



*The author advances into the swamp. The water at this site was often more than two metres deep. Photo: David J. Harris*

Balancing precariously on a submerged log, I cautiously took another step forward, keeping one eye on the screen of my GPS. A moment later the rotting wood gave way, and I plunged up to my chest into the tannin-stained waters of the swamp. After a few more metres of struggling through a tangled mix of water and roots, the GPS beeped. I'd arrived at the corner of my plot. I was two

weeks into a month-long trip to the northern Republic of Congo, and the cadence of movement through this forest was familiar now: take a few steps forward, fall into the water, climb slowly out, take a few more steps, and fall in again. Along with a team of Congolese collaborators and research technicians, we were there with two main questions in mind: what tree species grow in these swamps, and how does flooding intensity affect these species' distributions?

The Congo Basin is home to a vast tropical rainforest which covers an area more than twelve times the size of the UK. Abundant rainfall and one of the largest river systems on earth mean that a substantial portion of these forests are, in fact, forested wetlands. In spite of their abundance and potential importance, these forests have remained one of the least-studied tropical ecosystems. The plots that my team and I established this year are part of a small but growing dataset giving us novel insights into the ecological dynamics of Congolian forested wetlands.

Even before setting foot in these forests for the first time, I expected to see differences in the plant communities found on different rivers. Flooding doesn't just make work difficult for forest ecologists; it's also physiologically challenging for trees, so swamps with longer, deeper flooding can only be occupied by specially adapted species, a process known as environmental filtering. The largest rivers in the Congo Basin have their headwaters in the drier savannas surrounding the rainforest, and their water levels fluctuate with the monsoon rains. Smaller rivers which originate within the rainforest where precipitation is less seasonal typically have more consistent water levels.

The data from my plots supports this hypothesis, and I have described three types of forested wetland with different flooding regimes and distinct species compositions. Alongside the largest rivers are seasonally flooded forests, which are inundated for four to five months per year. Along rainforest rivers are permanently flooded tall swamps, where 35-metre-tall trees grow in waters more than two metres deep. Alongside smaller forest streams the flooding is shallower, just 10-30 cm, but still permanent, and the forests that grow here have lower canopies, only 10-15 metres tall. The level of specialization required for each of these environments is such that few species are found in more than one forest type.

This research represents one of the first rigorous, quantitative investigations of the ecology of forested wetlands in this part of the Congo Basin. In a country with a quickly-growing population and an economy heavily dependent on natural resource extraction, improving our understanding of these poorly-known ecosystems is vital for conservation and management. My results so far are intriguing, but there's always more to learn. I'm sure I'll be back to these beautiful forests to advance our understanding of these forests one shaky footstep at a time.



*The author (R) and collaborator Josérald Mamboueni (L) survey the canopy to identify a tree. The leaves of most large trees are five metres or more above the ground, so tree identification involves a lot of staring up into the canopy. The ground here may look solid, but it's actually a mat of roots and leaves over deep, boot-sucking mud. Photo: David J. Harris*