Research

Accounting for Yolŋu ranger work in the Dhimurru Indigenous Protected Area, Australia

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ABSTRACT. Over the past decade, there has been increased international interest in understanding and recognizing the contribution of Indigenous natural and cultural resource management, including Indigenous ranger work, to the sustainable management of social-ecological systems. In Australia, Indigenous rangers are responsible for managing land and seas that represent approximately 44% of the national protected area estate. Governments and other coinvestors seek to evaluate this ranger work and its contribution to biodiversity conservation and other public goods. However, current monitoring and evaluation approaches are based in conceptions of value and benefits and do not capture the full range of contributions and meanings associated with this work. We present an empirical case study from northern Australia in which we explore how to properly account for the full complexity and richness of Indigenous ranger work. We demonstrate that the work of being an Indigenous ranger at a Yolŋu (Indigenous people of Northeast Arnhem Land) land and sea management organization, (the Dhimurru Aboriginal Corporation or Dhimurru), can be understood as three sets of knowledge practices: the practices of "knowing and being known by Yolŋu country;" the practices of "mobilizing the Dhimurru Vision Statement;" and, the practices of "being *ralpa*" (Ralpa is a Yolŋu concept that means being willing to work and prepared to take on leadership responsibilities.) We contend that these knowledge practices represent criteria for judging the effectiveness of Yolŋu ranger work. The Dhimurru knowledge community of senior Yolŋu landowners and their collaborators, judge the effectiveness of Yolŋu ranger work based on whether Yolŋu rangers demonstrate these practices. By integrating such criteria into Dhimurru's formal monitoring and evaluation processes endorsed by its government funding partners, Dhimurru can more effectively and fully demonstrate the contribution of Yolŋu rangers to the Yolŋu vision for ecologically and culturally sustainable management of the Dhimurru Indigenous Protected Area in the Northern Territory as part of Australia's national conservation estate.

Key Words: *accountability; Indigenous (Yolŋu) rangers; knowledge practices; monitoring and evaluation; protected area management*

INTRODUCTION

Over the past decade there has been increased international interest by researchers, practitioners, and policymakers in understanding and recognizing the contribution of Indigenous land and sea management, or what is also called Indigenous cultural and natural resource management (ICNRM; Garnett et al. 2009), including Indigenous ranger work (Barber 2015, Social Ventures Australia 2016), to the sustainable management of social-ecological systems (SES). The reason for the global interest in these activities lies in academic and social-political movements to better recognize Indigenous knowledges in sustainability efforts (Muir et al. 2010, Bohensky et al. 2013, Johnson et al. 2016, Diaz et al. 2019), government obligations to meet international and national targets for biodiversity conservation and sustainable development (such as the Sustainable Development Goals, i.e., UN General Assembly 2015), and promotion of accountability (Hockings et al. 2006). Simultaneously, Indigenous people worldwide continue to assert and exercise their rights, responsibilities, and obligations to their custodial lands and waters on the basis of sovereignty, resource rights, and benefit sharing (Langton et al. 2004, Altman and Kerins 2012). This is despite the substantial limitations of dominant land and sea management governance regimes in supporting and accounting for, not only Indigenous ownership and management rights to lands and waters, but also the contribution of ICNRM to societies and their environments more generally (Yunupiŋu and Muller 2009).

Scholars have recently noted the challenges and opportunities for understanding and representing the contributions of ICNRM including the work of Indigenous rangers. The term, "Indigenous ranger" (Ross et al. 2009), refers to Indigenous people who are employed to undertake management activities on their custodial lands and seas. In Australia, Indigenous rangers are employed in Indigenous protected areas (IPAs), a form of protected area under the Australian Government's national reserve system (NRS). Various concepts have been used to describe the range of effects created through the activities of Indigenous rangers, including "cobenefits" (Green and Minchin 2012, Barber and Jackson 2017), "benefits" (Weir et al. 2011, Barber 2015, van Bueren et al. 2015), "impact" (Fogarty et al. 2015), and "outcomes" (Social Ventures Australia 2016). Although it is beyond our scope to critically review these different framings (Ison et al. 2013), we focus on the current interest by governments and others, and Indigenous peoples themselves, in accounting for "performance" (Australian Government 2016) in their land and sea management, along with the range of effects of their management activities.

The performance of land and sea management is usually assessed using monitoring and evaluation (M&E) or "accountability" (Neale and Vincent 2016) processes founded in Western (non-Indigenous) scientific conceptions of SES dynamics and functions (Stacey et al. 2013). These processes link management effort to the persistence and/or health of ecosystem dynamics and attributes and embed criteria and metrics to assess management that are based in non-Indigenous logics and frameworks

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(Hasselman 2017). Many Indigenous land and sea managers resist these conventional or "neoliberal" (Fache 2014) conceptions of accountability in environmental management and are now critically examining their own land and sea management efforts and exploring how to appropriately assess and communicate the impacts and outcomes of these (Jollands and Harmsworth 2007, Weir 2011, Austin et al. 2017, 2018). The motivation for this is twofold: to continuously develop their own capacity as land and sea managers; and, to contest or counteract dominant, neoliberal (Fache 2014) forms of environmental management (Thompson et al. 2020) accounting including frameworks that do not adequately represent the contributions of ICNRM.

Over the past three decades, a growing movement (Burgess et al. 2005) or system (Fache and Moizo 2015) of over 127 Indigenous rangers in Australia (Australian Government 2019) represents a significant form of ICNRM (Altman and Kerins 2012). A small number of important studies have examined Indigenous ranger programs in Australia with the aim of justifying ongoing government support and developing insights on how Indigenous ranger work contributes to a range of areas including: community and individual health and well-being (Sitole et al. 2008, Garnett et al. 2009, Marika et al. 2012, Barber 2015, Austin et al. 2017); governance and management capacity (Woodward 2008, Weston et al. 2012); education and workforce development (Ayre 1998, Marika et al. 2012); economic participation (Buchanan and May 2012, Buchanan 2014); and, biodiversity conservation (Kennett et al. 2004, Ens et al. 2015). We add to these through an empirical case study of Indigenous ranger work at the Yolŋu Dhimurru Aboriginal Corporation (Dhimurru) in the Northern Territory of Australia. Yolŋu is the word Aboriginal people of North-east Arnhem Land use to describe themselves. It translates literally into English as person or people. This paper, which emerges from this study, is a collaboration between Indigenous (Yolŋu) and non-Indigenous authors. Our study focusses on how the work of Yolŋu rangers at Dhimurru is accounted for within a cross-cultural or "both-ways" (Marika et al. 1989) knowledge community and what this means for decolonizing (Muller 2003, Dhimurru Aboriginal Corporation 2015) what some have identified as "technocratic" (Chouinard 2013) environmental M&E approaches. Both-ways is a term used by Yolŋu people to describe the explicit working together of Yolŋu (Indigenous) and non-Indigenous knowledge traditions (Marika et al. 1989, Yunupiŋu 1989, Stockley et al. 2017).

To appropriately account for Indigenous ranger work, we contend that the M&E processes for assessing this form of ICNRM must recognize and represent it as a unique form of knowledge work (Star and Strauss 1999, Verran 2013). This both-ways knowledge work is constituted by knowledge practices (Law and Mol 2002), which are the activities and processes involved in the production of Yolŋu ranger knowledge/s as it unfolds in particular times and places. For example, these practices include: interactions between people and their institutions and places; the physical (or material) environments in which Indigenous rangers work; and, the symbols (i.e., language, texts) used to communicate and translate meaning (Callon 1986, Mol et al. 2010, Green 2013).

We found that Yolŋu ranger work in the Dhimurru Indigenous Protected Area (Dhimurru IPA) in the Northern Territory of Australia is constituted in three linked sets of heterogenous

knowledge practices that we call: "knowing and being known by Yolŋu country," "mobilizing the Dhimurru Vision Statement," and "being *ralpa*." These practices can be understood as evaluation criteria for Yolŋu ranger work in that they circumscribe what is rightful and appropriate Yolŋu ranger work for the both-ways knowledge community of the Dhimurru Aboriginal Corporation (known as Dhimurru). We suggest that Yolŋu ranger work can be properly accounted for through formally articulating these criteria and by potentially integrating them into Dhimurru's M&E processes to guide future adaptive management of the Dhimurru IPA as part of Australia's NRS.

