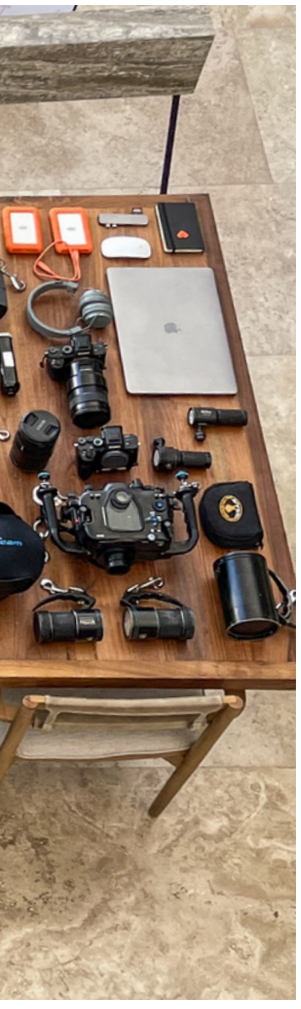
Photography & Video

Tools & Techniques

Photography and video were perhaps the most important elements of our project. We wanted incredible imagery to create excitement about the caves of Mayakoba.

Ultimately, the photos you see here, together with the video we shot for our short documentary film, were the result of lots of hard work as we refined our techniques to cope with the unique challenges in the caves.

While underwater photography is a team activity, requiring everyone—our diver subject, our lighting divers, and the photographer to all work well together underwater, a big part of the success of the photos in this book came from SJ Alice Bennett, one of the world's leading cave photographers. SJ not only shot amazing photos herself but brought new techniques to our team that made a big difference in the quality of our work.



Page 139: SJ prepares for a photo dive into Ma' Áayin, as Eric records footage for the documentary film from the boat.

Left: Matt and SJ prepare the scooter-mounted camera for a dive at Ma' Áayin. We used this setup to record a sequence moving through the largest passage in the cave.

Right: A clip from the documentary film showing SJ taking photos in Burrodromo.


SANTI
ATOMIC
AQUATICS
M1

Left: Henry having fun with the camera in Burrodromo.

Center: Matt and SJ prepare the scooter-mounted camera for a dive at Ma'Áayin. We used this setup to record a sequence moving through largest passage in the cave.

Right: Because Eric doesn't cave dive, we shot the underwater footage while he edited and helped with sound and storylines for our film.

We all took a turn in each role, as subject, photographer, and with lighting. But Henry Frawley-Fulcher, also an experienced photographer, did much of the topside photography, as well as incredible aerial drone photography, video, and sound recording, while also shooting many of our strongest underwater images.

Eric Heiland was our project's videographer. Because Eric doesn't cave dive, he edited video and helped with sound and storylines for our film.

While challenging to photograph, the caves at Mayakoba are also very beautiful and interesting, creating a big payoff when things went well.

Photography, the art of capturing light, is challenging in an environment that has absolutely no natural illumination. This means that great images required us to light the caves artificially. This task was particularly hard in the caves of Mayakoba, where every exhalation created percolation from the ceiling, spoiling the water clarity and making it tough to get the crystal-clear photos we wanted.

Amidst the photography, it was important to do our diving safely. Any dive in this environment means that you're managing a lot of equipment, maintaining situational and team awareness, conducting navigation, monitoring gas pressures, depth, and time, and being a good teammate if something goes wrong. There is a lot happening, and to be a safe diver, you must do it all.

Right: Once inside the cave, there is absolutely no natural light, requiring us to bring all of the illumination we'll need for a shoot. Here, Matt prepares a 35,000-lumen video light for a dive at Ma'Áayin. Each five times brighter than a car headlight, a typical shoot required 5+ lights.

To manage these challenges, we didn't shoot when we were exploring or surveying, and we only brought the cameras once we knew the cave well enough that we had the navigation nailed down and could properly choreograph the dive and photo shoot.

