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REWILDING CASE STUDY
Gorongosa National Park, Mozambique

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Introduction

Colonial exploitation, postcolonial depredations, and poverty have created explosive conditions in many of the most biodiverse regions on Earth. Since the mid-20th century, the great majority of armed conflicts have occurred in biodiversity hotspots (Hanson et al., 2009). Similarly, the great majority of mammal and bird species have had conflicts within their ranges (Mendiratta et al., 2021). Yet the ecological impacts of conflict are heterogeneous. On the one hand, wars have devastated many wildlife populations (Daskin & Pringle, 2018); on the other, they are a bulwark against large-scale habitat conversion, which leaves the door open for rewilding.

Mozambique's Gorongosa National Park (GNP) epitomises these conditions. Runaway poaching during the Mozambican Civil War (1977–1992) stripped GNP of >90% of its large-mammal fauna and extirpated several top carnivores (Stalmans et al., 2019). Since 2007, however, an innovative public-private partnership—the Gorongosa Project (GP)—has brought herbivore biomass back to nearly pre-war levels, nurtured the lion (*Panthera leo*) population back to abundance, and reintroduced two locally extinct and globally threatened carnivore species, African wild dog (*Lycaon pictus*) and leopard (*P. pardus*) (Bouley et al., 2018, 2021; Angier, 2021). Meanwhile, GP is working with Mozambique's government to expand the coverage and connectedness of protected areas and has initiated programmes focused on human development (Pringle, 2017).

This portfolio arguably makes GP the most ambitious and successful large-scale rewilding effort anywhere in the world to date. GNP is a model for understanding the ecological effects of defaunation and the trajectory of postwar community reassembly, while GP offers a potentially generalisable model for how diminished protected areas can be upgraded and upsized (Pringle, 2017)—in contrast to the global trend of protected area downgrading and downsizing (Mascia & Pailler, 2011). These models are relevant across large swaths of the Global South where conflict and poverty have destabilised protected areas. In this chapter, we describe GNP's history, the GP framework, the rewilding trajectory, and challenges that still loom.

Biological and historical context

GNP encompasses 4,000km^2 of lowland and montane savanna, grassland, and forest at the southern tip of the Great Rift Valley in central Mozambique (Figure 17.1). European hunters

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marvelled at Gorongosa's wildlife, leading the Portuguese colonial administration to create first a hunting reserve and later, in 1960, a national park. In the early 1900s, some 47 species of large mammal (≥5kg) occurred in GNP, many of which congregated on the productive Rift Valley floodplains around Lake Urema (Tinley, 1977). Although a few species had been extirpated by 1970—white rhinoceros (*Ceratotherium simum*), black rhinoceros (*Diceros bicornis*), roan (*Hippotragus equinus*), tsessebe (*Damaliscus lunatus*)—most were thriving. A 1972 survey recorded 2,500 elephant (*Loxodonta africana*), 3,400 hippo (*Hippopotamus amphibius*), 13,000 buffalo (*Syncerus caffer*), 6,400 wildebeest (*Connochaetes taurinus*), 3,300 zebra (*Equus quagga*), and 3,300 waterbuck (*Kobus ellipsiprymnus*) (Tinley, 1977).

The park was largely unscathed by Mozambique's War of Independence against Portugal (1964–1972) but was throttled by the Mozambican Civil War (1977–1992), an insurgent campaign against the newly independent government. Antigovernment forces were based in Gorongosa, and GNP was the theater for some of the most intense combat. Control of GNP changed hands several times, and combatants shot thousands of animals. Rebel forces are reported to have put special effort into obliterating GNP's infrastructure, and to have traded ivory for weapons with South Africa (Morley & Convery, 2014; Campbell-Staton et al., 2021). A peace accord in 1992 did not relieve GNP's wildlife, as commercial poachers, heavily armed ex-combatants, and a starving populace picked off the remaining game: 'Even small field mice are being unearthed as a meagre source of protein' (Dutton, 1994: 8).

Fixed-wing aerial surveys in 1994 and 1997 indicated near-annihilation of GNP's large mammals. In sum across the two surveys, spotters tallied 8 elephant, 7 hippo, 2 buffalo, 5 zebra, 40 warthog (*Phacochoerus africanus*), 1 bushpig (*Potamochoerus larvatus*), 157 waterbuck, and 148 other antelopes (Stalmans et al., 2019). Although these surveys were limited in coverage (<200km^2), several more extensive helicopter counts between 2000–2002 affirmed the general picture. Large-herbivore populations remained extant, but had declined by >90%; a handful of GNP's ~200 lion had survived, but leopard, wild dog, and spotted hyena (*Crocuta crocuta*) had been extirpated (Bouley et al., 2021).

