

Canon EOS R

by Team Backscatter

The Canon EOS R is Canon's debut in the full-frame mirrorless arena. It's got outstanding image quality that's so good, you can essentially consider it a mini-5D4. It feels right at home performance-wise among fellow full-frame mirrorless systems like the Nikon Z7, Sony a7R III, and Panasonic S1. What sets the Canon EOS R apart from the competition is the stunning ambient light custom white balance video color produced in-camera. Even at depths up to 70 feet, the Canon EOS R produces video color that requires little to no correction in post - a spectacular feat for any camera. However, these results don't come without some compromise in the control set, operation, and execution.

Still Photos On Par With 5D Mark IV

The image quality of the Canon EOS R confidently stacks up against it's SLR bigger brother, the Canon 5D IV. One would have to get down to an extreme pixel-peeping level of detail to eek out any major difference. The Canon EOS R's 30.3 megapixel image is rich in color and has detail just as sharp as the Canon 5D IV. Colors are vivid and packed with enough

natural color saturation and contrast to please the eye straight-out-of-camera. The dynamic range stands out with plenty of detail in the shadows and highlights. Shooting in RAW provides plenty of range for development allowing post-dive creativity to flourish.

Even though the Canon EOS R provides a level of image detail equal to the Canon 5D IV, there are other full-frame mirrorless cameras that pack a higher megapixel count and wider dynamic range. Users looking for the ultimate in still image quality should also look at the Sony a7R III and Nikon Z7 for their 40+ megapixel resolution, better low light performance, and wider dynamic range. The Panasonic S1 with 24-megapixel resolution ranks just after the Canon EOS R at 30.3 megapixels.

Our wide angle images were shot with the Canon EOS Control Ring Mount Adapter and the Canon 8-15mm Fisheye Lens. This combination allowed the use of our favorite EF mount lens for superior underwater wide angle coverage. Whether shooting with only ambient light or with strobes, the colors, contrast, and clarity produced by the



The Canon EOS R packs such great image quality that we call it the “Mini-5D Mark IV”

Canon EOS R | Canon 8-15mm Lens | 1/125 | ISO 200 | f9



The dynamic range of the Canon EOS R is demonstrated well in this sunball shot, with sharp detail in the darkest shadows and brightest highlights.
Canon EOS R | Canon 8-15mm Lens | 1/125 | ISO 200 | f8

Canon EOS R all scored high marks.

Our macro images were shot using the Canon EOS Control Ring Mount Adapter and the Canon 100mm IS f2.8L Macro USM Lens, along with an externally mounted Nauticam SMC-1 67mm Super Macro Converter Lens. This produced a greater than 1:1 ratio of subject-to-sensor allowing us to get some insane detail on even the tiniest subjects.

Snappy Autofocus In Wide Angle, Macro, And Even Super Macro

The autofocus performance of the Canon EOS R is one of its key strengths. Whether shooting wide angle, macro, or the notoriously AF-challenging super macro, the Canon EOS R exceeded our expectations. There was no noticeable performance decline between the Canon EOS R and Canon SLRs, like the Canon 5D IV.

The Canon EOS R is our top pick for ultimate autofocus performance



Wide angle autofocus performance was second to none on the Canon EOS R, allowing for tack-sharp images of even fast-moving and unpredictable subjects.
Canon EOS R | Canon 8-15mm Lens | 1/200 | ISO 200 | f8

among the current pack of full-frame mirrorless cameras. The Sony a7R III has great wide angle speed and tracking, but is flat-out horrible at macro autofocus and is practically unusable for super macro autofocus, forcing the shooter to rely solely on manual focus. The Nikon Z7 was just okay in both arenas, but not outstanding.

The Panasonic S1 relies on an adapter to use Canon EF-mount lenses, which can only currently be shot in AF-S mode. The Canon EOS R was the only full-frame

mirrorless to excel in both wide angle and greater than 1:1 super macro autofocus, earning it the top spot in that department.

Another advantage that the Canon EOS R brings to the table in the focus arena is the Focus Peaking feature. Focus Peaking outlines the sharpest part of your frame in a designated color in the electronic image. This is very helpful if you have a hard time determining critical focus with just your eyes, and is a major advantage for getting that tack-sharp detail in super macro shots. Optical



Backlit wide angle scenes such as this are often difficult to compose on an electronic viewfinder, but the Canon EOS R was able to display sufficient dynamic range for the shooter to properly compose it.

Canon EOS R | Canon 8-15mm Lens | 1/1200 | ISO 100 | f9

SLR viewfinders cannot display focus peaking like a mirrorless camera viewfinder can, so macro enthusiasts especially should take note of this benefit on the Canon EOS R.

