



Article

Toward a just and inclusive environmental archaeology of southwest Madagascar

Kristina Douglass

Department of Anthropology, The Pennsylvania State University,
University Park, PA, USA
Institutes for Energy and the Environment, The Pennsylvania State
University, University Park, PA, USA
The Morombe Archaeological Project, Velondriake Marine
Protected Area, Morombe, Madagascar

Eréndira Quintana Morales

Department of Anthropology, The Pennsylvania State University,
University Park, PA, USA
The Morombe Archaeological Project, Velondriake Marine
Protected Area, Morombe, Madagascar

**George Manahira, Felicia Fenomanana,
Roger Samba, Francois Lahiniriko,
Zafy Maharesy Chrisostome,
Voahirana Vavisoa, Patricia Soafiavy,
Ricky Justome, Harson Leonce,
Laurence Hubertine,
Briand Venance Pierre, Carnah Tahirisoa,
Christoph Sakisy Colomb,
Fleurita Soamampionona Lovanirina,
Vanillah Andriankaja and Rivo Robison**

The Morombe Archaeological Project, Velondriake Marine
Protected Area, Morombe, Madagascar

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Corresponding author:

Kristina Douglass, Department of Anthropology, The Pennsylvania State University, 413 Carpenter Building,
University Park, PA 16802, USA.

Email: kdouglass@psu.edu

Abstract

In this paper, we advocate a collaborative approach to investigating past human–environment interactions in southwest Madagascar. We do so by critically reflecting as a team on the development of the Morombe Archaeological Project, initiated in 2011 as a collaboration between an American archaeologist and the Vezo communities of the Velondriake Marine Protected Area. Our objectives are to assess our trajectory in building collaborative partnerships with diverse local, indigenous, and descendent communities and to provide concrete suggestions for the development of new collaborative projects in environmental archaeology. Through our Madagascar case study, we argue that contemporary environmental and economic challenges create an urgency to articulate and practice an inclusive environmental archaeology, and we propose that environmental archaeologists must make particular efforts to include local, indigenous, and descendent communities. Finally, we assert that full collaboration involves equal power sharing and mutual knowledge exchange and suggest an approach for critical self-evaluation of collaborative projects.

Keywords

Madagascar, indigenous archaeology, environmental justice, human–environment interaction, heritage

Introduction

In this paper, we reflect on the Morombe Archaeological Project (MAP), launched in 2011 and based in southwest Madagascar's Velondriake Marine Protected Area (Figure 1). We use our reflection on the MAP's partnerships with local, indigenous, and descendent (LID) communities as a case study in collaborative environmental archaeology, in order to strengthen our own collaborative process and reframe what environmental archaeologists understand as collaboration. In our case, collaboration entails equal power sharing amongst project participants, a significant commitment of resources and training for a particular team of local collaborators, as well as a dynamic engagement with LID communities at multiple scales. As we describe the successes and shortcomings of the MAP's collaborative approach, we acknowledge the challenges inherent in building meaningful community partnerships and assert that excluding LID communities from the research process has far-reaching negative implications for the quality of scientific research and its impact on the livelihoods, territories, and heritage of LID communities.

Africanist scholarship has greatly contributed to theories and methods in indigenous or community archaeology (e.g. Schmidt and Pikirayi, 2016). In Africanist contexts the focus has been on decolonizing practice, collaboratively building heritage, and integrating ethnoarchaeological approaches alongside studies of indigenous knowledge systems, oral traditions, and other forms of intangible heritage. Social memory, particularly in the form of oral history, plays an important role in history making in African communities (McIntosh et al., 2000); therefore,