The catastrophic decline of large-mammal populations was associated with significant changes to the landscape. Already in 1994, 'once lawn-like *Cynodon* grasslands… were standing knee-high for lack of grazers,' and 'previously pure grasslands are now invaded by aged woody plants' (Dutton, 1994, pp. 7–8). A study using declassified US spy satellite imagery from 1977 and high-resolution satellite imagery from 2012 found that woody cover had increased by 34% parkwide, by 51–96% in the Rift Valley savannas, and by 134% in the critical Urema floodplain (Daskin, Stalmans, & Pringle, 2016). An invasive woody plant of special concern—the wetland-choking shrub *Mimosa pigra*—proliferated in the floodplain (Guyton et al., 2020).

Phases of rewilding in Gorongosa

The history of rewilding in GNP is deep, intertwined with a history of intensive hunting that long predates Mozambique's 20th-century conflicts. Kenneth Tinley described attempts to (re)introduce several species that were thought to have occurred in GNP historically (Tinley, 1977). White rhino were eliminated by the 1940s; six individuals were imported in 1970. Six cheetah were introduced in 1973, although their historical status in GNP is not entirely clear. Six giraffe (the historical status of which is also unclear) were introduced around 1950 and purportedly eaten by lion.

Tinley was also an early proponent of expanding protected-area coverage from 'mountain to mangroves'—that is, from Mt. Gorongosa to the Zambezi delta—to increase its ecohydrological coherence and secure space for ungulate migrations. In the 1970s, GNP comprised 3,770km^2

of Rift Valley around Lake Urema along with strips of miombo woodland to the east and west. Tinley envisioned a 30,000km^2 management area encompassing Mt. Gorongosa (an 1,860m massif that generates orographic rainfall that feeds Lake Urema) and extending eastwards to connect with the Marromeu Reserve (Dutton, 1994). This vision remains influential today.

Mozambique emerged from the civil war as one of the world's poorest countries, and its government sought to revitalise protected areas to generate foreign exchange. An initial project in the mid-1990s, in partnership with IUCN and African Development Bank, laid important groundwork by rebuilding basic infrastructure and conceiving a 'more inclusive, less confrontational' approach to law enforcement that brought together rangers who had fought on opposite sides of the conflict (Morley & Convery, 2014: 140). Nonetheless, poaching remained rampant and funding was not commensurate with the scale of the challenge (Morley & Convery, 2014).

GP was conceived in the mid-2000s as a joint venture between Mozambique's government and the Carr Foundation, a US-based non-profit headed by businessman-turned-philanthropist Greg Carr. This public-private partnership coalesced in a 20-year co-management agreement, finalised in December 2007, committing the Carr Foundation to a $24 million investment in exchange for oversight capacity to achieve a long slate of objectives under the headings of conservation, law enforcement, tourism development, community relations, education/training, and infrastructure (Pringle, 2017). This partnership was later extended through 2040.

This long time horizon enables GP to adapt and evolve. The initial focus on ecological restoration and ecotourism has expanded, in coordination with the government, to include complementary objectives in human development for the ~200,000 residents of the park's buffer zone. Initiatives include providing financial and logistical support to district health authorities to extend primary health care services to rural communities; agricultural extension; financial and programmatic support for primary and secondary schools and teachers; and creation of safe spaces where youth can learn life skills, with a particular focus on enabling girls to avoid child marriage and early pregnancy so that they can finish school. We do not have space to detail all of GP's efforts to alleviate poverty and stimulate green economic development; some are described elsewhere (Pringle, 2017; Gorongosa National Park, 2020), but this topic requires separate treatment. GP also supports basic scientific research and a nascent programme in carbon sequestration and climate-change mitigation. The project's original moniker, Gorongosa Restoration Project, contracted to GP in light of this broad and increasingly people-oriented mission. GP's budget has grown in concert with its scope—to roughly $16 million in 2021—with a long list of development aid agencies and NGOs contributing most of the programmatic funding. As of 2019, philanthropic support accounted for nearly two-thirds of GNP's income (although the Carr Foundation was no longer a majority donor) and international aid contributed another quarter; generated revenue accounted for <10% but exhibited the greatest growth of all revenue sources from 2013 to 2019.

