



Research

## Can the center hold? Boundary actors and marginality in a community-based natural resource management network

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**ABSTRACT.** Community-based natural resource management (CBNRM) seeks to align the interests of local communities and conservation institutions. A significant challenge to this realignment is that CBNRM is often implemented in locations with colonial histories of oppression, persecution, and dispossession that have left legacies of inequity and marginalization. Social networks are one method for discerning how marginalized CBNRM actors can negotiate entitlements and agency. Through the lens of social networks, marginalization can be viewed as insufficient connectivity between the center and the periphery of the network. One possible remedy to this dysfunction are boundary actors, which are thought to be vital to connecting parts of social networks that would otherwise be poorly connected. Using social network analysis to visualize interactions between the Topnaar community and CBNRM institutional actors in Namibia's Namib-Naukluft and Dorob National Parks, we find a number of individuals well-positioned to serve as boundary actors. Although our results suggest these individuals can be effective in sharing and translating key knowledge, supporting transfers of benefits, and enabling or negotiating entitlements, we also found that social, political, institutional, and geographic constraints limited their effectiveness. In particular, the Topnaar Traditional Authority, adopted a “neo-traditional,” top-down, gatekeeper role, while their community wanted them to be more responsive and engaged in directly addressing the communities' problems. In general, the boundary actors were the focus of much discontent and conflict, in large part because of unclear pathways of accountability. We recommend the co-creation of boundary objects that specify responsibilities and thus reduce conflict and support effective boundary actors.

**Key Words:** *agency; Indigenous; marginalization; Namib Naukluft National Park; Namibia; qualitative research; social network analysis; Topnaar*

### INTRODUCTION

Community-based natural resource management (CBNRM), with the dual goals of conservation and sustainable development (Breen 2013), emerged from a paradigm that separated people from nature (Western and Wright 1994, Berkes 2004, Brockington and Igoe 2006, Dowie 2009). CBNRM is a framework that recognizes the codependence of human and natural systems and attempts to build stronger relationships between communities impacted by conservation regimes and institutions, i.e., the structures, rules, and norms governing land and water resources (Barrow et al. 2000, Kumar 2005, Stankey et al. 2005). Thus, it has the potential to bridge rationalities and relationships across communities and institutional divides (Sletto 2008).

Colonial histories that include war, persecution, and dispossession of land and other resources have led to persistent gulfs between local communities and government, other non-state actors, and market actors (Fanon 1952, Escobar 1995, Olusoga and Erichsen 2010). Conservation efforts have been part of the genesis of these colonial legacies (Hutton and Adams 2007, Dressler et al. 2010). These legacies often place communities at a power disadvantage when negotiating with other CBNRM actors and can preclude positive outcomes for communities (Nadasdy 2012, Mosimane and Silva 2015). In fact, CBNRM has often been critiqued as further cementing existing power differentials between communities and governing CBNRM institutions or structures as well as marginalizing communities by favoring community elites (Nandigama 2012, Anguelovski and Martinez Alier 2014, Stamm 2017).

Increasingly, CBNRM processes are being analyzed using social network analysis (Lauber et al. 2008, Bodin and Crona 2009, Snorek et al. 2020), highlighting the relational elements of natural resource management (Bodin et al. 2006, Agrawal et al. 2013, Barnes et al. 2016). CBNRM actors are perceived to provide formal and informal support and engagement with communities, supporting more reciprocal exchanges (Caimo and Lomi 2015). Social network exchanges can build trust through deliberate exchanges, bargaining processes, and conflict/cooperation dynamics (Ostrom 1999, Sanginga et al. 2010, Sjöstedt 2015), as well as facilitate social learning across cognitive boundaries (Bodin and Crona 2009, Long et al. 2013, Henry and Vollan 2014, Mguni 2019). In this way, social networks have the potential to function as an “arena” in CBNRM (Ostrom 1999, Breen 2013), wherein tensions can be voiced, entitlements negotiated (Sen 1983, Leach et al. 1997), and conflicts resolved (Villamayor and García-López 2018).

In social network terms, marginalization is a topological malady, reflecting insufficient connectivity between the center and the periphery of a social network. In this conceptualization, marginalized groups typically occupy the periphery of social networks (Shils 1961, Hooks 1989, Spivak 1999) while the center often consists of individuals and institutions that exhibit dominant values and beliefs, which are considered normal and irreducible (Shils 1961, Jeffery 2005). In turn, central actors tend to control entitlements or the range of types of benefits one can achieve in a given environment (Sen 1983, Leach et al. 1997). Marginality is reflected in the frequency and nature of interactions between marginal and central actors as well as the

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processes of social learning and sharing of entitlements (Pahl-Wostl 2009).

Boundary actors (also called boundary spanners or brokers) can shorten the distance between actors at the center and periphery of a social network (Williams 2002). To be effective, boundary actors typically serve as interpreters and constructors of meaning to bridge different rationalities stemming from one's identity, territory, and citizenship (Perrault 2003) and are essential to social learning processes between divergent social actors (Friedman and Podolny 1992, Olsson et al. 2004, Pahl-Wostl 2009, Long et al. 2013). Their role is to serve as facilitator to novel and heterogeneous information or resources in a transdisciplinary context to support social innovation (Rodan and Galunic 2004, Tiwana 2008, Long et al. 2013). The potential benefits of boundary acting include transforming boundaries by liaising missing information, mediating and resolving conflicts, or acting synergistically to build more cohesion and/or create opportunities for collective action (Ostrom 1990, Carlile 2002). Boundary actors also may become the sole liaisons for information and entitlements to marginalized groups (Sen 1983, Leach et al. 1997), which can lead to bottlenecks in their absence due to the dependencies they have facilitated (Cummings and Cross 2003, Miller 2008).

Serving as a boundary actor is a challenging, dynamic process that requires high sensitivity to social and cultural clues (Long et al. 2013, Mguni 2019). One problem that emerges when considering the effectiveness of boundary actors in interactions with marginalized groups is that by serving as facilitators of collective action, boundary actors have less ability to avoid engagement in a conflict, leading to stress and potential disempowerment of the boundary actor by more powerful actors (Singh et al. 1996, Balkundi et al. 2009, Long et al. 2013). To understand boundary acting and marginality in a CBNRM social network, we evaluate a Namibian CBNRM case from the Namib Desert.

CBNRM in Namibia began in the 1980s and is renowned as a successful model for integrated conservation and development (Child 2004, Hoole 2009a, 2009b, Suich and Child 2009). As envisioned by Namibia's Ministry of Environment and Tourism (MET)<sup>[1]</sup>, CBNRM aims to synergize rural development and biodiversity conservation efforts while empowering rural peoples to do the same, enhancing opportunities for green investment, increasing benefits from natural resources, integrating communities and government, and enabling communities to collectively engage in natural resource management (MET 2013a). Namibia's CBNRM approach is based on the premise that "if a resource is valuable," landholders have the right to use, benefit from, and manage it, and if "the values derived from this resource are competitive with and/or exceed that of other land uses, then sustainable use of this resource is likely to ensue" (MET 2013b:2, 4).

In Namibia, as in a number of African countries, decisions about rural communities' natural resources often fall to their traditional authorities. In Namibia, traditional authorities govern as well as provide continuity to pre-colonial cultures (Hinz and Gairiseb 2016). As a result of their elite position in CBNRM, traditional authorities in Namibia, and elsewhere, are often accused of

capturing and corporatizing the community's natural and cultural resources (Bixler et al. 2016). Concurrently, traditional leaders tend to favor top-down decision making over transparency and participatory approaches and may garner a disproportionate share of benefits (Botelle and Kowalski 1995, Kashululu 2009, Krämer 2020). These practices have been termed "neotraditional leadership" (Baldwin 2016, Krämer 2020). Thus, although traditional authorities can be important information brokers and boundary actors, adoption of neotraditional practices can undermine their ability to effectively play these roles (Krämer 2020).

In this study, we explored the role of boundary actors in bridging the divides between selected state CBNRM structures and local communities that have been forged by historical and current patterns of marginalization (Di Marco et al. 2010, Schnegg 2018, Krämer 2020). Although prior research has documented the importance of boundary actors in CBNRM (Mollinga 2010), there is a lack of research on their effectiveness in promoting equity, inclusion, and collective action in CBNRM arenas. To address this gap, we applied a mixed methods approach combining social network analysis with qualitative analysis to understand the CBNRM network. Specifically, we ask the following questions: (1) What are the CBNRM roles and activities of the major actor groups in the study area? (2) How does the structure of the CBNRM network reveal marginalization where community members are not robustly connected to the rest of the network? (3) Who are the boundary actors that have the potential to serve as links between poorly connected parts of the network? (4) What are the conditions that hinder or support those boundary actors to facilitate positive CBNRM outcomes for the marginalized groups?