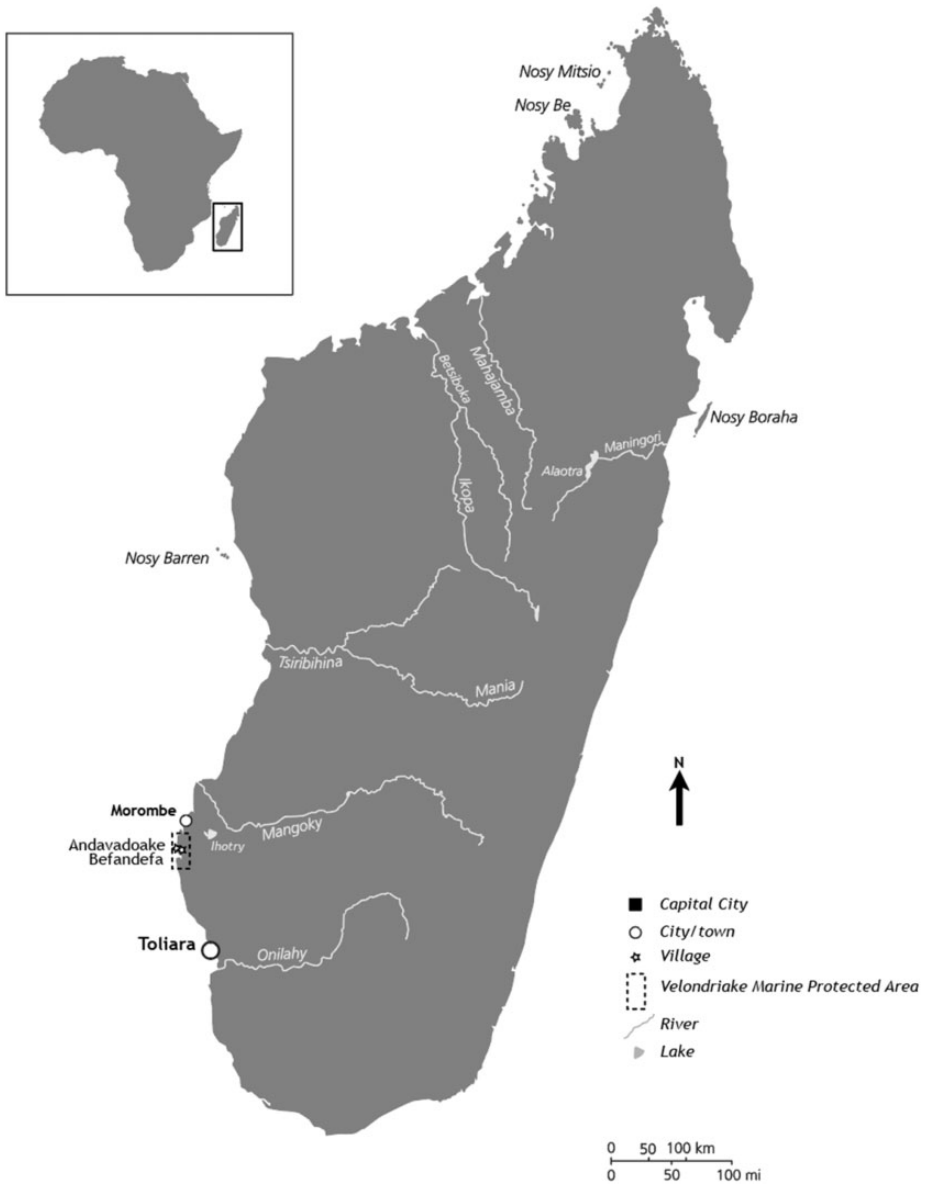


Figure 1. Map of Madagascar showing locations mentioned in the text.

embracing multiple, and sometimes even conflicting, interpretations of the past is key to successful community collaborations (Abungu, 2016; Chirikure and Pwiti, 2008). Furthermore, effective communication and trust with community partners creates the space to learn from shared dialogues and experiences (Pikirayi, 2016);

however, these goals do not align well with “fast science” research models that favor data collection over human interactions (Cunningham and MacEachern, 2016). Postcolonial approaches in Africanist archaeology include pursuing research of relevance to local communities, revitalizing past technologies and practices reconstructed through archaeology and oral history, and recognizing and integrating multiple perspectives on the past (e.g. Davies, 2012; Karega-Munene, 2009; Kusimba, 2009; Lane, 2011; Stump, 2013). Postcolonial archaeologies also recognize the role of African people and ideas in shaping core archaeological theories and the varied ways African scholars engage with archaeological theory (Wynne-Jones and Fleisher, 2015). Despite these contributions, there has not been an explicit articulation of where environmental archaeology fits within community archaeology paradigms.

Our collaborations with LID communities in southwest Madagascar build on Africanist perspectives to decolonize practice in environmental archaeology. First, we articulate environmental justice issues that intersect with archaeology in a region that has experienced significant ecological change and is home to socially, politically, and economically marginalized communities. Decolonizing practice in environmental archaeology is critical, especially in the Global South where communities bear a disproportionate burden of global environmental and climate change (Bauer and Ellis, 2018). Second, we argue that environmental archaeologists must make particular efforts to be inclusive of LID communities as an important step in decolonizing their practice; environmental archaeologists produce data and knowledge using eco-fact assemblages that are often processed, analyzed, and interpreted far from the field site and beyond the participatory grasp of LID communities, including local scholars. The need for advanced facilities and resources not available locally (e.g. accelerator mass spectrometers, DNA sequencers, reference collections, etc.) is often cited as justification for exporting samples, but the resultant exclusion of LID communities maintains colonial legacies of power over the production of knowledge (Wobst, 2010). These legacies are often apparent in media coverage of scientific research on human–environment interactions on Madagascar (e.g. Chu, 2016). Research results are frequently interpreted for the public as evidence of the destructive nature of ancient and contemporary Malagasy communities and their inability to sustainably manage their landscapes and resources.

Finally, we echo Schmidt and Pikirayi’s (2016) assertion that there is no one-size-fits-all approach to engaging in an inclusive archaeology, but also propose that archaeologists must take theoretical and methodological cues from collaborative ethnographers who have articulated the requirements and implications of power sharing (Lassiter, 2005). We assert that full collaboration requires equal power sharing and mutual knowledge exchange in all phases of a project and advocate that project participants and directors critically assess the degree to which they are sharing power with LID communities (Cipolla et al., 2018). Reflexivity is critical to evaluate the roles of and benefits to community members, and reorient research

strategies as needed (Schmidt and Pikirayi, 2016). We end our case study by offering a systematic approach to self-assessment.

Methods

This paper is based on a collective reflection of the MAP between 2011 and 2019. Project members answered questions regarding their experiences with the project, in order to facilitate a group discussion of successes, shortcomings, and future endeavors (Table 1). Each team member individually sat down with a designated interviewer to respond to the questions. Following a review of the individual responses, the full team engaged in a conversation about the issues raised and agreed upon points to emphasize in the paper. In the section that follows, we begin by outlining the environmental justice issues that motivated the research. The paper then follows the project's cycle of four overarching phases, each with its own set of activities that repeat with each new project/field season: (1) project development, (2) fieldwork, (3) analysis, and (4) output (Figure 2). For each of these four phases, we provide an example of the MAP's approach to collaboration by (1) recruiting diverse LID community members as project members and collaborators, (2) empowering all collaborators to contribute their knowledge to the project, (3) exchanging knowledge and skills, and (4) developing forms of output beyond traditional academic publication. We define full collaboration as a partnership in which power is shared equally among all project members and where knowledge is openly exchanged on all aspects of the project, including (but not limited to) logistical information, funding allocations and pay, previous research, technical training, LID community knowledge, and oral histories. In addition to highlighting how power sharing and mutual knowledge exchange have been integrated, we reflect on the challenges of ongoing collaborative work. Following the case study, we provide a chart to facilitate evaluation of the degree of collaboration within a project. Breaking a project down into its different phases and activities (Figure 2) allows for a careful evaluation of the level of power sharing and knowledge exchange.

Motivation for the MAP: Archaeology and environmental justice on Madagascar

From its inception in 2011 the MAP has investigated diachronic human–environment dynamics in coastal southwest Madagascar. Key questions involve the impacts of initial human settlement on endemic ecologies, including faunal extinctions. Long debated in the field of Malagasy archaeology, these questions are addressed by the MAP with an awareness of how Madagascar's archaeological narratives influence contemporary conceptions of the impact of LID communities on the island's environment.

Situated roughly 250 miles off the East African coast, Madagascar is putatively one of the last large landmasses to have been settled by human communities

Table 1. Questions used to solicit feedback from MAP team members and guide discussions about past, present, and future collaborations.

Questions about collaboration and the MAP

- How did you find out about the MAP and how did you become involved in the project?
- How long have you been a collaborator of the MAP?
- Do you think archaeology is important? Why or why not?
- What has your experience been like on the project?
- Is there anything you learned on the project that is important in another part of your life?
- What has been good about the project and what has been bad?
- What do you want to get from the project now and in the future?

