

## Full length article

## Fishing (in) the past to inform the future: Lessons from the histories of fisheries management in Lake Malawi and Mbenji Island

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## ABSTRACT

Without historical interrogation of past and present fisheries management, governors and their sponsors often fall into the trap of replicating and reproducing failed approaches. Even when aimed at community empowerment, a lack of historical awareness can lead to underappreciation of the institutional, economic, and socio-ecological contexts that resource users navigate. In this article, we explore the history of fisheries management in Lake Malawi through comparative investigation of two enduring management regimes that developed in the mid-twentieth century: centralised fisheries management and the chief-led regime at Mbenji Island. We argue that the long-term successes of Mbenji Island fisheries in comparison to under-resourced and patchy governmental management has resulted from targeted technical regulations combined with robust leadership, proactive enforcement, sustained ecological and economic benefits, transparent processes, and embeddedness in existing institutions and beliefs. Yet, this regime has not existed in isolation from centralised management but, instead, has been directly and indirectly impacted by it. Pairing comparative historical analysis with analysis of fish specimens and water quality, we consider the underlying principles, long-term outcomes, and entanglements of these two regimes. Such an approach offers important insights into questions of governance legitimacy, the feedback between management regimes, and the role of science within management. Ultimately, the findings reported in this paper agree with recent surveys emphasising the need to focus on processes centred on participation and capacity building rather than set ecological outcomes within small-scale fisheries management. However, we argue that this requires deep historical awareness and reflection that is too often neglected.

### 1. Introduction

It has been well established that overconfidence in scientific knowledge and technical solutions created a legitimacy crisis for centralised fisheries management in the final decades of the twentieth century [1–5]. The global shift towards participatory fisheries management from the 1980s attempted to address this crisis by increasing emphasis on empowering resource users and communities to advance conservation goals. Yet, several surveys maintain that participatory management has remained part of the “management toolbox” as an externally-imposed technical fix rather than a meaningful decentralisation of power and decision-making [2]. Consequently, it appears that the design and implementation of participatory structures—often referred to as co-management—has remained detached from local

contexts and realities [6–10]. As Nunan et al. have suggested, this has resulted from “inadequate recognition given to the social and political factors that influence how co-management structures operate and how representation is practised” [10].

In response to this legitimacy crisis, increasing attention has also focused on management regimes that exist or have existed outside of centralised structures. This is often referred to as ‘traditional’ or ‘customary’ management, defined by Aswani et al. to be “cultural and historical practices that have evolved to regulate the use of, access to, and transfer of resources locally, and ... informed by indigenous ecological knowledge and embedded in customary land and sea-tenure institutions” [11]. While there have been various attempts to incorporate customary management principles within contemporary marine resource conservation, this has met with only limited success. Like other

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co-management arrangements, such processes have been hindered by the predilection of governments, NGOs, and donors to construct context-specific customary management approaches as idealised blueprints that can be imposed in other places without regard for the heterogeneity of institutional, historical, and socio-ecological contexts [12, 13].

In this paper, we argue that comparative historical analysis of centralised and customary management can offer important lessons for future directions for fisheries management. While there have been several detailed and comparative studies of customary fisheries management, many of which engage with historical perspectives, these tend not to engage closely with the parallel histories of centralised fisheries governance, especially within colonial or formerly colonial contexts [14–16]. This means that the intersections and entanglements of different management regimes are often neglected [17–19]. As recent studies focused on American contexts have argued, this has also led to a lack of reflection on the deep-seated feedback between colonialism, fisheries science, and centralised fisheries management that continues to impact customary and participatory management [20–22]. Building on these important studies and focusing on Lake Malawi, this article stresses that this was a global process as fisheries science developed and new management approaches were being experimented with and imposed within colonised waters with diverse consequences. This occurred in parallel with, and often in response to, the adaptations and transformations of resource users and customary management structures [12,13].

Lake Malawi provides a unique case study to explore these parallel histories as two management regimes—colonially-imposed centralised fisheries management and chief-led fisheries management at Mbenji Island—developed in parallel in the mid-twentieth century and continue to endure. British colonial management centred on the dominant methods and principles emerging within fisheries sciences in the mid-century, which continued to influence governmental approaches following independence in 1964. Meanwhile, the Mbenji Island fisheries regime centred on existing leadership structures, socio-cultural norms, and knowledge of breeding seasons and fishing contexts paired with new regulations, committees, and enforcement structures. Both regimes responded to the intensification of fishing efforts and commercial opportunities in Lake Malawi from the 1930s onwards but with different approaches and outcomes. Today, the centralised fisheries regime under the Government of Malawi continues to struggle with questions of legitimacy, participation, and enforcement, leading to persistent concerns of overfishing. The fishery at Mbenji, however, is celebrated as a successful and sustainable fishery that experiences healthier fish stocks than those in surrounding government-managed waters. This is seen as a model for small-scale fisheries management in Lake Malawi [23–25].

Pairing comparative historical investigation with environmental sampling centred on comparative analysis of fish specimens and water quality, we consider these two management regimes' underlying principles and long-term outcomes. We argue that the lessons learned from this approach offer important insights into contemporary questions of legitimacy, the feedback between different management regimes, and the role of science within management. Ultimately, the findings of this study agree with recent surveys that have emphasised the need to focus on processes centred on participation and capacity building rather than set ecological outcomes within small-scale fisheries management [17, 26–28]. However, we contend that any such approach requires deep historical awareness and reflection that governors too often neglect [2, 21].

## 2. Methodology

### 2.1. Study site

Lake Malawi is the southernmost of the African rift lakes and the third largest lake in Africa. It has a total surface area of 28,000 km<sup>2</sup>, is

560 km long, has a 50–60 km mean width and an average depth of 292 m (maximum recorded depth 700 m). It is home to over 1000 species, most of which belong to the cichlidae family. Fishing is categorised into commercial and small-scale [23]. Malawi has approximately 64,000 small-scale fishers, with an estimated 2.8 million people dependent on fisheries across the value chain. Fish production has increased more than two and a half times between 1992 and 2019. Over 93 % of 2019 estimated fish production was from Lake Malawi, and more than 98.5 % of national production was by small-scale fisheries [29].

Mbenji Island is located about 10 km off the coast of Salima District on the western shore of Lake Malawi (Fig. 1). The island and its waters cover an area of 32 km<sup>2</sup>, spanning a radius of 5–7 km from the island. Small-scale fishers operating artisanal fishing crafts and gears dominate the fishing population, catching diverse fish species, principally the utaka (*Copadichromis* spp.). The island has been the site of a customary fisheries management regime under the leadership of Senior Chief Makanjira since the 1950s [25,30].

### 2.2. Archival research

Archival research concentrated on British colonial records held in The British Library (London), The British National Archives (Kew), and The National Archives of Malawi (Zomba). Various fisheries-related records were located, transcribed, and analysed. This collective documentation covered the principal period of colonial fisheries intervention between 1930 and 1964. This included reports, legislation, and requests for scientific support produced by the British Nyasaland Protectorate and sent to the British Colonial Office in London.

The records of the British Colonial Office were investigated to analyse the motivations, funding, and rationale behind three fisheries surveys established during the colonial period, while the minutes of the Colonial Fisheries Advisory Committee (1943–1961) were surveyed to understand overarching imperial visions for fisheries development. These records were paired with the published and unpublished material produced by the three scientific survey teams (1939–1955) alongside the annual reports of the Nyasaland Protectorate's Department of Game, Fish, and Tsetse Control (1950–1964). These records offer insight into the scope and findings of the successive scientific surveys and the focus and extent of colonial fisheries development and regulations.

As these surviving written records were compiled primarily by British colonial advisers, scientists, governors and technical officers, these records provide access to primarily (although not exclusively) colonial perspectives on the development of government-led fisheries policies surrounding Lake Malawi. These sources are couched in colonial language, rhetoric, and perceptions. Most crucially for the purposes of this research, this includes manifest assumptions of custodianship over colonised water bodies, resources, and peoples alongside suppositions of the technological and scientific superiority of European tools and methods [31–33]. Rather than addressing these biases, this research has sought to surface, interrogate, and present the dominant ideologies, approaches, contexts, and rhetoric shaping centralised fisheries governance in Lake Malawi from the offset. It is only by analysing the biases implicit (and explicit) in the construction of colonial regulatory and developmentalist frameworks that we can appreciate the ideologies and assumptions embedded within colonial fisheries management regimes. These colonial records were then paired with a legislative review of post-independence laws and policies to trace the continuing impact of colonially influenced management practices.

Importantly, this documentation does not only provide access to the perspectives and activities of colonial actors but it is possible to read these carefully 'along', 'through', and 'against' the grain to understand how fishers and fisheries participants engaged with, remade, and resisted colonial regulatory and developmentalist schemes in practice [34–40]. This is beyond the scope of this paper, but we have presented these findings in detail elsewhere.

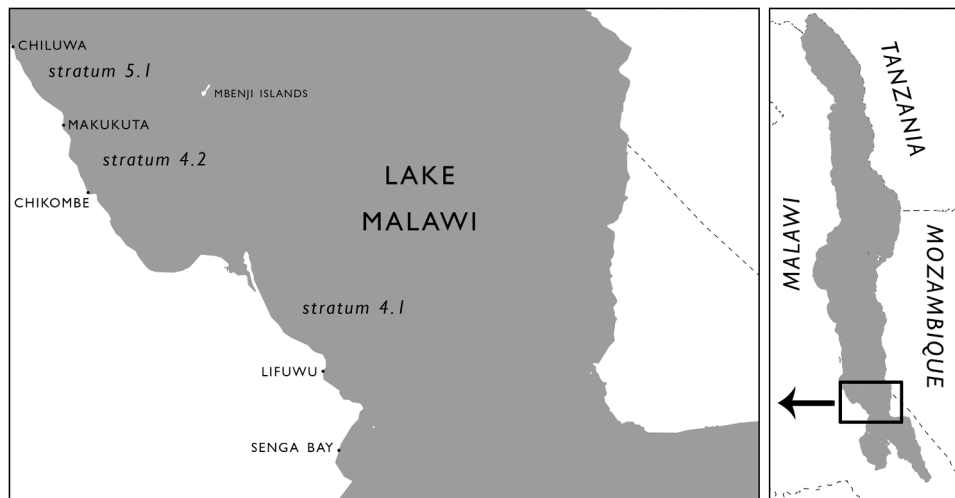


Fig. 1. Mbenji Island and surrounding area detailing sampling strata.

