEMO connectors.

What would make it better?

- An upgrade path to Epic or Scarlet. We all know they are coming and with a substantial investment in 'Deep Red' it would be nice to see a financially pleasant path to future upgrades towards Epic and/or Scarlet that allow for a refit or trade-in towards the coming cameras.
- Flat port option will be available as of June
- Some type of housing extension in order to allow three point contact by resting the back of the housing body against your shoulder. An option that Gates are considering.



*Left:
Housing option #3
that started out as
an original
AquaVideo unit. It
has since been
elongated so as to
accommodate more
batteries for longer
run times. The
impressive
workmanship of
Mr. Joe Ortega of
SL Cine in Los
Angeles is very
evident.*

Based in Los Angeles this engineering firm has set the standard as a third party manufacturer supporting many different leading brands in the world of cinematography. It was only a matter of time until ET started to supply an impressive array of support items for the RED One Digital Cinema Camera. From EVF supports, cheese plates and sticks to dovetails etc they seem to have an angle on most items. They have also designed and built their own underwater housing for the Red Camera. Whilst we did not have use of their RED underwater housing on this shoot, they did however modify one of our AquaVideo housings. Expert craftsmanship saw the addition of custom Focus and Iris gears specifically to allow for use with the uber impressive Arri 8R Ultra Prime lens as well as the addition of a Switchtronics dual battery tray to allow for up to three hours of recording. While we used this camera for a variety of shots, its main use was specifically targeted towards capturing underwater time-lapse sequences of jellyfish migrating from one end of the lake to the other. Our normal shot setup would be to take a frame every second over as many hours as we could get out of the system. Using this in conjunction with the Arri 8R Ultra Prime rendered stunning results.



Above: The elongated layout of the timelapse camera meant for an even longer underwater assembly once housing and domes were taken into account.

The main difference between the standard AquaVideo housing and this hybrid is the over all length of the unit. It is very long. Best suited to those with arms similar in length to those of a Silverback Gorilla this unit requires a lot of juggling to and fro as, again, the monitor is located at the back end of the housing behind the aluminum back plate and a small plexi-glass window. This is not a failing of the system though, an external monitor would have been great but that was not deemed necessary by the owner / operator who, through familiarization with the system, has gotten used to operating the housing as is.

Additional extras added by Element Technica are a cheeseplate and cheese stick used to create the carrying handle as shown in the first image. Using the standard Aquatica domes the system is still very much an AquaVideo base system. Four locking latches for security and an aluminum front plate allows for good heat dissipation. During use of this system for time-lapse shots we never had any overheating issues. Only once was there ever a temperature warning while on an extended reef dive while trying to make the camera overheat. Overall this system worked well for the tasks it was assigned to.

The design extras implemented on this system was overseen and built by Joe Ortega of SL Cine. Using a rod system that locks into place it is an example of old-world craftsmanship that is hard to come by nowadays. It should be noted that these are fixed gears and designed specifically for the Ultra Prime line. With some playing around with gear rings, one can make the gears work for a variety of lenses, however that would take much time and patience.



Left: The gearing & rods of the Element Technica housing. One option for future builds would be to have some form of shoulder for the rods at the red lever tightening end to sit on. There is only a certain amount of strain these rods can take before snapping. A shoulder with an opening for the rods to pass through would be one possible solution.

This is again a very simple and straightforward housing with very nice gear controls. Not as mind blowing as the Gates adjustable gears, but noteworthy none-the-less. With the addition of an external LCD, this would make for an excellent everyday use housing with some remarkable allowances for staying underwater for up to three hours and giving the user the satisfaction that their battery will likely not run dry by the time they exit the water.

Mark's verdict:

- A very long unwieldy housing specifically aimed at time-lapse applications.
- Not user friendly on reef dives.
- Good initial price point.

- Smooth as silk gearing.

Contentious points:

- Weight of the unit, it's a workout.
- Fiddly maneuvers to get the camera locked into position.
- Dome port availability.

The main issue with this system is that it uses direct pressure activation on the record feature. This means that as one descends through the water column the increased pressure can, and did on numerous occasions, initiate unwanted recordings. A simple spring activated system with a locking mechanism would have been a better idea.

John's verdict:

Differs a bit from Mark's as I see the potential of this housing.

- Great shoot times: up to three hours of record/run time
- Focus / Iris controls: these gears are a work of art
- A system that you can build to suit and in stages
- Great three-point contact with this housing—only the LCD is located on the back-plate behind a plexi-glass window so you cannot use it as currently modified.
- Easy access to quickly change batteries and hard drive as the back plate unsnaps and reveals the batteries and hard drive.

Contentious points:

- No external LCD or EVF
- No spring activated run/record lever—it's a bit soft and does not spring back.
- Dome port availability. Users of the AquaVideo systems may have to consider an alternative dome port since Aquatica no longer makes these screw on ports.
- Long reach to get to Focus and Iris knobs

What would make it better?

- External LCD on a dovetail rail or mounted to the cheeseplate
(Gates makes this possible if they decide to sell their LCD housing)
- Adjustable gears—this would put the system high up on the list if it just had adjustable gears.
(ET informs us that they are considering developing adjustable gearing)

Summary

All in all we had an extremely successful shoot in Palau. We had at our disposal three very different underwater housings to get the job done. The whole issue of housings for this camera was a bit of a unique situation. The RED 1 camera has been out for over a year and as such we are only now starting to see competition to the AquaVideo housings emerge on to the market. Mike Hastings of AquaVideo was first to jump on the bandwagon and get a working housing out in the field that may not have all the capabilities of the other manufacturers, but it did get things moving. Why has it taken others so long to get housings out on the market? Late R&D? An uncertain market? Who knows for sure. With the multitude of controls available on the Gates housing I can say that we were certainly happiest with the flexibility of that system. That is not to take any thunder away from AquaVideo though. Both systems for their intended use were up to the tasks set for them. With fingertip controls, the external monitor and access to the menu, all of these things combined allowed the Gates operators so much more flexibility and options. It was because of the 'Deep Red' that we accomplished the majority of the shots on our shot list. There are weak points to both systems at the moment, these have been passed back to the respective manufacturers and are either being addressed as this paper goes to press or are in line to be taken into account with next generation housings.



In closing we would like to thank Mr. Nick Martorano, owner of Ocean Wonders Underwater Productions and resident videographer at Sams Dive Tours in Palau. We were made to feel completely at home as we took over his store to charge batteries and dump camera gear for the nights. Nick also helped out on numerous days with BTS shoots and photo sessions. A few short video clips of housings being used underwater can be found at Nick's website located at:

http://www.oceanwonders.org/RED_Palau

“What we do in life, echo’s in eternity”