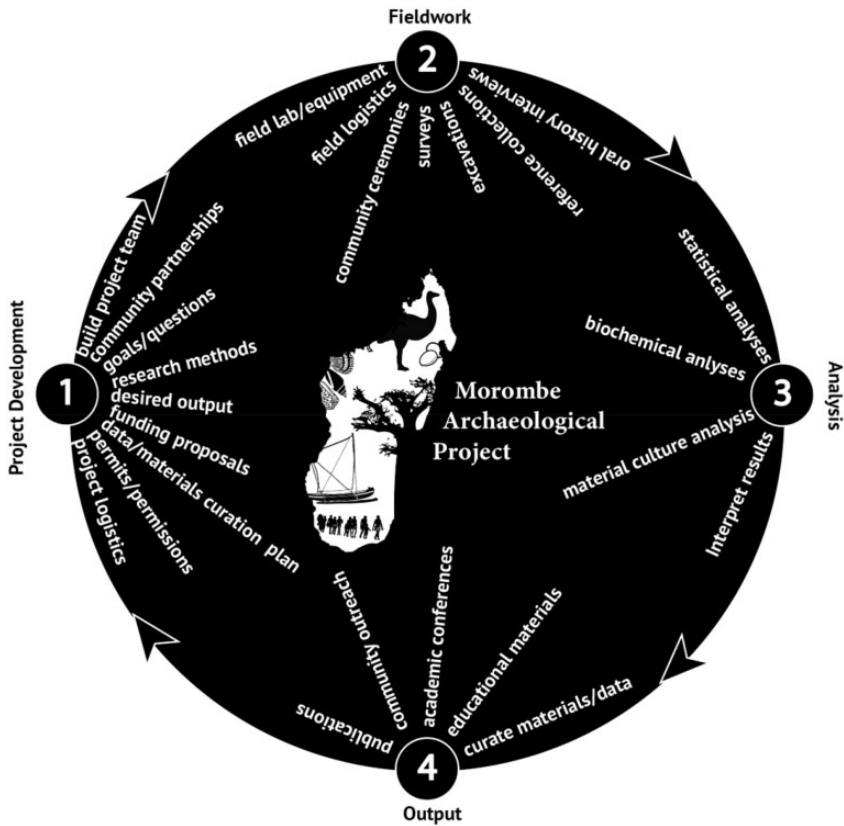


Figure 2. Cyclical phases of an archaeological project and examples of typical MAP activities within each phase. MAP logo credit: C Bruwer.

(Figure 1). Although the debate is ongoing (Douglass et al., *in review*), continued support for a Late Holocene colonization by people (Anderson et al., 2018) reinforces a long-held view that human settlement of the island was followed swiftly by environmental degradation, including deforestation and faunal extinctions (e.g. de la Bâthie, 1921; Wang et al., 2019). Thus far, however, the data marshalled to support hypotheses of human-driven extinctions, deforestation, and other forms of past environmental degradation on Madagascar are far from definitive and generally disconnected from archaeological remains of everyday life (Douglass et al., 2018). The debate over whether Madagascar's megafaunal extinctions were driven by human activities hinges more on paleontological and paleoecological evidence than on material culture and remains collected from archaeological settlements (Goodman and Jungers, 2014). The assumption that ancient Malagasy people are ultimately to blame for rapid environmental degradation, despite insufficient data on diachronic human–environment interactions, translates into Madagascar's own version of a “pristine myth” (*sensu*, Denevan, 1992). Whether consciously or not, conservation and development practitioners, the general public, and even academics often uncritically link a narrative of a formerly pristine island environment devastated by human arrival to the livelihoods of Malagasy communities in the present day. When we think of conservation of Madagascar's famous endemic biota, creatures like lemurs, tenrecs, and chameleons, we often evoke the fantastical beasts of Madagascar's past, the giant lemurs, pygmy hippos, and elephant birds, and the presumed human activities that led to their demise. Both historically and today this human–nature dichotomy has encouraged a “tragedy-of-the-commons” view of local resource use and landscape management, often resulting in “fortress conservation” policies that attempt to keep people out, in order to conserve (Douglass et al., 2019).

Despite a history of research that has privileged a monolithic view of the impacts of human arrival on Madagascar, there is growing recognition that waves of human settlement by diverse groups likely resulted in a range of human–environment dynamics across the island (Dewar and Richard, 2012; Dewar and Wright, 1993; Douglass and Zinke, 2015; Godfrey et al., 2019). Thus far, work carried out by the MAP in Velondriake has revealed a diversity of resource use strategies across archaeological sites spanning the Late Holocene. Though ancient communities in the region relied primarily on shallow reef habitats and estuaries, differences in species diversity and abundance characterize the assemblages of neighboring, and sometimes contemporary, sites (Douglass, 2016; Douglass et al., 2018). Furthermore, despite recorded remains of megafauna at paleontological sites in southwest Madagascar and the common perception that people hunted these animals to extinction, archaeological work in Velondriake has produced limited remains of now-extinct animals (Douglass et al., 2018).

Finally, through a combination of archaeological excavation and oral history recording, the MAP is reconstructing the historical ecology of Velondriake. Human and other biotic communities in southwest Madagascar face significant and linked threats (Douglass et al., 2019; Le Manach et al., 2012). In particular,

increasing pressures from extractive industries—industrial fishing and mining—have impacted local biodiversity and shifted practices away from traditional forms of subsistence and exchange toward a cash economy, in which local communities are located at the impoverished end of a complex international supply chain. Historical ecological investigation helps to clarify the pace and process of change. Today, for example, the local extirpation of most species of shark presents a serious ecological crisis and conservation challenge (Cripps et al., 2015). Sharks are fished by Vezo primarily to harvest fins for export (Cripps and Gardner, 2016). It appears, however, that large apex marine predators were rarely targeted in the archaeological record and shark meat is not traditionally a preferred food (Cripps et al., 2015; Douglass et al., 2018; Grealy et al., 2016). The archaeological record combined with ethnographic accounts of a noticeable decline in shark populations within living memory suggests that intensive human pressure on these populations began in the 20th century, driven by growing international demand for shark fins and other marine products (Cripps et al., 2015).