BACKGROUND

The Dhimurru Aboriginal Corporation and its Yolŋu (Indigenous) rangers

Since its inception in 1992, the Yolŋu Aboriginal organization of Dhimurru has employed Yolŋu rangers to implement the Yolŋu vision for sustainable land and sea management. Dhimurru is accountable to the Dhimurru knowledge community, including the "Yolŋu traditional owners who have control over decisions made on their lands" (Marika et al. 2009:410) and to others from whom it receives monies and other support. Its philosophy and operations are based on a Yolŋu-led both-ways governance model that has evolved over 25 years of collaboration by its members with non-Indigenous people and their organizations including governments, Indigenous representative bodies (i.e., the Northern Land Council) and research, industry, and community organizations (Muller 2008, Hoffmann et al. 2012, Herdman 2017, Rist et al. 2019). Seventeen Yolŋu landowning clans are represented in the membership of Dhimurru through the Dhimurru Board, which was established in 1990/1991 to govern Dhimurru's operations. In 2019 the board was an elected group of 10 members, 8 of whom were *Wäŋa Waṯaŋu* (patrilineal land owners in the Dhimurru IPA), and representing the various and often shared interests of other clans with responsibilities and rights in the Dhimurru IPA. Dhimurru's primary governance mandate is to implement sustainable recreational and commercial use and conserve the interdependent cultural and natural heritage values of the Dhimurru IPA (Dhimurru 2015). In the Dhimurru IPA model, Yolŋu landowners retain the primary decision-making authority for the management of Yolŋu lands and seas in the Dhimurru IPA. Dhimurru currently employs 10 Yolŋu rangers, three ranger facilitators, a senior cultural advisor, a managing director, executive officer, business manager, and an administrative officer.

Dhimurru is a leading ICNRM group and has been widely recognized for its work by commendation of numerous international, national (https://banksiafdn.com/2010-winners/), and regional awards (Hoffmann et al. 2012; https://chiefministerawards.nt.gov.au/archived-pages/award-winners/2006-awards). It has a focus on explicitly recognizing and negotiating between Yolŋu (Indigenous) and non-Yolŋu (non-Indigenous) knowledge traditions as a basis for appropriate and productive cross-cultural land and sea management activity. Yolŋu landowners receive funding from the Australian Government for operational support for the Dhimurru IPA and for its Yolŋu rangers. Dhimurru reports regularly to the Australian Government on its progress toward implementation of the agreed objectives of the Dhimurru IPA. The Dhimurru IPA Management

Plan (the Plan; Dhimurru 2015) is a key instrument for both organizing and tracking the work of the organization and Yolŋu rangers as key people who operationalize the Plan. Dhimurru IPA Monitoring Evaluation Reporting and Improvement (MERI) strategy (the MERI strategy) for the Dhimurru IPA forms part of the Plan and contains five monitoring actions against which Dhimurru must report annually. The MERI strategy supports the adaptive management of the Dhimurru IPA (Fig. 1).

Fig. 1. Map showing the location of the Dhimurru Indigenous Protected Area in the Northern Territory, Australia.
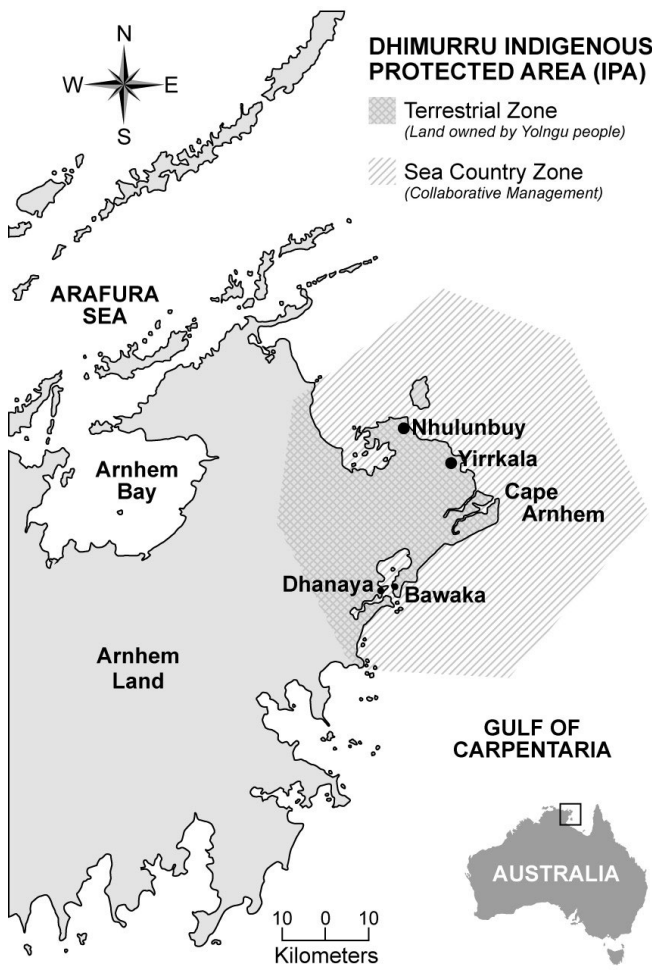
Adaptive management and Indigenous cultural and natural resource management

There is a growing and important body of international literature focused on assessing the contribution of ICNRM to global SES management. In the context of the international phenomenon of the "impact agenda" (Coombes et al. 2014) in environmental policy development, Indigenous and non-Indigenous scholars, practitioners, and their collaborators are exploring issues related to performance accounting (Wallington and Lawrence 2009) in environmental management. The overall goal of this scholarship and activity is to understand, articulate, and represent the contribution of ICNRM to the management of SESs including protected areas. Understanding and reframing (Cumming and

Allen 2017) protected areas as SESs is important in the context of ICNRM because this explicitly recognizes the complexity, intertwinedness, and relationality of social and ecological processes in their governance and adaptive management. For example, for many Indigenous peoples, and for the Yolŋu people of North-East Arnhem Land in Australia, there is an intimate and inextricable link between people and so-called nature, or the human and nonhuman (Bawaka Country et al. 2016).

Adaptive management is a principle and learning process for improvement of effective SES management worldwide (López-Angarita 2014), for e.g., in protected areas. In Australia, adaptive management is a key principle for assessing management effectiveness (Commonwealth of Australia 2010) of the NRS that include IPAs. In this context, Yolŋu owners of land and sea and their organization, Dhimurru, are committed to continuous improvement in the management of the Dhimurru IPA through regular and strategic reviews of its organizational capacity and performance (Dhimurru 2015) and the implementation of the MERI Strategy. For Dhimurru, central to its capacity to manage adaptively, is the work of Yolŋu rangers as people responsible for operationalizing the Dhimurru vision for sustainable management.

Although adaptive management is a global standard of environmental management, the implementation of, or practices of doing, adaptive management, are not routinely reported or well understood (Murray et al. 2015, West et al. 2019). A key part of these practices is M&E, which is the process and mechanisms for assessing progress toward stated goals and outcomes of adaptive management of SES. Normative processes of M&E in SES management aim "...to generate a knowledge base and to provide [for] performance planning" (Chouinard 2013:242). This knowledge base is used to inform decision making and resource allocation in SES, including protected areas owned and/or managed by Indigenous people. In the context of ICNRM, the challenge of harnessing and creating useful and relevant knowledge/s for M&E (Scarlett 2013, Hasselman 2017) is particularly acute because it involves creating and applying M&E frameworks that can appropriately credit knowledges other than Western scientific ones, as well as recognizing and accounting for different ontologies of place and people.