### 2.3. Oral histories

Semi-structured oral history interviews formed a key method of data collection for the study. The method was critical as Mbenji is a traditional fishery, whose development is embedded within the traditional and oral histories of the people of the area. The understanding was that oral histories would elevate the rich and contextually-grounded voices, experiences, and opinions of fishers, buyers, and fisheries managers not commonly contained in the existing written records [41]. With due respect to ethics governing research in Malawi and the UK (see 2.5 below), oral histories were undertaken in Chikombe where the Mbenji Island fishing industry is concentrated, Mbenji Island itself, and the Salima Fisheries department in 2022 on 15–18 August, 1–4 October, and 28–30 November. The aim of the oral histories was to understand and appreciate: (i) the origins of the chief-regulated fishery; (ii) the knowledge that underpins this; (iii) how and why this new governance approach developed; (iv) how this interacted with colonial and post-colonial fisheries governance; and (v) community perceptions of the long-term benefits of the fishery and its relation to broader fisheries management in Malawi.

A total of 24 people were selected due to their knowledge and experience with regards to the aims above. Oral histories were conducted with the guidance of a topic guide, enabling open-ended questions and conversational flexibility to empower interviewees to raise the issues and perspectives they were most concerned with or interested in within the broader topic areas [41]. The interviewees involved members of various committees of Mbenji Fisheries, including those responsible for the day-to-day operations the fishery, as well as government officials from Salima. Interviews were also conducted with fishing industry participants across the value chain, including elders with first-hand experience of the colonial period, fishers, fish traders, and fish processors. Interviews were also conducted with Senior Chief Makanjira who presides over the leadership of Mbenji fisheries, as well as Senior Group Village Headman (GVH) Nyanguru, GVH Mpiringidzo, and GVH Manguwale, who constitute the Mbenji Fisheries main committee. This allowed us to tap into their detailed experiential and historical knowledge about the past and present of the management regime, including its organising principles, underpinning motivations, and the reasons for adaptations over time.

Alongside oral histories, we also held focus group discussions with fishers and other fisheries stakeholders to capture as wide and varied perspectives as possible. Like the oral histories, these semi-structured focus group discussions were conducted with the guidance of a topic guide while following the discussion threads that focus group participants were most open to discussing and interested in raising. This was a

means to reveal collective understandings of the management regimes while surfacing the topics of collective and not just individual importance through interactions between participants [42].

Members of the research team were also invited by Senior Chief Makanjira and the Mbenji Fisheries Management Committee to attend closing and opening ceremonies in December 2022 and April 2023, respectively. Alongside participant observation across these ceremonies, further oral histories and group interviews were also conducted during these events with chiefs and government officials. Additional data was also recorded from the progress reports presented during the ceremonies by the chairpersons of the Mbenji Fisheries Committees, invited NGOs working on fisheries in the area, as well as Senior Chief Makanjira's speeches that concentrated on the origins of Mbenji fisheries, its success stories, and the ongoing challenges facing the fishery.

Interviews were recorded and transcribed verbatim with permission from participants. These were then analysed and translated by the team members who had overall responsibility for conducting and considering the interviews, focusing on qualitative analysis using coding techniques to evaluate the similarities and differences of perspectives across the issues discussed while reconstructing the history of Mbenje Island, particularly the origins, motivations, protocols, and challenges that have developed over time. The results of this data were presented for validation and additional input at a stakeholders' workshop held in Salima on 16 May 2023, where all interviewees were in attendance. Analysis of the collective interviews was written up in detail and shared with the other project members for comparative analysis with the findings from the archival research and environmental sampling work packages.

### 2.4. Environmental sampling

Environmental sampling focused on a comparative analysis of fish specimens and water quality in the waters surrounding Mbenji Island and the nearby fishing stratum under government management. These were Domira Bay (stratum 4.2), Senga Bay (stratum 4.1) in Salima district, and Nkhotakota south (stratum 5.1) between longitude  $34.3^\circ - 34.6^\circ$  and latitude  $13.3^\circ \text{ S} - 13.7^\circ \text{ S}$ . Sampling sites included Chiluwā, Makukuta, Chikombe, Mbenji Island, Lifuwu, and Senga Bay (Fig. 1).

Data on water quality were collected on physical and biological parameters in June and November 2022 to determine any spatial variations in environmental conditions in the study area. Depth-integrated physicochemical sampling was conducted to collect temperature, pH, specific conductivity, Secchi disk visibility depth, total dissolved solids, dissolved oxygen and soluble reactive phosphorous (SRP) data. In addition, biological sampling was conducted to collect data on chlorophyll-*a* as a measure of primary production that drives the aquatic food

chain on which fish productivity depends. The collection and processing of water samples and their subsequent laboratory analyses followed the procedures of Wetzel and Likens, Stainton et al., and Murphy and Riley [43–45]. Mean values for each parameter at each site were used to visualise water quality variations between the fishing strata. Analysis of variance (ANOVA) using Microsoft® Excel 2016 was applied to evaluate any significant differences between sampling strata at a significance level of  $p < 0.05$ .

A total of 462 fish samples belonging to the cichlid genus *Copadichromis* (Utaka) were collected randomly from artisanal fishermen along the shores of Nkhotakota south (Chiluwa), Domira Bay (Makukuta, Chikombe, Mbenji) and Senga Bay (Lifuwu, Senga Bay) fishing strata in September 2022. The study used fish specimens collected from chilimira seine only to have the same gear selectivity to allow comparison of size distributions among the fishing strata. The non-sex-differentiated fish were weighed and measured in the field within two hours of collection to calculate length-weight relationships.

The relationship between the length (L) and weight (W) of fish is expressed by the equation  $W = aL^b$ . When this equation is logarithmically transformed [ $\log(W) = \log(a) + b \log(L)$ ] linear regression can be used on the transformed data to calculate the parameters  $a$  and  $b$ , with ‘ $a$ ’ representing the intercept and ‘ $b$ ’ the slope of the relationship. When applying this formula on sampled fish,  $b$  may deviate from the “ideal value” of 3 that represents an isometric growth. The deviation may reflect environmental circumstances or the condition of the fish themselves. When  $b$  is less than 3, fish become slimmer with increasing length, and growth will be “negative allometric”. When  $b$  is greater than 3.0, fish become heavier showing a “positive allometric” growth and reflecting optimum conditions for growth [46]. To determine whether  $b$  of fish from each stratum was statistically significantly different from the consensus for isometric growth ( $b = 3$ ), a student  $t$ -test was done within 95 % confidence limits. The growth of fish is considered isometric when  $b$  is not statistically different from 3 ( $p > 0.05$ ). In contrast, a statistically significant difference of  $b$  from 3 indicates an allometric growth, either positive or negative ( $p < 0.05$ ). The  $b$ -values were used to draw box-and-whisker plot for each fishing stratum. All data was analysed and box-plotted using Microsoft® Excel 2016.

One of the key limitations to this research is that the Department of Fisheries of the Government of Malawi do not currently record catch and effort data at Mbenji Island, although they do record this in surrounding fishing grounds. Without such sustained data, it is impossible to evaluate fishing intensity and impact over the long term, leading to an important gap in the data available. Without sustained data surrounding fish catches, our analysis of fish stocks has had to rely on analysis of the length-weight ratio paired with water quality analysis to comparatively assess the health of fish at Mbenji Island and in the surrounding fishing strata. This information can only provide an indication of the comparable health of fish species at the time of recording and cannot definitively determine whether this is a result of the management regime or other environmental factors. Paired with the oral histories and archival records examined here, this data can however offer useful additional contextualisation and weight to fishers’ observations of the long-term success of Mbenji Island fisheries. It is important to state, however, that further analysis of environmental variations across the fishing strata that might affect utaka health paired with sustained catch and effort data is necessary to further test and verify the indicative findings presented here.

## 2.5. Data analysis, reliability, and validity

The research was separated into three work packages that aligned with each of the primary methodologies, namely (i) archival research; (ii) oral histories; and (iii) environmental sampling. According to their expertise and experience, each work package included three researchers who were responsible for different aspects of data collection and transcription, while undertaking collective analysis of transcribed data to

verify and test each others conclusions.

At regular monthly project meetings, work package leads presented the collective analysis of data gathered over the previous month. This allowed for regular feedback and questioning by other project researchers around the significance of the findings as well as how this could inform the subsequent activities across different work packages. This also ensured that data was being consistently transcribed, translated, presented, and shared in a way that was accessible for all project members while creating the space for different disciplinary perspectives to feed into and shape the interrogation and interpretation of this data throughout the duration of the project and not just at the project conclusion.

Once the process of data collection, transcription, and analysis was completed across each work package, further discussions were convened to collectively analyse these findings and bring together the specific findings offered across the different datasets. This included sharing and discussion of detailed written reports and statistical visualisations of the collective analysed data alongside the major findings surrounding our primary questions and aims. As historical study formed the core of this research, the data generated through archival and oral history research was compared and contrasted to understand the distinctive ideologies, protocols, and concepts that underpinned each while environmental sampling data was utilised to contextualise the findings of this data, namely the long-term legacies of the two management regimes. The results of this collective analysis constituted detailed histories of the two management regimes, their relations to each other, and their long-term legacies. This is presented below.