In response to deteriorating ecologies and threats to livelihoods, non-governmental organizations have stepped up efforts through the implementation of community-based conservation and development programs (Gardner et al., 2018; Harding et al., 2006; Harris, 2007). These programs institute projects to address aspects of community life, including reproductive health, education, and resource use (Blue Ventures, 2016). Though positive outcomes have emerged from community-based programs (e.g. Benbow et al., 2014; FAO, 2019; IUCN, 2018), a focus on behavior modification ultimately places the burden of conservation on impoverished and marginalized communities, despite the oftentimes more significant impacts of powerful multinational entities engaged in resource extraction. The disproportionate burden on marginalized communities to address environmental and climate change is a global trend (Bauer and Ellis, 2018). At the same time, conservation and development efforts are often guided by relatively short-term perspectives on how the region's landscapes and ecologies have co-evolved with human communities (Douglass et al., 2019). The MAP aims to collaborate with Vezo communities as well as with conservation and development organizations to understand how coastal communities have managed and shaped their landscapes over centuries and millennia and document Vezo traditional ecological knowledge and practices. These historical ecological perspectives combined with traditional knowledge can provide important insights and time depth to better understand the rate and process of ecological change and develop effective strategies for sustaining ecologies and livelihoods (Davies, 2012; Douglass et al., 2019). Furthermore, the MAP's work thus far underscores the changing nature of human–environment dynamics and the diverse resource-use strategies of distinct communities, even when it comes to contemporary groups occupying areas with similar ecologies. These insights discourage a baseline assumption that ancient and contemporary communities are blanket consumers of all available resources and call for further research to understand the region's human ecology.

Phase I: Project development

Recruiting and engaging with diverse communities at multiple scales. In this section we highlight how the MAP seeks to recruit and include LID communities at multiple scales, ranging from small communities in the southwest to the Malagasy diaspora and its far-reaching networks. The MAP began as an archaeological reconnaissance around several modern villages located along the coast between the cities of Toliara and Morombe (Figure 1). The MAP's first season was aimed at locating promising sites to establish a dissertation field project and at identifying local partners. In order to begin surveying the coastline, the project leader first made contact with Malagasy archaeologists based at the universities of Antananarivo and Toliara and obtained fieldwork authorizations. In addition to these authorizations, community leaders in villages along the coast were consulted, in order to obtain their permission to survey. Leaders in Andavadoake (Figure S1), a coastal fishing community within the Velondriake Marine Protected Area (Figure 1), were enthusiastic about the potential for an archaeological project to expand the scope of environmental research already being carried out by UK-based conservation organization Blue Ventures. Through early discussions in Andavadoake with community leaders and conservation scientists, it was clear that fruitful collaborations integrating archaeology, conservation science, and local knowledge could emerge.

Community is not a homogeneous entity (Agbe-Davies, 2010). The MAP collaborates with multiple LID communities at different scales. These collaborations have developed over a period of years and require flexibility, as the project adjusts to integrate the needs of various partners. First, we describe the representation of different communities within the MAP team, as this diversity within the team allows the project to communicate widely with LID communities and ensure their influence over the project and access to its potential benefits (Mehari and Ryano, 2016). Team members share information about the project most readily with individuals in their social networks and these networks are influenced by identity. The MAP field lab is based in the village of Andavadoake, where most community members identify as Vezo fishers, one of three subsistence-based identities in this part of southwest Madagascar (Astuti, 1995; Tucker, 2003). The core MAP team is made up primarily of individuals who self-identify as Vezo, but also includes members who identify as Masikoro (herders) and Mikea (foragers). The strong representation of Vezo team members is largely linked to the project's long-term interest in investigating coastal contexts and its base of operations in a coastal village. Vezo view their livelihood as being tied inextricably to the sea and are experts in marine and coastal ecology, fishing, and sailing (Astuti, 1995; Koechlin, 1975). Although they share clan affiliations, live near or even in Vezo villages, and regularly interact and trade with Vezo, Masikoro and Mikea individuals consider themselves to be expert herder/farmers and forest-based foragers, respectively (Yount et al., 2001). Depending on the location of an active survey or excavation, either on the immediate coast and offshore islands or inland, the

composition of the MAP field team shifts from being more heavily Vezo to including more Mikea or Masikoro team members. Moreover, the location of an archaeological site and the kinds of resources that dominate its assemblage often lead the team to describe the site as an ancient Vezo, Mikea, or Masikoro site.

Identity in Velondriake is multifaceted. As with the representation of subsistence-based identities (Vezo, Masikoro, and Mikea), representation of different ancestral clans within the team is important for equitable information sharing, influence over project design, and access to project benefits (jobs, training, etc.). But, in a region where clan identities co-exist with the more externally visible subsistence-based identities, knowing how and who to recruit requires collaboration right from the start with established community members, particularly elders who are guardians of clan genealogies. Finally, for the same reasons as highlighted above with regard to clan representation, the MAP recruits team members of different genders, ages, and educational backgrounds.

A diverse team means that the MAP is supported by a wide base of LID knowledge, a point to which we return when we discuss phases 2 and 3: fieldwork and analysis. One major challenge in terms of gender equity for the MAP team is in maintaining equal access to project opportunities that involve travel, as women on the team often bear the responsibility for child care within their families. This means that men on the team may find it easier to go on long fieldwork expeditions or travel to the city for supplies and meetings with regional partners. Our goal moving forward is to ensure there is sufficient project funding and support to accommodate women's child care and other family-related needs, so that they may participate more readily in work involving travel.

Beyond the local level, the project seeks to build partnerships at the regional, national, and international scale. These communities are part of the broader Malagasy community and diaspora, and share an interest in knowledge production about the island's past. At the national and regional scale, MAP is building relationships with public servants. These relationships require taking the time to understand the government's policies, procedures, and the people who are its infrastructure. Foreign archaeologists, in particular, are often put off by opaque and changing protocols for acquiring permits from national and regional authorities. This is not limited to the Madagascar case-study, and is often a challenge in countries where government is in a state of transition or conflict. It is especially in these politically and administratively challenging contexts that it is important to think of community and people, as institutional personnel play an essential role in maintaining institutional knowledge. Computerized and online systems for processing research, import, and export permits are limited and what may appear to a foreign researcher to be a lack of government infrastructure is actually infrastructure embodied and maintained by individuals. In this way, the act of obtaining permits for research is a social process.