The chief rewilding tactic of GP is to facilitate population recovery by curtailing illegal hunting. A revamped ranger squad patrols GNP, removes snares, and apprehends poachers. In addition, over 500 animals of nine species have been translocated into GNP; these translocations are a small fraction of the overall wildlife recovery, but were crucial in reestablishing several species (Stalmans et al., 2019). By gradually expanding protected-area coverage, GP aims to increase connectivity, enable resumption of migration, and buffer the system against climate change. Expansion does not entail evicting people; several communities live inside GNP. Instead, GP seeks to incentivise people to move outside park boundaries, in part by helping them to secure land tenure, which they otherwise lack. This reflects the foundation of GP's strategy (and its original motivation), which is to create fertile socioeconomic conditions for protected-area survival.

Ecologically, GP is open-ended in the sense that it does not intensively manage towards any particular historical baseline. The conditions of 1972 are a convenient reference point because they are well documented (Tinley, 1977), but are not a target per se. The guiding philosophy is rather to ensure that the essential pieces (species) are present, protect the larger system, and let the system reassemble itself.

Trajectory and success of rewilding in Gorongosa

One published framework (Torres et al., 2018) defines rewilding success along two axes (see also Carver et al., 2021). The first is decreased 'human forcing', quantifiable (in theory) as a function of material inputs and outputs. The second is increased ecological integrity, as indexed by the naturalness of disturbance regimes, intactness of communities, connectivity of ecosystems, and complexity of trophic networks.

The former axis is not a useful prism through which to evaluate rewilding success in this social-ecological system. Reducing human forcing in the form of poaching is a major focus; snaring pressure decreased by 65% and lion poaching decreased by 95% from 2015 to 2018 (Bouley et al., 2021). However, curtailing poaching requires massive material investment on multiple fronts—not just law enforcement, but also the community-relations and human-development activities designed to discourage and ultimately obviate illegal hunting. Indeed, human inputs and outputs were incorporated into GP from the outset (Pringle, 2017). The long-term co-management agreement stipulated, among other things, the requirements to maintain 'effective and strict law enforcement'; to 'employ Mozambican nationals and Mozambican firms'; to create 'lodging and tourism activities business'; to build and maintain physical infrastructure; to develop information-technology infrastructure; and to oversee 'animal-reintroduction and… breeding programs'. In short, human inputs are required to enable rewilding, in large part by creating outputs deemed by Mozambique's government to be in the national interest.

Along the latter axis, ecological integrity, GP has been successful by conventional criteria (e.g., Torres et al., 2018; Carver et al., 2021), although the recovery process is ongoing and it may take decades for GNP to settle into a new dynamic equilibrium. We discuss five such criteria (Torres et al., 2018): disturbance regime, species composition, community structure, trophic interactions and ecosystem functions, and ecosystem connectivity.

Disturbance

Fire and flooding are the main abiotic disturbances in GNP. As with human inputs/outputs, the 'disturbance naturalness' criterion (Torres et al., 2018) is nuanced in the context of GP. In Africa, anthropogenic fire has been part of savanna landscapes for as long as *Homo sapiens* has existed. Moreover, fire extent in southern African savannas is determined largely by rainfall (and hence fuel loads), irrespective of management strategy (Van Wilgen et al., 2004). Annual grass fires occurred throughout the park before the civil war (Tinley, 1977), and the same is true today; GP's management approach involves setting patchy, uncontrolled burns early in the dry season to reduce intense fires. While there is need for more research on how GNP's current fire regime compares to historic and prehistoric baselines, there is no directional trend in fire extent over the last 20 years, and the park-wide trend of increasing woody cover from 1977–2012 provides no reason to believe that fire became appreciably more frequent or intense during or after the war (Daskin, Stalmans, & Pringle, 2016). Similarly, hydrological regimes were not actively regulated before or after the war, although subtler anthropogenic effects are possible (Tinley, 1977; Guyton et al., 2020).

