crops and pixels

PETER RYAN (2)

Ludwig's Bustard in flight. Getting the wings of a bird in flight in an attractive position requires a fast frame rate. At 10 frames per second, Canon's 7D Mark II (this image) and Nikon's D500 are almost as fast as the professional Canon 1Dx Mark II (14 fps) and Nikon's D5 (12 fps).

In digital photography, image resolution is intricately linked to the density of pixels. Simply put, the more pixels that make up an image, the more you can zoom in without the image appearing degraded or 'pixelated'. However, there are limits to how many pixels manufacturers can cram onto a sensor. There is a trade-off between pixel size and the ability to capture information – bigger pixels capture more light and thus work better at low light levels. Also, adding pixels increases the amount of information that the camera needs to process, limiting the rate at which pictures can be captured – often a crucial factor for wildlife photographers.

These limitations can be offset by improved technology and there has been a steady increase in resolution, frame rate and low-light tolerance of digital camera sensors over the past decade or so. Just in terms of raw resolution, Canon leads the pack with its amazing 5Ds and 5Dsr bodies, which deliver more than 50 megapixels (MP). This sounds impressive – and it is! – but don't forget that this reflects the total number of pixels, not the linear density of pixels. To double the effective resolution, you need to increase the total pixel count four-fold, and to triple the resolution, the pixel count has to increase nine-fold. Thus the 50 MP Canon 5Ds captures an image with 8688 x 5792 pixels, not quite 60 per cent more resolution than Canon's flagship 20 MP 1Dx II (5472 x 3648 pixels).

A related issue particularly relevant to bird photographers is the size of the sensor. The first digital SLR cameras had sensors smaller than conventional 36 x 24 mm film. More recently, many top-end cameras have adopted 'full-frame' sensors that exploit the full image area of a lens. These larger sensors allow more pixels to be crammed in or for larger pixels to improve performance at low light levels, generally increasing image quality. However, one advantage of the smaller 'crop' sensors for birders is that by sampling only the central part of the image generated by lenses designed to operate on full-frame cameras, they deliver greater effective magnification from a lens of a given focal length. Thus a 500-mm lens gives the same magnification as 10x binoculars when coupled to a full-frame sensor camera, but gives 15–16x magnification on cameras with smaller sensors.

This added magnification is termed the 'crop factor' of a given camera and is 1.5x for Nikon and 1.6x for most Canon cropped sensors (until the advent of the full-frame Canon 1Dx range, most 1D bodies had a 1.3x crop factor). Of course this magnifying effect works against you when you want to capture landscape images. A 16-mm wide-angle lens on a crop-sensor body gives an image equivalent to a 24–26-mm lens on a full-frame body. Camera manufacturers have overcome this by designing lenses specifically to work with crop sensor bodies, but be warned that these lenses cannot be used on full-frame bodies.

So what does all this mean for bird photographers? To some extent, it depends on the type of images you want to capture. If birds in action are what turn you on, then the high frame rates and cutting edge autofocus capabilities of the Canon 1Dx II and Nikon D5 are hard to beat. They also have the advantage of the best low-light performance by quite some way – but they are very expensive and a lot heavier to lug around. Plus, if you are shooting birds that are rather small or distant, then the full-frame sensors on both these cameras might encourage you to consider the advantages of a crop sensor body, which substantially boosts your effective resolution. Here Canon's 7D II and Nikon D500 are the obvious choices, boasting 10 frames per second and the same resolution as the much more expensive professional bodies crammed onto a cropped sensor.

If frame rate is less of an issue and you want to capture stunning, high-resolution images of birds (and other subjects), then the best options probably are Canon's 5Ds or Nikon's D810. For those who also value video capability, the new Canon 5D IV is an attractive option as it offers more than three-quarters the resolution of the 5Ds with a slightly faster frame rate and 4K video capability.

I've had the opportunity to use the 5Ds for a few months and am seriously impressed by the image quality. But its pixel size is similar to that of the 7D II, so it offers only roughly the same resolution within the cropped area as the 7D, at half the frame rate. For now, the 7D is my camera of choice for most birding applications, with the 5Ds used mainly for landscapes and general photography. But when I'm close to the action, I'll probably wish I had a 1Dx!

PETER RYAN

above *The high resolution of Canon's 5Ds, coupled with its full-frame sensor, allows unprecedented detail to be captured, as shown by a tight crop of this immature Bank Cormorant's head. The other image shows the uncropped image of the whole bird, with the area that would be captured by a 1.5x Nikon crop sensor body (yellow box) and by a 1.6x Canon crop sensor body (white box).*

Camera bodies listed in order of descending resolution

Camera	Crop factor	Resolution (MP)	Frame rate (fps)	Pixel size (µm)
Canon 5Ds	1	50.3	5	4.1
Nikon D810	1	36.2	5	4.9
Canon 5D IV	1	30.1	7	5.4
Nikon D750	1	24.2	6.5	6.0
Canon 80D/760D	1.6	24.2	7	3.7
Nikon D7000 series	1.5	24.0	6	3.9
Nikon D5000 series	1.5	24.0	5	3.9
Canon 1Dx II	1	20.0	14	6.6
Nikon D5	1	20.6	12	6.5
Nikon D500	1.5	20.6	10	4.2
Canon 7D II	1.6	20.0	10	4.1
Canon 6D	1	20.0	4.5	6.6
Canon 1D IV	1.3	16.0	10	5.7