We have experienced interest in our work at the national and regional levels and have included staff from government offices in fieldwork, not simply as observers or report writers but as team members who engage with all aspects of the fieldwork.

Our view is that inclusion and first-hand participation in our project is more powerful than curtailed interactions at the start (application for research permits) and end of a project (processing export permits and submitting a written report). One example of how this ultimately impacts research is the circulation of information about active and past research projects in Madagascar. Because people are the pillars of government infrastructure, information is only accessible through people. There are no government or Madagascar-based institutional websites that provide information about who is currently conducting archaeological fieldwork or what unpublished reports may be available. Thus, without engaging with people it is impossible to conduct fully informed research. This issue primarily pertains to foreign archaeologists who typically endeavor to make their interactions with government offices as short as possible and are easily persuaded to hire individuals (especially ones who are fluent in one or more foreign languages) as fixers. These individuals facilitate the acquisition of permits and make it possible for foreign researchers to avoid spending any time in government offices whatsoever. Otherwise, foreign archaeologists often leave the task of obtaining paperwork to their Malagasy counterparts at local universities and museums. This is also problematic as it can fill local researchers' time on a project with bureaucratic work as opposed to participation in research activities; due to limited Malagasy funding for archaeology, local archaeologists are often constrained to working on foreign-funded projects. Building partnerships with regional and national government entities is certainly time-consuming, and this presents a challenge for many researchers who may not have budgeted time for building these relationships. Sufficient funding is also necessary, so that civil servants participating in the project are adequately compensated and reimbursed for travel and other expenses.

A critical aspect of the MAP's engagement at the regional level is its collaboration with scholars at the Université de Toliara, southwest Madagascar's leading research institution. Faculty have been members of several MAP field projects and co-authored papers for publication. As the MAP has developed over the years, its field-based research infrastructure has made it possible to offer significant training opportunities in field and laboratory methods to Toliara students. The MAP's collaboration with the university has also opened pathways for team members from Velondriake to pursue university studies, supported by crowdsourcing campaigns managed by the team.

Finally, although this level of collaborative engagement is just beginning to emerge, at the international level the MAP seeks to build regular dialogue with the Malagasy diaspora, as Malagasy musicians, filmmakers, diplomats, and other expatriates are powerful actors in shaping perceptions of Madagascar and its people, and guiding development agendas on the island. Malagasy artists living abroad are an especially important voice in introducing the international community to Madagascar and its people. They celebrate the island's cultural richness and raise awareness about social, political, and ecological challenges it faces. Their international stature also amplifies their voices at home; several Malagasy artists

have become widely recognized for promoting socially just views of resource use and land tenure. As archaeologists explicitly studying past resource use and the evolution of human and other biotic communities, we have the opportunity to collaborate with the diaspora's many voices in the arts, politics, and business, to build more inclusive understandings of how ancient and contemporary Malagasy communities have interacted with the island's environments.

Phase 2: Fieldwork

Empowered collaboration. Recruiting diverse collaborators into the project is not enough to ensure a full collaboration. In this section, we focus on the importance of empowering collaborators to be full participants in the project. In the examples that follow, we highlight the need to create contexts that allow for different collaborators' voices and perspectives to be amplified, as this is one form of power sharing that promotes knowledge exchange. The first example is of integrating the voices of the most important community members, the *Razana* (ancestors), in different levels of the project. *Razana* in southwest Madagascar are active community members. They are manifest in daily life. Most archaeologists working in Madagascar know about *Razana* because many local customs require that ancestors be consulted at the start of any significant undertaking. This usually involves a ceremony, including a libation or offering, performed by an *Olo Be* (elder) who has the authority to ask the *Razana* for their blessing (Figure S2). The MAP views *Razana* as integral members of the project who must be consulted regularly regarding project specifics like where to survey or excavate, how to maintain the safety of the team, and how to interpret our findings. We empower the voices of the *Razana* by performing ceremonies during which appropriate rituals and sacrifices are completed at different stages of the project (Figure S3). *Olo Be* are consulted closely to ensure that customs are respected, including selecting sacrificial zebu with the appropriate pelage for a given ceremony. *Olo Be* from several communities and clans are invited to attend and meat is distributed according to *fomba* (custom). During traditional ceremonies the *Razana*, via the *Olo Be*, contribute important insights to the project. In the context of traditional ceremonies, the authority of the *Razana* is emphasized and the *Olo Be* are empowered to act as mediums.

In addition to performing traditional ceremonies, the MAP's fieldwork methodology includes oral history interviews with *Olo Be* in every village community in Velondriake. We invite *Olo Be* to visit our excavation sites and share site histories (Figure 3). Collaborating with *Razana* and *Olo Be* has had a measurable impact on the MAP's ability to record archaeological landscapes. For example, the MAP has been entrusted with the location and history of caves that often do not appear on topographic maps of the region. These sites were intentionally hidden from map makers by their informants during the French colonial administration, as caves served as important places of hiding during the period of French colonial rule and earlier periods of political insecurity. Today caves continue to serve as important



Figure 3. GM consults with an *Olo Be* while excavating the site of Antsaragnangny in Velondriake.

sites for ritual and are often sacred. During the group discussions for this paper, several MAP team members expressed the importance of our collaboration with *Olo Be* and cited this collaboration as a personal benefit of being on the team. They emphasized the valuable knowledge they gained about clan histories and the relationships and interactions between ancestral communities. Learning these *fomba* (customs) and *tantara* (histories) allows team members to accumulate wealth in local knowledge and increase their social status as people who *mahay* (know) *tantara*.

Another example we offer is of collaborating with Velondriake women to study archaeological and contemporary shellfishing. Shellfishing is a sorely understudied topic in Madagascar both in terms of archaeological and contemporary communities (Douglass, 2016). The abundance of shellfish remains at archaeological sites and in living villages testifies to contributions of these taxa to subsistence, daily, and ritual life, but recorded data are sparse (Figures S4 and S5). Our approach to archaeological shellfish identification and analysis has been to assign leadership roles to women on the team who have been observing, gathering, and processing shellfish their entire lives (Figure S4). The sorting, identification, and taphonomic analysis of archaeological shellfish often take place around the *adesy* (charcoal cook stoves) used to prepare meals or on the *lay* (sail) of a *Vezo lakana* (outrigger canoe) spread over the sand; these spaces are ones in which women confidently exchange knowledge on a daily basis while managing their households

(Figures S6 and S7). Assigning prominence to the roles of women as shellfish experts has led to the collaborative development of an emerging ethnobiology project within the MAP to investigate shellfish gathering and processing, and indigenous taxonomy.