Scholars have recognized the challenge of accounting for so-called local (Taylor and de Loë 2012) and Indigenous knowledge/s, (Martín-López and Montes 2015, Corrigan et al. 2018) in adaptive management and environmental M&E, in which Western science typically provides the information basis for decision making and policy development. One response to this challenge is adaptive comanagement (Armitage et al. 2009), which promotes a reflexive consideration of power relations in SES management, as well as the contribution of multiple knowledges to the development of management capacity and options. This process of social learning, (or iterative learning in social groups; Blackmore 2010), is based on a recognition that different knowledge communities have different knowledge systems, with different theories, practices, and ontologies, related to cultural and natural resources and their management. For example, in resilience thinking (Folke et al. 2010), dynamics of uncertainty (e.g., nonlinearity of impacts), complexity (e.g., interdependencies and feedbacks between system functions), and diversity (e.g., the

role/s of multiple interests and knowledge/s) are characteristic features of SES (Scarlett 2013, Selomane et al. 2019). Alternatively, Indigenous managers of land and sea have a different ontology of land and sea. For them, land and sea are constituted in and by the relational dynamics between people and their custodial places (Hemming et al. 2007, Bawaka Country et al. 2016, Waapalaneexkweew 2018, Wilson and Inkster 2018, Latulippe and Klenk 2020). This means that assessing and tracking performance in adaptive management of SES under Indigenous control and direction will be based on different metrics and categories from those of Western science.

Monitoring and evaluation and Indigenous cultural and natural resource management (ICNRM)
In the context of ICNRM, the power dynamics between non-Indigenous and Indigenous knowledge systems in environmental M&E are such that the knowledge base for planning, implementing, and assessing SES management is primarily based in non-Indigenous categories and valuations (Bohensky and Maru 2011, Latulippe and Klenk 2020). Finding ways in which Indigenous and non-Indigenous managers of land and sea can have their contributions and knowledge/s equitably recognized and realized has been identified as critical for enhancing SES governance and management worldwide (Tengö et al. 2014). This includes the collaborative development of appropriate cross-cultural indicators and measures for assessing ecosystem health and functioning at local, regional, and even global scales (Austin et al. 2018). However, others have warned that government support for cross-cultural SES management in some contexts, including northern Australia Indigenous ranger groups, may be actively undermining Indigenous autonomy, power, and agency through a "focus on [particular] the notions of accountability and performance" (Fache 2014:282) that are "enforced by the state at all levels" (Fache 2014:282). For example, the ways in which the performance of Indigenous rangers is understood and accounted for in Australia are embedded in key government programs and initiatives related to ICNRM and Indigenous ranger work. These accountability constructions (Muller 2008) frame the scope and range of outcomes of Indigenous ranger work.

The *Indigenous Ranger Skills Guide* is a key government document that formally represents the normative scope of Indigenous ranger work in Australia. It provides a job classification of Indigenous ranger (Department of the Environment Water Heritage and the Arts 2009) and direction on how to plan skill development of Indigenous rangers according to units of competency (Commonwealth of Australia 2008), to be completed with registered training providers based on a national curriculum framework. The conventionally recognized outcomes of Indigenous ranger work (from the perspective of government) are mostly limited to employment and career development. For example, the key Australian Government programs that support Indigenous ranger work, the Indigenous Protected Area (IPA) and Working on Country (WoC) programs, account for the effectiveness of Indigenous rangers based on the following outcomes: "...availability of job opportunities (for prospective [Indigenous] Rangers) and the increase in the number of Indigenous adults in meaningful employment; ""[Indigenous] Rangers receive income, gain skills and training and increase in confidence, young people in community have more role models;" and, "improved land management career prospects for [Indigenous] Rangers" (SVA 2016:15).

It is important, however, to note that the performance assessment of Indigenous ranger work in Australia is implicitly embedded in: funding agreements between governments and Indigenous land and sea management organizations, and adaptive management mechanisms such as the Monitoring Evaluation Reporting and Improvement (MERI) frameworks that are a mandated part of protected area management plans including Indigenous Protected Areas. However, it has been recognized in Australia (Austin et al. 2018) and internationally that the roles, practices, and value of Indigenous ranger work is currently not clearly articulated, represented, and assessed in ways that explicitly embed Indigenous conceptions of value and meaningful caring for country activity. For example, Reed et al. (2020) emphasized the importance of engaging with Indigenous governance structures and knowledge/s to properly account for the work of Indigenous rangers.

Much of the progress in practicing M&E in the context of ICNRM has been on the monitoring aspects of adaptive management. Indigenous people and their partners have developed approaches to assess and report on environmental conditions and features to support adaptive management (Danielsen et al. 2009, Davies et al. 2013), both internationally and in Australia. For example, in New Zealand Indigenous Maori groups have developed assessment tools that articulate their own attributes and measures of social, cultural, and ecological health and functioning in the context of collaborative land use and freshwater management (Harmsworth et al. 2011, Awatere 2017). In Australia, Indigenous land and sea management groups, including Indigenous ranger groups, have developed collaborative ecological monitoring strategies that embed Indigenous knowledge and/or development of indicators for evaluation of SES conditions and functions (Ens et al. 2012, Gillespie et al. 2015, Gratani et al. 2016, Paltridge and Skroblin 2018). This monitoring work is critical for performance assessment in ICNRM because it provides an evidential basis for adaptive management. However, understanding how M&E processes can more broadly can enable Indigenous land and sea managers to understand, track, and represent their ICNRM work is also important for continuous improvement in SES management.

There are several approaches to the codesign and conduct of environmental M&E internationally that aim to enable an equitable, just, and productive exchange between people and groups with different knowledge systems. These include participatory M&E (Brown et al. 2012, Singh 2014), principles-focused evaluation (Patton 2017), and culturally responsive Indigenous evaluation (CRIE; Bowman et al. 2015). Principles-focused evaluation involves evaluating performance in relation to identified principles of an organization, project, or innovation context (Patton 2018). Unlike formative and summative evaluations, this developmental evaluation approach (Patton 2015) does not include assessing progress against predetermined criteria. Rather, it recognizes that criteria for success or improvement are emergent in the diversity and complexity of relationships, perspectives, and goals related to a particular change endeavor. Linked to this approach is CRIE, a blended practice (Waapalaneexkweew and Dodge-Francis 2018) that brings together Indigenous and non-Indigenous evaluation forms and frameworks. To date there are limited empirical examples in the published literature of the development and implementation of these approaches in ICNRM (Waapalaneexkweew and Dodge-

Francis 2018, Thompson et al. 2020). Exceptions include a description of adaptive comanagement in marine management in which "rules for [Indigenous] country" are described as a foundation for cross-cultural collaboration (Nursey-Bray and Rist 2009:123). Stacey et al. (2013) examined the participatory measurement of the performance of jointly managed protected areas involving Indigenous and non-Indigenous managers. In the United States, scholars and researchers have advocated for CRIE as a way of achieving social justice in Indigenous/non-Indigenous relations (see Bowman et al. 2015) and, in Canada, Indigenous managers are doing community-based monitoring as a practice of Indigenous water governance (Wilson and Inkster 2018). This research adds to this important work by critically reflecting on the work of Indigenous rangers in northern Australia to understand and articulate how the nature and contributions of this form of ICNRM can be accounted for or evaluated.

CONCEPTUAL FRAMEWORK

We aimed to understand and represent the meaning and contribution of Indigenous ranger work to the management of the Dhimurru IPA from the perspective of the members of the Dhimurru knowledge community who have worked for and with Dhimurru over its 25-year history. To stay true to this perspective, we took inspiration from science studies scholars (Shapin and Schaffer 1985, Star and Greismer 1999, Mol 2002a, Law 2004, Shove and Walker 2010) and Yolŋu Aboriginal scholars (Marika-Mununggiritj 1991, Yunupiŋu 1998) who understand the work of knowledge communities (Strathern 2004) to emerge through knowledge practices (Law and Mol 2002) or epistemic practices (Mol 2002b, Verran and Christie 2014). In this framing, …"'epistemic' refers to knowledge and how we account for what it is; our story or theory of knowledge" (Verran 2013:144). Knowledge (or epistemic) practices "…are those collective, routine socio-material ways of carrying on that enable people to say 'we know' with at least some degree of certainty" (Verran 2013:155). These practices emerge from the everyday interactions between people, material objects, symbols, and the meanings created through interactions between them.