While we have conducted detailed historical investigations using a wide range of qualitative and quantitative data, the findings presented below are necessarily based on fragmented, imperfect, and incomplete data. The mixed methods approach utilised was deployed to see how the pairing of historical and scientific methods could be used to address some of the gaps and biases evident within the available archival, oral, and environmental data. In particular, we wanted to investigate the long history and outcomes of different management regimes not solely or even primarily through statistical data but, instead, through the perceptions and observations of those involved in constructing, maintaining, and reforming these regimes over the long-term. Given the stark discrepancies in data collection across the two management regimes studied—from the perspective of both available written and scientific data—we had to employ methods that can only offer indicative results and conclusions. Still, we believe that the findings from this project offer useful and stimulating perspectives that will, we hope, encourage similar historically-rooted projects in the future.

## 2.6. Ethical considerations

As this research involved human participants, the project underwent rigorous ethics review. As is a requirement for any research project involving human participants in Malawi, the study was approved by the Mzuzu University Research Ethics Committee and the Government of Malawi through the National Commission for Science and Technology in May 2022. Parallel to this process, the study also gained mandatory approval through the University of Strathclyde Ethics Committee in May 2022.

Before the implementation of the study, members of the project team provided a detailed briefing to Senior Chief Makanjira, the Mbenji Fisheries Committee, and officials from the Government of Malawi Fisheries Department about our project goals and activities. Following this briefing, each authority gave us consent to conduct the study in their area. Throughout the project lifetime, these authorities also participated in designing of the project focus, particularly surrounding the challenges and opportunities exemplified by the Mbenje Island fisheries management processes. During project implementation, these authorities also acted as key respondents, research guides, and mediators with all the other respondents involved. As such, all research was conducted

according to local norms and protocols.

All interviews were conducted with the voluntary, prior, and informed consent of participants. In oral and written briefings prior to interview, interviewees were given full disclosure of the project and the topics that were to be covered. Most interviews were conducted in Chichewa, the predominant language of the region, except where participants chose instead to speak in English. All participants were offered the option of full anonymity, although most participants chose to disclose their identity to receive full acknowledgement for the detailed knowledge and information they provided. Given the focus of our interviews, there were no specific risks or harm associated with participating in the study. However, interviews were scheduled at participants' convenience at a time and place they deemed most comfortable and convenient. As well as agreeing topics prior to discussion, participants were also advised that they could stop interviews at any time and that they did not have to answer any questions or discuss any topics that they subsequently deemed sensitive or that they were not comfortable answering.

Environmental samples were collected in public-access areas with permission from village leaders and/or Beach Village Committees as well as officials from the Fisheries Department in Salima. For the collection of archival data, permission was granted from the Archives Director of the Malawi National Archives in consultation with the Government. Equivalent permission is not required from The National Archives in the United Kingdom as this data is under Crown copyright / Open Government Licence and can be published in any format and any medium.

A validation and community peer review workshop was conducted in Salima on 16 May 2023 at the closure of the project. This was organised in collaboration with the Centre for Environmental Policy and Advocacy, a Malawi-based advocacy institution promoting sustainable environment and natural resource management. This workshop brought together Senior Chief Makanjira, Mbenji Fisheries Committee members, fisheries participants, government officials, researchers, and academics to discuss, endorse, and cross-examine our project findings and integration of data across the three main research activities (archival research, oral histories, and environmental sampling).

### 3. The history of centralised fisheries management in Lake Malawi

#### 3.1. Colonialism and fisheries management in Lake Malawi

The foundations of centralised fisheries management in Lake Malawi can be traced to the 1930s when the British colonial government responded to expanding non-African fisheries southeast of the lake (Figs. 2–3). This prompted the first colonial fisheries regulations, which focused on regulating non-African fishers by requiring them to gain permits to fish commercially. These permits set mesh size restrictions for seine nets, the principal gear used by African and non-African fishers in the southeast lake at this time; mesh sizes were only applicable to permit holders (i.e. non-African fishers). Permit holders also had to submit monthly returns surrounding the average size of nets, number of casts, approximate total catches and approximate average proportions of the targeted species in each type of gear [47,48]. However, this data could not be used to inform fisheries management approaches without much greater understanding of fish biology, behaviours, recruitment, and overall stock health alongside the impact of fluctuating lake conditions on fish populations [47,49]. To address this, three fisheries surveys were organised between 1939 and 1955 to assess fish stocks and fishing efforts while advancing recommendations for the regulated development of lake fisheries [50–52].

The surveys suggested that the maximum sustainable yield (MSY)—the maximum yield of fish harvested yearly without damaging fish stocks—could only be achieved through greater governmental oversight of the fisheries alongside technological transfer and training

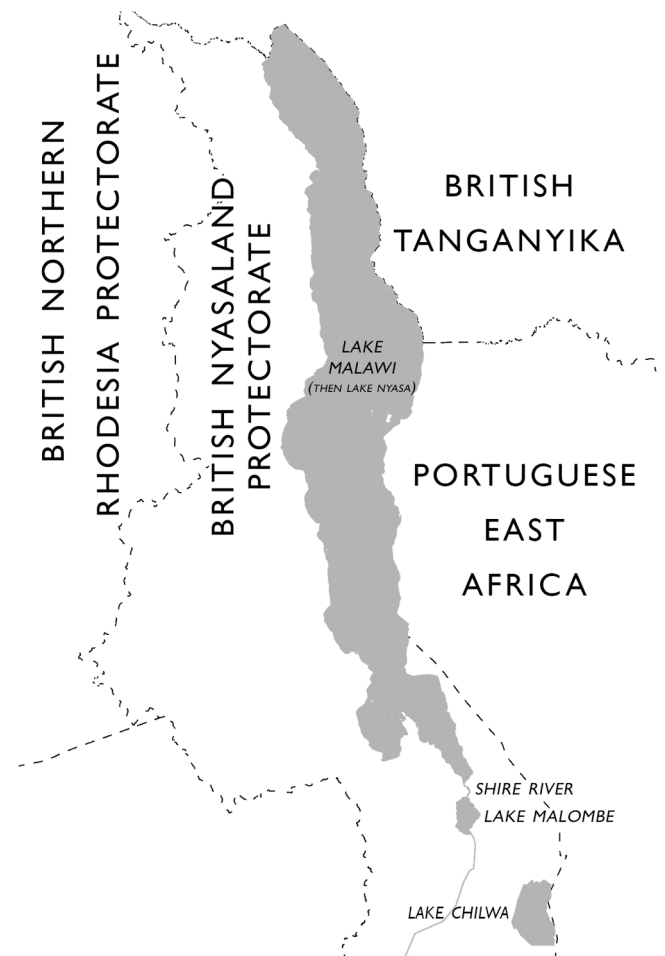


Fig. 2. Colonial boundaries surrounding Lake Malawi (then Lake Nyasa) including British Nyasaland Protectorate (Malawi).

programmes targeted at African fishers [50–52]. Of particular concern was that the second survey, focused on the important tilapia fisheries in the southeast arm between 1945 and 1947, intimated that the limit for commercial expansion of tilapia fisheries had already been reached [52].

While recommending greater centralised management, each report emphasised the need for more substantive and sustained data to inform management decisions. Such an approach centred fisheries management on monitoring single species biological indicators by assessing the catch per unit effort. This was in line with the dominant approaches emerging within the burgeoning field of fisheries science in the 1930s and 1940s [50–54]. Although each survey team engaged with and relied on African fishers' knowledge, none of the surveys engaged with the existing institutions and protocols governing African fisheries. Rosemary Lowe, who led the second survey, was particularly concerned that regulations being made by separate bodies would prove detrimental to management. She recommended that the "easiest way to make the fullest use of all the fish stocks on a long-term basis would probably be by having unified and Government control over all the separate fisheries" [52].

Based on these recommendations, the final two decades of colonial rule witnessed the foundation of a patchwork regime of fisheries regulation and monitoring. The principal regulatory framework was the Fisheries Ordinance 1949, which significantly expanded governmental powers, including to prescribe closed seasons, protected areas, minimum landing sizes, and gear specifications. The immediate aim was to make registration of fishing nets mandatory to understand where, when, and how many different types of nets were employed across different areas. This was intended to enable estimation of African fishing efforts in

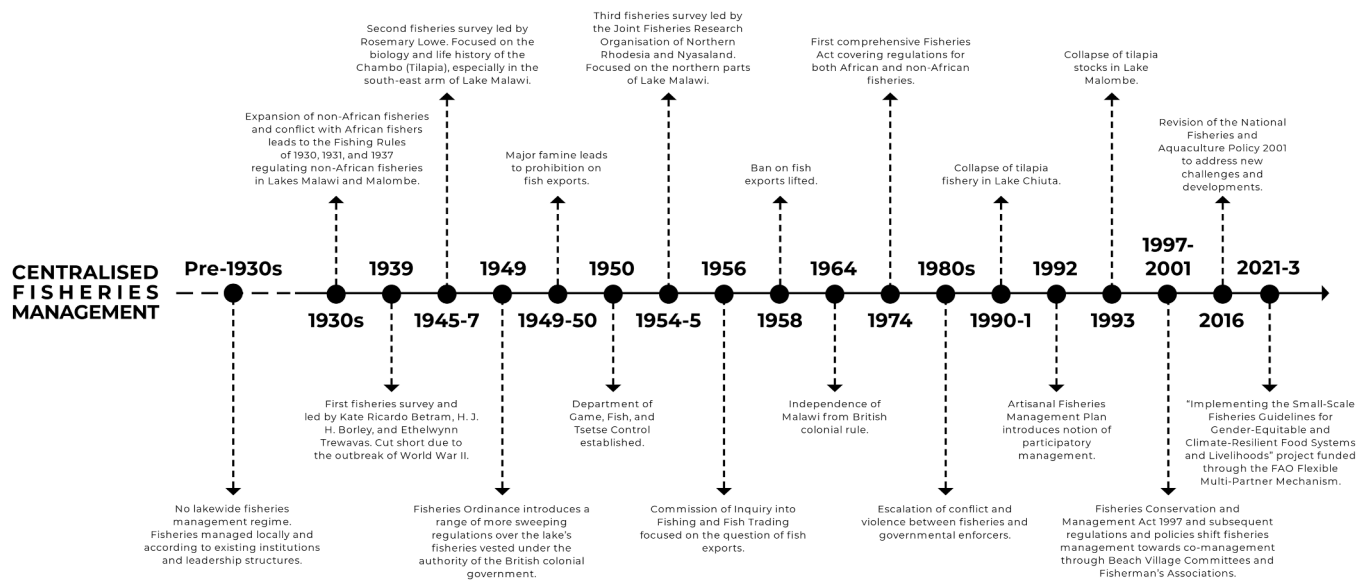


Fig. 3. Timeline of Centralised Fisheries Management surrounding Lake Malawi.