Species composition

All large-herbivore populations present in 1972 survived the war, but some were nearly extirpated. For four of these, translocations may have been crucial for persistence. Wildebeest were not detected in postwar aerial surveys until 2007 (n=16 members of the original population); 180 were introduced that same year, and 627 were counted in 2018. Buffalo were sporadically detected in aerial counts from 1994 to 2007 (2–26 individuals); 210 were translocated from 2006 to 2011, and 1,021 were counted in 2018. Eland (*Tragelaphus oryx*) were intermittently detected until 2012 (when 3 individuals were counted); 35 were introduced in 2013, and 142 were tallied in 2018. Zebra were consistently detected, but at extremely low numbers; 15 were imported in 2014, and 44 were counted in 2018. Reintroduction of ungulates extirpated before the war (roan, tsessebe, white and black rhino) is a potential longer-term goal.

Wild dog were successfully reintroduced (Bouley et al., 2021) by importing 45 individuals from genetically distinct source populations between 2018 and 2021; the population now exceeds 100. Intensive camera trapping from 2012 to 2018 failed to detect any leopard. A single male of unknown origin was finally spotted in 2018, and four individuals were introduced in 2021. A hyena was intermittently sighted in 2012, but as of 2021 there was not a viable population; hyena reintroductions began in 2022. Side-striped jackal (*Canis adustus*) occupied GNP in the 1970s but appear to be functionally absent as of 2022; limited reintroductions are planned.

No other species is known to have been lost from GNP in recent decades, although quantitative pre-war data exist only for large mammals and plants. GNP supports dense breeding colonies of waterbirds and more than a dozen globally threatened species of raptors and other birds.

Community structure

By 2018, GNP's total large-herbivore biomass had reached nearly pre-war levels (Figure 17.1), and the lion population was also approaching pre-war abundance (Stalmans et al., 2019). However, relative abundances remain heavily skewed relative to pre-war GNP and intact savannas elsewhere. Medium-sized and solitary-to-moderately-social ungulates (waterbuck, impala, reedbuck, kudu, nyala, warthog) now account for the vast majority of biomass, in contrast to the pre-war fauna dominated by larger-bodied gregarious species (elephant, hippo, buffalo, wildebeest, zebra). In particular, 57,000 waterbuck accounted for >50% of all ungulate individuals in 2018 (Stalmans et al., 2019). This shift in community structure appears to have arisen from differences in traits that affected species' resistance and resilience to poaching during the war. Large size and social groups make animals easy to see and shoot; large size also means slow reproductive rate; and gregarious species rely on herds to detect and avoid predators, including people. Conversely, individuals in smaller groups are more dispersed, making them harder to hunt (resistance), and smaller mammals reproduce faster, enabling swift recovery (resilience). Warthog have shorter gestation and produce threefold more offspring per litter than GNP's other ungulates. Kudu and especially nyala are woodland-affiliated and cryptic, while reedbuck and especially waterbuck can take refuge in the inaccessible, crocodile-rich floodplain (2,745 *Crocodylus niloticus* were counted in 2020, making it GNP's fifth-most abundant megafauna).

The rapid recovery of mid-sized ungulates (Figure 17.1) has enabled GNP to export animals to support restoration of other defaunated protected areas—a rewilding positive feedback. GNP has exported fourfold more animals than it has imported, including 1619 waterbuck, 200 warthog, 193 reedbuck, 50 oribi (*Ourebia ourebi*), and 48 sable (*Hippotragus niger*). The