To identify the knowledge practices of Yolŋu ranger work, we draw on a conceptual framework of knowledge production initially proposed by science studies scholars, Shapin and Schaffer (1985). In this constructivist framework, Shapin and Schaffer (1985) contended that all knowledge is produced in sets of heterogenous knowledge production technologies, or what we call practices (Ayre and Nettle 2015). These knowledge practices can be categorized in a typology of social, material, and textual (or, symbolic; Ayre and Nettle 2015) practices (see Table 1). In this study, we applied this typology and coded qualitative data relating to the meanings and contributions of Yolŋu ranger work as reported by members of Dhimurru's knowledge community and in relevant documents. We thereby identified social practices of Yolŋu ranger work, which are the activities of people and groups as they go on (Verran 2001) in various ways doing Yolŋu ranger work such as negotiating, communicating, performing Yolŋu ceremony (*buŋgul*), sustaining Yolŋu stories (*dhäwu*) of land and sea, etc. We also identified material practices of Yolŋu ranger work as the physical aspects of entities that provide context to human action, for example Yolŋu land and sea and its features. We then identified symbolic practices of Yolŋu ranger work,

which are the signs and symbols used to translate and communicate meaning between different people-places and times such as written documents, language, photos, and Yolŋu paintings (*min'tji*), etc. By identifying these different types of Yolŋu ranger practices, we reveal the scope, richness, and diversity of effective both-ways knowledge production for Yolŋu land and sea management.

Table 1. Typology of knowledge practices (adapted from Shapin and Schaffer 1985).

Knowledge practice type	Examples of knowledge practices
Social practices	Interacting through talking, ceremony, negotiation, etc; ways of doing and learning; sharing responsibility for land and sea management
Material practices	Sites in the land and sea; equipment and buildings (i.e., infrastructure)
Textual or symbolic practices	Language, painting, dance, written texts, photography, and video

METHODS

The research reported here is a qualitative social-science inquiry, which included the following methods: semistructured interviews (from 30 to 45 minutes in length); focus groups (from 30 to 45 minutes in length); participant observation; and, document analysis (see Table 2). The objectives and outcomes, methodology, budget, and communication strategy of the research was detailed in a Dhimurru Research Partnerships Agreement that was endorsed by the governing body of Dhimurru, the Dhimurru Board. The research was also approved by the Faculty of Science Human Ethics Committee at the University of Melbourne in 2016. During the research, the coauthors engaged the Dhimurru Board to discuss progress and findings and to iteratively negotiate directions and protocols for the research.

Primary data was collected from 38 semistructured interviews with members of the Dhimurru knowledge community including: Yolŋu rangers (current and former; 12 people); senior Yolŋu community members and landowners (15 people); and, non-Indigenous Dhimurru employees and collaborators (current and former; 11 people; see Table 2). Interviews were undertaken in English and transcribed. Although English is a fourth or fifth language for most Yolŋu people (who each speak several mutually intelligible Yolŋu clan languages), Yolŋu people interviewed speak English regularly in their work and in interactions with non-Indigenous people. We conducted the interviews in pairs, with non-Indigenous coresearchers (Margaret, Greg Wearne a long-term advisor to Dhimurru, and Jonathan) working with Indigenous coresearchers (Djalinda and Mandaka) to locate interviewees, gain informed consent, pose interview questions, and validate findings. In 2019, we discussed and confirmed the use of all direct quotes and the key findings of the research with participants including Dhimurru staff and Dhimurru Board members. Members of the board were engaged on five occasions in this research; not only as a matter of governance process, but to seek and include their direct input and ideas.

The purposive sampling strategy for interviews was designed to mirror the primary Dhimurru governance structure for the management of the Dhimurru IPA, the Dhimurru Board. The elected Dhimurru Board has agreed representation of Yolŋu clans with ownership and custodial rights and responsibilities in the Dhimurru IPA. It comprises of 10 members, with 8 of these people elected from the 2 primary, patrilineal landowning clans (*Wäŋa Waṯaŋu*) identified by the Northern Land Council in accord with the *Northern Territory Land Rights Act 1976*: the Rirratjiŋu (4 members) and the Gumatj (4 members) clans. These land-owning clans were the most intensively sampled by interview in this study: the Rirratiŋu (10 respondents) and Gumatj (9 respondents). The remaining two members on the Dhimurru Board are elected from closely related Yolŋu clans who have varying and shared interests, responsibilities, rights, and history of engagement in the Dhimurru IPA. Many of the Dhimurru staff are drawn from these clans and have very specific responsibilities to Dhimurru and the land and sea it manages. The remaining interviewees are representative of the broader Dhimurru knowledge community: Gälpu (1 respondent); Djapu (4 respondents); Dhaḻwaŋu (1 respondent); Ŋaymil/Dätiwuy (1 respondent); Golumala (1 respondent); and, key non-Indigenous past and present Dhimurru staff and collaborators (6 respondents).

Primary data were also collected in 2 focus groups with a total of 10 Yolŋu rangers. These group interviews were cofacilitated by Indigenous (Djalinda and Mandaka) and non-Indigenous coresearchers (Margaret, Greg, and Jonathan). Margaret also undertook participant observation at numerous Dhimurru activities between 2016 and 2019 in which Yolŋu rangers were involved including: daily planning meetings; Yolŋu community celebrations (see Table 2); and, *Galtha Rom* workshops. *Galtha Rom* is a Yolŋu-led both ways educational approach that has been a part of Yolŋu ranger work at Dhimurru since the middle of the 1990s (see Marika-Mununggiritj 1990, Marika-Mununggiritj and Christie 1995, Verran 2002*b*). Dhimurru rangers participate in *Galtha Rom* workshops as part of the Learning on Country program at Dhimurru and the Yirrkala Community Education Centre (Fogarty et al. 2015). Margaret, Jonathan, and Djalinda also collected secondary data including photos and historical documents on Dhimurru's development and the work of Yolŋu rangers in the Dhimurru IPA.

To analyze the qualitative data, Margaret coded them thematically in NVIVO software using the typology of knowledge practices presented in Table 2. This typology posits that all knowledge practices can be characterized by three broad types of practices which are: social, material, and textual (Shapin and Schaffer 1985), or what we call symbolic practices (Ayre and Nettle 2015). Margaret then used this typology as an analytical framework to identify the different knowledge practices of Yolŋu rangers as they are represented and embodied in the accounts and documents collected by the research team. Margaret coded qualitative data sources (interview and focus group transcripts and documents) using this typology and developed a series of summary statements that characterized the different social, material, and symbolic practices of Yolŋu rangers. Research team members then worked together to characterize these sets of practices in three broad categories (see Table 3) that reflect the nature and features of Yolŋu ranger work. The coauthors of this paper did this as a team in discussions over a period of several

months in 2018 and named and then validated these broad categories of Yolŋu ranger knowledge practices together with Dhimurru Board members at meetings in 2018 and 2019.

RESULTS

Knowledge practices of "Knowing and being known by Yolŋu country"

The set of Yolŋu ranger knowledge practices we call "Knowing and being known by Yolŋu country" emerge in the responsibilities bestowed on Yolŋu rangers as custodians for Yolŋu land and sea by the Dhimurru Board, Yolŋu landowners, and knowledge authorities of Yolŋu estates in the Dhimurru IPA. These practices include: learning, knowing, and keeping knowledge of Yolŋu country and Yolŋu land and sea management; fulfilling cultural responsibilities for land and sea through songs (*manikay*), ceremonies (*buŋgul*), totemic designs (*miny'tji*) and creation stories (*dhäwu*); knowing and representing your *wäŋa* (Yolŋu land and sea imbued with knowledge, relations, spirituality, and resources); demonstrating respect for and communicating with Yolŋu country and the ŋaḻapaḻ (elders) and landowners of different *wäŋa*; patrolling and managing access to different places on Yolŋu lands and seas; and, sharing knowledge with non-Indigenous people about Yolŋu country including rights and responsibilities related to appropriate activities and behaviors. Members of the Dhimurru knowledge community noted:

> …*they're doing the right work when they fully understand the land…that's the right thing for* [Yolŋu] *rangers to do*. Djawa 2 Burarrwaŋa, former Dhimurru Board member, Miwatj Health Board member, and Lirrwi Yolŋu Tourism chair, 22/6/2016