## METHODOLOGY

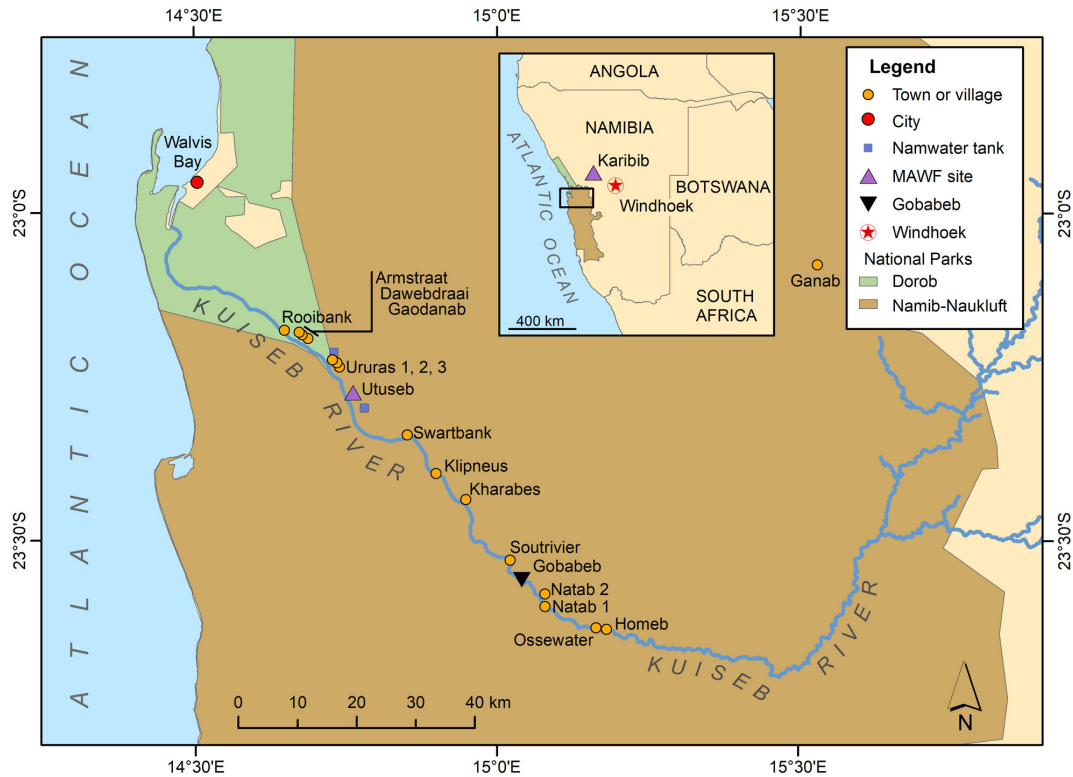
### Study site and design

The geographical and ontological center of the CBNRM network is the lower Kuiseb River valley, which crosses the hyperarid Namib Desert in Namibia. The study area lies completely within the Namib-Naukluft and Dorob National Parks (Fig. 1), both administered by the Ministry of Environment and Tourism (MET).

The pastoral *!Aonin* or *Topnaar* are a *Khoekhoegawob*-speaking people who have lived for over eight centuries in the central Namib Desert along the non-perennial Kuiseb River and the inland sand dunes (Henschel et al. 2003). Considered to be one of the larger Nama ethnic groups (Raper 2010), *Topnaar* have faced significant marginalization, forged over the course of more than a century of colonial and apartheid processes and their persistent and systemic vestiges. Prejudicial accounts have also stemmed from anthropologists, including being labeled "probably the most miserable of all the remnants of the Nama," (Hoernlé 1925).

The *Topnaar* are not only marginal to state institutions, but they also inhabit an environment that is peripheral to the larger Namibian consciousness (Ashcroft et al. 2002). The *Topnaar* area supports limited livestock rearing, terrestrial and marine resources, and a major endemic food source, the spiny, dune-growing cucurbit, *!nara* (*Acanthosicyos horridus*) plant, which is harvested annually (Budack 1983, Widlok 2000). Infrastructure

**Fig. 1.** Map of the Kuiseb communities, urban centers, and institutional sites.



is rudimentary, consisting of makeshift dwellings and (typically) a single community water source. Topnaar cattle meander along the dry riverbed without shepherds or dogs, consuming the pods fallen from the leguminous *Faidherbia albida* and *Acacia erioloba* trees. These pod-eating cattle rarely experience the impacts of drought in the rest of Namibia, yet contrariwise face food shortages when the ephemeral river flows, washing away their source of fodder. Cattle rarely enter “kraals” (livestock enclosures), and owners seeking to slaughter or sell a cow must engage in a chase in 4x4 vehicles. Intermittent income from livestock is supplemented by government pensions and urban remittances, and some Topnaar work for CBNRM institutions or the Topnaar Traditional Authority (TA).

The Namib Desert is a quintessential periphery (Martin 1983), existing outside the normal or desired (Nunes 1995, Nadasdy 2012, Long et al. 2013). Residing in the periphery may have been to their advantage in the German colonial and apartheid periods. When many Nama groups were nearly exterminated (Olusoga and Erichsen 2010), the Topnaar successfully resisted the forced relocation attempted by the South West Africa apartheid government (Widlok 1998, 2000, Hopkins 2020). This peripheral status, however, is no longer serving the community, as shown by the recent publication of Topnaar internal struggles (Krämer 2020), which prompts further analysis of the marginalizing effects of this distance between the center and the periphery.

For the past seven years, The Department of Environmental Studies of Dartmouth College has been co-developing a research agenda with two Namibian affiliates: the Gobabeb Namib

Research Institute and the Topnaar Traditional Authority (Table 1). This agenda incorporates a collaborative research design process (Raymond et al. 2010, Armitage et al. 2011) marked by our participation in and co-hosting of community meetings and training workshops as an observer-participant.

From our earliest visits, we observed latent conflict and misunderstanding of CBNRM rules, objectives, or ideologies between institutional actors and Topnaar community members in the Kuiseb. Much to our surprise, these misunderstandings were not only apparent between communities and institutions responsible for enacting CBNRM policy (Table 1), but also between community members and the Topnaar TA. To understand how and through which CBNRM actor marginal actors express their agency, we carried out a social network analysis of individuals living and/or working within the geographical boundary of the Kuiseb River valley.

Key CBNRM conflicts we encountered centered around the challenges of livestock formalization, human-wildlife conflict, and water shortages. Our objective was not to analyze these conflicts, but to identify the potential of boundary acting in CBNRM-relevant collective action.

#### Study participants

To do so, we engaged community members to identify the representatives from the Ministry of Environment and Tourism (MET), the Ministry of Agriculture, Water, and Forestry (MAWF), the Traditional Authority (TA), and Gobabeb Namib Research Institute (GBB) with whom they interacted (Table 1).

**Table 1.** Actor groups of the community-based natural resource management (CBNRM) network.

Abbreviation	Name	Actor Group Type	CBNRM Role
GBB	Gobabeb Namib Research Institute	Institution	Research institute focused on arid environments, and it provides research and training to promote CBNRM
GTS	Gobabeb Namib Research Institute Topnaar Staff	Community and Institution	Topnaar staff at GBB have direct access to other Topnaar community members and thus have the potential to share information about CBNRM objectives and activities.
MAWF	Ministry of Agriculture, Water, and Forestry	Institution	Government agency focused on community development including the modernization of the agriculture sector; it issues harvesting permits, manages the rural water supply, and supports livestock health and registration, all of which maintain the livelihoods of the community members living in the parks
MET	Ministry of Environment and Tourism	Institution	Government agency focused on biodiversity conservation by establishing sustainable use of natural resources in the context of CBNRM in the parks
TA	Topnaar Traditional Authority	Community and Institution	Topnaar community's leadership, who are charged with defending and perpetuating the culture of the Topnaar people by ensuring and protecting their right to the continued use of natural and cultural resources in the parks
TOP	Topnaar Community	Community	Community members living in the national parks who are engaged in CBNRM with other state and nonstate actors
Other	NamWater	Institution	A Namibian parastatal institution that controls the distribution and management of water resources including those within the parks
MURD	Ministry of Urban and Rural Development	Institution	Government agency that facilitates the process of decentralization
	Desert Hills	Institution	Business that purchases <i>Inara</i> seeds to produce cosmetics
	Uri Adventures	Institution	Tourism company that formerly operated a Topnaar tourism concession, which provides tourists accessibility to the park

GBB was established as a research facility in the Kuiseb valley in 1962 during the apartheid regime, and it hosts between 20 and 50 researchers (17 during this research project), staff (10 individuals, both Topnaar and other ethnicities), and visitors throughout the year and supports the facilitation of CBNRM events and activities, e.g., park cleanup days. The TA consists of elected leaders of Topnaar cultural identification and serves as the primary point of reference between government and the community. The MAWF and the MET are governmental institutions with sub-offices in the Kuiseb (Table 1).

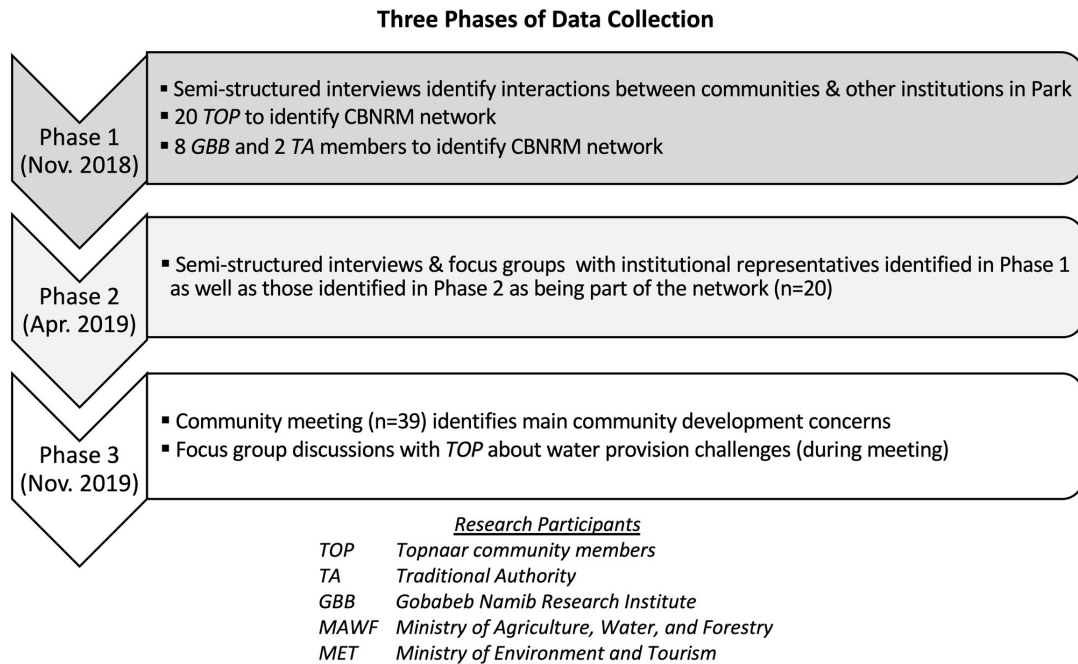
The process of deriving the boundaries of the Kuiseb's social network was both complex and dynamic (Heath et al. 2009, Cooper and Shumate 2012); the network is a subset of the full network. Based on our own estimates, the maximum number of Topnaar people residing along the Kuiseb varies seasonally between 110 to 450 people, spread across 14 villages (Fig. 1). Topnaar often keep their residences in the Kuiseb while working full time in the city. Although these temporary city-dwelling residents play an important role in the Kuiseb CBNRM activities, many of the households we visited were empty upon our arrival. We carried out interviews in all the 14 villages of the Kuiseb and only stopped interviewing new individuals when no new qualitative phenomena or connections were being mentioned (O'Reilly and Parker 2013, Fusch and Ness 2015). The CBNRM network included only institutional actors who were mentioned by community members. This subset of institutional and community actors subsumes the Kuiseb's CBNRM network, geographically situated within two national parks. In future studies of this kind, we recommend interviewing all the institutional actors mentioned by anyone living in the Kuiseb to be able to obtain a full network analysis.