While shooting in the dark is traditionally the realm of strobe bulbs (very bright flash bulbs that fire once when a photo is taken), we believe that shooting in a cave with a continuous light source is preferable, since it allows us to compose the scene knowing exactly how the lighting will perform. The downside of moving away from the strobe is that we needed more and bigger lights, since they don't provide an intense flash.

After some trial and error, we settled on Keldan LED lights, a high-end underwater light made for shooting video. It wasn't uncommon for us to take five video lights or more into the cave with us, some 30,000 lumens each—five or more times brighter than a car headlight.

We shot with full-frame mirrorless cameras. In an underwater housing, this is a big setup, looking a bit like those from the old Jacques Cousteau films. But the size of the camera was a tradeoff we were willing to make to get a big image sensor and fast lenses that are capable of shooting with very open apertures to let in more light.

Our favorite camera was the Sony A7SIII for its phenomenal low-light performance and video capabilities. Despite being only 12 megapixels, this camera's ability to capture images with a huge dynamic range in very low-light conditions made it our top choice.

We used a few different lenses, but the Sony FE 24–70 F2.8 zoom lens behind a large glass *dome port* was often best. Topside, we used a large variety of Sony glass.

We used housings made by a small company called Nauticam. High quality underwater camera housings are incredible feats of engineering, filled with complicated levers, dials, and switches that physically manipulate the controls on the camera as you press the corresponding buttons on the outside of the housing. It's almost hard to believe that they work as well as they do, but the tradeoff is complexity and size.

The biggest challenge in shooting was avoiding *backscatter* caused by the illumination of percolation and other particulates in the water, which created a snow-like cloudiness that spoiled many shots. It was also frequently challenging to get enough light in our photos without over-exposed hotspots, given the relatively dark walls and floor of the caves, which tended to absorb a lot of our light.

The best technique was to use lots of off-camera light to illuminate the subject and background, but to avoid much direct light from the camera. This meant that our best photo shoots were days when we had at least three divers so that we could have a photographer, a subject, and at least one additional lighting assistant. The assistant could create a floating source of off-camera light as well as help us stage the off-camera lights more quickly, minimizing the amount of percolation that would develop as we set up the shot.

We'd position a few powerful video lights around the cave to highlight notable features in the distance, adding depth and background detail to the photo. With the background set, we'd often backlight the cave diver with a *halo.* This effect provides a gorgeous pop of light and helped add more depth to the shot while highlighting the subject.


LOW
MID
HIGH

Left: Ivo out past Broken Stairs in Burrodromo.

Right: We used whiteboards at Matt's house to plan the intense project schedule, to inventory our photo and video shots, and to sketch maps and diagrams.

Page 148–149: We had fun experimenting with panorama shots in which we stitched multiple images together to create large high-resolution composite photographs. Henry took this panorama that contains six images of Matt hiding in the "gate" area of the church passage at Burrodromo.

The halo is made by having our third diver hide behind the subject and shine a very bright light right into the diver's backside. When the photo is taken, the diver behind the subject can't be seen, because they are hidden behind the sunburst surrounding the subject diver.

In addition to our off-camera lighting, we frequently used two smaller lights on the camera, mounted to adjustable arms. These were often pointed off to the sides, or upwards toward the ceiling to cast a bit of diffused light.

We captured a few great images through strokes of luck, but most of the best photographs were the result of careful planning. While not a completely static scene, these photos incorporate the dynamism of a cave dive, but with perfectly set off-camera light and typically a nicely backlit diver. A typical plan might be like this:

- Diver 1 (photographer) swims into the room and places lights behind two interesting formations to provide off-camera background illumination.
- Once photographer is in position on the far side of the room, diver 2 (subject) follows and slowly swims towards the photographer with their primary light pointed away from the camera to prevent hotspots in the photo.
- Diver 3 (lighting assistant) swims hidden behind subject, providing a halo.
- Photographer takes a series of photos as subject swims towards photographer; when subject get too close, the scene ends.

After shooting an area a few times, we eventually learned what worked best for the environment and started getting the shots we wanted.

In the end, our video and photography were much more art than science. In some sense, this is a bit of a numbers game—for each photo in this book, we shot many more that didn't make the cut. ✦