Phase 3: Analysis

Scientific training. The MAP encourages equal access to training, information, responsibilities, and promotion within the team. One baseline principle is that all team members, regardless of age, gender, literacy, and skill, spend time working on all aspects of the project, from management to data collection, analysis, and interpretation. When it comes to the analysis of archaeological materials, we seek to maximize in-person collaboration.

A recent fish remains workshop exemplifies how the MAP applied a collaborative approach that emphasized knowledge/skills exchange. The idea for the fish workshop arose organically because of the success the team had in analyzing shellfish remains and a desire to do more analysis in the field together. Similar to shellfishing, fishing is largely understudied in Madagascar, despite its importance to past and present communities (Douglass et al., 2018). Our ability to understand past fishing practices and their socio-ecological impacts has been limited by a lack of locally accessible reference collections of Malagasy marine fauna. To address this challenge, in June 2018 EQM, a MAP team member, led a three-week workshop in Andavadoake on the development and use of a fish skeletal reference collection. Participants in the workshop were MAP team and community members, including two students from the Université de Toliara. Our goal was to provide the training and tools needed to develop and manage a community-based resource for interpreting archaeological fish remains.

In the first part of the workshop, we focused on developing a locally based fish reference collection. The workshop integrated the skills and knowledge contributed by a diverse group of participants, including fishers, sailors, shellfish gatherers, and community leaders representing various ages and genders. We all shared different experiences with fish bones, whether as zooarchaeologists, fishers, cooks, and/or avid fish eaters. For example, CSC, a skilled fisher, taught others how to process a large *lamatsa* (*Scomberomorus commerson*) and remove all edible meat from this local delicacy before the maceration process (Figure 4). By jointly integrating diverse skills and knowledge, we adapted a “scientific” method of building collections in a local context to ensure the sustainability of the collection as a community-based resource. The workshop was hands-on—participants learned first by observing the steps of the process, then by practicing the steps themselves several times, and finally by teaching the steps to others. Throughout this process, we adjusted the steps to integrate our diverse skills and knowledge. In this way, participants not only contributed to developing the process, but were ultimately the teachers themselves. At the end of the workshop, participants created a set of instructions—translated in Vezo and English—for processing collection specimens



Figure 4. During the fish workshop CSC, an expert fisher on the MAP team, demonstrates how to fillet a *lamatsa* fish to remove all edible flesh before the maceration process.

(Figure S11). To ensure the sustainability of the project the PI committed to paying wages to those who had been trained so that they could continue to practice and develop the reference collection year-round. By the end of the workshop, the collection included 40 specimens and has grown to almost 250 specimens of varied fish species in less than one year. Project members and local community leaders expressed their great pride in the growing comparative collection, which represents the only skeletal fish reference collection for zooarchaeological analysis on Madagascar.

The second part of the workshop demonstrates the MAP principle of including team members in many aspects of the research process. The workshop provided an introduction to the analysis of archaeological fish remains with the goal of expanding the training so that team members can carry out the analysis and interpret the data locally (Figures S9 and S10). Participants used the finished reference specimens to learn about fish skeletal anatomy, how to morphologically differentiate fish taxa, and how to estimate the size of live fish from fish bone. Additionally, participants practiced leading an archaeology project using skills previously acquired through MAP activities (Table 2). Groups of participants conducted an ethnoarchaeological study of fish consumption in Andavadoake; each selected their

Table 2. List of skills mentioned by team members during interviews about collaboration and the MAP; skills are ordered by the number of times they were mentioned by different people.

#Mentions	Skills
7	Analyze ceramics
6	Identify and analyze fish bones
4	Conduct excavations
4	Use GPS
3	Identify and analyze shellfish
3	Build reference collection
3	Use microscope
2	Conduct interviews
2	Conduct walking surveys
2	Use a compass
1	Analyze elephant bird egg shells
1	Take photos
1	Analyze different materials
1	Record data

sites, undertook surface collections of fish remains, and collected data on their assemblages (Figure S8).

Beyond the practical skills shared through the workshop activities, participants exchanged knowledge about fishing practices and the role of fish in Vezo communities, such as the types of fish that are highly valued. Team members expressed the value of this knowledge exchange beyond archaeology and a desire to learn more about fish ecology and biology for their own knowledge and in connection to conservation practices. The ability for shared experiences and conversations to spark knowledge exchange is recognized as a key component of community archaeology by Africanist scholars (Schmidt and Pikirayi, 2016). In the MAP, the knowledge exchanges that result from including diverse team members in all aspects of the research process are critical to shaping the direction of the project itself.

Phase 4: Output

Thus far MAP output has primarily been driven by efforts to reach out to the broader Velondriake community and to meet the PI's requirements for academic promotion in the United States (e.g. academic publications and conference presentations). All MAP publications have been summarized in Vezo and copies of papers and their translations are available in the Andavadoake community library, which the MAP helped establish. The team regularly presents research results to the broader community,



Figure 5. MAP team marches in Independence Day parade along with other community organizations.

often at meetings of the local fishers' association. We are proud of the MAP's accomplishments to date in working toward the inclusive production of knowledge (Willyard et al., 2018). We are, however, eager to develop outputs that are equitable and provide greater benefits to the team and community. Here we highlight one example of project outreach, outline some of the barriers we face in establishing a stronger collaboration on project output, and describe possibilities for future outputs.