> *First and foremost … they need to have that knowledge of the country. Yolŋu knowledge. Yo* [Yes]. *It's always there. When a Yolŋu child is born, when we're growing up, that knowledge is there. Because it's passed down from Yolŋu families…Because when you're working on country, you need to have all that Yolŋu knowledge inside.* Yananymul Munuŋgurr, Yambirrpa School Council member, East Arnhem Region councilor, Laynhapuy Homelands Aboriginal Corporation Board member, and Yothu Yindi Foundation Board member, 20/6/2016

> *The knowledge is there for them in the country. When you take people away from Yolŋu country, that takes their mind away from the country.* Balupalu Yunupiŋu, former Senior Dhimurru Ranger and Yothu Yindi Foundation Board member, 15/6/2016

> *Because for the Yolŋu this is Yolŋu wäŋa, this is their land. They know everything and anything that is on the land, wherever it is, whose it is. Why is it there. This includes the epistemology, the knowledge and the study of who they are and their being. Because the land and the Yolŋu are one.* Merrkiyawuy Ganambarr-Stubbs, Yirrkala School Co-principal, 23/6/2016

> [Yolŋu ranger work] *is for the land. The land gave birth to us with the big responsibility of maintaining and monitoring the resources and the culture to be able to have sustainability in both worlds. And so that the Yolŋu and the land recognise and know each other on common*

Table 2. Data collected, methods used, and participants involved in the research.

Research Methods	Date/s	Research Participants
Semistructured interviews with members of the Dhimurru knowledge community[†]	12 June-30 September, 2016	38 people including: senior Yolŋu landowners (15 people); Dhimurru Yolŋu rangers (10 people); former Dhimurru Yolŋu ranger staff (2 people); non-Indigenous collaborators of Dhimurru (4 people); current and past non-Indigenous Dhimurru staff (7 people).
Focus groups with Dhimurru rangers	Focus group 1: 14 June, 2016 Focus group 2: 20 September, 2016	Focus group 1: Yolŋu rangers (6 people); Dhimurru fanger facilitator staff (3 people as observers). Focus group 2: Yolŋu *Miyalk* (women) rangers (4 people); senior Yolŋu management staff (2 people as coresearchers and cofaciliatorats).
Participant observation by coresearchers at Dhimurru activities including: Attendance at Dhimurru Yolŋu ranger activities; Attendance at three *galtha rom*[‡] workshops; Dhimurru 25 year anniversary celebration;	Three periods of field work: 13-24 June, 2016 17-24 September, 2017 27-30 September, 2018	Coresearchers with members of the Dhimurru knowledge community participating in Dhimurru activities.
Presentation and discussion of research findings with senior Yolŋu landowners at Dhimurru Board meetings.	27 April, 2016 30 November, 2016 11 April, 2017 12 April, 2018 9 May, 2019	Presentation and discussion by coresearchers at five Dhimurru Board meetings on research process, outcomes, and approvals/endorsements.

[†]At any one time, there are usually 8 to 10 Yolŋu rangers working at Dhimurru with 2 to 3 senior Dhimuru management staff and an average of 6 non-Indigenous people with 3 in Yolŋu ranger facilitator roles.
[‡]*Galtha rom* workshops have been developed as a both-ways learning and teaching methodology by members of the Yirrkala schools communities (Marika-Mununggiritj 1990, Marika-Mununggiritj and Christie 1995) and then by Dhimurru and its knowledge community members (Verran 2002*a*) as part of the formal "Learning on Country" (Dhimurru Aboriginal Corporation 2014) program at Dhimurru.

ground. Patrick White, former Dhimurru Senior Ranger, 24/6/2016

Yolŋu land/water itself was also identified as an active participant in Yolŋu ranger work. Respondents explained that Yolŋu land will recognize and know Yolŋu rangers as they visit focal sites on Yolŋu country (*wäŋa*) to undertake management tasks. This recognition is predicated on the reciprocity of respect and knowledge between people and significant *wäŋa*, Yolŋu law (*rom*) and *gurruṯu* (the Yolŋu system of kinship relations). The learning/teaching episodes of *Galtha Rom* workshops are one important way in which the knowledge practices of Knowing and being known by Yolŋu country are enacted in the work of Yolŋu rangers through Dhimurru's Learning on Country program (Fogarty et al. 2015). *Galtha Rom* workshops are a unique both-ways pedagogy developed by Yolŋu knowledge communities and non-Yolŋu collaborators (Marika et al. 1990, Marika 1999) in which Yolŋu rangers and school children engage in reciprocal learning with Yolŋu elders (ŋaḻapaḻ) and are required to demonstrate and enact this learning in Yolŋu place/s (*wäŋa*), in the school curriculum, and everyday life.

Knowledge practices of "Mobilizing the Dhimurru Vision Statement"
The set of Yolŋu ranger knowledge practices of "Mobilizing the Dhimurru Vision Statement," emerge in the accountability of Yolŋu rangers to the Dhimurru knowledge community and its collaborators (e.g., governments, NGOs, and industry) to fulfil the Yolŋu both-ways land and sea management mandate. These practices include: reading the Dhimurru Vision Statement (Fig. 2) at the start of every Dhimurru Board meeting and other events; recognizing the Dhimurru Vision Statement as the inspiration and guidance for Yolŋu ranger work; remembering and honoring the words and intentions of the founders of Dhimurru represented

in the Dhimurru Vision Statement; and, participating in productive partnerships that align with Yolŋu objectives and priorities for land and sea management. The statement is a form of constitution that supports the work of Yolŋu rangers in the Dhimurru IPA, and it is part of their role to represent and enact this vision of the ŋaḻapaḻ; to bring it continuously into the present through their actions and duties.

A Dhimurru ranger reflected:

> *I think for me it always goes back to our Vision Statement. It was good for me because I'd look at it and then it would drive me to do the work.* Daryl Lacey, former Dhimurru Senior Ranger, 17/6/2016

A former Dhimurru Board member also commented:

> *Having that Vision Statement, where every time we have a Board meeting, one of us* [Dhimurru Board member or Yolŋu ranger] *reads it. It's good. Because it reminds me of when the* ŋaḻapaḻ [Yolŋu elders] *work together.* Rärriwuy Marika, former Dhimurru Board member, 17/6/2016

Knowledge practices of "Being *ralpa*"
The concept of *ralpa* was proposed by several participants in this research to describe the nature and function of Yolŋu ranger work. Ralpa is a nuanced Yolŋu concept that can be translated as energetic, active, hard-working (https://yolngudictionary.cdu.edu.au/). The work practices of being *ralpa* emerge in the everyday efforts of Yolŋu rangers to honor the vision of Dhimurru's founders and leaders as well as pursue their own personal and professional development aspirations. These practices include: learning, teaching, and applying Yolŋu knowledge of Yolŋu land and sea; talking with ŋaḻapaḻ about issues associated with land

Table 3. Knowledge practices of Yolŋu rangers in the Dhimurru Indigenous Protected Area.

Knowledge Practice Type Number	Knowledge Practice Type Category [†]	Knowledge practices of Yolŋu Rangers
1	Material practices	"Knowing and being known by Yolŋu country" • Demonstrating respect for and communicating with Yolŋu country and the ŋalapal (Yolŋu elders) and landowners of different *wäŋa* (clan places on Yolŋu country); • Knowing and keeping sacred knowledge of Yolŋu country; • Knowing and taking responsibility for managing and caring for your *wäŋa* (Yolŋu country and important places on country); • Being on Yolŋu country and being recognized and known by Yolŋu country; • Participating in *buŋgul* (ceremony) and other clan activities on Yolŋu country; • Patrolling/managing access to different places (*wäŋa*) on Yolŋu country; • Sharing knowledge with non-Indigenous people about Yolŋu country including rights and responsibilities related to appropriate activities and access on Yolŋu lands and seas.
2	Symbolic practices	"Mobilizing the Dhimurru Vision Statement" • Reading the Dhimurru Vision Statement at the start of every Dhimurru Board meeting; • Recognizing the Dhimurru Vision Statement as the inspiration and guidance for Yolŋu ranger work; • Remembering and honoring the words and intentions of the founders of Dhimurru as they are represented in the Dhimurru Vision Statement; • Participating in productive partnership arrangements that align with Yolŋu objectives and priorities for land and sea management consistent with the Dhimurru Vision Statement.
3	Social practices	"Being *ralpa*" • Doing what has always been done to care for Yolŋu country (for example, learning, teaching, sharing, and utilizing Yolŋ?u knowledge of country); • Talking with ŋalapal and communicating with the right people about issues of Yolŋu land and sea management; • Being prepared to take over from older Yolŋu rangers when the time is right; • Being teachers and learners on Yolŋu country; Knowing what to do in your everyday Yolŋu ranger *djäma* (work); • Being motivated and disciplined in your Yolŋu ranger *djäma* (work); • Showing pride and leadership and being a role model for other Yolŋu, particularly the younger generation; • Working together with Yolŋu and ŋapaki to achieve balance through Yolŋu-led both-ways land and sea management (e.g., through the process of *Galtha Rom*).

