

Case Study #1: The Okavango Delta – A Living System Engineered by Animals

Magnus Sylvén, Global Rewilding Alliance



Figure 1: The Okavango Delta in Botswana at the peak of flooding when water spreads over an area of 6,000–15,000 km². [Image Source](#)

In the Okavango Delta ([Figure 1](#)), three important ecosystem engineers - hippos, elephants, and termites - play a vital role in its creation and ongoing maintenance ([ref](#)). The annual floods peak in the upper delta between February and April and reach the distal end of the delta five months later, between June and August. The water moves from the main channels to the side arms and lagoons in a dynamic equilibrium between sediment deposition and the actions of large animals, especially hippos and elephants. The vegetation is shaped by a complex interaction of water flow, soils, nutrients, and fire. In addition to the annual flooding regime, the large-scale processes that link the terrestrial and aquatic ecosystems determine the shape of the delta. Three key processes have been identified ([ref](#)):

- Role of large animals,
- Role of termites,
- Biotic mobilisation of nutrients.

Large Animal Engineers

Hippos: Through their daily movements between water and land, hippos ([Figure 2](#)) create vegetation-free channels that facilitate water flow during flooding ([ref](#)). Hippos regularly break through dense papyrus and reed beds, diverting water and sediments into new areas. The lagoons created and maintained by hippos also act as major habitats for fish. Hippos also play a critical role in transferring organic matters (carbon, nitrogen and hydrogen) from land to water, ([ref](#)) as well as silicon ([ref](#)) (more information on the ecological role of the hippo is given in section 7).

Elephants: Elephants create channels, both by walking through flooded vegetation ([Figure 3](#)) and through creation of depressed pathways during the dry season, which subsequently serve as

conduits for floodwaters ([ref](#)). Through killing and mangling trees along with other plants, elephants keep areas open within the delta. They also play an important role in seed dispersal through their dung.

African buffalo: Live in high densities in the delta ([Figure 4](#)), affect vegetation structure and fertilize floodwaters through their droppings, enhancing fish productivity.

Other key fauna, such as otters, Nile crocodiles, water monitors, and fish-eating birds, play essential roles in nutrient recycling and food web maintenance.

The delta also supports a globally important population of the **Southern lechwe antelope** (*Kobus leche*), with numbers rising from 57,637 in 2014 to 88,585 in 2018 ([ref](#)). Their ecological role is detailed in section 7 of the main report.

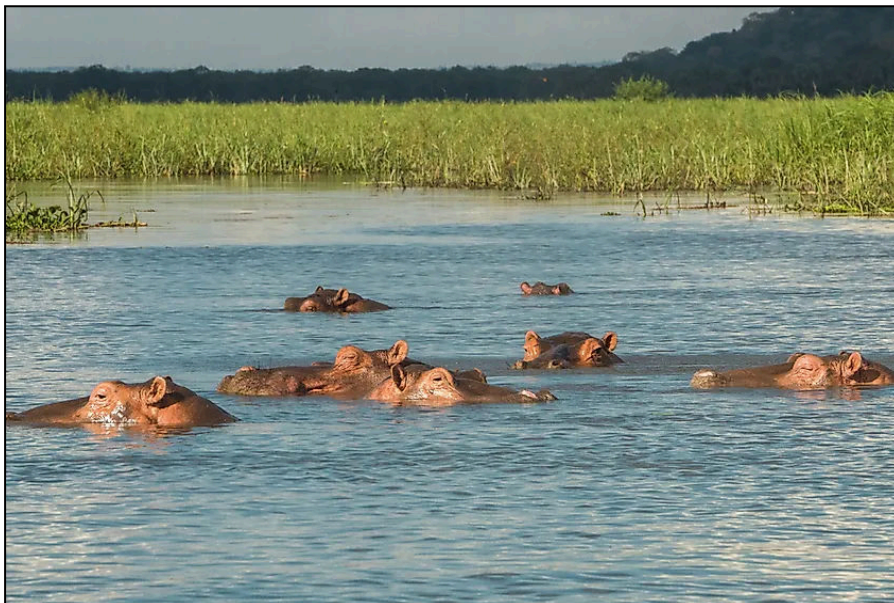


Figure 2: The common hippo is a true keystone species in the Okavango Delta, facilitating the flow of nutrients from land to water, creating and maintaining lagoons and channels for the water flow, benefitting the entire wetland ecology. [Image Source](#)



Figure 3: The savanna elephant creates channels in the Okavango Delta, both by walking through flooded vegetation and through creation of depressed pathways during the dry season, which then serve as conduits for floodwater and the dispersal of fish and other aquatic organisms. [Image Source](#)



Figure 4: A group of buffalo plough through the wetlands of the Okavango Delta, creating new canals for fish and other aquatic animals and plants to colonise. By defecating in the water, the buffalos also fertilise the water. [Image Source](#)