#### Data collection procedures

Data was collected in three sequential phases using mixed methods (Fig. 2). In Phase 1, we engaged two methods: participant observation at a community meeting and semi-structured interviews (n = 30). To find Topnaar participants, we requested interviews with some of the community meeting attendees, and thereafter used a snowball sampling method to find a total of 20 Topnaar respondents (13 male and 7 female, 7% of the population based on an average of 280 Topnaar rural residents). All were Kuiseb residents and the majority had less than 10 years of schooling and ranged between 20 and 65 years old (Table 2). We also interviewed 10 institutional participants who lived and worked in the Kuiseb: eight individuals from GBB and two from the TA. All interviews addressed basic demographics, knowledge of institutional or community actors in the CBNRM network, and the types and quality of their interactions. From the 20 community interviews, we derived a list of individuals who are known locally and who are supporting the Kuiseb with CBNRM challenges. This list of individuals constitutes the subset of individuals interviewed in Phase 2.

In Phase 2, we carried out semi-structured interviews with the list derived from Phase 1 (n = 20). Interview questions were the same as Phase 1. During the Phase 2 interview, we obtained a longer list of individuals mentioned as being active in CBNRM in the Kuiseb. However, we were not able to interview every mentioned individual because of nonavailability (Table 1); all, however, were included in the analysis and considered to be a subset of the Kuiseb social network. Non-interviewed individuals are important to the network because of the influence community members perceive that they have on CBNRM activities in the Kuiseb. Also, their inclusion supported the objective to explain the process of boundary acting between those living inside the Kuiseb area with institutional actors located outside the Kuiseb.

**Fig. 2.** Phases of data collection.



Some of the institutions mentioned by community members, however, could not be considered CBNRM institutions. These were categorized as Other (Table 1).

Phase 3 involved a recorded/transcribed and observed community meeting with Topnaar community members (n = 39) as well as four focus group discussions with community members during a community meeting. We included only anecdotal information from the latter discussion in our analysis.

For all phases of the research, we contacted participants by phone to set up interviews. Semi-structured interviews were conducted with an average of two research team members with one male or female Topnaar translator (if conducted in Khoekhoegowab instead of English) for a duration of 30–60 minutes. Of all the respondents, 64% were Topnaar people and 36% of multiple ethnicities. Of these, 84% of respondents had residency at least part time in the Kuiseb area (Table 2). Notes were typed on a laptop computer during the interview to capture an approximate transcript. Some interviews were also digitally recorded and transcribed. Interviews were conducted at a place deemed to be most comfortable for the participant, typically a participant's home or workplace, and were conversational and sensitive to the positionality of the researcher and respondent.

Respondents rarely gave information about the quality of interactions with other CBNRM actors. Thus, we sought knowledge of any institutional actors' names known by respondents and, whenever possible, asked the frequency and purpose of their communication, e.g., information, benefits, or support from said individual. If a respondent did not state the name of an individual in a CBNRM actor group, but merely used the general institutional/community name, no link was derived between that individual and said institution/community. Finally,

in the case that a relationship had potential of closer connection, e.g., the individual in question was a Topnaar, we inquired about the personal nature of the relationship.

It is worth noting that on 24 January 2019, just after our first phase of research, the Topnaar Chief passed away suddenly. The traditional council held a meeting to determine the interim governance structure. During subsequent phases of our research, the Deputy Chief had assumed the role of acting chief. The interim chief and several other members of the TA supported the continuation of our research by signing the late Chief's endorsement letter.

#### Data analysis

Qualitative data was converted into an edge list to be used in social network analysis. Interview notes and transcripts were imported into AtlasTi (v8.4.5), a qualitative data analysis program. We coded these both deductively and inductively, following grounded theory methodology (Bryant and Charmez 2007, Bendassolli 2013). Based on an initial coding tree, we derived 434 unique inductive codes based on 901 quotations, which were divided into 37 coding groups. Coded themes included: connections between actors and actor groups (Figs. 3 and 4), CBNRM programmatic activities and their perceived functions (Table 3), positive and negative perceptions of other actors and their CBNRM goals (Tables 4 and 5), livelihood challenges and stresses, conflicts derived from CBNRM rules, and the types and outcomes of collective action. To translate these codes into an edge list, we used the AtlasTi "link" function. If a community member named individual X in institutional actor group Y, we linked that individual to both the actor group and the individual. Associations were exported as an edge list, and consequently analyzed in social network analysis software Gephi (v0.9.2).

**Table 2.** Demographics and groupings of respondents.

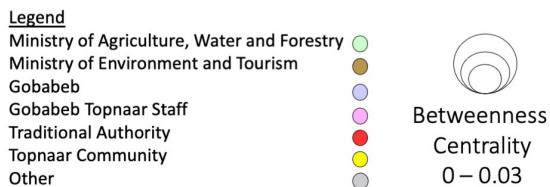
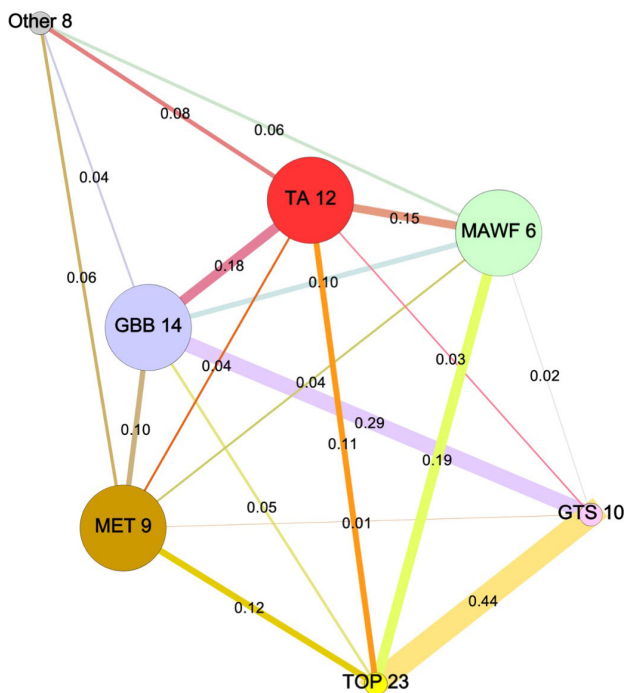
Participant Categories	Age		Ethnicity		# Yrs. Educ		Gender		Kuseib Resident	
	≤ 40	> 40	TOP <sup>†</sup>	Other	≤ 10	> 10	M	F	Yes	No
All = 50	21	29	32	18	30	20	33	17	42	8
Men = 33	14	19	22	11	21	12	33	0	26	7
Women = 17	7	10	10	7	9	8	0	17	16	1
TOP <sup>†</sup> = 20	10	10	20	0	19	1	13	7	20	0
GBB = 10	6	4	0	10	0	10	4	6	9	1
GTS <sup>‡</sup> = 6	2	4	4	2	6	0	4	2	6	0
MET = 1	0	1	0	1	0	1	1	0	0	1
MAWF = 4	2	2	1	3	0	4	3	1	2	2
TA = 7	1	6	7	0	5	2	6	1	5	2
Other <sup>§</sup> = 2	0	2	0	2	0	2	2	0	1	1

<sup>†</sup> Topnaar community members.

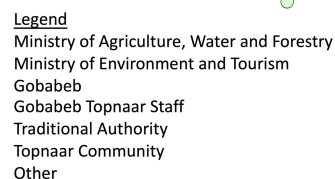
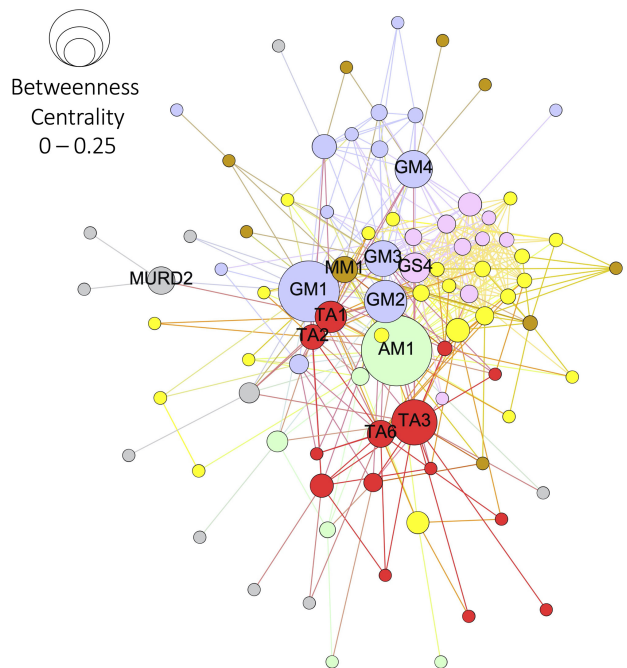
<sup>‡</sup> Gobabeb's Topnaar staff.