[†] Adapted from Shapin and Schaffer (1985).

and sea management; managing access to Yolŋu country; being a role model and demonstrating pride and leadership; being motivated and disciplined; and, working together with Yolŋu and ŋapaki (non-Indigenous people) to achieve balance through both-ways approaches based on the principles of the Yolŋu reality of *Djalkiri*. *Djalkiri* "...symbolises the foundation, where the human being actually comes into contact with the land, his or her environment...[Yolŋu] people cannot exist independently of their environment" (Marika-Mununggiritj 1991:18).

As a former Chair of the Dhimurru Board explained:

> ...they [Yolŋu rangers] *have a connection to country in terms of kinship. This is my great grandmother's land. This is my mother's land. This is my land. They have a different connection to how a non-Indigenous person would see caring for country. They're actually taking care of land and sea that belongs to them, or their relatives.* Rarrtjiwuy Herdman, former Dhimurru Board chair, 21/6/2016

Long-standing members of the Dhimurru knowledge community elaborated:

> ...*you bring the two knowledge systems of Western science (non-Indigenous knowledge) and Yolŋu knowledge, together perfectly in how you look after country. This involves finding ways to balance the two*

knowledge systems through collaboration. Djawa Yunupiŋu, former Dhimurru Senior Ranger, former Dhimurru Managing Director, former Dhimurru Board chair, and Yothu Yindi Foundation Board member, 15/6/2016

> *I think the Yolŋu rangers are really good at drawing on both Yolŋu and ŋapaki ranger work, at integrating both cultures, and gaining experience from the different cultures.* Daryl Lacey, former Dhimurru Senior Ranger, 17/6/2016

> ...*the old people* [ŋalapal] *were there* [at the formation of Dhimurru in 1990/1] *and they made the decision to look after country and to have Yolŋu rangers on our country...their input* [to the formation of] *Dhimurru and their vision* [for Yolŋu land and sea management]...*is still being carried on.* Rärriwuy Marika, former Dhimurru Board deputy chair and Yambirrpa School Council member, 18/6/2016

> [Being ralpa is about]...*being proud of the country that they are working for, you know, their wäŋa.* Balupalu Yunupiŋu, former Dhimurru Senior Ranger, 15/06/2016

> *Yolŋu people have to be really strong to work at Dhimurru. The* ŋalapal *want to see that. The strength and the discipline. Through sharing knowledge and*

Fig. 2. Dhimurru Vision Statement.

Dhimurru's vision is guided by the wisdom of our Elders who founded Dhimurru. They have inspired us in our work. They exhorted us to look after our land and sea country for those who will follow, to protect and maintain it. In 1990, on behalf of our Elders, Roy Dadaŋa Marika said,

"Be firm and strong for the land, and the strength of your solidarity will you sustain you in your cause."

"Our country (land and sea) will exist forever. It must be protected so that it will remain the same, so that it can be seen in the same way that the Elders saw it in the past. Our vision and hope is that Yolŋu will continue to use our country for all the generations to come."

The Elders said, *"We the old people hope that Dhuwa[a] and Yirritja[b] country will continue to be looked after through the connection of Yothu Yindi.*

All our country is Yirritja and Dhuwa. Our songs, our law, our sacred art, our stories are embedded in our country, which is the foundation of our knowledge. That's how we see our country; that is what our Land Rights Act[d] says.

The decision-makers are the landowners, the clans that are connected through Yothu Yindi and Märi-Gutharra kinship. They have placed certain areas of our country in the hands of the Dhimurru Committee, which authorises the Dhimurru Rangrs to manage and preserve, maintain and protected the areas designated for recreation use.

The landowners put the recreation areas in Dhimurru's hands to manage. They envisage on committee, one voice, and one body under one umbrella, Dhimurru. Only Yolŋu will make decisions for this land, not government officials or any other person who is not a landowner. We envisage working together with the Parks and Wildlife Commission and other Indigenous Protected Area collaborators, especially in the management of our sea country; we need their help in making our vision a reality. But the only people who make decisions about the land are those who own the law, the people who own the creation stories, the people whose lives are governed by Yolŋu law and belief."

(Dhimurru Aboriginal Corporation, 2015: 25)

[a] *Dhuwa* is one of the two Yolŋu moieties. Moiety means a division into two halves.
[b] *Yirritja* is the other Yolŋu moiety. In the Yolŋu world, all things belong in either one or the other moiety. This is a foundational principle of Yolŋu ontology (see Williams 1986).
[c] *Yothu Yindi* (translated into English as 'mother-child') and *Märi-Gutharra* (the maternal grandmother-grandchild relationship) are relational structures in the Yolŋu.system of *gurruṯu* (kinship) (Williams 1986).
[d] The *Aboriginal Land Righs Act (Northern Territory) 1976* is a Commonwealth of Australia statute that confers communal freehold title of estates in North-eastern Arnhem Land to Yolŋu traditional owners.

consulting with the ŋaḻapaḻ. Djawa 2 Burarrwaŋa, former Dhimurru Board member, Miwatj Health Board member, and Lirrwi Yolŋu Tourism chair, 22/6/2016

...Everything that Dhimurru does is our power, is our language. It's our identity, our strength...that's what they hold. Merrikiyawuy Ganambarr-Stubbs, Yirrkala School Co-principal, 23/6/2016

Diverse knowledge practices are evaluation criteria for Yolŋu ranger work at Dhimurru

The diverse knowledge practices of Knowing and being known by Yolŋu country, Mobilizing the Dhimurru Vision Statement, and Being ralpa are evaluation criteria for Yolŋu ranger work. This is because members of the Dhimurru both-ways knowledge community use them to judge the performance of Yolŋu rangers. They are the accepted standard of this work for this unique knowledge community. This is evident from our research because members of the Dhimurru knowledge community explained that

they know that Yolŋu rangers are working effectively and properly if they are: regularly communicating with them about and demonstrating adherence to Yolŋu protocols about access and activities on Yolŋu estates (i.e., the knowledge practices of Knowing and being known by Yolŋu country); reading, acknowledging, and following the Dhimurru Vision Statement (i. e., the knowledge practices of Mobilizing the Dhimurru Vision Statement); turning up to work on time and in uniform, being reliable hard workers, and role models for others in their communities by participating in both-ways teaching/learning with Yolŋu school children and elders through the Learning on Country program (i.e., the knowledge practices of Being ralpa).