lieu of statistical data [52,55]. Following the Ordinance, restrictive regulations continued targeting non-African fishing firms who responded to falling inshore catches in the 1940s by targeting open-water species using ring nets. From 1950 onwards, a one-month closed season was imposed on the non-African seine and ring net fishing in the southeast arm every December to coincide with the tilapia breeding season. By 1960, it was clear that this had not had the desired effect, as a decline in catch-per-unit efforts led to an extension of the closed season to include November [56,57]. In contrast to direct, if limited, regulations targeting non-African fisheries, there was continued reluctance to introduce restrictions on African fisheries. Instead, the focus concentrated on assessing the effort and scope of African fisheries while attempting to shape these through technology transfer and commercial guidance [58].

When assessing African fishing efforts, African Fisheries Assistants were stationed at various beaches to record the number of hauls per net and the average catch per haul throughout the year. Given the number of landing sites and the fact that most observed beaches were based in the southern lake, these statistics provided only a vague suggestion of the overall effort of African fisheries. This was meant to be utilised alongside net registration data, but such information was never successfully collected during the colonial period; colonial authorities relied on traditional authorities to provide these figures but proved unwilling or unable to do so [56,58].

In the final years of colonial rule, it became apparent that assessments of African fishing efforts had been considerably underestimated [56]. Notably, these underestimations occurred when African fisheries were undergoing significant changes. Following an expansion of riverine and seine net fishing efforts in the 1930s and 40 s, the 1950s witnessed a marked increase in manufactured twine, gill nets, and chilimira nets. This was predominantly driven by decreasing tilapia catches in seine net hauls, which encouraged investment in and experimentation with alternative fishing technologies. Such innovations were then disseminated and adopted throughout the lake as fishers migrated in response to changing ecological, commercial, and political contexts [48,59]. While the colonial administration attempted to divide fisheries along racialised lines, this ignored the hybridity of the fishing trade, in which fish caught by African and non-African fishers using adapted and imported gears entered local, urban, and export markets through connected lakeshore and roadside markets [60]. Through these competing and collaborative networks, African and non-African fishers increased their fishing efforts and extended the distribution of their harvests [61].

At the point of independence in 1964, a patchy and fragmented centralised fisheries governance regime had been instituted over Lake Malawi. This centred on monitoring tilapia stocks and regulating non-African efforts in the southern lake through technical (gear) restrictions and closed seasons but without the ability to limit fishing intensity for most of the year. Most lake fisheries remained outside the government's purview, monitoring, or enforcement. This uneven and fragmented centralised fisheries management regime continued following independence.

### 3.2. Centralised fisheries management and co-management in Lake Malawi

For the first three decades of independence, the newly-created Department of Fisheries (DoF)—which retained British expatriates in senior roles for the first twenty years—continued to concentrate on technical specifications and closed seasons aimed at tilapia fisheries [24]. In 1973, the independent government introduced their first comprehensive regulations, which aimed to:

maximize the sustainable yield from fish stocks that can be economically exploited from the national waters; improve the efficiency of exploitation, processing and marketing; promote investment in viable fish farming units, and exploit existing and develop new aquatic resources [23].

Building on the Fisheries Ordinance 1949, the Fisheries Act maintained the licencing system for 'commercial fisheries'—now defined as "any fishing by means of a trawl net, ring net or purse seine net"—while introducing technical specifications for gears used by commercial and small-scale fishers [24,62]. Regulations also sought to reduce conflict between commercial and small-scale fisheries by banning commercial trawlers and ring nets from operating near the lakeshore. To protect tilapia during the breeding season, the annual closed season was extended to cover ring and seine nets in Lake Malawi, Lake Malombe, and the Upper Shire River; for the first time, this included African fishing efforts. Although MSY remained the underlying management goal, there was no attempt to limit fishing effort or output [23,24].

These decades were also marked by growing violence and repression towards fishers by government enforcers in response to their resistance to government impositions. Central to this tension was that several members of the leading Malawi Congress Party under President Banda (1964–1993) invested in commercial fishing while Banda nationalised the previously Greek-owned commercial fleet, becoming the largest

fishing interest on Lake Malawi. Moreover, the DoF was expected to fund scientific trawling activities through income raised by selling harvested fish. This placed fisherfolk in competition with the same governmental elites who held authority over the regulatory regime. This led to uneven and inequitable enforcement, encouraging escalations in fishers' resistance—especially towards the closed season—and an upswelling of violence between fishers and enforcers in the 1980s [24,63].

This increasing violence was emblematic of growing dissatisfaction towards the national single-party government, which collapsed in 1993. That same year, the chambo stocks of Lake Malombe also collapsed, highlighting the failures of centralised management. One year previously, the lack of legitimacy of the DoF, alongside international donor pressure, stimulated the Artisanal Fisheries Management Plan (1992) [24]. This introduced the notion of participatory management, which became increasingly prevalent in global fisheries discourse over the previous decade [7,63,64]. The turn to participatory management continued following the beginning of multi-party democracy in 1994, embedded through the Fisheries Conservation and Management Act 1997 (FCMA) and subsequent policies [65,66]. This created the basis for delegated management responsibilities to Beach Village Committees (BVCs), established to control fishing activities on a particular beach; members were elected by villagers living proximate to beaches throughout Malawi's lakes [66]. Under FCMA, BVCs were empowered to enact and enforce regulations, including technical restrictions, closed seasons, closed areas, and gear licensing. BVCs were also expected to maintain records of registered fishing vessels, gears, gear owners, and fish workers [67].

The problem was that this transfer of regulatory powers and seeming willingness to decentralise management authority did not translate into action. Past research has pointed to failures arising from reliance on funding from external agencies and donors [24], the reluctance of government authorities to relinquish power and responsibility [23], the lack of support provided by the DoF [25,67], poor integration of BVCs into existing governmental structures [64], the failure of BVCs to represent fishers' interest [64]; and discriminatory enforcement on small-scale fishers paired with ineffective punitive measures [68]. One of the central issues, however, was that BVCs were designed at a government level, which assumed homogeneity amongst fishing communities while neglecting customary institutions and protocols [63,69].

As Hara and Njaya have emphasised, this meant there was little consideration of the critical role that village heads would play within BVCs, undermining their legitimacy. Village heads were closely consulted and included in forming BVCs and regulations, so their patronage has proven crucial for BVC-led activities. Where it is felt that BVCs are infringing on customary authority or where the interests of village heads and BVCs diverge, village heads have proven obstructive. Without regard for existing institutional structures and power realities, the imposition of externally driven co-management blueprints has resulted in greater complexity and pluralities within management structures without effectively addressing the problems of resources, legitimacy, power imbalances, and uneven enforcement [29,67].

The shift towards participatory management has resulted in what Bene et al. refer to as a “deconcentrated” system of power, shifting governmental centres of power and regulation without empowering end users as intended. Part of the reason for this is that co-management has effectively worked to transfer monitoring and enforcement activities to lower-level representatives who are ultimately reliant on and accountable to the government for resources and support, meaning that governments maintain control over decision-making and agenda-setting [64]. Fisherfolk are expected to adhere to government regulations that they receive only limited information about and have no real capacity to influence. BVCs are expected to enforce such regulations—alongside locally imposed initiatives—with limited governmental backing or resources. Consequently, enforcement, compliance, and regulatory legitimacy remain fragmented and dependent on local contexts and leadership. Meanwhile, there has been the continued adoption,

adaptation, and innovation of new fishing gears and methods (such as light fishing) that are prohibited but that continue to be employed throughout the lake, especially as catches using legal gears decrease due to ecological change and ineffective management [29,67,69–71].

National policies may have adopted the language of participatory management and instituted new participatory frameworks, but the emphasis on governmental resources remains concentrated on the southern tilapia fisheries and the annual closed season. Within this approach, there continues to be no capacity or willingness to impose regulations on overfishing efforts, meaning that even tilapia fisheries are only partially managed according to conventional fisheries management approaches. Meanwhile, a lack of meaningful engagement with and support of customary institutions and contexts has remained. This has resulted in institutional barriers within co-management implementation while side-lining, neglecting, and potentially undermining a crucial source of potential knowledge and partnership [68,70].

#### 4. Fisheries management at Mbenji Island

##### 4.1. The development of the Mbenji Island Fisheries Regime

The colonial government was not the only authority responding to concerns of intensifying fishing efforts from the 1930s onwards. At Mbenji Island, fishing activities had been well established since at least the 1860s (Fig. 4). However, it was not until the arrival of two prominent fishers from Likoma Island, Kalemba Assani and Mr Kampunga, that a structured fisheries management regime was instituted [72]. These fishers arrived at Mbenji in the 1950s after failing to secure fishing space in the southeast. At Mbenji, the experienced fishers noted the abundance of utaka and other species in high demand in the commercial urban centres of Blantyre and Lilongwe. Applying to Senior Chief Makanjira (then Msosa), the senior authority in the region, the two fishers requested permission to settle at Mbenji [73]. Makanjira agreed, expecting to extract tribute from the commercial operations [74,75]. The successes of Assani and Kampunga, who experienced significant catches using gears made from manufactured and imported twine, encouraged the arrival of more migrant fishers [74]. Increased fishing efforts, particularly when paired with more efficient gear, encouraged Makanjira to establish regulations out of concern for fish stocks and fishers' safety and social harmony.