<sup>§</sup> Individuals of the J.P. Brand School and the Ministry of Urban and Rural Development.

**Fig. 3.** Community-based natural resource management (CBNRM) actor group social network. Circle sizes represent the betweenness centrality of each actor group. Link color is a mix of two adjacent nodes' colors. Link widths (weights) are normalized dividing the actual link by total potential links. The numbers next to the actor group represent the total unique mentions that a link exists between individuals in the actor groups. Nodes are arranged using Force Atlas 2, a linear retraction, repulsion model in Gephi v0.9.2.



**Fig. 4.** All community-based natural resource management (CBNRM) actor-actor exchange network. Links express the exchange of information, benefits, friendship/kinship, and support. Link color is a mix of two adjacent nodes' colors. Nodes (N = 87) are sized with betweenness centrality, colored with the respective actor group color. Twelve highest betweenness centrality nodes are (listed highest to lowest): AM1, GM1, TA3, GM2, GM4, TA1, GS4, GM3, MURD2, TA6, MM1, TA2. Nodes are arranged using Yifan Hu Proportional, a linear retraction, linear repulsion model in Gephi v0.9.2.



We first examined interactions and exchanges among individual actors inside and outside the Kuiseb network by conducting an “actor-actor” social network analysis (SNA) using Gephi. The actor-actor network is based on data from three interview questions: (1) With whom do you speak in institution X when you need their assistance? (2) [For institutional actors] With whom do you speak in the community Y to fulfill your organization’s duties? (3) Who do you know in community Y? Community members generally stated that they knew “every Topnaar person,” so community-to-community linkages formed a tight-knit group. In total, we identified 87 actors in the network ( $N = 87$ ); all actor-actor links are non-directed, weak links (both actors did not necessarily identify a link). In further research of this type, it would be useful to establish strong links between mentioned institutional actors and community actors.

To investigate interactions among actor groups we conducted an actor group SNA by subsuming all the individual actors into their CBNRM actor groups (7 groups, see Table 1) and then summing actor-actor linkages among the groups. To quantify the strength of connection between actor groups we summed the number of non-directional links between individual actors in the linked groups. To normalize this and control for the effect of differing group sizes we divided the number of non-directional links between groups by the total number of potential non-directional links between the two groups. The latter quantity was estimated as the product of the number of unique individuals in the two groups.

To identify actors and actor groups supporting boundary acting, we examined betweenness centrality. Freeman’s (1977) betweenness centrality ( $C_B$ ) is useful to identify actors serving boundary-spanning and brokerage roles in a variety of social contexts (Himelboim et al. 2014, Paletto et al. 2015, Mulawa et al. 2018), by calculating the potential of actor interactions “between” various other points on the graph via geodesic paths (the shortest distance between two nodes). Those with high  $C_B$  are considered boundary actors because of their ability to control or mediate relations and exchanges between groups of actors that are not directly connected (Freeman 1977, Scott 2000, Knoke and Yang 2008).

## RESULTS

### CBNRM institutional actor group qualitative analysis

Based on our qualitative research (summarized in Tables 3–6) we characterize the role and perceptions of each actor group in the CBNRM network and present their collective CBNRM activities.

Actor groups engaged in a range of activities, some of which are clearly aligned with CBNRM goals, e.g., youth education, while others are basic livelihood support services, e.g., petrol sales (Table 3). The most frequently mentioned programs (listed highest to lowest) were farmer support (cooking training, giving goats, clerical services, building kraals), skills training, water management, serving as liaison, and patrolling the park. Gobabeb ( $n = 14$  programs) and MAWF (13) were perceived to be engaged in the most programs followed by the TA (9) and the MET (7). This may be linked to available infrastructure, with GBB possessing the largest meeting space, a formal catering service and mess hall, and sleeping accommodations conducive to programs and events. Likewise, the TA offices, located in Utuceb, possess a

meeting space, and have the capacity to provide informal catering services, and have frequently been host to events.

Many of the actor groups are perceived to be engaged in the same or similar programs (Table 3). The TA and GBB liaise with government ministries for multiple CBNRM activities such as training and eco-tourism development. GBB is perceived to cooperate with the MET (4 shared programs) and MAWF (5). Skills training is the most frequently cited activity and is perceived to be carried out by GBB, MAWF, TA, MET, and Other. All of the TA’s activities are shared by other CBNRM actors within the network. Notably, while the TA may not be perceived as the purveyors of programs, they play an essential role as convenors by supporting the planning of events, providing information to community members, attending, opening, and closing each meeting.

### *The Ministry of Environment and Tourism (MET)*

Because the Topnaar settlements along the lower Kuiseb lie within two national parks, the MET has significant influence over their lives by limiting hunting, harvesting, and land ownership. “They are losing traditions because now they lost culture through the rules from MET” (TA6). “If you get wood from the river, they will come and control you and say you must not get so much wood” (CSO2). The MET permits housing for the Topnaar on Park lands, but despite this, most Topnaar have not constructed permanent housing; the majority live in makeshift corrugated metal shacks and receive water from a communal pump. Individuals from government institutions also parroted the false belief that the Topnaar are not able to obtain housing in the park. This falsity has not been corrected by the MET because of their absence. Their nominal presence along the lower Kuiseb was demonstrated by several respondents not knowing the name of any MET officer.

Also, Topnaar expressed confusion about the MET’s rules and procedures. “Rules of these ministries are very difficult to understand for rural communities like us” (TA1). Topnaar individuals rarely contact the MET office and those who do call to report tourists not in compliance with park rules. Individuals mentioned obtaining support for attacks on their livestock by wildlife in the park (wildlife removal), but also see very little response to human wildlife conflict. When carrying out activities that would normally require a permit, such as rounding up cattle to bring them to market (which requires off-roading in the park), Topnaar seek permission of their Chief. “The permits are difficult to get because their office is far and our transport is difficult. The office is in Walvis” (CSO2).

One area of consonance with the MET is related to its stewardship of the Topnaar tourism concession, a source of Topnaar income. “MET came up with a policy to give communities the right to access certain areas that one cannot access otherwise ... The concession operators pay a small amount to the community, based on agreements established by the MET ... All people living in the park are entitled to benefit from the concession.” Only one individual identified this as an activity of the MET (Table 3).

### *Ministry of Agriculture, Water, and Forestry (MAWF)*

Livestock are an important part of Topnaar livelihoods. Livestock farmers face challenges relating to disease, predation, water availability, and difficult access to markets. Because of these

challenges, support from the MAWF is critically important. The MAWF extension office, located in Utuseb adjacent to the TA office, supports two full-time staff members. Their work includes sharing information and providing formal training on livestock: health, vaccinations, formalization, and marketing and non-livestock farming (gardens). They also facilitate communication with the water division of the MAWF, who manages all the rural water resources east of Utuseb in the Kuiseb area.

**Table 3.** Actor groups mentioned as carrying out community-based natural resource management (CBNRM) and other livelihood support activities. Number represents the number of mentions by respondents about each group.

Activity/Program	GBB	MAWF	MET	TA	TOP	Other
Ambulance	4					
Farmers Day		2		1		
Gardening Support		2				1
Gen. Farm Support	2	3			2	
Liaison				4		1
Livestock Census		3				
Livestock Health		3				
Livestock	2	2				
Registration						
Livestock Training	2	1				
Livestock		2				
Vaccination						
Market Access		1				
Microfinance						2
Nara Commerce	1			1		3
Nara Harvest				1	1	
Park Clean-up	1	2	1			
Park Patrol	1	1	2	1		
Petrol Sales	1					
Research	4					
Skills Training	1	2	1	1		1
Sporting events	2			1		
Tourism Concessions			1	1		
Tourism Training	2					1
Water Management	1	2		1		2
Wild Meat Provision			1			
Wildlife removal			1			
Youth Education	1		1			

Respondents feel they can easily approach the MAWF extension office. “[There is] easy access to [the office] ... any time night hours, day hours, I can contact [them]” (C7). People typically call the extension service for numerous reasons, some of which are not related to the MAWF but to the close relationships that its officers have developed within the community. “[I] only know [the office staff]. Even [one of the officers] visits us once a month but MET and GBB do not” (C18). For individuals who travel to Utuseb, the office is perceived as very helpful, sometimes going beyond the call of duty by preparing documents or sending email on behalf of farmers.

Despite the accessibility of the MAWF extension office, there are frequent complaints about their responsiveness and productivity. “If they don’t come back to help us, we don’t get answers from them. They will tell us to wait, wait. We often find the doors are closed with a note on the door saying come back on this day. When we call them, they are always busy with some other project. When we go back, they are not there. Then it goes year to year. I have to go to them for [cattle brands] and sales” (CU1). The MAWF’s absence and slow action was expressed by many

individuals in the network (Table 4). In turn, they are perceived to provide few benefits or entitlements for the Topnaar community members (Table 5). Several respondents pointed out that limited resources prevented their effectiveness in carrying out MAWF work in the Kuiseb.

Topnaar livestock remain on the periphery of Namibia’s formal livestock markets because of their noncompliance with state regulation. “These people are marginalized communities, so most don’t have [ear tags and stock brands]. Only a few have them” (AV1). Several Topnaar stated that they lack funds and access to register their livestock, which leaves their livestock at risk of confiscation or losses, and they would like more assistance from MAWF. “Vet services will come and destroy livestock [if there is sickness]. [The government] is beginning to be ruthless for animals without ear tags; they get killed on sight” (GM2).

