downunderpix

TIPS AND TRICKS NO 7.

Digital Noise

In digital photography image noise originates from either the camera sensor or the sensitivity of the camera sensor, or sometimes both. Noise manifests as random coloured dots scattered over the image or a fuzziness across the whole image. Noise can become an issue when available light is low, the exposure requires a long shutter speed or a high ISO is used.

Every digital camera is equipped with a sensor that collects light particles via very tiny buckets called “photosites”, which later become pixels in the final digital image. A 12 megapixel camera has a sensor with 12 million photosites.

ISO refers to the light sensitivity of the camera’s image sensor. Light hits each photosite of the sensor and is converted to a signal which is amplified electronically and recorded as pixel data to create the image. The higher the ISO, the more the signal, including noise, is amplified. The camera’s native ISO is the ISO at which a camera has the highest dynamic range and tonal values and usually the lowest or 2nd lowest ISO number available.

The digital camera sensor is not perfect and includes noise. Usually, in a normal exposure, the light is significantly stronger than the noise. However in low light conditions or when high ISO’s are used noise levels can become significant and result in pixels in the photos that include more noise data than real photo light data. With regard to ISO, an analogy is the amplification of audio. With significant amplification the sound distorts.

Noise often appears in the darker sections of the image. This is because a relatively small number of tonal values exist in the darker sections of the image and limited data is recorded here. It is easier for the level of noise to exceed the level of light data for a given pixel.

Point and shoot cameras are more susceptible to noise than DSLRs. This is due to their smaller sensor size. Whilst the cameras in the table below are all outdated, they all have 12 megapixel sensors that will help explain the relationship of sensor size to digital noise.

Camera	Type	Sensor Size	Area	Photosites	Photosites / mm^2
Nikon D700	Full Frame	36.0mm x 24.0mm	864.0mm^2	12.1 m	14,005
Nikon D300	Crop Sensor	23.5mm x 15.6mm	372.9mm^2	12.3 m	32,985
Olympus PEN E-P3	Micro Four Thirds	17.3mm x 13.0mm	224.9mm^2	12.3 m	54,691
Canon G16	High End Point and Shoot	13.2mm x 8.8mm	43.3mm^2	12.1 m	279,446
Canon IXUS 255 HS	Point and Shoot	6.2mm x 4.6mm	28.5mm^2	12.1 m	424,561

The D700 sensor is more than 30 times larger than the IXUS 255 sensor but each has 12 million photosites. Therefore the photosites on the IXUS are significantly smaller than those on the D700. The larger photosites are able to better collect light thus any noise will be insignificant in comparison to the light data. On smaller sensor cameras, light collection is more imperfect and noise data can become more significant. Because of this, more megapixels does not mean better image quality.

To minimize noise in underwater photography the following options exist:

a. Never use auto ISO, rather set the camera, especially point and shoot and even micro four thirds cameras, to the lowest ISO number available.

b. Have good lighting options which may include external strobes and / or video lights.

c. If your camera allows, turn on noise reduction features.

d. Use noise reduction options in post production software such as the noise reduction filter in photoshop.

e. Consider upgrading to a newer camera with more advanced sensor technology and/ or a larger sensor.