On the preservation of fish stocks, the principal regulation introduced was an annual closing of Mbenji Island to any form of fishing or human settlement during the rainy season between December and March/April. This aligned with established knowledge that this was also the breeding season of utaka, so it prohibited the catch of smaller fish and allowed multiple breedings without the impact of intensive fishing [25,75,76]. During the open season, regulations were established over time, including bans on unsustainable fishing methods, particularly light fishing and using gear with small mesh sizes [24].

Technical restrictions were paired with social restrictions to control settlement and human activity. Makanjira ordered that Mbenji Island be uninhabited during the rainy season to enforce the closed season best. This coincided with the main agricultural season in the villages of nearby Salima, ensuring locally based fishers instead concentrated on agricultural production. Migrant fishers had to concentrate their efforts elsewhere, returning to Mbenji during the open season and establishing temporary makeshift camps. Alongside ensuring better enforcement of the closed season, this was a means to protect fishers during the rainy season when the island experiences violent thunderstorms and unstable water levels, making human settlement and fishing particularly hazardous [24,25].

During the open season, strict prohibitions were established surrounding alcohol, *chamba* (Indian hemp), and gambling. Other regulations focused on protecting fishers from spirits who oversee the island, lake, and fisheries. Tradition holds that women found at Mbenji would often disappear mysteriously, and so did those people who attempted to

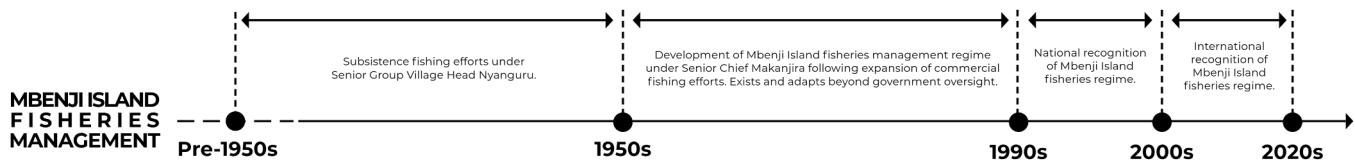


Fig. 4. Timeline of Mbenji Island Fisheries Management Regime.

kill snakes (who were related to the spirits). Consequently, prohibitions were placed on the killing of certain animals and women were not permitted to travel there [76]. Collectively, these regulations were instituted to maintain social and spiritual harmony amongst fishers to ensure better order and compliance on the island. Rule violators are warned and charged penalties for breaking the rules. More serious offences can result in suspension and even banishment. Such violations are also seen to incur spiritual punishment through a loss of fish, hauntings by snakes and ghosts, and lightning strikes; the mysterious disappearance of violators has reinforced these beliefs over time [25,77].

Ceremonial events have been established to mark the season's opening and closing, review and share knowledge of fishing efforts and yields, offer sacrifices, mark regulatory achievements, and advocate for their continuance. These ceremonies are funded by proceeds from the tributes and penalties collected from rule violators so that community members can see how the fees generated through the regulations are used to continue enforcement while funding ceremonial feasting and festivities for the community. During the ceremonies, rule violators are also named, and their convictions are made public, adding further social repercussions for offenders [75].

There was no instant compliance when the regulations were implemented. However, violations gradually dwindled as regulations became better enforced and offending fishers faced eviction. Beliefs in ghosts on the island and the mysterious disappearance of rule breakers, many of whom presumably continued to fish during the hazardous rainy season, aided in this growing compliance. Most importantly, fishers experienced bumper catches during reopening, leading them to appreciate the wisdom of the closed season through the tangible benefits reaped. During the closed season, those fishers who did not turn to agriculture relocated to other areas that remained open to fishing [76,78]. Crucially, fishing was also permitted in the shallower parts of the lake a few kilometres offshore from Chikombe, as the closed season around Mbenji is regulated by water depth. The lake area surrounding Mbenji deepens rapidly before becoming shallow again; the closed season is only applicable in areas bounded by a line about 100 m deep where the water colour is markedly different. While the waters near Chikombe are not as productive, their exclusion from the closed area enables vulnerable villagers—particularly those without more specialised fishing equipment and expertise—to continue fishing, which is crucial to their livelihoods [25, 76,78]. This ensures that the closed season remains rooted in the needs of villagers who fall under Makanjira's domain. Today, there is evidence that negotiated access continues, as there have been occurrences where fishers have lobbied Makanjira to permit fishing for a limited time during the closed season in periods of special hardship [79].

As the fishing industry grew and enforcement difficulties arose, Makanjira instituted new committees to support the implementation and enforcement of regulations. The main committee consists of group village heads chaired by Senior Group Village Head Nyanguru, who is responsible for enforcing rules among fishers, especially patrolling Mbenji Island during the closed season. Subcommittees have also been established to oversee the day-to-day operation of fishers. Before the beginning of each fishing season, fishers must submit their gear to this committee, which checks whether it meets the required specifications [25,30,80].

Prior to the 1990s, the Mbenji Island regime operated beyond the oversight of the colonial and independent governments. Only with the passage of FCMA and the establishment of BVCs did the regulations at

Mbenji come to be formally acknowledged within national governance. Yet, while Mbenji became part of the newly created Chikombe BVC, the regime continues to operate semi-autonomously. As occurred elsewhere, creating the Chikombe BVC could have created tension between existing leadership structures (traditional authorities) and BVC membership (elected villagers). However, the Chikombe BVC has been adapted to suit the existing institutions and practices at Mbenji, in which the Mbenji leadership exert power over the BVC. In this arrangement, co-management is essentially informative, in which Makanjira and the Mbenji Island committees exert more authority than the government, informing the government of their activities and decisions. In contrast, the government acts mainly in a supportive role [6].

Although the BVC system has not negatively impacted the Mbenji Island regime, this has brought only limited support in practice. For example, the DoF had provided a boat with an outboard engine—now out of order—to enhance lake patrols during the closed season and supported improving facilities at the landing site [25]. However, the DoF has also remained reluctant to support gear confiscations for fear of being sued by gear owners; when the Mbenji Island committee confiscates gear, they often request fisheries officials to use their mandate to burn them, but they have been hesitant. As such, there remains some ambiguity over the extent of the powers of Mbenji Island committees to confiscate and destroy gear, especially gear not covered by government regulations [81]. Nevertheless, the Mbenji Island committees continue to enforce the rules they have set with varying governmental support.

Since the 1990s, Makanjira has worked to disseminate news of the regime's positive impacts. Nationally, he has been central to establishing a network of fisheries leaders, whom he has negotiated with in attempts to reduce fishing pressure and rule violations by migrant fishers. Through this network, traditional authorities throughout the lake have also been invited to the annual ceremonies to learn about the regime and its successes. The lessons to be learned from Mbenji Island are not just restricted to national recognition, however, with Makanjira having travelled to Japan, Kenya, South Africa, Thailand, and Zimbabwe through partnerships with academics and NGOs over the past two decades to present on the regime and to learn from success stories within small-scale fisheries in these countries too [25,75]. Meanwhile, the DoF has celebrated Mbenji Island fisheries as a model for community-led management, with Makanjira recognised as a leading voice within small-scale fisheries [81].

The observed long-term successes at Mbenji Island have reinforced the legitimacy and efficacy of management rules amongst participants. Consequently, villagers have developed a strong and proud attachment to the fishery. This long-term success has only been possible through strong leadership, strict and sustained enforcement, and effective communication. Despite national and international recognition, however, there remain questions about the status of fish stocks at Mbenji Island and the factors influencing it due to the lack of recorded statistical data. Such questions need to be answered to help inform the management committees' long-term decisions [25,30].

#### 4.2. Assessing Utaka Stocks at Mbenji Island and Nearby Government-managed Waters

Due to financial limitations, the DoF are not currently recording catch and effort data at Mbenji Island. This means that it is impossible to evaluate fishing intensity and impact over the long term, leading to an



important gap in the data available to inform local management decisions. This is similar to other customary, community-based, and co-managed fisheries regimes, in which analysis has focused predominantly on socio-economic outcomes without pairing them with ecological outcomes [82,83]. As a first step to rectifying this, it is crucial to use the available data to establish whether the management regime at Mbenji Island is responsible for the healthier fish stocks observed there by fishers in comparison to nearby waters or if this is a result of specific environmental conditions unique to the region. Without sustained data surrounding fish catches, our analysis of fish stocks has instead relied on analysis of the length-weight ratio paired with water quality analysis to comparatively assess the health of fish at Mbenji Island and in the surrounding fishing strata at Nkhotakota South, Domira Bay, and Senga Bay (Fig. 1).

A total of 462 utaka specimens—the principal species targeted by fishers at Mbenji Island and the surrounding beaches—were measured and weighed in September 2022. Across the specimens, total length and body weight ranged from 7.0 to 21.7 cm and 16.8–101.3 g, respectively (Table 1). While fish lengths did not differ significantly across sampling sites, there were considerable differences in body weight (Table 2). This means that changes in length were not accompanied by equal changes in body weight, indicating different growth behaviour across the strata. Based on b-values in the growth equation  $W = aL^b$ , Nkhotakota South showed negative allometric growth across specimens, implying increased small-sized fish and potential overfishing of larger fish (Fig. 5) [84]. For fish caught at Mbenji Island, however, there was a positive allometric growth, meaning that there was a more significant change in weight per unit change in length. This is a typical growth behaviour in areas with optimal growing conditions where large fish are numerous and are not overfished [46]. Fish from Senga Bay also showed negative allometric growth as their b-values differed significantly from 3 ( $p = 0.02$ ). In contrast, fish from Domira Bay were close to 3 ( $p = 0.24$ ), indicating isometric growth and suggesting that this fishing area was likely receiving a spillover of healthy fish stocks from Mbenji Island [85].