*Traditional Authority (TA)*

The TA is the most immediately relevant government body to the Topnaar community and includes the chief, deputy chief, secretary, and 11 traditional counselors that comprise the traditional council. The Topnaar chief is the highest-ranking traditional leader and was often cited as gatekeeper to the Topnaar community (Hinz and Gairiseb 2016). The Chief perceived his position to be equivalent to that of government and as such he served as a mediator between different government bodies, the private sector, and the Topnaar community. The Chief convenes conferences and meetings, negotiates the terms of development interventions, manages the community funds stemming from tourism concession’s activities, and responds to the Topnaar community’s problems. The TA is expected to disseminate information and benefits from multiple CBNRM structures (NGOs, government, research institutions, etc.) to the Topnaar community. As such members of the TA should be natural boundary actors. “It is [the TA’s] responsibility to bring the partners together, to look into areas that need development, to change ways of operating [to permit the] traditional community to live within the traditional rights as recognized by Namibia’s constitution” (TA1). In the power vacuum left by the passing of Chief Kooitjie, frustrations with the TA emerged. “[The TA] [doesn’t] have portfolios. The main issue is that when our late chief was alive, he was the one that was doing everything ... We are starting to say that we need to give each other the full information. And [roles]” (TA10).

According to all respondents, the TA was criticized for poor communication, a lack of accessibility, and for ignoring problems like a water pump’s malfunctioning or closure (Table 4, 5, and see below). Also, community members see the TA as a bottleneck to accessing benefits or information: “if you have a problem, you can’t go straight to the MET office, you must go through the TA” (C16). Several mentioned these challenges as well as a lack of transparency, conflict amongst the TA members, and a lack of information transfer (Table 5). According to one institutional respondent, “[w]e are having concerns about the infighting of people in the community; there are some who want more benefits and others do not have access [to benefits]” (MM1).

One very contentious issue is the TA’s use of funds earned from the communities’ concessions, which are tourism rights within protected areas granted by the MET and administered by the TA. The community has three concession areas, two of which are located within the parks. The TA has been publicly accused of



**Table 4.** Institutional missions juxtaposed with Topnaar perceptions organized by community-based natural resource management (CBNRM) actor group.

Actor Group	Institutional Mission-based Activities (alpha order)	Topnaar Perceptions of Activities (# of mentions) <sup>†</sup>
MET <sup>1</sup>	Create employment opportunities	Protect wildlife (13)
	Develop tourism infrastructure	Patrol the park (2)
	Ensure sustainable use of natural resources	Protect livestock from wildlife (2)
	Promote biodiversity conservation	Provide yearly wild meat (2)
MAWF <sup>2</sup>	Safeguard the environment	Provide tour guide training (1)
	Ensure policy compliance	Livestock and garden aid (10)
	Manage rangelands	Livestock vaccinations (7)
	Manage water provision systems	Drought relief (4)
	Promote food security	Rural water supply (3)
	Provide veterinary service	Livestock workshop (3)
TA <sup>3</sup>	Realize potential of agriculture, water, and forestry sectors	Inaction or lack of activity (3)
	Adjudicate disputes	Liaise to solve problems (8)
	Communicate with community	All talk, no solutions (3)
	Govern land and water	No communication (2)
	Hold annual Traditional Assembly	Provide transport (1)
GBB <sup>4</sup>	Liaise with institutional actors	
	Preserve Topnaar history and customs	
	Monitor desert ecosystem	Research (9)
	Provide educational activities	Training (5)
	Research and dissemination	Provide transport (3)
	Study Topnaar agriculture and herding	Teach school children (2)
	Supply ecotourism facilities	Collaring cows (1)
	Training	No knowledge (1)

<sup>1</sup> (Ministry of Environment and Tourism 2020)

<sup>2</sup> (Ministry of Agriculture, Water, and Forestry 2020)

<sup>3</sup> (Hinz and Gairiseb 2016)

<sup>4</sup> (Gobabeb Namib Research Institute 2020)

<sup>†</sup> This information is derived from the qualitative analysis of all interviews and focus groups.

improper use of community revenues from these concessions (De Clerk 2019, Hartman 2019). As stated by one respondent, “In every community trust there is money. The community must know about the money in their trust. But there is no feedback” (C18). Participants at the community meeting requested greater transparency about how the money is spent, but there was no response to this request.

#### *Gobabeb Namib Research Institute (GBB)*

As a research station, GBB at first glance is not likely a CBNRM institution. However, they are perceived by many respondents to be actively engaged with the Topnaar community in CBNRM activities (Table 3). These relationships sometimes express a keen appreciation for and understanding of GBB’s mission and values (Table 4). GBB managers have longevity in the CBNRM social network and have developed relatively strong relationships with all CBNRM actor groups, including the Topnaar community (TOP), TA, and MAWF.

The Topnaar-GBB relationships are not without frustration. Some GBB individuals perceive Topnaar to be difficult to work with, disruptive of experiments, or perceive they lack knowledge of GBB’s mission (Table 4). Community members express that GBB is not doing enough, “GBB was supposed to come and help [with human-wildlife conflict]. We don’t see any benefits of research - you are only wasting someone else’s time. Research must bring difference” (CU2). These high expectations of GBB were repeated by MAWF and the TA. GBB’s management is aware of how others perceive them. “The community sees Gobebeb as a

rich privileged institution benefiting a few. That is how it has always been perceived” (GM1). “They see rich foreigners, tourists, scientists coming into and spending time in Gobabeb with nice cars, good equipment, and see that the community doesn’t benefit from all the inflow coming into Gobabeb” (GM2). In defense of their mission, managers at GBB made the frequent statement, “we are not a development agency.”

Nevertheless, GBB has built partnerships, supplied meeting space, and facilitated CBNRM activities (Table 3), which have been met with mixed levels of success. In support of MAWF, they provide transportation to TOP community members for Farmer’s Day, other CBNRM events, and (infrequently) to Walvis Bay, the nearest urban center and other locations. Some Topnaar respondents who had attended a livestock training co-hosted by GBB and MAWF expressed great appreciation for GBB’s efforts in the Kuiseb. “I saw feedback for the first time. I was very happy with the workshop and very proud of it. They were changing the living standard of us” (CSO2). “They do a great deal to invest in this community ... grade 7 learners go there ... exposed us firsthand to nature ... practical experiences, things I had only read in books. Workshops on environment, tourism, climate, insects, a lot of things. Literacy programs, including training for unemployed people like me - bricklaying, sewing ... Since their existence, they have just been thriving to make this community a better place ...” (CA4).

Notably, Topnaar individuals held more perceptions of Gobabeb, both negative and positive, than of any other institutional actor

**Table 5.** Summary of respondents’ positive and negative perceptions of actor groups, based on qualitative analysis. These expressions relate to knowledge (information, ideas, training), benefits (physical elements received), and entitlements (expand one’s ability to obtain knowledge and benefits; # of respondents).

	Knowledge		Benefits		Entitlements	
	+	-	+	-	+	-
GBB	Shares findings (7)	Not sharing findings (7)	Jobs (6)	Low wages (2)	Negotiated for us (1)	Not talking with TOP (2)
	Training (2)	No training (2)	Ambulance service (2) Repair equipment (1)	No benefits (8) Not helping everyone (1)		“Rich” institute (2) No help on HWC <sup>†</sup> (1)
MAWF	Provides training (1)	No training (1)	Gives rides (7) Installs kraals (1) Livestock health (1)	No transport (4) No benefits (2)	Prevents HWC (1)	Inaccessible (3)
MET	Provides workshops (1)	Not sharing info (1)	Removes predators (1)	No help on HWC <sup>†</sup> (12)	Liaise with TA (2)	Rules limit livelihoods (5)
TA		Not sharing info (5)	Concessions <sup>‡</sup> (1)	No benefits (6) No benefits (5)	Gives rides (1) Resolves problems (2)	Concession problems (1) Not accessible (2)
TOP	Shares TEK <sup>§</sup> (3)	Not sharing TEK (4) Break rules (4) Depend on aid (1)		No projects (2) Lack of skills (3) Disruptive (4)	Empowers youth (1)	Conflict (1) Conflict (4) Insobriety (3) Lack of mutual trust (1)

<sup>†</sup> Human wildlife conflict.

<sup>‡</sup> Concessions are rights to engage in tourism activities within the park.

<sup>§</sup> Traditional ecological knowledge.

group (Table 5), highlighting the conflicts that arise through GBB’s efforts for development facilitation. In 2017, GBB launched an ecotourism development program, “Benefit Sharing in the Namib Sand Sea,” with support from the Finnish Fund for Local Development. The project addresses how local communities can benefit from the area’s inscription as a World Heritage Site by training them in tourism services and handicraft production and sales. When accommodations for the Topnaar women in the sewing program were shifted from GBB’s houses to safari tents as the result of a scheduling conflict, Topnaar women boycotted the training. Gobabeb managers sometimes expressed frustration with lack of appreciation for what they do for the community and a feeling that no matter what they do they will be criticized by some in the community. “We don’t raise expectations that we can’t sustain. We can’t transport people into town because our bus will only last for so long and then we won’t get a new one... This is part of sustainability” (GM2). “[We] need to stay true to ourselves and what we do best - [research]” (GM1).

Despite the presence of conflict, the relationship between GBB and the Topnaar community is generally that of good neighbors. “Sometimes when we need emergency help, GBB responds” (TA7). “I got a call from [GBB Topnaar staff], and I had to rescue [her]. She had been beaten up by her husband” (GM3). GBB has one of the only garages for making vehicle and infrastructure repairs, which it occasionally shares with community members. “I was one of the guys that installed solar systems and sewage pipes [at GBB]. When I have problems with my car, GM1 helps. I always ask [them] for help. When I want to weld something, they let me” (C1). The late Chief’s funeral was held at GBB; they engaged donors on behalf of the Topnaar to support broader training and CBNRM initiatives. This engagement with the

community builds trust, which has also raised community members’ expectations and, thus, sometimes has led to disappointment and criticism.

