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Indigenous Cultural and Natural Resources Management and Mobility in Arnhem Land, Northern Australia

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1 **Indigenous cultural and natural resources management and mobility in**
2 **Arnhem Land, northern Australia**

3
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28 **Abstract**

29 Many programmes formally engage Australian Indigenous people in land and sea management to
30 provide environmental services. There are also many Indigenous people who ‘look after country’
31 without rewards or payment because of cultural obligations. We investigated how Indigenous
32 peoples’ mobility in and around two communities (Maningrida and Ngukurr) is affected by their
33 formal or informal engagement in cultural and natural resource management (CNRM).
34 Understanding factors that influence peoples’ mobility is important if essential services are to be
35 provided to communities efficiently. We found that those providing formal CNRM were
36 significantly less likely to stay away from settlements than among those ‘looking after their
37 country’ without payment or reward. Paying Indigenous people to engage with markets for CNRM
38 through carbon farming or payments for environmental services (PES) schemes may alter
39 traditional activities and reduce mobility, particularly movements away from communities that
40 extend the time spent overnight on country. This could have both environmental and social
41 consequences that could be managed through greater opportunities for people to engage in formal
42 CNRM while living away from communities and greater recognition of the centrality of culture to
43 all Indigenous CNRM, formal or otherwise.

44

45 **Keywords:** cultural obligations; fire management; land and sea management; ‘looking after
46 country’; payments for environmental services (PES); pest control; temporary movements

47

48

49 **1. Introduction**

50 This study is concerned with mobile Indigenous people, which, defined by the World Alliance of
51 Mobile Indigenous Peoples (WAMIP 2004) are Indigenous people “whose livelihoods depend on
52 extensive common property use of natural resources and whose mobility is both a management
53 strategy for dealing with sustainable use and conservation and a distinctive source of cultural
54 identity”. Changes in mobility patterns of Indigenous people and their causes and consequences
55 have been researched world-wide, particularly of pastoralists (mobile livestock husbandry, e.g.,
56 Fratkin and Roth 2005; Lkhagvadorj et al. 2013; Tsegaye et al. 2013) and of swidden
57 agriculturalists (shifting cultivation, e.g., Mertz et al. 2009; van Vliet et al. 2012; Schmook et al.
58 2013). Research on the changing mobility among Indigenous people who were traditionally hunter-
59 gatherers, as is the case for Indigenous Australians, is harder to find (e.g., Levang et al., 2005;
60 Nilsson and Fearnside 2011).

61
62 In Australia, however, the mobility of Indigenous people across different boundaries and time
63 frames has been the focus of research for many years. Two forms of mobility are studied, mostly
64 quite separately from each other (Bell and Ward 2000): (1) residential migration, defined as the
65 movements of people across specified boundaries for the purpose of establishing a new or semi-
66 permanent residence, and (2) more temporary, short-term movements of people. Temporary
67 movements of people between remote Indigenous communities can mean services like health,
68 housing, employment and education are often not provided in the places with greatest need (Taylor
69 1998; Prout 2008; Taylor and Dunn 2010). For these reasons, understanding movements to and
70 from small and remote communities is important since even small demographic changes may result
71 in rapid, significant and long lasting impacts on service demand (Biddle and Prout 2009).

72
73 While world-wide research on environment driven population movements (e.g., Warner et al. 2010;
74 Black et al. 2011; Hugo 2011) and on the impacts of population mobility on pressure on the

75 environment is increasing (Garnett et al. 2007a; Harte 2007), there is almost no research, at least
76 none in the Indigenous Australian context, on the relationship between cultural and natural resource
77 management (CNRM) practice and mobility.

78

79 This gap in research is particularly relevant to groups who depend strongly on natural resources,
80 such as those of Indigenous peoples in northern Australia. For many Indigenous people culture,
81 nature and land are inextricably intertwined (Fuller and Parker 2002) and a healthy country¹ is
82 essential for their health and well-being (Garnett and Sithole 2007; Rigby et al. 2011). There is
83 strong evidence that Indigenous people who are engaged in ‘looking after country’ (traditional
84 Indigenous CNRM) gain physical, psychological and social benefits (e.g., Burgess et al. 2005;
85 Garnett and Sithole 2007; Garnett et al. 2009a; Campbell et al. 2011). Conversely there is also a
86 belief that the health and productivity of land or sea country depends on regular human visits: sites
87 must be occupied, used and talked about (Povinelli 1993) and simply spending time on country can
88 be seen as looking after country. Traditionally, people moved around their country depending on the
89 seasons, there being specific times for specific activities (e.g., fire management) in all traditional
90 Indigenous seasonal calendars (Prober et al. 2011; Woodward et al. 2012). While people now tend
91 to travel by vehicle rather than on foot, there continues to be a high degree of mobility among
92 Indigenous Australians with high mobility being seen as ‘a unique expression of Indigenous
93 peoples’ spatiality’ (Prout 2009; Morphy 2010).