These findings align with fishers' observations of healthier and stouter fish at Mbenji Island. To provide indication whether this is a result of successful management rather than distinctive environmental conditions, water quality was assessed across each sample site. Water quality plays a substantial role in influencing fish production and the health status of fish stocks, so water quality assessment is crucial to any study to understand the spatial or temporal dynamics of fish productivity [86]. Furthermore, as utaka are zooplankton-feeding cichlids, they rely on zooplankton biomass, which in turn depends on phytoplankton.

**Table 1**

Sampling sites, number of examined specimens, total length and weight data of the studied populations *Copadichromis* spp. (Utaka). Stratum 5.1: Nkhotakota south; Stratum 4.2: Domira Bay; Stratum 4.1: Senga Bay.

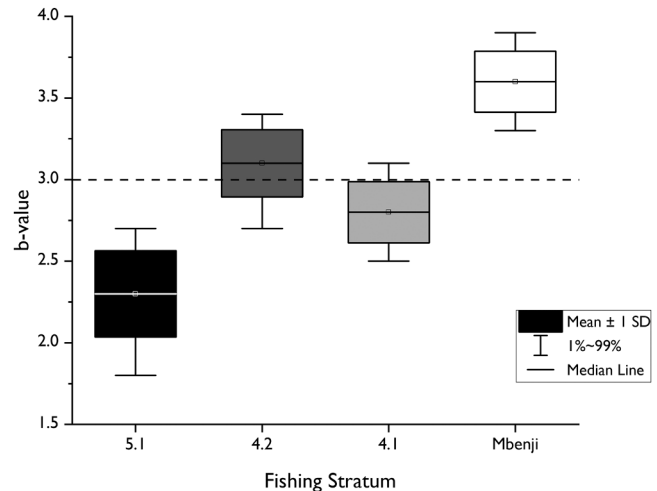
Stratum	N	Total length (cm)		Body weight (g)			
		Min	Max	Min	Max	Observed	Calculated <sup>a</sup>
5.1	154	7.0	17.0	4.3	34.8	16.8	18.2
4.2	103	8.0	18.0	5.9	71.7	31.8	26.8
4.1	154	7.0	19.2	7.0	201.0	39.0	32.5
Mbenji	51	8.0	21.7	11.5	228.5	101.3	83.8

<sup>a</sup> Once parameters *a* and *b* are known for a fish of particular length and species, it is possible to calculate the expected weight of a fish of the same species group. The expected or calculated weight may differ from the observed or actual weight depending on the b-value. When b-value is significantly smaller than 3 (as in negative allometry), the observed weight will be smaller than the calculated weight, and the fish will be slimmer. The opposite happens when b-value is significantly bigger than 3 (i.e. observed weight is larger, as in positive allometry). When b-values are not significantly different from the ideal value of 3 (as in isometry), observed and calculated weights may not significantly differ (i.e. the differences, if any, are not statistically significant after running the statistical tests).

**Table 2**

Analysis of variance (ANOVA, *F*-value and *p*-value) of the means ( $\pm$  SD) of total length (*L*, in cm) and body weight (*W*, in g) of the studied populations *Copadichromis* spp (Utaka). Values with the same superscript in a row are not significantly different at  $\alpha = 0.05$ .

—	Unit	—				<i>F</i> -value	<i>p</i> -value
		5.1	4.2	4.1	Mbenji		
L	cm	12.0 $\pm$ 3.1	12.2 $\pm$ 2.8	11.9 $\pm$ 2.8	12.7 $\pm$ 2.7	1.135	0.334
W	g	16.8 $\pm$ 9.5 <sup>a</sup>	31.8 $\pm$ 20.8 <sup>b</sup>	39.0 $\pm$ 28.2 <sup>b</sup>	101.3 $\pm$ 64.8 <sup>c</sup>	108.8	0.000



**Fig. 5.** Box and whisker plots of b-values of the growth equation  $W = aL^b$  of *Copadichromis* spp (Utaka) populations in the various fishing strata of central Lake Malawi, suggesting negative allometric growth in Nkhotakota south, positive allometric growth in Mbenji island, and isometric growth in Domira Bay and Senga Bay.

Phytoplankton is influenced by the level of nutrients, particularly soluble reactive phosphorus (SRP), emphasising the link between water quality and utaka production [87]. Notably, none of the water quality parameters investigated in the study, including SRP and phytoplankton biomass, differed significantly between the various fishing strata (Table 3). This offers some evidence that the variations in utaka health across the sites analysed is not linked to environmental differences.

While unable to evaluate all environmental variations that might affect utaka health, our findings of variable health status of utaka across fishing strata that feature consistent water quality conditions provides further weight to observations supporting the considerable success of the Mbenji Island management regime in harnessing healthy fish stocks. As the annual closed season runs for the whole breeding season and constitutes a complete ban on fishing activities, utaka have been able to breed and grow to larger sizes before being harvested. Under government regulation, a similar closed season focused on utaka fisheries does not occur in the surrounding waters, as the government-enforced closed season focuses on chambo fisheries during November and December. While gear restrictions are similar across the two regimes, enforcement also appears stricter at Mbenji Island [88].

Although these findings support the assessments of sustainable fisheries management at Mbenji Island, the lack of catch and effort data makes further comparison difficult, especially as it is impossible to calculate MSY, which government management focuses on. Most importantly, catch and effort data would provide a significant additional source of information to advise future management decisions being made by the Mbenji Fisheries Committees, particularly if fishing

**Table 3**

Water quality parameters (ANOVA, *F*-values, and mean  $\pm$  SD) in the sampling strata of Mbenji and surrounding waters. Temp: temperature; DO: dissolved oxygen; Cs: specific conductivity;  $Z_{SD}$ : Secchi disk visibility; TDS: total dissolved solids; SRP: soluble reactive phosphorus; Chl-a: chlorophyll-a. N: number of observations.

	Unit	N	Fishing strata				<i>F</i> -value	<i>p</i> -value
			5.1	4.2	4.1	Mbenji		
Temp	°C	82	24.3 $\pm$ 0.4	24.5 $\pm$ 0.3	24.2 $\pm$ 0.3	24.4 $\pm$ 0.2	1.76	0.15
DO	mg L <sup>-1</sup>	82	7.4 $\pm$ 0.1	8.2 $\pm$ 0.2	8.3 $\pm$ 0.4	8.5 $\pm$ 0.6	1.01	0.09
$Z_{SD}$	M	30	6.2 $\pm$ 2.4	4.8 $\pm$ 1.5	5.8 $\pm$ 1.7	4.5 $\pm$ 2.4	1.14	0.12
pH	-	82	8.3 $\pm$ 0.1	8.4 $\pm$ 0.2	8.2 $\pm$ 0.2	8.4 $\pm$ 0.1	1.20	0.12
Cs	$\mu$ S cm <sup>-1</sup>	82	243.6 $\pm$ 4.8	245.8 $\pm$ 7.1	244.3 $\pm$ 9.2	246.3 $\pm$ 8.5	3.75	0.17
TDS	g L <sup>-1</sup>	82	0.26 $\pm$ 0.1	0.28 $\pm$ 0.1	0.27 $\pm$ 0.1	0.29 $\pm$ 0.1	1.03	0.09
SRP	$\mu$ mol L <sup>-1</sup>	30	2.7 $\pm$ 0.3	3.8 $\pm$ 1.1	2.8 $\pm$ 1.5	4.5 $\pm$ 1.0	2.28	0.10
Chl-a	$\mu$ g L <sup>-1</sup>	30	1.2 $\pm$ 0.4	1.4 $\pm$ 0.3	1.7 $\pm$ 0.5	1.8 $\pm$ 0.6	2.19	0.12

pressure continues to intensify during the open season. As Makanjira has already seen the need to negotiate with surrounding lakeshore leaders to reduce fishing pressure during the open season, long-term catch and effort data would offer a substantial aid in helping to inform any such future negotiations and restrictions.

## 5. Discussion

In this section, we consider the lessons that can be drawn from our comparative historical assessment of these two distinctive fisheries management regimes in Lake Malawi. We are particularly interested in what this can tell us about the variables shaping management outcomes across these contexts and, especially, how the colonial context has influenced and impacted these outcomes. The principal points for discussion that arose from our comparative analysis surround: (i) the question of legitimacy; (ii) the connections between management systems; (iii) the role of science in decision making; and (iv) the significance of historical analysis to understand current management contexts.

In highlighting each of these issues, we align with research that seeks to move beyond panaceas within fisheries management to instead emphasise the importance of highly localised contexts, histories, and variables in shaping management outcomes [89,90]. Our concentrated analysis on Lake Malawi and Mbenji Island provides an illustrative case study, but we do not presume that this is indicative of all such entanglements between different management regimes that arose within colonial contexts or that the lessons learned here can (or should) be replicated elsewhere. On the contrary, we argue that the lessons from these histories, and especially the history of success at Mbenji Island, is not that these structures can or should be replicated in other contexts. This would only act to once again ignore the distinctive cultural, environmental, political, and social contexts that shape the realities and outcomes of management regimes. Instead, we want to emphasise some of the variables that shape this success, which is not only linked to the origins, principles, and long-term enforcement at Mbenji Island but also how this regime interacts with and has been shaped by other management regimes and external factors over time.

To apply these lessons more globally, we would stress that the significance here is not about the specific structures or principles of the particular fisheries management regimes studied—although these are of course important—but, instead, it is to understand the comparable issues and challenges that these structures and principles have or have not been able to overcome. As we have shown here, comparative historical analysis of the origins, outcomes, and legacies of entangled but distinctive management regimes offers one insightful approach to investigate these issues.

