downunderpix

TIPS AND TRICKS NO 15.

It's not all about Megapixels

Recently someone I was talking with made the statement that a particular camera must be really good because it has so many megapixels.

My response was may be. That's because it's not only about how many megapixels a camera is but also how big it's sensor is. That is, how many pixels are crammed onto the sensor which determines how big each pixel is.

Some general statements to start off. I will explain why below.

1. The larger the sensor size the greater the image quality for the same number of megapixels.
2. The smaller number of megapixels the better low light performance for the same sensor size.
3. The smaller the sensor the more noise for the same number of megapixels.

A digital camera image sensor captures and processes information about the light that enters the camera through the camera lens. There are literally millions of light collecting areas on a digital camera image sensor that are called "photosites" or commonly known as "pixels". One million pixels equals a megapixel (MP).

The key to the statements above is the density of photosites on the camera's sensor. It's all about the photosites per square millimeter on the sensor or alternatively, the size of each pixel on the sensor. Consider the following popular cameras for diving.

Camera	Type	Sensor Size	Area	Photosites	Photosites / mm^2
Nikon Z8	Full Frame	35.9mm x 23.9mm	858.0mm^2	46.0 m	53,612
Canon R7	Crop Sensor	25.1mm x 16.7mm	419.2mm^2	32.5 m	77,534
Olympus OM-1	Micro Four Thirds	17.3mm x 13.0mm	224.9mm^2	20.00 m	88,928
Sony RX100 vii	High End Point and Shoot	13.2mm x 8.8mm	116.2mm^2	20.1 m	173,037
Olympus TG-7	Point and Shoot	6.17mm x 4.55mm	28.1mm^2	12.0 m	427,449

The Nikon Z8 has fewer photosites (53.6k) per square mm than the Olympus TG-7 (427.4k) meaning that the photosites (pixels) on the Z8 are approximately 8 (427.4/53.6) times larger than the TG-7.

Now light photons are collected by photosites on a camera's sensor that is converted to digital information which is stored in the camera's memory. A larger pixel is able to receive more photon information than a smaller pixel. Think of buckets in the rain, a bucket with a surface area 8 times larger will receive 8 times more rain than the smaller one. For sensors, this translates to more light information being collected by the larger pixel..

With regard to the first statement above, more light information per pixel means a better quality of image. So, the Olympus OM-1 noted above has pixels around twice the size of the Sony RX100 vii. Both are 20 MP cameras with the OM-1 sensor being approximately twice the size of the RX100. Expect the OM-1 images to be roughly twice the quality of the RX100.

Turning to the second statement, consider for example 2 cameras with say a micro four thirds sensor, one camera being 10MP, the other being 20MP. The 10MP camera will have pixels twice as large as the 20MP camera. The larger pixels on the 10MP camera are able to collect more light information than the 20MP camera. So, in low light situations like being underwater, the 10MP camera collects more light and will therefore perform better.

Turning to statement 3, noise arises from poor light information reaching the sensor and smaller pixels collect less light information than larger pixels. Expect cameras with small pixels to have poor noise performance, especially in low light conditions, where ISO is increased above native or where the image is enlarged.

Another sensor size consideration is depth of field. For a given aperture and distance to subject and equivalent lens focal length, a larger sensor will have smaller depth of field than a smaller sensor. But I will leave the explanation of this for another time.

So, in summary, it's not just about how many megapixels, it's also about pixel size with larger pixels collecting more light information allowing better low light performance and better image quality with less noise.