



# Human migration and marine protected areas: Insights from Vezo fishers in Madagascar



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## ABSTRACT

Human migration may negatively impact biodiversity and is expected to increase in future, yet the phenomenon remains poorly understood by conservation managers. We conducted a mixed-methods investigation of a contemporary migration of traditional fishers in western Madagascar, a country which has been expanding its protected area system through the establishment of both strict and multiple-use sites, and critically evaluate different models of marine protected area in light of our findings. Interviews with fishers in major destination areas revealed that most migrants come from southwest Madagascar, use non-motorised vessels, and principally target sharks and sea cucumbers. Drivers of the migration include both push and pull factors (i.e. declining resource availability in areas of origin and the continued availability of lucrative resources for export to China). Traditional fisher migrants cause limited social conflict with residents and a number of environmental problems in destination areas; however artisanal fishers with motorised vessels probably represent a greater threat to marine resources than migrants, due to their greater harvesting capacity. We suggest that multiple-use arrangements may be more appropriate than strict protected areas in both source and destination areas, because they integrate the interests of migrants rather than marginalising them; however seascape-scale management provides the best approach for managing the threats and opportunities provided by the migration at the appropriate scale.

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## 1. Introduction

The movement of people across the planet has been a defining characteristic of human history and tends to have major environmental impacts. Indeed human migrations, coupled with climate change and other factors, have triggered substantial environmental change on all inhabited landmasses over the last 50,000 years, including extensive ecosystem conversion and the extinction of both continental and insular faunas (Cincotta and Engelman, 2000; Kirch, 2002). Migration may be characterised along both the temporal and spatial dimensions. In temporal terms, it may take the form of permanent changes of residence from one location to another, or temporary mobility such as seasonal, circular movements (Bell and Ward, 2000; Chapman and Prothero, 1983; Rothman et al., 1977). Research on the spatial aspects of modern migrations has concentrated principally on international and rural-urban migration (Boyle et al., 1998; Carr, 2009), but in fact the scale of rural-rural movements may exceed these in many

tropical developing countries (Bilsborrow, 2002). The dispersed and variable nature of rural-rural migration makes it difficult to research, however, and as a result we know little about its determinants (including pull factors in destination sites and push factors in areas of origin), or its cultural, social and environmental impacts in source and destination areas (Curran and Agardy, 2002). Such knowledge is essential to underpin the development of evidence-based conservation strategies (St. John et al., 2013), yet our understanding of how to reduce, manage and mitigate the impacts of human migration on biodiversity remains poorly developed (Oglethorpe et al., 2007).

Understanding rural-rural migration and its impacts is important for conservationists since it can be expected to negatively impact remaining areas of high biodiversity, such as forests and shallow coastal seas. This is because such areas represent resource frontiers harbouring concentrations of little- or unexploited natural resources, and there are often few legal, social or technical barriers to their utilisation (Carr, 2009; Sunderlin et al., 2005); they thus become attractive destination areas for the poor and displaced. Once established, the presence of migrants may encourage the arrival of others, such as family members or members of social networks, thus reinforcing the movement in a positive feedback

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loop (Palloni et al., 2001). Migration to resource frontiers is likely to increase in future, as a result of multiple interacting factors including population growth, climate change, environmental degradation, globalised trade, emerging diseases, growing wealth inequalities, resource scarcity and armed conflict, which may negatively affect economic or social conditions in populated rural areas and push residents to seek a better life elsewhere (Oglethorpe et al., 2007). In addition, conservation activities may themselves trigger migration, either attracting people to protected area boundaries through a ‘honeypot’ effect (Wittemeyer et al., 2008, though see Joppa, 2012), or displacing communities through eviction or the imposition of access restrictions (West et al., 2006; Ewers and Rodrigues, 2008; Mascia and Claus, 2008).

Migration may also pose a particular challenge for conservation managers. It is widely thought that migrants may be ‘exceptional resource degraders’ whose land and resource use practices in destination areas have greater environmental impacts than those of residents (Jacobsen, 1994; Cassels et al., 2005; Codjoe and Bilsborrow, 2012). This may arise because their poverty and tenure insecurity cause them to have short time horizons, where future benefits are heavily discounted against short term gains (Ostrom et al., 1999; Codjoe, 2006) or because, lacking social ties to, and knowledge of, their settling areas, they value resources and landscapes differently to residents and thus have less incentive to manage them sustainably (Begossi et al., 2002; Codjoe and Bilsborrow, 2012). In addition, migrants may exploit resources more destructively as a result of the harvesting methods and technologies they employ (Bremner and Perez, 2002; Williams, 2002; Perz, 2003), or because they do not respect the social norms and customary institutions that regulate access to common pool resources amongst resident populations in their destination areas (Jodha, 1998; Curran, 2002; Sandy, 2006). The latter is a particular concern since the breakdown of these institutions can cause residents to stop regulating access to resources or join the race to exploit them, thus turning common property systems into open access ones and precipitating a ‘tragedy of the commons’ (Ostrom et al., 1999; Katz, 2000; Curran and Agardy, 2002). On the other hand, people may migrate as part of an adaptive resource management strategy to prevent overexploitation in their areas of residence, and this may not only reduce their environmental impacts but also lead to conservation opportunities through the temporary or permanent reduction of pressure on natural resources in their areas of origin (Andersen et al., 2014; Arunotai, 2006; Klooster, 2012; Koocheki and Gliessman, 2005; Sabogal, 2012).