#### CBNRM social network analysis

Seven actor groups were mentioned by our respondents as being connected; these mentioned connections feed our social network analysis (Table 1, Fig. 3). This actor group network accounts for cumulative types of stated exchanges: information, support, and benefits amongst individuals in the CBNRM network actor groups. The analysis shows the strength of the links between GBB’s Topnaar employees (GTS) and Topnaar community members (TOP). However, neither GTS nor TOP have direct connections to “Other,” which includes a parastatal NamWater that controls a Kuiseb water pipeline, the government’s Ministry of Urban and Rural Development (MURD), a private company Desert Hills that purchases *!nara* seeds, and Uri Adventures, a tourism company that formerly operated the Topnaar tourism concession. The lack of connection to these actor groups reveals marginalization especially where boundary actors do not effectively transfer information on behalf of community members. Most community members’ connections to Other come through the four actor groups engaged in this study. Also, the links between TOP and MAWF (0.19) as well as GBB and GTS (0.29) have a higher normalized weight than TOP and other actor groups. Of the four actor groups with equivalent betweenness centralities ( $C_B$ ), TA, MET, MAWF, GBB (all 0.03), MAWF and GBB are perceived to have greater potential for connection to the Topnaar groups (Fig. 3).

Analysis of the actor-actor social network revealed who is perceived to be a boundary actor in the CBNRM network (Fig. 4). Topnaar community members (TOP, yellow nodes) primarily

**Table 6.** Most mentioned recommendations by all respondents (# = respondents).

Recommendation	to	#	Representative statement from respondents
Share more information	GBB	13	Share results and reports with community
Provide more trainings	GBB	8	More trainings and follow up from trainings
Consult the community	GBB	7	Sit down with the community and ask what it needs
Provide more jobs	GBB	7	Provide more job and education opportunities
Support learning	GBB	6	Help more with children/learners
Do more applied research	GBB	2	Not all the research is relevant to us
Help with transport	GBB	2	Especially need transport for children/learners
Find solutions for HWC <sup>†</sup>	GBB	1	They should intervene if possible
Compensate for HWC	MET	5	They could compensate for predation of livestock
Prevent HWC	MET	5	Find wild animals and remove them
Change Park land tenure	MET	3	It would be good to have land rights
Hire more local staff	MET	3	[Topnaar] know the people and the area
Provide more training	MET	2	Would like more tour guide training
Legal assistance	MET	1	Rules of ministries are very difficult to understand
Visit communities often	MAWF	3	So that community can report challenges they are facing
Provide more workshops	MAWF	3	We want more workshops
Consult the community	TA	1	If we work together, there is peace
Share more information	TA	2	Every 3 months...give feedback to the community

<sup>†</sup>Human wildlife conflict

form a small, tight-knit group in the upper right corner. These are frequently connected to others in the network through the Topnaar working at Gobabeb (GTS, pink nodes), one of which is amongst the 12 highest  $C_B$  of the network (Figure 4, see also Appendix 1, Table A1.1). Nodes with higher  $C_B$  possess greater potential to bridge the subgroups of the community members (TOP and GTS) and other organizations, which may not otherwise be able to easily access the Topnaar communities. It is notable that those with highest  $C_B$  or the boundary actors include one Ministry of Agriculture, Water, and Forestry (MAWF) agent (AM1), four GBB management and one Topnaar Gobabeb staff (GTS) actor(s) (GM1, GM2, GM3, GM4, and GS4), four Traditional Authority (TA) actors (TA1, TA2, TA3, and TA6), one Other institutional actor (MURD2), and one MET actor (MM1).

To reduce the bias derived from including the non-interviewed actors (peripheral nodes in Fig. 4) and increase the overall transparency of our analysis, we also carried out an alternative analysis with only the interviewed actors (Appendices 1 and 2). Similar subgroups and configurations emerged in both analyses. However,  $C_B$  ranking of the alternative analysis introduces more of the GTS (Gobabeb's Topnaar staff) as boundary actors (because of higher  $C_B$ ). This difference in relative  $C_B$  ranking is likely due to GTS not being well connected to the non-interviewed actors. GTS were not well-represented as boundary actors in the qualitative data, introducing another type of bias. Focusing on the network with all mentioned (interviewed and non-interviewed) actors is, thus, a stronger analysis.

#### Boundary acting in the CBNRM network

Combining the qualitative data for some of the individuals identified in the social network analyses exhibited the conditions that hindered and supported boundary acting to facilitate positive CBNRM outcomes for marginalized groups. The social network analysis identified boundary actors from the Traditional Authority, Gobabeb, and the Ministry of Agriculture and Forestry, who occupied positions of high betweenness centrality

in the actor-actor social network (Fig. 4). Three examples of boundary acting illustrate the main challenges facing community members and how they address these with the boundary actors of the CBNRM network. Through their responses and the consequent recommendations (Table 6), we illustrate the varied effectiveness of boundary actors to respond to community members.

#### Slow livestock formalization

AM1 stands out as a key boundary actor in the CBNRM network (Fig. 4, Appendix 1), through which most interactions between community and institutional CBNRM representatives pass. This individual also resides in the Kuiseb and deeply understands the Topnaar community. "AM1 is very involved in the community. [He] has meetings to inform farmers how to put on ear tags, what we have to do, these types of things. [He] assists us well, including water problems" (CO1). Others find their expectations of AM1 are not being met; some complain about inactivity or a lack of continuity between personal and professional goals. "Most days [he is] busy with the communities dealing with community politics. [He is] supposed to do the livestock issues, project, etc. agriculture project, etc., but we only hear these things on the radio" (TA10). The community has higher expectations of AM1 in part because of the fact that he is also a member of the community.

The inaction and slow response of the MAWF was a common criticism. For example, during a livestock workshop in November 2018, several MAWF agents explained that all livestock must comply with laws: be branded, registered, and ear tagged. With donor support, all Topnaar attending the workshop were offered free livestock registration and AM1 was tasked to visit households across the Kuiseb to create a list of registrants. At the donor's return one year later, the list had not been assembled, likely because of the MAWF's broken down service vehicle. Community members again complained during a subsequent meeting and placed blame on the MAWF office. "I was at the MAWF office and asking about ear tags ... [my registration] is still in process" (C20). "AM1 has promised to help with ear tags. We are still

waiting” (TA7). The delays in registration translate to lost market and government program opportunities. For example, drought-related subsidies are only delivered for registered livestock as explained at a Farmer’s Day community meeting in the second year of our data collection.

As outsiders, it is difficult for us to understand how cultural norms influence these responses and critiques. General MAWF budgetary restrictions have slowed or reduced extension activities, repairs, and responses overall. This relates to an unserviceable MAWF vehicle and slow response on livestock formalization process in the Kuiseb. “[They don’t] have a working vehicle or support staff so [their lack of performance] is not entirely [their] own doing but, rather, is constrained by the environment [they are] working in” (GM1). However, this account demonstrates that AM1 plays a critical role in livestock formalization and other MAWF activities in the Kuiseb.

#### *Human-wildlife conflict*

Because of the lack of a sustained presence of the MET in the lower Kuiseb, the Topnaar manage human-wildlife conflict unilaterally. Despite high losses of small stock to predation, Topnaar farmers feel powerless to inhibit predators like the black-backed jackals (Tables 4 and 5). Perhaps because of this absence of MET and resulting poor communication, the Topnaar are unclear about MET rules. MET policy states that Topnaar can kill a predator inside their kraal but cannot use a firearm (which are forbidden in the park) and must report this to the MET within 10 days (MET 2013a). Few Topnaar were aware of the specifics of this policy and expected the MET to compensate for the losses. “MET policy says there is no compensation for the communities [living] in the park if wildlife causes conflict. So, it’s difficult for us to promise people what we cannot [give],” said MM1. A woman recounted losing 13 goats to a cheetah; she filed a report with the MET, with no response (TA7). Despite the law permitting it, Topnaar believe that any defense of livestock from wildlife predation is illegal. “I am afraid of the MET, because if I do anything to that jackal going into my kraal, and MET rangers find out, I go to jail. So, I must ... watch the “boss,” the jackal, go into my kraal [and] kill whatever he wants. What about the rights of the humans who live in this park?” (TA1).

Because of the lack of clear accountability and responsiveness, Topnaar individuals cast a wide net to others in the CBNRM network in seeking solutions. The TA directs complaints of livestock losses to the MET but typically does not receive a response. The community also looks to GBB. According to one GBB researcher, “many of [the community members] have raised concerns that they are losing their livestock to predators such as the jackal and brown hyena, cheetah ... We cannot neglect these issues, we need to look into this problem” (GR10). GBB has begun some predator-focused research, installing camera traps to monitor livestock kraals to quantify attacks. Some think GBB is not doing enough to support them with this issue. “People complain about predators killing livestock, those things, GBB was supposed to interfere there. Step-in for the community. They didn’t do that” (CU2). There is evidence (Table 6) that community members would like MET to have a stronger presence overall, providing opportunities such as training during which rules and land rights can be discussed.

#### *Water woes*

The precarity of life in the Namib is exacerbated by a lack of physical infrastructure and incremental losses to entitlements over land and water. Water has been a key concern across the Kuiseb. For nearly two years, communal taps in several villages in the lower Kuiseb have been turned off by the parastatal, NamWater, because of unpaid bills. Residents in these villages have attempted to resolve the conflict but have difficulty approaching NamWater. “If you just go as a person, as a human being like me, they will ask, what is your traditional authority doing?” (CU2). “We need [the TA] to come out and reach out to us. The problem that stops us now from gardening is water. The water was cut off last year in September” (C13). Community members, during our community meeting, emphasized the need for the TA to pay the outstanding bills with funds from the community trust. The TA representative present did not respond.

