10.8.2 Using the Ratios 1 – Fitting Design to Rough

Let's say you want to cut your own Sakhir out of a nice piece of morganite you picked up. The design is already optimized for beryl, so happily no transformations or scaling will be required. Your morganite is mostly clean, and careful examination has shown that there is a promising flawless region that is about 12 x 9 mm and 8 mm thick.

Your understanding of the geometrical ratios will let you answer at least two critical questions: 1. Is Sakhir a good match to your piece of rough? 2. Assuming no screw-ups or hidden flaws, how big a gem will you get?

The two questions are closely related, and they both require an additional simple calculation of the *depth* of the gem design. Recall from the previous section that GemCAD reports the L/W, C/W, and P/W ratios, but not the *total* depth, which we will call D. In fact, for consistency and comparison, you should focus on D/W, that is, the ratio of D to the width of the stone. You can readily estimate D/W by adding up the crown, pavilion, and girdle using the formula:

$$D/W = C/W + P/W + 0.02$$

which assumes the "classic" girdle height equal to 2% of the width W of the gem. For Sakhir, D/W=0.783.

You now know Sakhir's ultimate external "envelope." Independent of the actual final size in millimeters, you will need a volume of material whose dimensions are a multiple of:

$$L/W \times 1 \times D/W$$

You should recognize this as length x width x depth, where I have cleverly simplified W/W to the number one – all those years of college seem to have paid off. The actual values for Sakhir are 1.153 x 1 x 0.783.

How well do these dimensions match the rough and how big a gem can you get? The clean area of morganite is 12 x 9 x 8 mm. Given these proportions, you clearly want to try fitting L along the 12 mm direction, W along the 9 mm direction, and D along the 8 mm direction.

The maximum possible gemstone size would then have L = 12 mm. You can divide Sakhir's dimensions by L/W and then multiply by 12 to get the physical size of such a gem:

$$\frac{L/W \times 1 \times D/W}{L/W} \cdot 12 = 12 \times 10.4 \times 8.1 \text{ mm, scaled to maximum } L$$

Therefore, cutting a Sakhir with L=12 mm would require a piece of gem rough at least 12 x 10.4 x 8.1 mm. Unfortunately, the piece of morganite is somewhat smaller.

This exercise illustrates that W is the problem. When you matched the long dimensions of design and rough, the required depth (8.1 mm) is only slightly more than the available depth (8 mm), whereas the required width (10.4 mm) is considerably greater than what you have (9 mm).