Despite the importance (and indeed probable ubiquity) of migration as an underlying contributor to resource use patterns in frontiers and other high biodiversity areas, the phenomenon is rarely discussed in the conservation literature and there are few guidelines for managers on how to influence and mitigate human movements in the places they work (Oglethorpe et al., 2007). This applies in particular to the management of protected areas, our principal tool for the conservation of global biodiversity, which now cover over 15% of global land area and 3.4% of the oceans (Juffe-Bignoli et al., 2014). Protected areas are complex social-ecological systems (Ostrom, 2009; Milner-Gulland, 2012) in which extractive natural resource use is forbidden or tightly regulated. As such, migration from or (in particular) to them will alter patterns of local resource use and thus require a management response (such as surveillance, enforcement or mitigation), and may also influence governance processes by disrupting local social dynamics. Since protected areas tend to be managed as static rather than dynamic institutions (Bengtsson et al., 2003; Folke et al., 2005), this greatly increases management complexity. Protected areas include an array of models and approaches from ‘strict’ sites in which extractive uses of biodiversity are not permitted, to ‘multiple-use’ categories in which sustainable natural resource

use is central to management aims (Dudley, 2008). Regardless of category, all protected areas must be effectively managed (CBD, 2010), but this will depend in part on understanding and adapting to the social dynamics that influence them (Geoghegan and Renard, 2002; Gardner et al., 2015).

The development of management guidelines and appropriate policy for protected areas will depend, in large part, on the publication of in-depth, empirical case studies from a range of cultural and environmental contexts (Oglethorpe et al., 2007). Here we present the results of a mixed-methods investigation into the characteristics, drivers and impacts of a rapidly-evolving traditional fisher migration in coastal western Madagascar, and critically evaluate existing models of marine protected area in the region in light of our findings. Since 2003 Madagascar has been in the process of tripling the coverage of its protected area system (SAPM) through the development of two parallel sub-networks employing fundamentally different approaches to protected area management and governance: while the existing network of centrally-governed, strict protected areas (IUCN categories I, II and IV) is being expanded by its para-statal managers Madagascar National Parks (MNP) through the creation of several new parks and the expansion of existing ones, a raft of new protected areas is also being created. The latter areas are primarily established by non-governmental organisations (NGOs), designed as multiple-use sites (IUCN categories V and VI), and are administered by shared-governance structures integrating local resource users (Gardner, 2011; Virah-Sawmy et al., 2014). The objectives of the expanded protected area system include the conservation of biodiversity, the maintenance of Madagascar’s cultural diversity and the sustainable use of natural resources for poverty alleviation and development (Gardner et al., 2013). An evaluation of the appropriateness of different protected area models in managing fisher migrations is particularly pertinent given that the Malagasy government committed in 2014 to tripling marine protected area coverage (Rajaonarimampianina, 2014). Given that many anticipated new marine protected areas will likely be located in western Madagascar where marine conservation priorities lie (Allnutt et al., 2012) and will thus be influenced by the activities of Vezo fishers, we discuss the strengths and weaknesses of existing protected area models in managing fisher migrations towards the multiple objectives of biodiversity conservation and improved human wellbeing. Our specific objectives are to: (i) characterise the principal fisher migrations of western Madagascar in terms of origins and destinations; (ii) identify the origins and livelihood activities of migrants in principal destination areas; and (iii) use our findings to critically evaluate the appropriateness and potential effectiveness of new protected area models employed in areas experiencing fisher migrations. We also investigate conflicts between residents and migrants in so far as they impact on resource management.

## 2. Materials and methods

### 2.1. Study system

The coastal and shallow marine areas of western Madagascar (defined here as the region between Androka in the south and Maintirano in the north) form part of the Southern Mozambique Channel Marine Ecoregion (Obura, 2012). The region is characterised by extensive coral reefs, notably fringing and barrier reefs in the south-west region (Androka to Morombe), and an ancient submerged reef manifested as a string of banks, shoals and small islets running parallel to the coast north to Maintirano. These habitats support a number of species of global conservation concern including cetaceans, sea birds, sea turtles (five species), sawfish, sharks and the coelacanth (*Latimeria chalumnae*) (Cooke et al.,

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