94

95 In addition to the conventional drivers of income opportunities and family responsibilities, one of
96 the principal motivations for looking after country is to fulfil cultural responsibilities (Murray 2003;

¹ According to Aboriginal creation stories, country is home to ancestral beings which created all aspects of the land on their journeys leaving traces that are imbued with spiritual significance (Rose 1992). We use the term ‘country’ for Indigenous-owned traditional land and sea and ‘looking after country’ to describe traditional Indigenous resource management in which the natural and cultural aspects are inseparable, in contrast to western land management.

97 Zander et al. 2013). Traditionally, Indigenous people in Australia looked after country according to
98 seasonal calendars and in line with cultural traditions that ensured a regular supply of food and
99 other physical necessities (Prober et al. 2011). Much of the management was based on sophisticated
100 patterns of burning that had endured for millennia (Head 1994; Yibarbuk et al. 2001). The arrival of
101 European settlers altered this pattern. Many people left their traditional lands, leading to
102 abandonment of traditional fire regimes, and even where the native vegetation remained, feral
103 animals and exotic weeds altered the effects of fire (Petty et al. 2007; Setterfield et al. 2010).
104 Arnhem Land, where this study took place, has had a less disrupted history of Indigenous land
105 management than other parts of Australia, thus maintaining one of the longest continuous traditional
106 fire regimes anywhere in the world (Yibarbuk et al. 2001). Although several species of feral animal
107 are widespread, there are very few weeds (Franklin et al. 2008; Preece et al. 2010) and many of the
108 biological values of the landscape have been retained (Woinarski and Traill 2007).

109

110 This continued attachment to country was reinforced from the 1970s onwards by the homelands
111 movement when many people who had left their traditional country returned, often with non-
112 Indigenous support. However, the feral animals and other new threats to the country, such as
113 breaches of quarantine from beach-washed debris or illegal boats, require a non-traditional response
114 (Altman 2003; Altman and Whitehead 2003; Wohling 2009). This led to the creation, in many of
115 the larger settlements, of ranger groups and other who were paid to provide environmental services
116 such as feral animal control, beach patrols and weed management, in addition to looking after
117 country in a traditional sense (Whitehead et al. 2009).

118

119 However, the jobs in ranger groups are limited and in some communities still relatively new or not
120 yet established. In fact, many Indigenous people look after country without being engaged formally
121 in CNRM and without being compensated for it. This group of people 'look after country' to 'make
122 sure their country is healthy' entirely because of cultural obligations and as part of their daily

123 routines (Muller 2008; Zander et al. 2013). Hence, those who manage natural resources can be
124 divided into two groups: those who are paid for some or all of the work that they undertake and
125 those who have never received any payment. The contribution of the latter group to CNRM is rarely
126 acknowledged (as in e.g., Ens 2012; Ens et al. 2012; Gorman and Vemuri 2012).

127

128 Rangers are mainly paid through government programs to deliver environmental services by
129 undertaking activities that are partly traditional (fire management) and are partly the result of non-
130 Indigenous influences (weed control, coastal quarantine control). Many rangers are also traditional
131 owners of the land on which they are based and some of their activities also fulfil cultural
132 obligations that they have to their country. Some rangers, however, come from elsewhere and hence
133 have limited access to local cultural knowledge and a corresponding lack of cultural obligations
134 (Northern Land Council 2004). Typically rangers are not only paid for the work they do but also
135 have access to vehicles, boats and other transport, something that few unpaid people in the
136 communities can afford. Those who ‘look after country’ without payments, on the other hand,
137 mainly pursue activities such as fulfilling cultural responsibilities to country, and social activities
138 such as gathering food and medicines, creating artworks, story-telling and educating children about
139 the country (Zander et al. 2013).