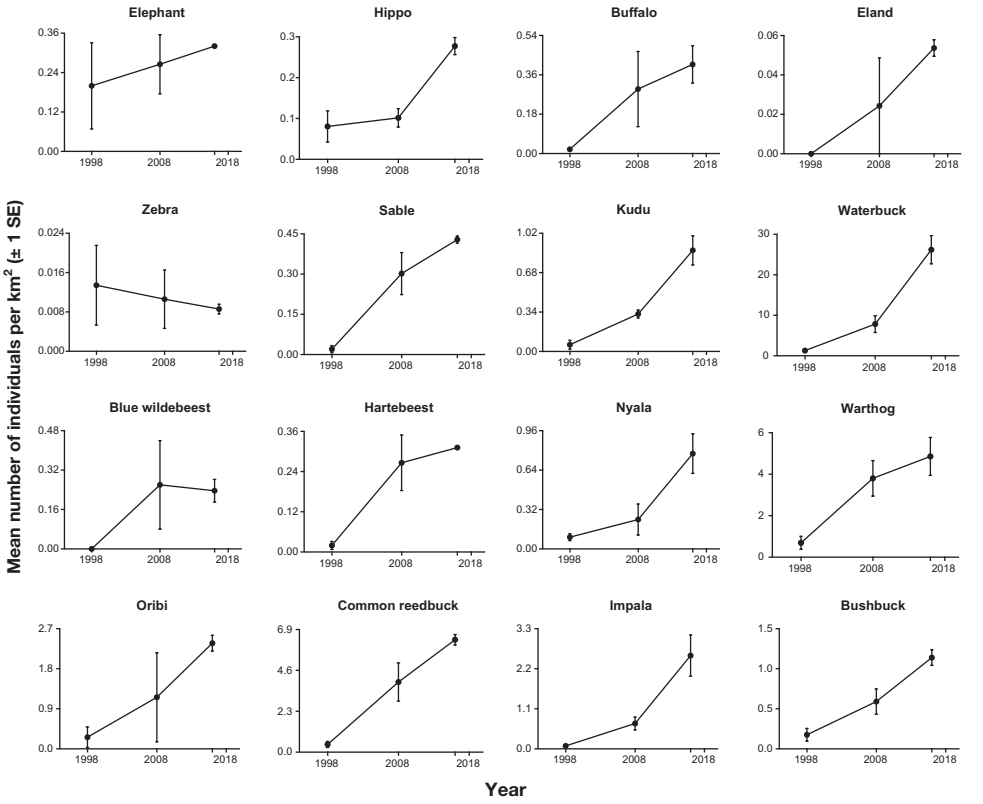

Figure 17.1 Post-war recovery dynamics of 16 large mammalian herbivore species in Gorongosa National Park, Mozambique, 1994–2018 (aerial survey data from Stalmans et al., 2019).

reestablishment of wild dog was so rapid that 5 were exported in 2021. Aside from this selective offtake, GNP's populations are not culled or otherwise actively managed.

Trophic interactions and ecosystem functions

The uneven recovery of large mammals in GNP has produced various ecological anomalies. Intensive ivory poaching caused the evolution of increased frequency of tusklessness in GNP's female elephants, from 18.5% of individuals in the 1970s to 51% in the early 2000s (Campbell-Staton et al., 2021); preliminary data suggest that tuskless females may eat different diets than tusked ones, which might affect their functional role in the ecosystem. Without large scavengers, carcasses decomposed slowly (versus overnight, as typical where hyena are abundant). Vultures have difficulty accessing unmanipulated carcasses, but experimentally creating an incision along the belly led to rapid skeletonisation, suggesting an important role of mammalian scavengers in modulating vulture foraging and nutrient cycling. Similarly, extirpation of large carnivores produced a 'landscape of fearlessness' in which animals did not take typical antipredator precautions. Bushbuck (*Tragelaphus sylvaticus*), ordinarily woodland-restricted antelopes, have increasingly occupied the treeless floodplain, but exhibited strong avoidance of experimentally simulated predator presence (Atkins et al., 2019). The ongoing reassembly of the historical

apex-carnivore guild provides an opportunity to test how rapidly such behavioural relaxation reverts. In the first year after wild dog were reintroduced, they subsisted largely on bushbuck (Bouley et al., 2021), suggesting that anomalous behavioural patterns may dissipate rapidly.

Waterbuck have likewise expanded into new habitat, but in the opposite direction (floodplain to savanna) and for a different reason (intraspecific competition instead of risk relaxation). A study from 2015–2019 found that waterbuck were approaching density-dependent limits in the Urema floodplain, depleting preferred food plants, and spilling over into adjoining woodland habitat where resource concentrations are lower (Becker et al., 2021). As forecasted by that study and a simple logistic-growth model (Stalmans et al., 2019), waterbuck numbers dipped from 2018 to 2020. Waterbuck have unusually high water and protein requirements, and we predict that the population will contract as formerly dominant competitors (e.g., wildebeest, buffalo) and carnivores continue to recover. A parallel scenario played out in Kenya's Lake Nakuru National Park from 1970 to 2004 (Ogutu et al., 2012).

In these no-analog, non-equilibrial conditions, large herbivores exhibited anomalously weak dietary niche differences relative to elsewhere in Africa (Pansu et al., 2022). Abundant, wide-ranging species such as waterbuck ate broad diets that overlapped extensively with other species and included plants that they did not historically eat (Pansu et al., 2019; Pringle & Hutchinson, 2020; Potter et al. 2022). This overlap probably reflects ecological release from interspecific competition and predation risk, which relaxes constraints on where and what ungulates eat. We predict that increasing wildlife densities and community evenness will lead to stronger niche differentiation over the coming decade.