> Rangers need to talk to the Ŋalapal [senior Yolŋu land and knowledge holders] ...to get their advice on how to do it. How you go about doing certain things on country. Djawa Yunupiŋu, former Dhimurru Senior Ranger, managing director, and Dhimurru Board chair, 15/6/2018

DISCUSSION

Epistemic evaluation criteria and Indigenous ranger work

The insights and testimonies from members of the Dhimurru knowledge community presented here reveal that Yolŋu ranger work in the Dhimurru IPA is embodied in diverse knowledge practices. Although from a constructivist perspective, all work can be understood as an outcome of coordinating diverse knowledge or epistemic practices (Knorr-Cetina 1983, Star 1983, Law and Singleton 2000), we seek to emphasize the unique contributions of Yolŋu ranger work as it emerges in the effort and strategy required to enact and sustain both-ways Yolŋu land and sea management. We have shown that Yolŋu ranger work is constituted by sets of social, material and symbolic knowledge practices that we call: Knowing and being known by Yolŋu country, Mobilizing the Dhimurru Vision Statement, and Being ralpa (see Table 3). This includes, in Knowledge practice type 1 (see Table 3), a focus on maintaining relationships between people and Yolŋu place/s based on Yolŋu mandates for caring for Yolŋu land and sea. These mandates are unique to the epistemology of Dhimurru's knowledge community as they include, for example, the imperative of Yolŋu rangers Knowing and being known by Yolŋu land and sea. Land and sea as animate entity (i.e., as a knowing actor) is a foundation of Yolŋu ontology and therefore the knowledge practices of sustaining this people-place relationship (see Ayre and Verran 2010) are judged by members of this community as vital and important for Yolŋu ranger work.

A second feature of Yolŋu ranger work is working to enact the Dhimurru Vision Statement as an expression of the governance mandate of past (Ŋalapal) and present Yolŋu senior landowners (Wäŋa Wataŋu). Although most contemporary Indigenous and non-Indigenous institutions alike have a vision statement of some sort (Nankervis et al. 2012), we contend that the knowledge practices of Yolŋu rangers in Mobilizing the Dhimurru Vision Statement (see Knowledge practice type 2 in Table 3) do more than represent or symbolize (although this remains important) the Yolŋu land and sea management vision. These practices also involve the ongoing negotiation of this vision as it evolves in the collective action of the Dhimurru knowledge community (i.e., social practices) and in the hearts and minds of Yolŋu rangers (Mandaka Marika, *personal communication*) as they recite, refer

to, and memorialize the vision statement. The material practices of the Dhimurru Vision Statement include it being held, read, and gestured to by Yolŋu rangers in important meetings and events such as Dhimurru Board meetings. And, third, for Yolŋu rangers, Being ralpa (see Knowledge practice type 3 in Table 3) embodies practices of being prepared and willing to work hard and take on leadership roles and responsibilities such as teaching young Yolŋu adults at *Galtha Rom* workshops.

Revealing the different sets of Yolŋu ranger knowledge practices as evaluation criteria for Yolŋu ranger work allows us to explicitly name and identify the activities, roles, and responsibilities that constitute this unique, both-ways ICNRM endeavor. These criteria are the knowledge practices that members of the Dhimurru knowledge community expect Yolŋu rangers to demonstrate in their everyday work. However, we don't suggest these criteria apply to all work at Dhimurru and acknowledge that explicitly non-Indigenous components of the work of Yolŋu rangers (e.g., first aid, 4 WD training, etc.) may require different criteria. These criteria emerge in the unique epistemology of the Dhimurru both-ways knowledge community and are both evaluative and generative of Yolŋu ranger work. We contend that they are evaluative (Fischer 2010) because members of the Dhimurru both-ways knowledge community use them to judge the performance of Yolŋu rangers. They are also generative because they involve the production and reproduction of what is considered rightful and appropriate Yolŋu ranger work. To take this still further, however, we suggest that these criteria are epistemic in nature because they embody the knowledge practices of Yolŋu ranger work.

The epistemic evaluation criteria for Yolŋu ranger work we've identified are able to do what general Western scientific (i.e., non-Indigenous) criteria fail to do; which is to account for the relational ontology (Ayre 2010, Jackson and Palmer 2015) of Yolŋu knowledge/s. In Yolŋu ontology, people and places are inextricably and mutually coconstituted such that Yolŋu people and Yolŋu land and sea (or Yolŋu country) are in no way differentiated or separated (Verran 2002b, Muller 2014). We have shown that Yolŋu ranger work is produced in complex and diverse sets of knowledge practices. These practices are founded in the Yolŋu (relational) ontology in which "the land and the Yolŋu are one" (Merrkiyawuy Ganambarr-Stubbs, Yirrkala School Co-principal, 23/6/2016). However, these practices are also connected to the unique knowledge domain of Yolŋu ranger work, which includes Western scientific (non-Indigenous) practices of rangering such as checking permits, grading roads, collecting marine debris, etc. Therefore, the criteria for Yolŋu ranger work (see Table 3) do more than represent a Yolŋu ontology or worldview, they also help account for and navigate the cross-cultural or both-ways nature of this work as it contributes to the Yolŋu vision for land and sea management.

The Dhimurru knowledge community uses the epistemic evaluation criteria identified in this research to know that Yolŋu rangers are doing the right work. By articulating these criteria explicitly here, we are responding to the challenges of "making Yolŋu [Indigenous] systems of accountability visible" (Muller 2008:410) where they are considered not readily quantified, measured, or fiscally reported for conventional evaluation frameworks. In describing and naming the knowledge practices

of Yolŋu rangers as evaluation criteria for Yolŋu ranger work, we emphasize that these practices are contingent and performative (Mol 2002*a*) as part of an emergent, cross-cultural and Yolŋu-led accountability framework (Muller 2003) for the Dhimurru IPA. In contrast to standard environmental M&E frameworks, this accountability framework reminds us that we must be aware of how particular constructs of accountability (Muller 2008, Austin et al. 2018), such as criteria and indicators of performance, are enacted and privileged within them. This is consistent with what other aboriginal, Indigenous, and First Nations peoples report and advocate for in the stewardship of their lands and seas elsewhere in the world.

In the United States, for example, Indigenous and non-Indigenous scholars (Bowman et al. 2015, Waapalaneexkweew 2018, Waapalaneexkweew and Dodge-Francis 2018) note the importance of inclusive evaluation of Indigenous activities, along with reform of evaluation practice itself, through CRIE. Culturally responsive Indigenous evaluation draws on Indigenous "traditional knowledge and contemporary Indigenous theory and methods" including Indigenous metaphors for collaboration and learning (Waapalaneexkweew and Dodge-Francis 2018). The principles of CRIE include continuous improvement and empowerment (Waapalaneexkweew and Dodge-Francis 2018), which align with Dhimurru's mandate and that of its Yolŋu rangers: to adaptively manage the Dhimurru IPA based on Yolŋu both-ways knowledge practices. Similarly, Maori people in New Zealand have made a significant contribution (Jollands and Harmsworth 2007) to developing approaches to environmental monitoring that account for Indigenous (i.e., Maori) values and interests through the development of indicators of sustainability. In a Maori worldview, sustainability is recognized as a holistic entity (Jollands and Harmsworth 2007), including both environmental and social/cultural dimensions, and Maori concepts are integral to managing change, effects, and dynamics in SES. The constructs such as Maori environmental indicators that emerge from Harmsworth and Tipa's work embody key Maori knowledge practices that must be embedded "within the right social and cultural environment or framework" (Harmsworth and Tipa 2006:9). Supporting and recognizing such culturally appropriate M&E frameworks presents an ongoing challenge to conventional adaptive management of SES in New Zealand, as it does for Dhimurru's management partners in Australia.

Understanding and demonstrating the value of Indigenous ranger work
Scholars have noted that in evaluating sustainability efforts, generally due to the complex, diverse, and uncertain nature of change in SESs, it is important to move beyond "the early conception of evaluation as a straightforward procedure for rational decision-making" (Julnes 2019:13) and engage with different evaluation skillsets and methods (Uitto 2019). Although there is evidence of innovation in environmental M&E in ICNRM, much of it is focused on monitoring biodiversity (Turreira-García et al. 2018). In protected area management contexts, M&E frameworks to date have been largely based on logics of project management (see Stern et al. 2005) and do not account adequately for the nexus between human/social and natural/environment attributes and outcomes of adaptive management (Stoll-Kleemann, 2010) including in ICNRM (Rowe

2019). The case of understanding and assessing Yolŋu ranger work we present demonstrates an alternative approach to the conventions of neoliberal (Fache 2014) performance accounting for adaptive management. This approach has codified diverse Yolŋu ranger knowledge practices for adaptive management as epistemic evaluation criteria. By codifying these unique, both-ways practices in a set of evaluation criteria, the Dhimurru knowledge community has cocreated a new object of governance for Yolŋu land and sea management. Although some have argued that Indigenous ranger groups risk reflecting neoliberal principles (Fache 2014) through participation in the bureaucratic dimensions of Indigenous rangering and its accountability structures, we suggest that in Dhimurru's case, these criteria have the potential to empower the organization through asserting Indigenous (i.e., Yolŋu) governance as a priority (see Reed et al. 2020) and its Yolŋu Rangers to better represent and enact their work. This is because these criteria reflect a principles-focused (Patton 2017) approach to doing environmental M&E based in the tenets and ontological foundations of Dhimurru's both-ways knowledge community (see Marika and Roeger 2012 for details of these).