When faced with the inconsistencies of the TA, community members’ and other CBNRM actors turn to those who are perceived as more effective CBNRM actors. During our field visit in November 2018, we learned that the solar-powered borehole pump in an upper Kuiseb village had failed. When a TA representative placed a phone call to the MAWF office in Karibib (Fig. 1), an administrative center 200 km away, his request was ignored for eight months. To secure water in the interim, villagers traveled to nearby villages and to GBB with donkey carts. Because of the pump failure, gardens desiccated, livestock sought water in other villages, and family members contracted illnesses. Finally, the community members made a plea for help to GM1, who has personal connections to the directorship of MAWF and placed a call to the office on the community’s behalf. Soon after a technician arrived to repair the pump.

#### **DISCUSSION**

Although there have been other studies on the link between marginalization and CBNRM, this study is the first to examine the role of boundary actors in bridging divides between central and marginal actor groups in the context of CBNRM. This study also contributes to an understanding of the challenges of boundary actors, pointing to how divergence among actor groups produces more conflict and more challenges for boundary actors to navigate. The literature on boundary acting emphasizes the boundary actor’s role in bridging structural holes in the social network. Long et al. (2013) emphasize that these boundary actors need support to maintain optimal function in establishing and maintaining these bridges. Where there are socio-cognitive boundaries, such as the white/black divisions evident in South African businesses, boundary actors must dynamically adapt to fit the socio-cultural needs of any given group (Mguni 2019). This ability is bolstered as boundary actors build agency amongst more marginalized groups of actors.

Overall, this study of a CBNRM social network demonstrates the qualitative and quantitative nature of a community’s expression of agency through a social network. Examined through the perspectives of the Topnaar community toward institutional actors involved in CBNRM activities, community members perceive a lack of accountability from multiple CBNRM actors, and they cast their net widely when seeking assistance. Some institutional actors are not accessible to this “net,” namely the ‘Other’ category in Figure 3 and the outliers in Figure 4, leaving

the localized and sometimes less-powerful actors to respond to CBNRM challenges. Other more appropriate or powerful CBNRM actors remain at the periphery of the network (Fig. 4), and as qualitative data have shown, community members do not often perceive that they can access these outliers. The most obvious boundary actor group and liaison (the TA) was criticized for inconsistent support of the community, resulting in low levels of trust of the TA. This broad-reaching approach is a common response in marginalized communities, but it can get in the way of building accountability amongst appropriate CBNRM institutional actors (Ostrom 1999, Dietz et al. 2003).

The Topnaar communities' perceptions of the Topnaar traditional authority suggest the TA follows a top-down model of governance not well suited to the decentralized nature of CBNRM (Kumar 2005). Our research indicates the community wants a more open and participatory governance structure that is more engaged with their daily challenges. Lack of transparency from the TA, an important signal of neotraditional behavior (Krämer 2020), has fueled the disenfranchisement of the community from the decision-making processes of the TA. Past TA leaders have facilitated multiple development projects in the Kuiseb area. In this way, they acted as what Krämer (2020) calls a "gatekeeper," serving as a pipeline for outside actors to the territories within their purview. Although the TA can rightfully point to these projects as accomplishments, the community is alienated from decision making and feels they do not address their greatest needs. Thus, the TA's actions eroded trust in themselves, which is the essential "lubricant" for boundary acting within a CBNRM social network (Pretty and Smith 2004, Long et al. 2013, Tasselli et al. 2015).

The MET and to a lesser extent the MAWF experience multiple geographical and social constraints to boundary acting. Although the MET and MAWF have direct statutory responsibilities and budgetary support for CBNRM activities in the lower Kuiseb, Topnaar respondents suggest that both have had limited positive impacts on CBNRM in the area. Both actor groups have a small physical presence in the Kuiseb, with MAWF representatives residing in the Kuiseb area and infrequent visitation and residency from the MET. Especially for the MET, relationships and trust building have been demonstrated to be limited. AM1 (a MAWF agent) has great potential for effectiveness as a boundary actor, but it's not being realized because of a lack of capacity and low accountability on the part of other MAWF managers. AM1 has a strong central network position because of being a Topnaar community member as well as in a professional position. However, comments revealed that this individual is not sufficiently empowered to deliver in this role. Concerns were also expressed about adherence to regulations of both the MAWF and the national park.

The challenges of institutional multiplexity are prevalent in AM1's role as a boundary actor. Institutional multiplexity is a phenomenon that exists when there are multiple institutional requirements that bring up contradictory engagement: for instance, community sharing of resources versus fixed boundaries for property, costs, and sanctions (Schnegg 2018). As a Topnaar and MAWF agent, AM1 lives under a sometimes-conflicting set of norms. Navigating normative boundaries may result in both conflict and mixed perceptions of both actor groups as to the

trustworthiness or legitimacy of one's actions (Liu et al. 2014). The multiplex roles of boundary actors are only evident by examining the data through both a quantitative and qualitative lens.

In a variety of ways, Gobabeb stood out in our results. Among non-Topnaar institutional actors, GBB's management has the largest and most visible presence in the Kuiseb Valley. In the actor group network (Fig. 3), GBB has the greatest connection to the Topnaar community through the Topnaar GBB staff, and GM1 has the second highest betweenness centrality in the actor social network (Fig. 4). It is engaged in many CBNRM activities (Table 3) and elicits by far the most perceptions (Table 5) and recommendations (Table 6). The primary tension between the Topnaar community and GBB stems from differing perceptions of the role and potential of research to influence CBNRM outcomes in the short-term as well as the conflation of development and research activities. As stated by a former liaison between the Topnaar and GBB, the community feels "I should eat the fruit [of research] by the end of the day" (Bolger et al. 2018). This perception conveys the impression that research should have short-term tangible development benefits to the Topnaar.

Topnaar community development is not part of Gobabeb's mission as reflected in their institutional mission statement. "What we do with the community is social corporate responsibility ... Good neighbors try to help one another out in times of emergency and real need" (GM1). GBB management emphasizes that they receive no core budgetary funding from the Namibian government and no government support for community development. Similar tensions have been commonly reported in the literature on relationships between communities and research institutions. The same literature suggests these tensions are unlikely to be resolved without a more participatory approach to research (Wolff and Maurana 2001, Silka et al. 2008, Peterson 2010). Based on discussions with Gobabeb, an internal review of operations in 2018 recommended broadening GBB's research portfolio to include the socio-economy of living in the Namib landscape. If that path were taken, capacity within relevant disciplines would need to be developed to complement the existing expertise in environmental sciences, and funding would have to be found to support these efforts (Hart et al. 2015).

## CONCLUSIONS AND RECOMMENDATIONS

In the title, we play off a line from the poem, "The Second Coming" by W. B. Yeats. The line "Things fall apart; The center cannot hold," and the poem, reflect the anxiety and uncertainty of post-World War I Europe. The "center" of the social network in Figure 4 is occupied by our putative boundary actors. Our research demonstrates that the social connections among CBNRM actor groups depends critically on the actions and qualities of these well-positioned boundary actors. However, our results also suggest that social, political, institutional, and geographic constraints limit the effectiveness of these potential boundary actors and thus the ability of the social network to function as a CBNRM arena and support the reversal of historical marginalization of the Topnaar community. Under the best of circumstances, boundary actors have a difficult, conflict-laden job navigating the connections between the center and periphery of social networks (Balkundi et al. 2009, Long et al. 2013). In the

lower Kuiseb, the tendency toward conflict is increased by lack of clear pathways of responsibility and accountability, limited transparency, and insufficient resources. Given these pressures, it is appropriate to ask, can a few boundary actors bear the arena needs of CBNRM in this network? Can they alone be expected to hold things from falling apart? Based on this case study, we find that multiple boundary actors are essential for effective boundary acting in the context of CBNRM and marginal groups.

One obvious recommendation from these findings is that boundary actors within this network need more support. This support could take the form of more recognition of the important boundary roles they play, more resources, and more training. Furthermore, we think that in addressing marginalization through social networks, and to further support boundary actors, it may be helpful to apply the “boundary object” concept. This concept originated in the field of science and technology studies (Star and Greismer 1989) and has been adapted to multiple fields of study including that of sustainability (Clark et al. 2016, Franco-Torres et al. 2020) and natural resource management (Carr and Wilkinson 2005, White et al. 2010). Boundary objects are material or non-material entities such as a document, stakeholder committee structure, theory, or model that inhabit multiple social worlds and fulfill the informational requirements of each (Star and Greismer 1989). Ideally a boundary object can hold a robust identity across social divides, thus enabling dialogue among stakeholders even in the absence of consensus (Star and Greismer 1989, Star 2010). Given its topological focus, it seems a natural adjunct to social network approaches related to CBNRM because it provides a common space, set of information requirements, or inclusive committee design to reduce the disenfranchisement and increase the access of marginalized actors to power centers and powerful actors. In these ways, boundary objects can play many of the same roles as boundary actors and can be used as tools by boundary actors (Kimble et al. 2010).

Contributing to the pressure on boundary actors in the Kuiseb network is the lack of clear articulation of individual and institutional roles that would then foster accountability to fulfill those roles and reduce conflict and misunderstanding. In this context, a well-constructed boundary object could enhance the collective action arena function of the social network by spelling out these roles and responsibilities. A good boundary object in this case would offer the potential of positive outcomes for all the stakeholders even if the currency and motivations of these outcomes are very different, in that way allowing adaptability to different viewpoints.

Elsewhere in Namibia, conservancy constitutions often play this role and spell out a collaborative CBNRM management plan (Schick et al. 2018). There is no conservancy in the Kuiseb, presumably because Namibian law does not permit conservancies in national parks. However, recently the Kyaramacan Association was established by the residents of the Bwabwata National Park in northeast Namibia (Koot 2019). The association acts similarly to a conservancy and could serve as a model for a similar association in the lower Kuiseb.