Despite these shifts in community structure, behaviour, and diet, GNP's recovering ungulate population has reestablished at least one key ecosystem function. The invasive shrub *Mimosa pigra* was present in GNP long before the war but was kept in check by herbivores. While the collapse of herbivore populations enabled *M. pigra* to expand, the rapid increase of antelope biomass since 2007 brought the infestation back to pre-war levels by 2019 (Guyton et al., 2020). This finding is significant in the context of trophic rewilding, both because it demonstrates the speed with which ecosystem functions can be recovered even in no-analog communities, and because it eliminates the need for additional human forcing (e.g., chemical or biological control) to mitigate the impacts of biological invasions.

Ecosystem connectivity

At the onset of GP, Mozambique created a 5,400km^2 buffer zone around GNP. This designation allows sustainable natural-resource use by the ~200,000 inhabitants, but prohibits ecologically damaging uses of land (e.g., mining) and water (e.g., diversion, pollution). In 2010, the portion of Mt. Gorongosa above 700m elevation was legally annexed to GNP after a thorough consultation process with members of the communities most affected and other stakeholders, conferring legal protection for the chief source of water into Lake Urema along with sustainable-development support to the communities.

Much of the land between GNP and the coastal Marromeu Reserve is occupied by large hunting concessions (coutadas). These reserves are protected areas (IUCN Category VI) with few human inhabitants. In late 2016, GP signed an agreement with the Portuguese company that managed the nearest such reserve, Coutada 12 (C12, 2,000km^2), effectively expanding the park by 50% (C12 has not yet been formally appended to GNP, but its addition is anticipated). Importantly, C12's miombo and vleis support small populations of species rare in GNP, such as zebra and leopard (Easter, Bouley, & Carter, 2020).

Moving forward, GP aims to work with the government to create community conservancies that will establish corridor connectivity between the 'core' park, Mt. Gorongosa, and C12; to extend buffer-zone designation in a broad belt between GNP and the coutadas, up to the Zambezi River. These moves may eventually result in a vast contiguous network of protected areas of varying stringency. They would also preserve space for human inhabitants and their livelihoods and create new opportunities for sustainable development.

Challenges

Large animals require large spaces. Large herbivores (and elephant in particular) do not harmonise with agriculture. Large carnivores do not harmonise with livestock. Cultural conservation ethics may be deep (Matos, Barraza, and Ruiz-mall, 2021), but are easily trumped by livelihood needs. Practices that would be sustainable on a given area for a community of 1,000 are not sustainable on the same area for a community of 100,000. Communities are not monolithic and consist of individuals with diverse interests, across a nested set of scales: household, village, district, province, nation. Power asymmetries exist at all of those scales. Mistrust is hard to dissolve, especially among those who have been marginalised by regional, national, and international political and conservation manoeuvres. Resentment of authority and restrictions is a common human trait. Capital has the power to redress past wrongs and also to perpetuate them. The tape of history cannot be rewound. The future is shaped by actions in the present, but durable change requires time, effort, and continuous proof of trust and care. These are simple facts, but they create a great deal of complexity and many challenges for GP.

Community relations

GP's mission is to navigate these challenges in a way that enables large animals and diverse ecosystems to exist in perpetuity amidst a rapidly growing populace. GP's mandate is to execute that mission in a way that adheres to Mozambican law and advances the interests of the nation as perceived by its government. The shadows of colonial dispossession, postcolonial conflict, and regional suspicion of the government all hang over the effort. Inevitably, not all stakeholders express satisfaction; there is a spectrum of attitudes both within and among communities in the buffer zone. Villages closest to GNP, which have greatest access to employment, health, and educational opportunities created by GP, also have some of the most complicated relationships with GNP, owing in part to human–wildlife conflict. Conversely, some members of more distant villages perceive that GP is not doing enough in their communities. Relationships with communities on Mt. Gorongosa are particularly delicate, and ongoing deforestation in that area is a major concern. For most people, benefits accruing at the household level (e.g., agricultural assistance and disaster relief) are more meaningful than those directed towards whole communities (e.g., schools, clinics, wells), yet GP's legal mandate is to support 'projects that benefit the entire Community and not individual actors'. GNP shares 20% of annual revenues with the communities and is legally obligated to channel these funds through community representatives, yet community-level revenue sharing is often overshadowed by individual-level perceptions that representatives misuse funds. Building and maintaining trust is a long-term process and one reason why GP needs a 30-year time horizon, but neighbourly relations require constant maintenance.