On 26 June, people across the country celebrate Malagasy Independence Day with community gatherings, performances, parades, and speeches. In Velondriake, the 26th is celebrated in the village of Befandefa, the seat of local government (Figure 1). In 2014 and 2018, years when MAP fieldwork coincided with Independence Day, the team participated in the celebrations in Befandefa by marching in the parade with other local community groups (youth groups, women's groups, etc.) and by performing dance choreographies (Figure 5). All team members wore project t-shirts that relayed information about archaeology and oral history. Choreographies were selected to represent the team's backgrounds. In 2018, for example, MAP performed an American hip hop choreography and a choreography set to an original song in Vezo composed by BVP that describes how archaeology helps us to learn about the past (Figures S12 to S14). Daily morning dance rehearsals in preparation for the performance allowed everyone to bond and collaborate on how MAP presents itself to the broader community (Figure S12). Bonding through music and dance breaks down perceived and real

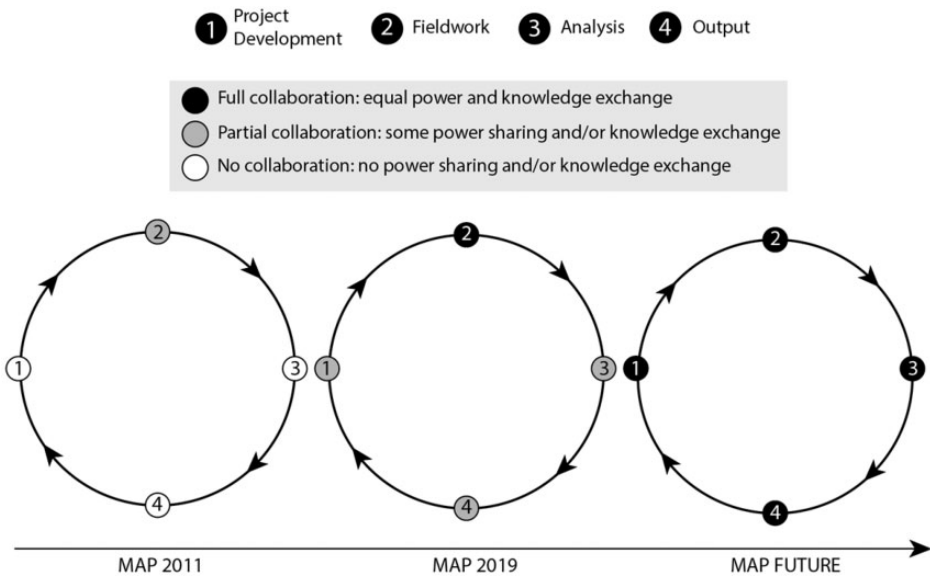


Figure 6. Progression of degree of collaboration in the MAP from 2011 to 2019 and desired level of collaboration in the future.

hierarchies within the team, whether between foreigner and Malagasy, elder and youth, or male and female. Likewise, performing during Independence Day makes all members of the team more approachable to people in the community. Breaking down barriers in this way encourages better communication within and beyond the team. Furthermore, dancing and feasting with members of the community creates shared spaces and experiences that are shaped by community members. A sign of the community's appreciation for the performances on Independence Day is the tips people place in a container in front of the performers during each act. In both years that the MAP participated in the Befandefa ceremonies, the team received more tips than any other group. In the nights following the performances people requested and shared the music from the MAP choreographies; the songs could be heard playing in many local shops and bars.

Despite our desire to be an equitable project, our primary research output via academic publications and presentations brings more professional and economic benefits to team members on an academic career track (e.g. PI, university students, postdoctoral researchers, especially at non-Malagasy institutions) than to most Velondriake team members. As we discussed some of the frustrations that stem from these inequities, future possibilities emerged. For example, many team members expressed disappointment that the project does not run continuously year-round due to funding limitations. This frustration is both economic and research-related; the project provides only sporadic income, and vast archaeological landscapes and oral history archives remain undocumented. Furthermore, the

archaeological and oral historical records that are prioritized at the development phase do not necessarily reflect those LID team members might have selected had they been full collaborators from the start (Figure 6). Team members were eager to investigate archaeological and oral historical records beyond the scope of current MAP research, particularly given the destructive impacts of increasingly frequent extreme weather events on material remains and economic changes that are steadily eroding traditional knowledge and practices. The realities of an academic funding stream are such that the MAP is unlikely to provide full-time, long-term employment to a large group of archaeologists, and that our efforts, influenced by the interests of foreign funding bodies versus those of LID communities, will only touch a relatively small portion of the archaeological and oral historical record.

One possibility for future outcomes, inspired by dialogue between the MAP and the local fishers' association, is to found a cultural resources management (CRM) company run by MAP team members. The rapid pace of development in Africa brings opportunities for employing local archaeologists (Kusimba, 1996). In southwest Madagascar income could be generated by performing cultural resource assessments of sites earmarked for mining and construction. Multinational corporations involved in development in southwest Madagascar commission cultural resource assessments when they operate in countries whose laws require them. The MAP could help to facilitate the founding of a CRM company by prioritizing relevant methodological training and providing use of MAP equipment. More broadly, skills learned through the project could be useful for other jobs (Table 2). Two team members have applied archaeological field skills to work on conservation projects.

Another possibility for promoting more equitable outcomes is to tailor project training opportunities so that they include topics and skills that team members are eager to learn. Through our group discussions for this paper we came to understand that the historical ecological insights and zooarchaeological training (e.g. the fish remains workshop) derived from the project benefitted LID team members who are weighing in on conservation policy. Several members of the team described the value of understanding the long-term changes in coastal ecologies through the archaeological record, as these diachronic perspectives could inform present and future fisheries management strategies. This is also the reason several LID team members are eager for further ecological and biological training to complement the curriculum of the fish remains workshop.

Discussions of future collaborations between the MAP and the Université de Toliara have centered on three areas in which to strengthen the existing partnership. The MAP aims to (1) provide greater support for student research projects at the undergraduate and graduate levels, (2) organize occasional colloquia at the university, and (3) coordinate with the university's anthropology museum, the Centre de Documentation et de Recherche sur l'Art et les Traditions Orales à Madagascar (CeDRATOM), to develop site- and CeDRATOM-based exhibits to showcase archaeological research. This last objective to expand our public outreach

Table 3. Chart designed to evaluate the degree of community collaboration within an archaeological project, using the present-day MAP as an example.

Phase	Task	Level of collaboration
Project development	Build project team	1
	Build community partnerships	1
	Define goals/questions	1
	Determine research methods	0
	Identify desired outcomes	1
	Create data/materials management plan	1
	Develop funding proposals	0
	Obtain permits and permissions	1
	Plan project logistics	1
Fieldwork	Community and elder greetings	2
	Manage field logistics	2
	Manage field lab	2
	Carry out excavations	2
	Carry out surveys	2
	Conduct interviews	2
	Build reference collections	2
Analysis	Collect data on excavated materials	1
	Choose samples for biochemical analyses	0
	Perform statistical analyses	0
	Interpret results	1
Output	Prepare publications	1
	Present at academic conferences	0
	Organize community outreach	1
	Develop educational materials	1
Legend	(0) None: no power sharing and/or knowledge exchange	
	(1) Partial: some power sharing and/or knowledge exchange	
	(2) Full: equal power and knowledge exchange	

efforts through exhibits is also of particular interest to public officials in Velondriake.