As accountability requirements of governments and others grow, Indigenous organizations and their Indigenous rangers face a situation in which "...it is likely that government will become increasingly prescriptive about what counts as 'valuable' work for (Yolŋu Rangers)" (Morphy 2017:84). In Dhimurru's case, its IPA management partners are constrained by the view that many of the program benefits (of the IPA and WoC programs, for example) are considered nonmarket and difficult to value (van Bueren et al. 2015) or intangible (Austin et al. 2015). In this context, moves toward prescription of what Indigenous ranger work is, and how it can be appropriately represented or valued, are being resisted and contested by Indigenous land and sea managers including the Dhimurru knowledge community. For example, at a recent workshop in the Northern Territory, Indigenous and non-Indigenous experts recognized the need to build approaches to the co-creation (Ayre et al. 2018) of success criteria for Indigenous land and sea management "...within a shared Western scientific and traditional ecological knowledge two-toolbox approach" (Austin et al. 2015:51). This challenge of improving M&E in ICNRM emerges in a context in which the Australian Government, in its IPA Monitoring and Evaluation Guidelines for Indigenous organizations, advises on "...choos[ing] simple indicators (things to measure) that [Indigenous] Traditional Owners will recognize and understand" (see https://www.niaa. gov.au/sites/default/files/publications/IPA_monitoring-evaluation_guidelines.pdf). Our research shows that criteria, and therefore indicators of success (Austin et al. 2015) for ICNRM activity, such as Indigenous ranger work, are unlikely to be simple or straightforward (see Julnes 2019:13), but rather, are rich and complex expressions of a both-ways epistemology emergent in the practices of doing Yolŋu land and sea management together.

The way forward for accounting for Indigenous ranger work
The incumbent accountability framework for the Dhimurru IPA is formally represented in the Dhimurru IPA management plan, which includes the Dhimurru Vision Statement and the Dhimurru IPA MERI strategy. To fully account for the work of Yolŋu rangers in the Dhimurru IPA, the Dhimurru Board and Dhimurru management team resolved in June 2019 to integrate the epistemic

evaluation criteria for Yolŋu ranger work identified here in an updated version of the Dhimurru IPA MERI strategy in 2020. By doing this, the Dhimurru knowledge community can better support its Yolŋu ranger workforce through appropriate skill development and adaptive management strategies for learning/ teaching and practicing Yolŋu land and sea management in the Dhimurru IPA. This is a responsible and local form of accounting for the unique, both-ways knowledge production enterprise that is Yolŋu ranger work at Dhimurru. It should be noted that Dhimurru's own capacities to know itself as an organization, on its own terms, are also critical to both the creation and functioning of Dhimurru's IPA accountability framework. Our collaborative action research is a key part of building such organizational capacity.

We suggest that accountability structures in adaptive management of SESs, such as management plans and MERI strategies, can be used to productively manage the differences between Indigenous and Western scientific knowledge/s. However, these structures must be decolonized (Muller 2003) in ways that recognize, embed, and celebrate the unique, both-ways knowledge practices of ICNRM. This is consistent with the multiple evidence base approach in ecosystem governance, which advocates the joint assessment of knowledge (Tengö et al. 2014) and promotes adaptive management processes that move "beyond aspects that can easily be fitted into conventional models and frameworks" (Tengö et al. 2014:589). We have shown that the both-ways knowledge practices of Yolŋu (Indigenous) people must be the principle foundation for judging Yolŋu ranger work. These practices can contribute to Yolŋu ranger work through their formalization in the bureaucratic requirements (Fache 2014) and procedures (Marika at al. 2009) that are part of the adaptive management of the Dhimurru IPA such as the Dhimurru IPA MERI strategy. By including the epistemic criteria for Yolŋu ranger work in the MERI strategy, Dhimurru members can better track and iteratively assess the performance of Yolŋu rangers as part of the organization's annual M&E reporting cycle. This means that the epistemic criteria for Yolŋu ranger work are operationalized through the conventions of protected area management M&E in a way that resists normative constructs of what Indigenous rangers should know and do. This has implications for M&E in other contexts involving Indigenous and other knowledge systems in which moving beyond traditional evaluation frameworks that "focus on improving and making decisions about projects and programs" (Patton 2015:18) is critical to the capacity of M&E processes to support systemic change, adaptation, learning, and empowerment (Sheil et al. 2015).

The Australian Government is currently trialling an "Indigenous Land and Sea Management (ILSM) Outcomes Framework" (https://www.socialventures.com.au/work/prime-minister-and-cabinet-indigenous-environment-branch/) that aims to credit and represent different knowledges as evidence for ICNRM performance and to "...help different stakeholders to explore and agree on how to measure impact in a number of shared priority areas" (Australian Government 2017:1). Although this is a positive step in improved accounting for ICNRM, it must be accompanied by a commitment to taking epistemic evaluation criteria seriously as they emerge in different times, places, and knowledge communities. This will require governments and others to adapt their own accountability frameworks to include

evaluation criteria (and other accounting mechanisms) that are generated with and by Indigenous land and sea management knowledge communities. If this doesn't occur, the full contributions of Indigenous rangers and other ICNRM activities may continue to be undervalued, or even missed, by policymakers and others.

CONCLUSION
We described possibilities for better accounting for Indigenous ranger work as a significant part of global and national efforts toward sustainable social-ecological futures in Australia and internationally. We show how Yolŋu (Indigenous) ranger work is constituted in and through diverse knowledge practices that accredit Yolŋu rangers with the responsibilities and capacities to perform Yolŋu land and sea management in the Dhimurru IPA. These knowledge practices, which we identified as Knowing and being known by country, Mobilizing the Dhimurru Vision Statement, and Being ralpa, can also be understood as epistemic evaluation criteria for Yolŋu ranger work. They are generated in the collective action of the Dhimurru knowledge community as members negotiate the different meanings and contributions of Yolŋu-led both-ways land and sea management within the Dhimurru IPA.

To properly account for Indigenous land and sea management, there is a need for Indigenous knowledge communities and their collaborators to work together to adapt the structures and approaches that currently circumscribe what counts as good performance in ICNRM. In our case study of ICNRM, the epistemic evaluation criteria for Indigenous (i.e., Yolŋu) rangers hold possibilities for improved performance assessment (Barber et al. 2012) in the adaptive management of SESs such as IPAs. In revealing the complexity, diversity, and embodied nature of Indigenous ranger knowledge practices, we demonstrated that "new forms...of categorisation and assessment" (Barber and Jackson 2017:3) in ICNRM are emergent in both-ways knowledge communities in particular times and places. This means that policymakers and other management partners in ICNRM must pay attention to the ways in which M&E frameworks are designed and implemented because these frameworks can hinder and constrain how the contribution of ICNRM toward sustainability and resilience efforts is understood and recognized. Resilience of SESs relies on understanding and managing SES dynamics (Folke 2006) which, in the case of IPAs such as the Dhimurru IPA, are intractably about the relationships and connections between people and the places they know and are related to. The knowledge practices of Indigenous land and sea managers, such as Indigenous rangers, should therefore be included in Indigenous-led accountability structures as a principle of good governance (Lebel et al. 2006) and adaptive management in SESs.

Responses to this article can be read online at:
https://www.ecologyandsociety.org/issues/responses.php/12149

Data Availability:

The data that support the findings of this study are available on request from the corresponding author, [MA]. The data are not publicly available because they contain information that could compromise the privacy of research participants and the culturally sensitive nature of some material.

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