### 5.1. Addressing the question of legitimacy

When comparing the parallel histories of centralised fisheries governance in Lake Malawi and the chief-led fisheries management regime centred on Mbenji Island, one of the starkest differences relates to the question of legitimacy. From its colonial origins, centralised

fisheries governance in Lake Malawi has centred on top-down and externally influenced blueprints, which seeks to derive its legitimacy solely through legislative assumptions and the authority ascribed by governmental officers in technical solutions. Such blueprints have effectively neglected existing institutions and power structures beyond the improbable expectations that local leaders would acquiesce to centralising agendas and regulatory regimes. This has led to a recurring cycle of uneven and unequal enforcement, outbreaks of violence between fishers and government enforcers, ineffective consultations and negotiations, and elite capture or obstruction of participatory structures. This has fundamentally undermined the legitimacy of government-led management initiatives, even those aimed at greater participation and empowerment, especially as this history of tension, opposition, and imposition is inscribed in user-enforcer relations [23,24,64,67,81,91].

Rather than claiming legitimacy through scientific knowledge or newly created structures, governance at Mbenji Island has achieved legitimacy by basing this within existing power structures and institutional relations alongside spiritual beliefs and knowledge of breeding seasons. Legitimacy has then been maintained through persistent, strict, and equal enforcement of regulations, which is carried out by established village authorities. Annual ceremonies ensure that regulations are regularly communicated and celebrated while providing space for communication and transparency. The focus on a protected area also provides a well-defined geographic boundary in which enforcement is concentrated, while the complete closure to all fishing makes effective enforcement more viable [9]. This has led to an acceptance of regulations and collective pride and celebration among fisheries participants [25,92-94]. One aspect that should not be overlooked is the straightforward needs-based approach to the Mbenji Island fishery, in which fishing grounds near Chikombe remain open for the most vulnerable to continue fishing efforts during closed seasons. Negotiations have also occurred in which Makanjira has permitted fishers to fish for a limited time during the closed season. Crucially, such negotiations occur within the existing management structures, so negotiation is a feature of rather than separate from the governance regime [20,73].

One of the key lessons from charting these histories, therefore, is how governance legitimacy at Mbenji Island has been established and sustained by embedding technical solutions within other essential elements—institutional, political, spiritual, social, and economical. As Jentoft and Chuenpagdee argue, “The solution to wicked problems and hence, the governability of the system-to-be-governed, is not to be found in the management tool box. They are not technical first and foremost, but institutional, political, even philosophical” [2]. It is through the recognition and embeddedness of this plurality of factors within the management approaches at Mbenji Island that has led to the regime’s sustained legitimacy and accomplishments over the long term.

These findings at Mbenji Island align with similar findings across studies of effectual customary, community-based, or co-managed natural resource management, emphasising the importance of integrated social, political, and resource-related principles. Gutiérrez et al. found that successful fisheries management resulted from community leadership engagement, strong social cohesion, individual or community

quotas, and community-based protected areas. Most important is leadership, in which the legitimacy of governance is embodied within community leaders guided by collective interests and committed to resource management to sustain community livelihoods [9]. Senior Chief Makanjira offers this strong and committed leadership at Mbenji Island; during the opening ceremony in 2023, he declared, “We have set these strict restrictions to preserve Mbenji fisheries for the future generation. We will accept no violations” [95].

### 5.2. Management regimes do not operate in a vacuum

The government- and chief-led fisheries management regimes we have charted in Lake Malawi developed concurrently in the mid-twentieth century in response to lakewide pressures, particularly the intensification of fishing efforts due to external commercial opportunities, new fishing gear, and the movement of fishers to different fishing grounds throughout the lake. Although the two regimes were embedded in distinctive ideologies and structures, fishers (and fish) moved across the intangible watery boundaries that they constructed so that the two regimes were intersected even when there was no effective dialogue between management authorities. When it comes to addressing the continuing legacies of colonial management regimes, our learnings from Lake Malawi suggest that these connections across different management regimes need to be better acknowledged and addressed, understanding how local and external factors shape the successes and failures of different management regimes [6,17,95].

One clear example of this from the history of Mbenji Island is the fact that the regime started as fishers migrated to Mbenji in response to declining fishing opportunities in the south-east of the lake. This process of migration has continued to this day when fishers from throughout the lake voyage to Mbenji during the open season and migrate to other waters to continue fishing during the closed season. By doing so, fishers take advantage of the laxity of regulations in other waters. This allows them to continue making a livelihood while alleviating pressure on Mbenji stocks [63,69,96,97]. Given the limited capacity for enforcement at Mbenji, especially without a vessel with an outboard engine, a lack of such alternative fishing grounds could encourage greater non-compliance and ultimately undermine the regime’s success [91]. As this suggests, no management regime exists in a vacuum, but rather, the successes of fishing activities and regulations at Mbenji have been shaped over the long-term by the fishing pressures and regulations elsewhere. Senior Chief Makanjira and the Mbenji Fisheries Committees have recognised this, leading Makanjira to consult with other Traditional Authorities to alleviate fishing pressure and rule violations by fishers migrating from communities under their authority. At the same time, through this engagement, he is also advocating for more sustainable management elsewhere, encouraging and creating the space for lakeshore leaders to learn from Mbenji [25,75].

This speaks again to the importance of leadership, this time to reach across management divides. However, as the history of centralised management in Lake Malawi has shown and as was common throughout colonial regimes, indigenous leadership structures were either neglected or co-opted to varying degrees of success by colonial authorities. This then continued under independent governments. Although significant literature has focused on elite capture within fisheries management, occurring when traditional authorities or other elites mobilise their influence to exert control over decentralising initiatives, continuing to ignore existing power structures and institutional realities is not a feasible response. Without this engagement, leaders have frequently proven to be obstructive to different management arrangements [23,64,92,69,98].

This is well borne out in the history of co-management in Malawi, which was implemented without regard for existing leadership structures. This has not meant that the influence of traditional leaders has declined. Instead, the engagement of traditional leaders has often determined the success of co-management regimes. Working within

these existing structures while creating space for downward accountability—such as through new institutions created through engagement and negotiation with traditional leaders—may be seen as a “clumsy solution” that does not align with idealised co-management principles. However, it is essential, given the legitimacy crisis that continues to burden centralised governance within small-scale fisheries [64,99]. Again, the accomplishments at Mbenji Island can attest to this, given the central role and leadership of Senior Chief Makanjira, not just in maintaining and promoting the regime at Mbenji Island, but through his negotiations and advocacy work with other Traditional Authorities.

With this in mind, our findings reflect the importance of scaling up capacity for peer-to-peer engagement by working across existing leadership and institutional structures (government-led, co-managed, customary, community-based) while drawing from lived management experiences to better inform and influence decision-making across the scale. After all, the successes at Mbenji have been underpinned by local networks of negotiation, knowledge sharing, and collaboration across management regimes (i.e. across different ‘types’ of co-management arrangements) [27,28,71,81]. Moving away from external blueprints and agenda setting based on incomplete data, governmental and international funding surrounding small-scale fisheries would be better targeted at supporting long-term engagement and knowledge sharing between fisheries leaders and participants, providing sustained backing through tangible resources (and not just legislative provisions) to enable communities to implement decisions made based on lessons learned and shared.

### 5.3. Science to support decision-making by the lakeshore

Our pairing of indicative but imperfect environmental data with oral histories and archival research acknowledges science as “one input among many”, recognising the “useful technical insight and ecological reality checks” that scientific analysis provides [100]. We agree with other scholars, however, who have stressed that such data cannot explain or provide the basis for successful management regimes without engagement with the multiplicity of other variables shaping fishing activities and management outcomes. Nevertheless, scientific data is important to support decision making and define management objectives based on ecosystem health and trends, but such research has to be co-designed with community-based leadership to address their data needs and aspirations [93,100]. This requires that resources be made available by governmental and external organisations to support capacity building with the aim of long-term and sustained monitoring, pairing participants’ observations, goals, needs, and practices with scientific assessment and analysis.

At Mbenji Island, the DoF recognises the significance of successes achieved by the management regime. Yet, there continues to be a lack of sustained scientific data surrounding fish stocks and ecosystem health as this is not being monitored by the DoF or Mbenji Fisheries Committees, who lack the resources to do so. Despite co-management arrangements, in which the DoF recognises the legitimacy of the Mbenji fisheries regime, monitoring by the DoF continues to be fragmented and centred on waters that they directly govern. While our analysis of fish stocks aligns with fishers’ observations of healthier utaka stocks at Mbenji, this provides only an imperfect snapshot of current conditions that cannot inform future management decisions. There remains a critical need to support the Mbenji Fisheries Committees in generating sustained scientific data that can be paired with their extensive experiential knowledge to inform future decisions and solutions [101].

This requires a significant shift in approaches towards co-management that enables stakeholders to determine and, most significantly, address data gaps that can support their decisions. This aligns with calls to focus on process rather than outcomes when bridging knowledge systems, in which different types of knowledge can co-exist on an equal footing to inform decisions collectively [102–104]. Any such pairing of place-based knowledge with ecosystem monitoring

requires local decision-makers to be active and leading participants in the design of ecosystem monitoring processes and structures. This includes shaping the agenda of what data is needed (i.e. what science would be helpful) and co-designing the processes through which this data is gathered and integrated into decision-making to respect existing processes, institutions, and practices [4,64,93,105].