Although a comprehensive CBNRM plan might be one desirable boundary object, a more achievable short-term goal could be to create more limited agreements around specific resources. One

possibility is a livestock working group. Similar to the boundary objects described by Carr and Wilkinson (2005), this could be a group comprising a representation of Topnaar livestock owners from settlements up and down the Kuiseb, members of MET to help address human wildlife conflict and other park management issues, MAWF representation to assist with livestock health, legal compliance, and market access issues, and Gobabeb to assist with livestock-oriented research. In our experience, assistance with livestock is the most desired development assistance by the community (Dartmouth College, *unpublished data*). Another suggestion is the creation of a Kuiseb council that would involve representatives from the Topnaar community, the TA, MET, MAWF, Gobabeb, and NamWater (this latter actor was not analyzed specifically in this article but merits further research). The council would provide the possibility for a co-productive process between communities and institutions by increasing communication, responsiveness, and accountability (Schick et al. 2018).

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<sup>[1]</sup> As we were drafting this manuscript, the name of the ministry was changed to Ministry of Environment, Forestry, and Tourism (MEFT). To maintain consistency to respondents’ comments, we retained the original name and acronym.

*Responses to this article can be read online at:*  
<https://www.ecologyandsociety.org/issues/responses.php/13512>

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#### **Data Availability:**

*The data that support the findings of this study are available on request from the corresponding author, JLS. None of the data are publicly available because of internal review board restrictions to protect the privacy of human subjects. The anonymity of the respondents has been considered and most of the individuals being discussed cannot be identified by anyone outside the research team. However, given that this is a small community, it was difficult to mask the identity of two boundary actors. With these two, we shared*

*the identifiable information and obtained their approval for its inclusion in this manuscript prior to publication. Ethical approval for this research study was granted by Dartmouth College #STUDY00031607.*

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## Appendix 1 Betweenness centrality for Figure 4 and Appendix 2

**Table A1.1** The following table shows two betweenness centrality ( $C_B$ ) measurements – one for Figure 4’s actor-actor social network analyses (middle column) and the other for an alternative analysis (Appendix 2) of the CBNRM network that excludes non-interviewed actors. Betweenness centralities were calculated using Gephi v0.9.2 and are organized as highest (top) to lowest for  $C_B$  -All – Figure 4. The five actors with the highest  $C_B$  are, respectively AM1, GM1, TA3, GM2, and GM4 for  $C_B$  -All and AM1, GM1, GM2, GS4, and GM3 for  $C_B$  -Alternative.

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Label	$C_B$ -All – Figure 4	$C_B$ -Alternative
AM1	*0.17603	*0.255871
GM1	*0.147455	*0.132172
TA3	*0.099908	*0.030018
GM2	*0.090702	*0.072693
GM4	*0.075362	0.013337
TA1	*0.057645	*0.091
GS4	*0.053065	*0.072286
GM3	*0.048961	*0.056735
MURD2	*0.04571	0
TA6	*0.04423	0.011836
MM1	0.041623	0.025555
TA2	0.038092	n/a
GR8	0.035847	0.004759
CSO1	0.033807	0.011959
TA10	0.033153	0
GS2	0.033049	0.023396
CA4	0.030062	0.00051
AV1	0.025669	0.002813
MURD1	0.023684	0.000694
GMF1	0.020001	0.011693
TA13	0.018711	0.002779
CA1	0.017577	0.004596
GS7	0.017297	n/a
AS1	0.015978	0.011054
GS5	0.015817	*0.033052
GS1	0.013401	*0.02896
GS3	0.013299	*0.02615

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GR6	0.013098	0.004807
CO1	0.012172	0.004004
GR10	0.011488	0.002132
AMO1	0.010263	0.003123
CA3	0.010132	0.003802
GR7	0.008093	0.002079
CA2	0.007929	0.002328
CSW2	0.007093	0.004129
CN1	0.006903	0.002122
TA5	0.006895	0.011711
CSW3	0.006765	0.001431
MR1	0.006482	n/a
GS10	0.006436	n/a
CSW5	0.004968	0.005934
GS9	0.004925	n/a
GS6	0.004758	n/a
CSO3	0.003827	n/a
CSW1	0.003716	0.000216
CN2	0.003618	0.004143
GR2	0.003028	n/a
CSO2	0.001958	0.002554
CG1	0.001891	0.001431
CU4	0.001603	n/a
GR1	0.001321	0.001944
CK1	0.001205	0.000663
MS	0.0012	n/a
CA5	0.000844	0
GSF1	0.000819	n/a
MR2	0.000594	n/a
CU2	0.000579	0.000692
TA9	0.000579	n/a
CU3	0.000557	0
TA7	0.000472	0.001018
TA8	0.000385	n/a
TA11	0.000309	n/a
CW01	0.000285	n/a
TA4	0.000195	n/a
GM5	0.000144	0.000425
CSW4	0.000093	0.000085
CU1	0.000022	0

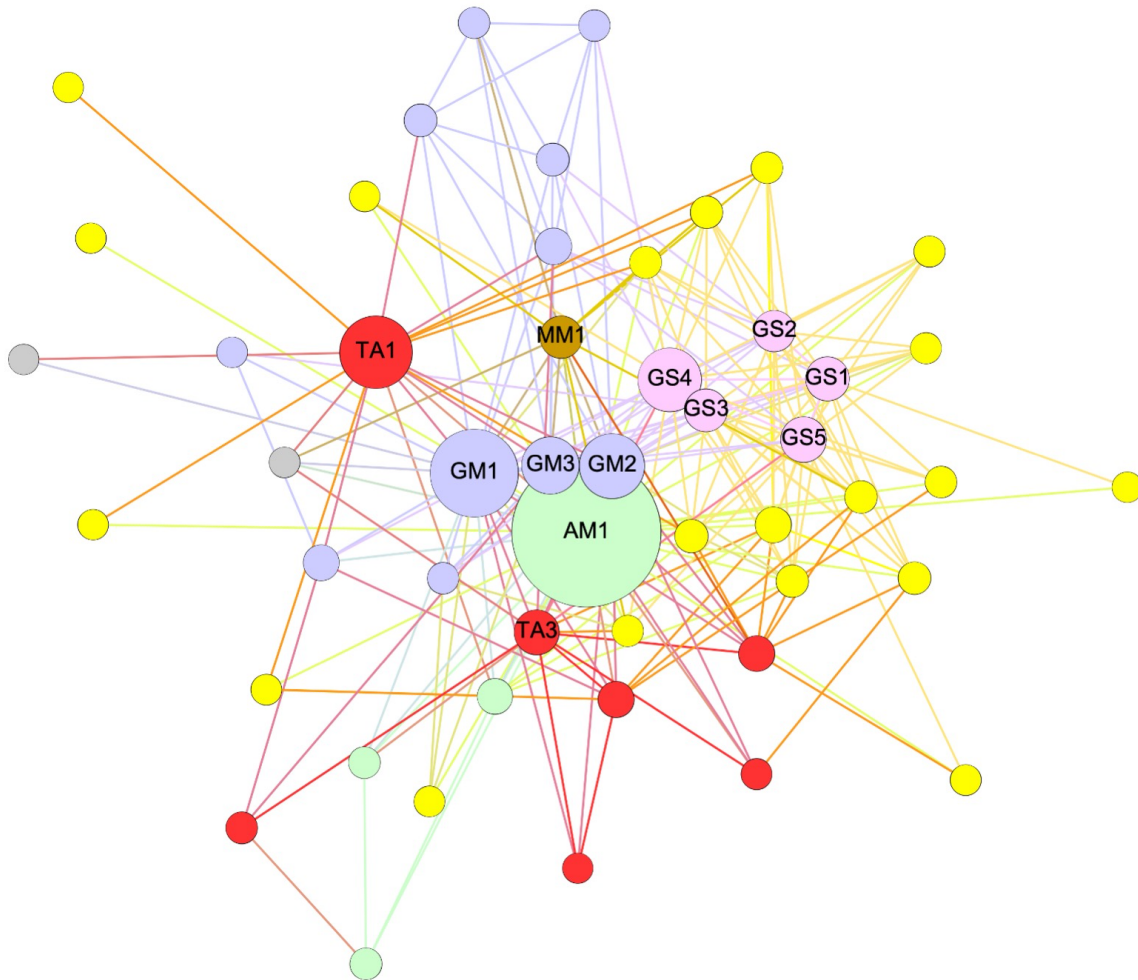
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AMO2	0	n/a
AS2	0	n/a
DAR1	0	n/a
GR5	0	n/a
GR9	0	n/a
MMW1	0	n/a
MMW7	0	n/a
MMW8	0	n/a
MMW9	0	n/a
MR3	0	n/a
MURD3	0	n/a
MURD4	0	n/a
MURD5	0	n/a
NAM1	0	n/a
NAM2	0	n/a
TA12	0	n/a
TSC4	0	n/a
UNI1	0	n/a
URI2	0	n/a
WB02	0	n/a








\* Top ten C<sub>B</sub>'s for each group.

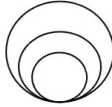
## Appendix 2. Actor-Actor Social Network Analysis (alt.).

Figure A2.1 This alternative analysis has excluded non-responding actors from the social network analysis and represents the whole community network. Links express the exchange of information, benefits, friendship/kinship, and support. Link color is a mix of two adjacent nodes' colors. Nodes are sized with betweenness centrality, colored with the respective actor group color. Twelve highest betweenness centrality nodes are (listed highest to lowest): AM1, GM1, TA1, GM2, GS4, GM3, GS5, TA3, GS1, GS3, MM1, GS2. Nodes are arranged using Yifan Hu Proportional, a linear retraction, linear repulsion model in Gephi v0.9.2.



### Legend

Ministry of Agriculture, Water and Forestry	
Ministry of Environment and Tourism	
Gobabeb	
Gobabeb Topnaar Staff	
Traditional Authority	
Topnaar Community	
Other	

	Betweenness
	Centrality
	0 – 0.25