Ultimately, equitable output is more realistically achieved when full collaboration takes place during project development. The team has recently submitted grant applications to support a collaborative project development workshop in Madagascar that engages researchers, community members, and conservation and development representatives. If funded, the workshop would result in a collaboratively developed proposal to fund a multi-year project investigating the

ecological role of traditional Vezo practices and threats to livelihoods and biodiversity, where participants could agree upon desired outcomes from the start.

Guidelines for self-reflection

We engage in ongoing self-reflection in our effort towards full collaboration. Since 2011, the project has evolved from being PI-driven with partial collaboration during fieldwork to engaging in at least partial collaboration with LID communities in all research phases (Figure 6). We developed a chart to evaluate our level of collaboration throughout different project phases (Table 3). The chart can be adapted to evaluate any project. One of the patterns that emerged from our self-evaluation is that the MAP is more collaborative while everyone is in the field engaging in person, while tasks scheduled outside of the field season continue to be PI-driven. Recognizing that shared experiences facilitate collaboration led us to bring more project planning to Velondriake, build local research infrastructure, and invite LID community members to participate in research activities at institutions abroad.

Conclusion

We argue that practicing archaeology inclusively on Madagascar is a matter of social and environmental justice made urgent by the many environmental and economic challenges facing the island's diverse communities today (Douglass et al., 2019). Among many reasons to engage in more integrated and collaborative research, we highlight two in the context of our work. First, the archaeology of Madagascar has been dominated by an interest in environmental questions linked to the island's initial settlement by people, leading to a heavy reliance on eco-facts (carbon samples, botanical remains, animal bones, soils, etc.) for the production of archaeological knowledge. A reliance on eco-facts that are often processed, analyzed, and interpreted in overseas laboratories has created a gulf between living Malagasy and the archaeological investigation of the Malagasy past. In this regard, environmental archaeology must engage in critical self-reflection and find ways to work collaboratively with LID communities. Similar issues have been raised regarding ethical treatment and use of human genetic material taken from archaeological and museum contexts (Prendergast and Sawchuk, 2018). Second, our understanding of past human–environment interaction on Madagascar has shaped perceptions of present human–environment interactions, with consequences for the development of resource-use and conservation policies. Although we focus here on Madagascar as a case study, intersections of archaeology and environmental justice exist in other regions, particularly where the archaeology is dominated by questions relating to long-distance human migrations, the settlement of formerly uninhabited regions, ecological change, and faunal extinctions, and where local communities today are politically, socially, and/or economically marginalized.

Finally, we are committed to ongoing self-reflection as our collaborative project continues to evolve. We hope that the insights and suggestions presented in this paper will facilitate self-reflection in other projects. As Hinson (1999) writes about collaborative ethnography:

True collaboration entails a sharing of authority and a sharing of visions. This means more than just asking for consultant commentary, more than inviting contributions that deepen but don't derail, more than the kind of community tokenism that invites contributors to the opening but not to the planning sessions. [...] It also means directing the collaborative work toward multiple ends, ends that speak to different needs and different constituencies, ends that might be so differently defined as to have never even been considered by one or more of the collaborating parties. (p. 2)

Collaboration presents many challenges and requires a long-term engagement with communities, facilitated by locally based infrastructure to support joint research. Primary challenges include (1) time, (2) lack of adequate training for archaeologists (e.g. language background, ethnographic methods), and (3) conflicts with academic rewards systems (e.g. funding guidelines, peer-reviewed publication). Despite these challenges, we believe collaboration is necessary to produce more informed, meaningful, and just knowledge about the past.

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Supplemental material

Supplemental material for this article is available online.

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Author biographies

Kristina Douglass is an assistant professor of anthropology at the Pennsylvania State University. She directs the Morombe Archaeological Project (MAP) in southwest Madagascar and the Olo Be Taloha and Pond Zooarchaeology laboratories at Penn State.

Eréndira Quintana Morales is a postdoctoral researcher in the Olo Be Taloha Lab at Penn State. She joined the MAP in 2018.

George Manahira is the MAP field team manager and is a scuba instructor for Blue Ventures Conservation. He is based in Andavadoake, SW Madagascar.

Felicia Fenomanana is a MAP team member and octopus fisher. She is based in Andavadoake, SW Madagascar.

Roger Samba is a MAP team member and former president of the Velondriake fishers' association. He leads the MAP's oral history recording efforts in Velondriake and is based in Andavadoake, SW Madagascar.

Francois Lahiniriko is a MAP team member and student of the IHSM Biodiversity program in Toliara. He is based in Andavadoake, SW Madagascar.

Zafy Maharesy Chrisostome is a MAP team member and student of the IHSM Biodiversity program in Toliara. He is based in Andavadoake, SW Madagascar.

Voahirana Vavisoa is a MAP team member and octopus fisher. She is based in Andavadoake, SW Madagascar.

Patricia Soafiavy is a MAP team member and octopus fisher. She is based in Andavadoake, SW Madagascar.

Ricky Justome is a MAP team member and fisher. He is based in Andavadoake, SW Madagascar.

Harson Leonce is a MAP team member and fisher. He is based in Andavadoake, SW Madagascar.

Laurence Hubertine is a MAP team member. She is based in Andavadoake, SW Madagascar.

Briand Venance Pierre is a MAP team member and musician. Originally from Ampasilava (SW Madagascar), he is now based in Antananarivo, Madagascar.

Carnah Tahirisoa is a MAP team member. She is based in Andavadoake, SW Madagascar.

Christoph Sakisy Colomb is a MAP team member and fisher. He is based in Andavadoake, SW Madagascar.

Fleurita Soamampionona Lovanirina is a MAP team member. She is based in Andavadoake, SW Madagascar.

Vanillah Andriankaja is a MAP team member. He is based in Andavadoake, SW Madagascar.

Rivo Robison is a MAP team member and fisher. He is based in Andavadoake, SW Madagascar.