Making photographic palaeontological plates

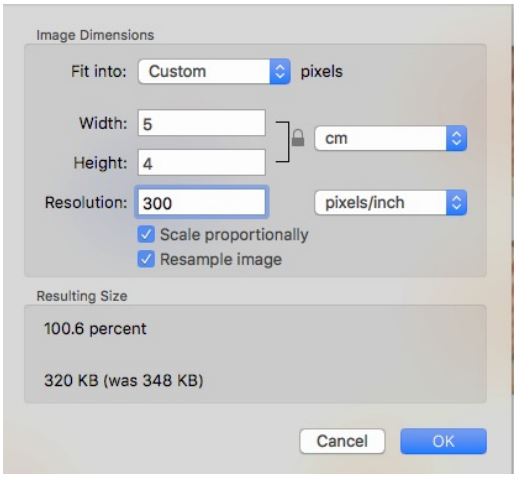
The process of making a publication-quality plate involves two steps. The key is to plan carefully, so that original images are not lost, but so that the finished plate is crisp and clear, informative, supports the paper, and not too huge in terms of memory requirement. There are three steps, (1) taking the photographs, (2) processing the individual images, and (3) making the plate.

Taking the photographs

1. **Key tip – look at published plates of the kind you hope to produce to see what they should look like** – pay attention to the orientation of images, lighting, colour balance, type and spacing of images, use of scale bar (or not).
2. Take photographs or microphotographs to the highest standards, using stacking technology or other means to ensure that they are *perfectly in focus*.
3. The light source should be in the north-west in all cases - so make sure the specimens are sensibly oriented when you take the photographs – e.g. teeth always have the occlusal tip uppermost, gastropods have the tip of the spire uppermost, ammonites have the living chamber at the bottom.
4. Take all photographs for a single plate, or series of plates, as far as possible, under identical conditions of lighting, magnification, and using the same camera/ microscope set-up. This saves endless fiddling on processing.
5. Before moving to image processing, **save a complete set of the images**, perhaps in separate folders according to the taxon or plate number – you always need to keep the originals in case you might have to re-edit them later.

Processing the images – basic work

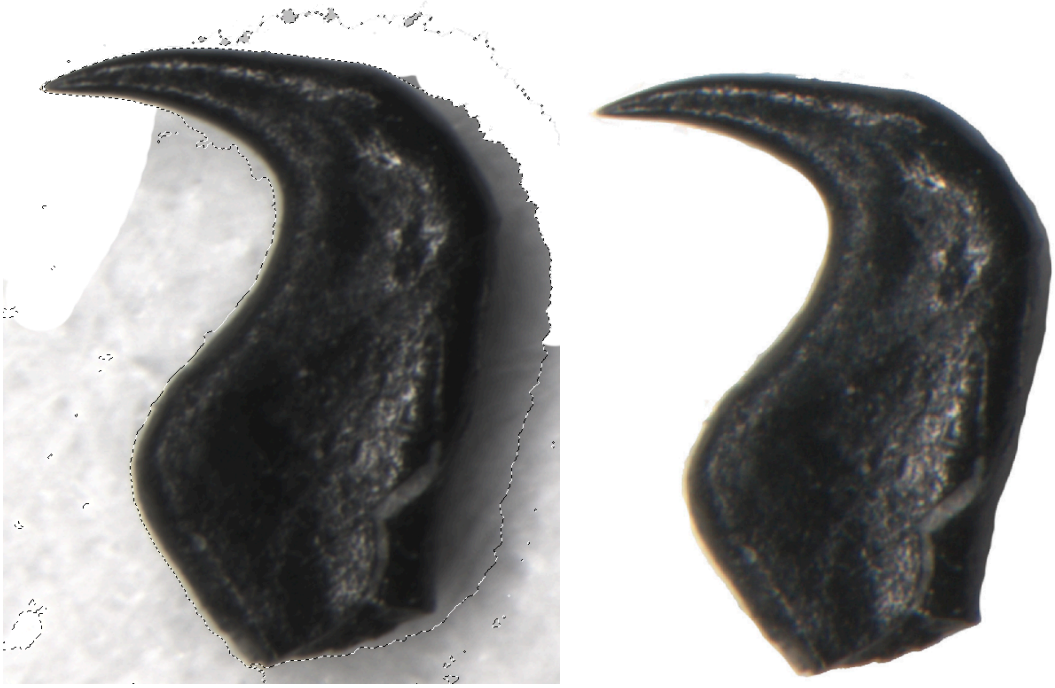
1. Use Preview, Adobe Reader, or equivalent free software, to save images to a standard width and standard image characteristics.
2. First, use the 'rectangular select' tool and 'crop' to remove excess borders, and home in on the fossil. Leave a clear margin around the specimen, but crop as closely as you can, and crop all images to the same extent.
3. Select the correct image resolution. Check with your target journal, but most require minimally that images are saved with resolution of 300 dpi (dots per inch; ppi = pixels per inch).
4. Consider the final width of the individual image – most photos are 50 cm wide or more, and so occupy 5–10 Mb of computer memory. **This is far too large, and you must reduce it**. [Most journals have a limit of 20 Mb per figure overall, so for a figure containing a composite of 10 or 20 photographs, that means each image has to be < 2 Mb or < 1 Mb in size.



5. First, go to Image/ Adjust Size and save as width 3 cm, 5 cm or 10 cm (according to average final width in the plate). Save as jpg or png or tif.
6. Use 'Adjust color' tools, such as Exposure, Contrast, Highlights, Shadows, Saturation, Temperature, Tint to achieve the original fossil colour (sometimes microphotographs have a blue tinge that should be removed). Experiment with first setting 'Contrast' to maximum, to sharpen edges (but don't do this if the image becomes too 'harsh'), and 'Saturation' and 'Temperature' can help adjust browns and yellows to bring back a rich, honey-like colour.