Electronic Viewfinders A Mirrorless Compromise

One of the biggest things to consider when looking at mirrorless cameras is the Electronic Viewfinder. The lack of an optical prism and mirror within the camera body is the defining difference between

Mirrorless and SLR cameras. The problem is that most electronic viewfinders don't come close to the dynamic range that an optical viewfinder can display. This leaves underwater photographers to struggle when composing backlit shots because the underexposed foreground is shadowed or silhouetted, and the background is blown out and overexposed, making it difficult to see detail in either area.

The electronic viewfinder on the Canon EOS R is certainly better than



A smaller camera body means less room for dedicated function buttons, so compromises must be made.

average among mirrorless cameras but isn't quite the best that we've seen. That accolade has to go to the Nikon Z7, which truly surprised us with the dynamic range it was capable of displaying. The Canon EOS R takes second place overall, with the Panasonic S1 and Sony a7R III sitting just behind.

A Smaller Body Means Fewer Buttons & More Workarounds

One of the most appealing benefits of a mirrorless camera is the overall smaller body size compared to optical SLRs. While there are the obvious benefits of reduced weight and a smaller body to pack, it also means that there is less space on the camera body for dedicated-function buttons. On the Canon EOS R, this produces some quirks that the

underwater photographer needs to be aware of.

The Canon EOS R does not have a dedicated ISO control button. Instead, there is an innovative 'swipe' bar on the back of the camera. While it may look cool and impress other camera operators topside, it's a difficult control to adapt in an underwater housing. At the time of this review, no housings supported operation of this 'swipe' control. This can lead to a convoluted process of setting the ISO via one of two workarounds: either from the Quick Menu and LCD screen or by assigning a custom function button (we used M-Fn) that must remain depressed while simultaneously scrolling a control wheel. Both of these workarounds were cumbersome and time consuming to use underwater when the action got fast. Fortunately,

there was a third option available: The Canon EOS Control Ring Mount Adapter.

The Canon EOS Control Ring Mount Adapter differs from the Canon EOS Mount Adapter by adding an integrated control ring to the adapter itself. This control ring can be conveniently assigned to ISO control, negating the drawback of losing a dedicated button on the camera body itself. More than just eliminating a workaround, this control ring provides the ‘holy trinity’ of triple dials dedicated to shutter speed, aperture, and ISO.

Fortunately, the Nauticam NA-R housing provides a control on the housing to interface directly with this gear, providing in-water access to it. We have not yet seen other housings implement this feature yet. With the Canon EOS Control Ring Mount Adapter, your days of wishing for an otherwise nonexistent dedicated instant ISO dial are gone forever.

One detail of the controls and operation that we enjoyed was the separation of settings for both Photo and Video modes. The user is able to retain their exposure settings relative to each mode, so when quickly swapping back and forth there is less time spent dialing in the aperture, shutter speed, ISO, and white balance.



In this screenshot from our underwater test footage we can see the perfect color captured with a manual white balance at a depth of about 45-feet/14-meters.

The Best In-Camera Video Color but Not The Easiest Execution

In the underwater video world the term “Canon Color” is a real thing. Historically, Canon cameras have produced the best in-camera ambient light custom white balance color even at depths past 50 feet, and the Canon EOS R is no exception. Our test footage yielded near-perfect color down to depths of about 70 feet. This is unparalleled performance among not only the current pack of full-frame mirrorless cameras but most current SLRs as well.

As great as the color performance of the camera may be, there is a major caveat to be aware of. The process to

actually execute and assign a custom white balance requires some of the most control activations out of any camera that we are currently shooting underwater. This stems from the lack of a Photo-Video Mode Switch on the camera. Typically, Canon cameras require a still photo be captured to assign a white balance. Most Canon cameras and housings offer a physical Video-Photo toggle that is activated from the outside of the housing.

The Canon EOS R requires activation of the Mode Button, then the Info Button to toggle between the various photo or video modes. This minor difference isn’t a deal breaker on its own, but it does become

somewhat of an inconvenience for frequent white balance changes (which are needed every ~10 feet in depth). The user cannot capture a photo while in video mode and also cannot record video while in photo mode, so for every new white balance, the user must switch back and forth between the two modes every time.