As is common elsewhere, co-management in Lake Malawi has primarily focused on engaging fishers in harvest management, and making and enforcing decisions surrounding fishing practices. As Puley and Charles recently evaluated, this has meant fishers' participation becomes concentrated in only one part of management, despite fishers' desire to be involved across the management spectrum. There is a lack of engagement in direction setting, planning, and policy development, which remains dominated by top-down decisions dependent on government assessments and objectives [4]. This relates to where different pieces of knowledge are included or empowered too. For example, while BVCs in Malawi are intended to enable decisions based on fishers' ecological and experiential knowledge, the design of these institutions failed to engage with key stakeholders surrounding the social, cultural, institutional, spiritual, and economic contexts shaping fisheries activities [23,24,92,67,68,75]. This means practical knowledge is recognised as essential to inform harvest management but only through institutions that stakeholders were not involved in designing. In practice, this has meant that management goals are focused on conventional outcomes determined at the national level (i.e. sustainable yield and maximised output). There remains a lack of capacity for stakeholders to define management objectives, design appropriate context-specific management structures, and determine the knowledge required to inform management decisions [4,92].

In Lake Malawi and beyond, such data is not only crucial to advising the management decisions surrounding specific fisheries but also to offer insight into where, when, and why certain management regimes are achieving desired outcomes over others. Enabling small-scale fisheries leaders and participants to access monitoring tools and data offers the potential to support long-term and more effective local and national monitoring. This would allow them to become true partners in all aspects of fisheries management while supporting the interpretation and integration of collective data across knowledge systems to support decisions by the lakeshore and throughout the lake [24,26,106,107].

#### 5.4. Fishing the past to address the future

The late colonial period proved an important watershed as fishing operations expanded and transformed in response to ecological changes, increased competition, technological innovations, and changing market opportunities. Such developments were not limited to colonial contexts, but it was within colonised regions where assumptions surrounding custodianship and control over watery environments were more starkly and rapidly imposed through the construction of legal scaffolding based on scientific management over delineated fishing boundaries. These centralised regimes were not only increasingly disconnected from but also regularly challenged the everyday management of fisheries according to local customs and protocols. Under the guise of scientific management, deep-rooted assumptions of technical superiority based on racialised binaries became embedded within colonial-imposed management frameworks that entrenched a faith in and reliance on scientific data and modelling without due regard for political, socio-cultural, and economic contexts [21,54,108–112].

As we have shown with regards to Lake Malawi, government-led management was only ever one of a plurality of management regimes influencing fishing realities. The history of Mbenji Island exemplifies how fishing communities and leaders enacted and adapted their own responses to increased fishing pressures in the same period. We have to pay attention to these parallel and connected histories, and how these histories transcend periodic binaries between colonial and independent rule, if we are to understand the extent to which colonial management

tools and philosophies continue to haunt centralised management regimes to the detriment of effective relations across management systems [20,21,113].

With unrealistic expectations of control over environments and diverse resource users paired with a lack of capacity and legitimacy to enact more than a modicum of enforcement, particularly over small-scale fisheries, centralised management has proven unable to effectively adapt and adjust to changing commercial, technological, and environmental contexts over time. This lack of flexibility is also seen in the continuing struggle to incorporate place-based observations, objectives, and values despite shifts towards participatory management [21, 27,104]. This has not only impacted the capacity of fishing communities to shape management objectives but has also limited the ability of government agencies to respond to context-specific challenges [2,106]. In Lake Malawi, as elsewhere, this has only reinforced negative and often violent relations between resource users and governmental enforcers over time [91].

The continuing predilection to characterise resource users as 'traditional' or 'non-modern' is also evident in idealised perspectives on the relations between resource users and environments, which more recently has tended to construct certain resource users as harmonious stewards of environments, ignoring the complexity of their socio-ecological relations [114–116]. The management regime at Mbenji Island was established less than 100 years ago—making it only as historical as the centralised regime—in response to many concerns that included but were not exclusively centred on maintaining the long-term sustainability of utaka stocks. Rather than resulting from an intrinsic affinity to live in environmental harmony, this was pragmatic and proactive stewardship of a distinctly economic system responding to contemporary concerns and developments [117]. This has required consistent enforcement and persistent leadership to deter unsustainable fishing, maintain livelihoods, and sustain ecosystem health.

We must avoid the continual reproduction of homogenising and harmful binaries that align with colonial rhetoric of 'modern' and 'traditional' ways of knowing and being. Instead, we need to consider the particular histories and contexts in which the activities, knowledge, technologies, and institutions of diverse groups of resource users have developed, adapted, and transformed over time. This includes the impact of centralising governance regimes and how far this has transformed the capacity of resource users and stakeholders to influence the exploitation and management of natural resources. This approach recognises the impossibility of reversing historical changes, including the impact of prior management tools. It focuses instead on understanding the contexts in which current challenges and obstructions have emerged [2,21,109,112,118]. This includes more recent shifts towards co-management, recognising this as part of an extended spectrum of idealised blueprints ill-suited to specific contexts, particularly where these have ignored social, cultural, and institutional diversity [69,92].

Taking a longer view of the contexts in which scientific and environmental knowledge was produced offers an opportunity to consider how this shaped what was learned and what was not learned about the socio-natural world. By tracing the roots and trajectories of management regimes, we can track the types of knowledge deemed most valuable to centralising structures and how this enabled certain forms of knowledge to circulate and become more dominant than others [116,119–122]. As Oreskes puts it, "Every history of science is a history both of knowledge produced and of ignorance sustained" [120]. We would add that this is also a history of knowledge ignored or neglected, particularly as colonial fisheries management was established at the height of rhetoric that constructed non-European fishers as 'traditional' and 'conservative.' This encouraged perceptions by colonial officers and governors that fishing communities lacked useful insight into management objectives despite scientists' recognition of their environmental knowledge [31, 115,122,123]. This also ignored the active experimentation, adaptation, and emerging hybridity of resource users' methods, organisation, and management approaches in reality [35,36,39].

Aligning with Silver et al.'s recommendations, addressing this history requires tracing and engaging with entrenched assumptions about the appropriate scale of research, management, and objectives; the appropriate management authorities and institutions; and the appropriate indicators of success. This is only possible through acceptance of the intricacies and uncertainties of factors shaping fisheries management and practices past, present, and future. We must work with rather than ignore such complexity if we are to learn from past failures centred on unworkable technical fixes and rigid outcomes to innovate new pathways centred on flexible processes and capacity building instead [21,124–127].

## 6. Conclusion

Compared to the under-resourced and patchy fisheries management regime led by the Government of Malawi, the long-term successes and preservation of Mbenji Island fisheries has resulted from the collective elements of the customary regime and not just the technical principles and ecological knowledge underpinning it. This has combined targeted technical regulations with robust leadership, proactive enforcement, sustained ecological and economic benefits, transparent processes, and embeddedness in existing institutions and beliefs.

While this is seen as a model for small-scale fisheries management in Lake Malawi (and beyond), we need to be careful not to replicate past mistakes by thinking that these technical principles and the institutions that support them can be simply isolated and applied elsewhere. Not only would such an approach face a similar crisis of legitimacy as has been seen across other externally-led co-management schemes, but this could also work to undermine the long-term benefits and legitimacy of the Mbenji Island regime. With this in mind, we need to pay closer attention to how the developments within one management programme can reverberate across other management regimes with significant consequences. Recognising and working with this entanglement can unlock new ways of thinking about and engaging with diverse approaches to fisheries management. Rather than concentrating solely on the often-uncertain boundaries between customary, centralised, and co-management regimes, we need to understand how these regimes have developed and adapted alongside each other while directly and indirectly influencing and impacting one another over time.

Such an approach requires deep historical analysis of past and present fisheries management approaches. Without regard for this history, it is all too common for governors and their sponsors to fall into the trap of replicating and reproducing blueprint-centred one-size-fits-all approaches, even where these aim at greater decentralisation and empowerment of resource users. This aligns with calls to move beyond a “panacea mindset” rooted in conceptual narratives, power disconnects, and heuristics and biases [90]. As the history charted here indicates, fisheries management regimes with origins in colonial contexts were particularly susceptible to institutionalising such characteristics, particularly as these entrenched racialised perspectives that neglected existing management approaches and structures while placing abject faith in technical fixes.

One of the enduring legacies of this is how centralised regimes have regularly failed to engage or address the complex institutional, economic, and socio-ecological contexts that resource users navigate, which are shaped by past and present management approaches, whether locally or externally imposed. As Jentoft and Chuenpagdee have stressed, governors at all levels must regularly reflect that even the short-term imposition of management tools can generate long-term and enduring consequences that continue as management approaches shift to new ‘best practice’ paradigms. This is especially important as the tensions, deficiencies, and discriminations experienced within past approaches guide the reception and perceptions of future approaches amongst resource users, community leadership, and enforcement agents [2]. Considering distinctive management regimes in a comparative context rather than investigating these in isolation or through a

polarising lens offers a critical starting point to inform future fisheries management that acknowledges, learns from, and responds to this entangled history.

## Ethics statement

The primary ethical considerations arising concerned the oral histories conducted with key stakeholders surrounding the Mbenji fisheries management regime. All interviews were conducted with the voluntary, prior, and informed consent of all participants. Research projects undertaken at the University of Strathclyde that involve human participants must adhere to the University's Ethics policy. The University of Strathclyde Ethics Committee approved of our project approaches in addressing these ethical considerations. Furthermore, we received research clearance from the National Commission for Science and Technology from the Government of Malawi.

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## CRediT authorship contribution statement

**Bryson Nkhoma:** Writing – review & editing, Writing – original draft, Validation, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Elias Chirwa:** Writing – review & editing, Writing – original draft, Visualization, Validation, Resources, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **David Wilson:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Wapulumuka Mulwafu:** Writing – review & editing, Validation, Funding acquisition, Conceptualization. **Tracy Morse:** Writing – review & editing, Validation, Funding acquisition, Conceptualization. **Charles W. Knapp:** Writing – review & editing, Validation, Resources, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Milo Gough:** Writing – review & editing, Investigation, Formal analysis, Data curation.

## Declaration of Competing Interest

The authors have no competing interests to declare.

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## Data availability

Qualitative and quantitative historical data gathered is readily available on our project website. Oral history data is confidential. Data from environmental sampling made available on request.

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