Invertebrate Engineers: The Role of Termites

Termites (*Macrotermes michaelseni*) play an important role in the ecology of terrestrial and water ecology of the delta. During dry periods, they colonise areas with suitable clay soils and vegetation. Some of these mounds ([Figure 5](#)) become colonised by trees and other plants, serving as feeding grounds by many mammals and birds, like colony breeding species, which fertilise the soils. During flooding the termite colonies create local influxes of nutrients from the fungi gardens and from the

termites themselves ([ref](#)). For fish, the 150,000 termite-derived islands not only determine the location of channels but also provide complex habitats with fallen trees (often the result of elephants' actions) and other structures, which attract terrestrial insects that become an important source for fish ([ref](#)).



Figure 5: Termite mounds serve as the foundation for new islands in the terrestrial-aquatic mosaic of the Okavango Delta. [Image Source](#)

Biotic Mobilisers: Birds and Fish in Nutrient Cycling

Okavango Delta is also important for breeding waterbirds, and with 31 breeding species distributed across 8 colonies ([Figure 6](#)) it's one of the most important breeding areas for many species in the whole of southern Africa ([ref](#)). Since breeding colonies of waterbirds generate a lot of nutrients (nitrogen and phosphorus) in other wetlands around the world ([ref](#)), it can be safely assumed that the same applies to the delta with positive impacts on the oligotrophic water conditions ([ref](#)).

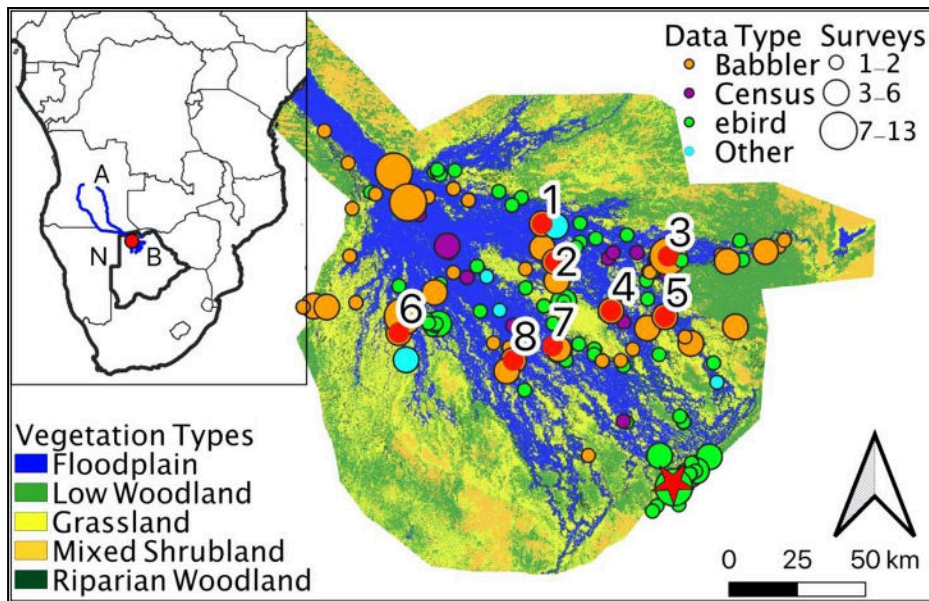


Figure 6: Distribution of the eight main breeding colonies of herons, egrets, storks, ibises, spoonbills, and cormorants in the Okavango Delta. [Image Source](#)

Fish is a very prominent feature of the delta ([ref](#)). The approximately 70 species exhibiting a wide range of life history strategies adapted to the delta's mosaic of permanently and seasonally flooded habitats. Predatory species such as Tigerfish (*Hydrocynus vittatus*) ([Figure 7](#)), sharptooth catfish (*Clarias gariepinus*) and Threespot tilapia (*Oreochromis andersonii*) dominate the permanent swamps, while the most common fish species in the seasonal swamp are Silver butter catfish (*Schilbe intermedius*) and African pike (*Hepsetus odoe*). The ecological relationships within the fish community, such as the annual catfish runs, are finely tuned to the hydrological, chemical, and biological components of the delta ecosystems. Understanding and protecting these components and processes is key to maintaining the Okavango Delta as one of the world's most remarkable wild places ([ref](#)).



Figure 7: The predatory Tigerfish is one of the keystone species in the permanent swamps of the Okavango Delta. It can grow up to 1 metre in length and has been described as a “fierce hunter”, living in schools when smaller but hunting alone when larger and older. It has even been found jumping out of the water to catch Barn swallows (*Hirundo rustica*) on the wing as they fly near the surface of the lake feeding on insects. [Image Source](#)