The steps to execute a custom white balance on the Canon EOS R are as follows:

- 1) Select Photo Mode
- 2) Adjust your exposure to zero the meter
- 3) Capture photo of intended white balance target
- 4) Assign that photo to Custom White Balance (Menu -> Custom White Balance -> Set)
- 5) Hold Mode and hit Info to bring up Video Modes
- 6) Select Video Mode
- 7) Set White Balance to Custom
- 8) Check exposure settings and record
- 9) Repeat steps 1-8 every 10 feet or as needed for new white balance

The Canon EOS R only has one custom white balance bank, so the user cannot store multiple white balances for different depths or lighting situations. If the shooter is willing to commit to the somewhat cumbersome process outlined above, the payoff will be the best



The 1.7x crop can be used to your advantage when shooting 4K video by allowing you to get tighter shots without having to get quite as close to skittish subjects.

in-camera underwater ambient light white balance capable from a current mirrorless or SLR system. A bit of good news is that when shooting with video lights, it's practical to just utilize the Auto White Balance setting and your color will look just fine.

1.7X Crop In Video - Use It To Your Advantage

The Canon EOS R utilizes a fairly heavy 1.7x crop when shooting 4K video. While this is using a significantly reduced area of the sensor it is not that much of a detriment, especially if you choose your optics to make the most out of it. The Backscatter go-to lens for

wide angle is the Canon 8-15mm fisheye lens, which is typically only shot at 8mm or 15mm (nothing in between) due to the otherwise partial vignetting that occurs on a full frame sensor. On a 1.7x crop sensor area, this lens can be used around 9-10mm for a 180-degree diagonal angle of coverage, and may then be zoomed up to 15mm for even tighter shots. This is actually pretty cool for wide angle video shooters because it allows for more versatility out of an otherwise fairly single-purpose lens.

When shooting macro video, the 1.7x crop increases the reproduction ratio of the subject while also maintaining a manageable depth of



Size comparison between the Canon EOS R & Canon 5D IV Cameras.

field. This is a win-win for macro shooters because you can get a tighter shot without reducing an already paper-thin depth of field even when your aperture value is maxed out, and you have more working distance to avoid spooking skittish critters. The flip side is that larger macro subjects can be more difficult to fit into the frame, so a less powerful lens like the Canon 50mm Macro f2.5 lens may be a better choice than the Canon 100mm IS Lens.

EOS R Vs. 5D Mark IV - The Mirrorless Vs SLR Debate

Body for body, the Canon EOS R is going to save some weight compared to the Canon 5D IV, but by the time the system is fully assembled in an underwater housing, the overall size difference is basically negligible. The lack of an optical viewfinder and lack of a dedicated photo-video switch

are the most notable differences between the two systems once they are in-hand and ready to shoot underwater. Autofocus performance side-by-side between these two cameras is so similar that there is effectively no discernible difference.

Underwater shooters with a primary interest in capturing video will find that the Focus Peaking and Highlight Warning tools on the Canon EOS R give a distinct in-camera usability advantage over the Canon 5D IV which does not have these features.

The process of capturing a white balance on the Canon EOS R is more complicated than on the Canon 5D IV, and some may find that the extra steps required are enough to negate the additional advantages of the Focus Peaking and Highlight Warnings.

The additional control ring that can be added with the Canon EOS

Control Ring Mount Adapter is, frankly, pretty awesome. Having a triple-control-dial system for shutter speed, aperture, and ISO control is super practical and is a distinct advantage towards the Canon EOS R (as long as used in a housing that supports it, such as the Nauticam NA-R).

If your priority is a smaller-bodied camera without compromising image quality, then the Canon EOS R is the way to go. If underwater wide angle is your priority, then the optical viewfinder of the Canon 5D IV makes it a better choice given its ability to more easily see the scene and compose accordingly. For wide

angle photo composition, nothing beats an optical viewfinder and the dynamic range of the human eye. Macro enthusiasts will feel the benefit of the Canon EOS R's Focus Peaking, especially if you can't see critical focus very well with just the naked eye.

If video is the main priority, then the pro/con lines are not as clearly drawn. The drawbacks of the electronic viewfinder are no longer as relevant since either system will likely be working from the LCD screen. In fact, the electronic viewfinder of the Canon EOS R creates an advantage when shooting macro video, because you have an in-viewfinder Focus

Peaking option. Add on a 45 degree expanded viewfinder and you have a great macro system that allows you to keep your face out of the sand. The Canon 5D IV would require an external monitor to achieve the same Focus Peaking. The Canon EOS R has in body image stabilization, but the Canon 5D IV fewer button activations for custom white balance.

As a video shooter, if one can reconcile themselves with the cumbersome white balance execution, the Canon EOS R does offer more tools and is a superior system for video when compared to the Canon 5D IV.

When ultimate still image quality is on the line, the Nikon Z7 is our camera of choice. The extra dynamic range and super fine image details captured by the Z7 are just enough to tip the scales in its favor. The electronic viewfinder of the Nikon Z7 is the best that we've seen and is the closest to an optical viewfinder is capable of displaying. While the Nikon Z7 autofocus performance may not be as fast and accurate as the Canon EOS R, these can be worked around and overcome.

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