Processing the images – cleaning up

1. Next, clean up the image – use Photoshop, GIMP or equivalent. You may be able to use a 'wand' tool to highlight unwanted background (or highlight the fossil specimen), and remove it in one move.
2. Alternatively, use the 'eraser' tool to remove the background. First take away broad areas of background away from the fossil, then jack up the magnification so you can see individual pixels, and remove them right to the margin of the fossil. Be careful not to remove any pixels belonging to the fossil!



Making the plate

1. Look at the target journal to explore plate design.
2. Plan the plate width to match the target journal – is it full page width (say, 16.1 cm) or single column width (say, 7.8 cm)? Width is key – the length (depth) of the plate can be anything, so long as it is not deeper than a whole page. [It's nice to allow space for the caption at the bottom, but not essential – caption can be on facing page.]
3. Draw a straight line of the exact page (or column) width across the top of the imager sheet, and use this as a guide to build the plate.
4. Look at image spacing, lettering, style of scale bars (if they are used).
5. Plan your plate so individual images run in the correct order from top left to bottom right – usually a, b, c, etc across row 1, then back to row 2, d, e, f, etc, and so on. The order must be exactly the order of reference to images in the text.
6. Make plate in Adobe Illustrator, or other image package, or even in Word – make sure each image and each piece of text, scale bar, etc, is a movable item – the key is to save the plate as an editable ("object-mapped") pdf or as a Word document
7. Sometimes you have photos of different styles (e.g. field photos; microphotographs; SEM images; 3D scan images). Generally, it is not ideal to mix these in a single plate, and it's better to try to plan to keep them separate.
8. Example of completed plate, with commentary:

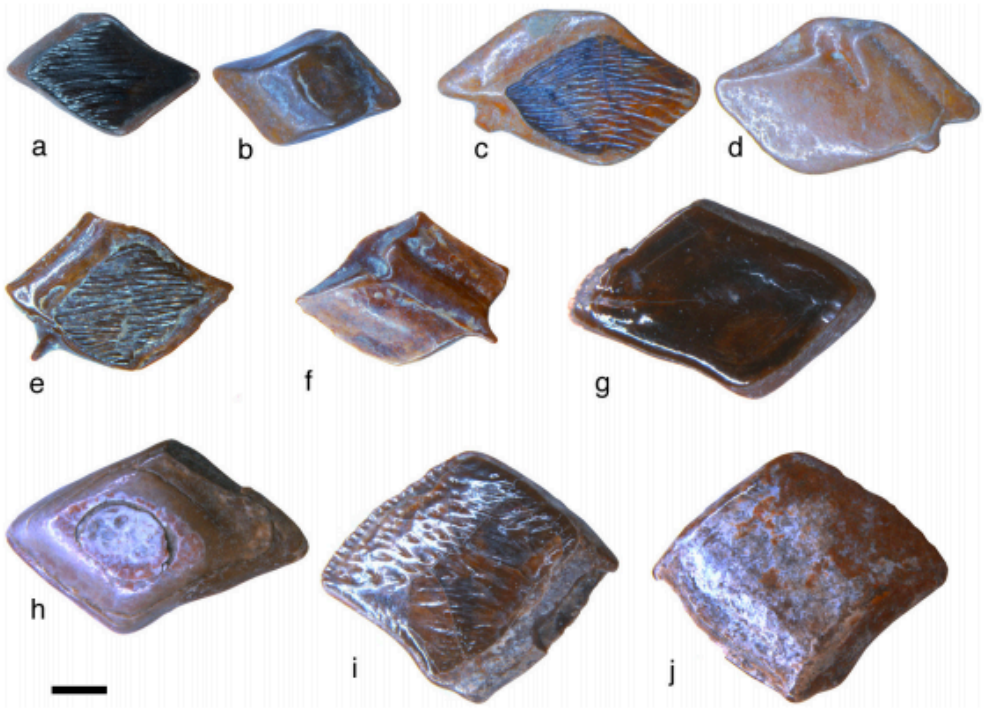


Fig. 10. Osteichthyan scales from bed 9 at HFQ. (a and b) *Gyrolepis alberti* scale in external (a) and internal (b) views (BRSUG 29371-1-344). (c and d) Morphotype S2 scale in external (c) and internal (d) views (BRSUG 29371-1-348). (e and f) Morphotype S3 scale in external (e) and internal (f) views (BRSUG 29371-1-351). (g and h) Morphotype S4 scale (*?Pholidophorus*) in external (g) and internal (h) views (BRSUG 29371-1-355). (i and j) Morphotype S5 scale in external (i) and internal (j) views (BRSUG 29371-1-361). Scale bar represents 0.5 mm.

Good and bad points of the above plate/ figure:

1. Individual images of fish scales all show the same colour balance and lighting (from NW).
2. Images are all show in comparable orientations, effectively with dorsal side of fish upwards.
3. They are all scaled the same so they are easy to compare – note the single scale bar at bottom left.
4. There is not too much wasted space – arguably, the images a–d are too close and nearly touching.
5. Lettering of individual images (a–j) is logical, running from left to right, and top to bottom, in clear rows.
6. Note that this applies in detail – e.g. a/b, c/d, e/f, g/h, i/j are external and internal views of the same specimens.
7. A further criticism might be that g and h are not beside each other, even though they are images of the same specimen.