Human–wildlife conflict

Residents of villages neighbouring the park suffer frequent crop-raiding and occasional fatalities by elephant and other species, and this threat will grow as wildlife populations increase (Branco et al., 2019). Mozambican law disallows compensation schemes, and fencing the entire perimeter of the park would reduce connectivity (although smaller-scale fencing is under consideration). GP's mitigation efforts have focused on rapid response by rangers (many of whom are posted in the main conflict corridor along the Pungue River), building improved silos (also an asset against rodents), and placing beehive fences at key elephant crossing points (Branco et al., 2020).

Climate change

Models predict that Mozambique will be among the countries worst affected by climate change, with substantial reductions in total rainfall, more frequent drought, higher maximum precipitation and flood risk, and more extreme weather events (Collins et al., 2013). In 2019, one of the worst storms on record in the Southern Hemisphere—Cyclone Idai—directly hit central Mozambique, leading to severe flooding. Whereas the ecological effects on GNP were strong but non-catastrophic, the human toll was immense. GP coordinated local relief efforts, which as of 2021 was the event that people most often noted when asked about the benefits of living near GNP. Impacts of climate change on agricultural livelihoods will influence park-community relations, but in ways that are difficult to predict. Expansion of protected-area coverage may help the coupled human-natural system absorb these impacts (e.g., by buffering floods) but may also strain logistical capacity.

Funding

GP's budget grew from ~$9 million in 2017 to ~$14 million in 2019 to ~$16 million in 2021. This funding is lavish by the standards of African protected areas. Even when GNP is construed as including the entire buffer zone (where much of the budget is spent), the funding per km^2 is an order of magnitude greater than the median for Africa's protected areas (Lindsey et al., 2018). Indeed, GP's current annual budget exceeds the total state-provided protected-area funding for all but four African countries; Mozambique's total contribution in 2017 was ~$2 million (Lindsey et al., 2018). GP aims to catalyse a regional transition out of poverty and create ecologically self-regulating conditions such that GNP requires a much smaller budget. Yet fiscal self-sufficiency for GNP seems distant, with generated revenue accounting for <10% of the budget in 2019. Ecotourism has developed more slowly than initially hoped. Other enterprises such as honey, coffee, cashew, and carbon are emerging, feeding revenues into a trust dedicated to conservation and human-development programmes in Gorongosa.

Instability

Mozambique's peace process is ongoing. In 2019, leaders of the two dominant political parties convened to sign a peace accord in GNP—once the hub of the civil war and now an international symbol of Mozambique's vitality and environmental leadership. Yet instability remains a threat to GNP and Mozambique more broadly. As the national political parties have increasingly embraced peace and demilitarisation, an Islamist insurgency in Cabo Delgado province (~900km from GNP) has intensified since 2017. In 2021, this conflict spread in into Niassa

National Reserve, forcing community members and conservationists to flee. Armed groups with international ties remain a threat to the people and parks of Mozambique, as in 1977.

Conclusion

Gorongosa is proof that socio-ecological systems devastated by conflict can be revived on decadal timescales. The assisted recovery of large-herbivore and carnivore populations has reinstated top-down control and resurrected ecosystem functions—the defining objective of trophic rewilding. GP has achieved this objective through a multifaceted public–private partnership, which envisions GNP as an engine for economic development in a region where three-quarters of people live below the international poverty line. GP's multi-decadal span and broad scope, which contrast sharply with the conservation status quo, is necessary to allow adaptive evolution of targets and tactics, and to build trust needed to resolve the disputes that inevitably arise around any societal institution.

While some ecological scars of GNP's violent history will persist for generations, they will continue to lessen as long as Mozambique remains peaceful. Reintroduction of rhinoceroses, planned for 2040, would represent the healing of scars predating the civil war and would be a capping achievement of GP from a purely ecological perspective. Yet GP's success and viability as a replicable model of protected area upgrading will ultimately be judged in terms of the well-being of the people of Sofala Province and the handing back of GNP in a condition that allows its survival in perpetuity.

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