140

141 For both groups it is important to understand if the way they practice CNRM influences their long-
142 term mobility. An improved understanding of mobility among Indigenous Australians is considered
143 essential for efficient service provision. Service provision in Indigenous communities, particularly
144 in the health and education sector (Kainz et al. 2012), has become a major challenge because of
145 rapid and often unpredictable changes in the number of people requiring health, education and other
146 services (Taylor and Carson 2009; Taylor 2011). Various policies have concentrated infrastructure
147 and services larger Indigenous settlements, in the past referred to as ‘growth towns’, and now as
148 ‘priority communities’ (Department of Social Services, 2013) and ‘major remote towns’

149 (Department of Community Services, 2013).

150

151 The aim of this study is to investigate whether the extent of involvement of Indigenous people in
152 CNRM influences their mobility. We interviewed Indigenous people in two communities in
153 Arnhem Land in the Northern Territory (NT) to reveal how much time they spend in these
154 communities, how much time they spend outside the communities on their country and if and how
155 they ‘look after country’. We aimed to reveal relationships between mobility, the activities people
156 carry out and whether they are paid to undertake CNRM. We place this in the context of data from
157 the latest census (2011) on the Indigenous labour force in the NT in general and in the CNRM
158 sector in particular.

159 **2. Methods**

160 *2.1. The research area*

161 Our study area comprised two communities in Arnhem Land in the Northern territory (NT),
162 Maningrida and Ngukurr (Figure 1). Arnhem Land covers an area of 97,000 km² and has a monsoon
163 climate with rainfall from October to April (wet season) and almost none from May to September
164 (dry season). During the wet season the study communities are only accessible via air as the main
165 access roads are flooded.

166 [Figure 1]

167

168 In the 2006 census, 1903 Indigenous people listed Maningrida as their usual place of residence
169 (92% of all residents) (Australian Bureau of Statistics 2006) and 860 Indigenous people listed
170 Ngukurr (95% of all residents). In the latest census in 2011 there were 6.5% more Indigenous
171 people in Maningrida (2063) and 11.6% more in Ngukurr (960; Australian Bureau of Statistics
172 2011). Until 2012 both communities were part of the policy initiative ‘Working Future’ (‘Territory
173 Growth Towns’) which aimed to centralise service delivery in service hubs. The two communities

174 are situated within a network of much smaller, poorly serviced, clusters of dwellings on Indigenous-
175 owned lands, called ‘homelands’.

176 *2.2. Sampling and survey procedure*

177 All interviews were carried out by local Indigenous co-researchers (co-authors CB, OC, CD, GD,
178 EN, GD, GB) to minimise the impact of language and cultural barriers. This approach helps bridge
179 cultural gaps and leads to more effective knowledge sharing among respondents (Garnett et al.
180 2009b; Marika et al. 2009).

181

182 We aimed to interview 120 people stratified into the two research areas (Maningrida and Ngukurr).
183 The Indigenous co-researchers chose respondents within each community, selecting only those
184 respondents whom they knew were traditional owners of areas in the vicinity and ‘usual residents’
185 of the communities for considerable parts of the year. ‘Visitors’, who had no traditional connection
186 to the research area, were not interviewed. Although every effort was made to ensure all residents
187 had a similar chance of being selected, the sampling process was non-random. Cultural taboos on
188 what can be discussed meant that female co-researchers were only able to interview female
189 respondents and male co-researchers male respondents. Also some people were ineligible as
190 respondents because of kinship rules² that prevented one-on-one communication between co-
191 researchers and people of an incompatible tribal lineage. However bias was considered negligible
192 given that people of different networks were broadly representative of all age and gender classes.
193 And while there was potential for the relationship between interviewer and interviewee to influence
194 responses, we felt that these costs were far outweighed by the benefits of the interviews being
195 conducted by Indigenous co-researchers whom respondents knew they could trust. Interviews in

² Kinship defines a ‘social organisation’ and provides strict rules on the ways in which Aboriginal people should behave towards each other, defining a person's position within their network of relatives. Kinship relationships in Aboriginal culture are very different to any Western system with incompatibility between networks inhibiting some types of communication (Ranzijn et al. 2009).

196 Ngukurr were carried out between September 2011 and March 2012, interviews in Maningrida
197 between April 2011 and December 2011.

198

199 The questionnaires were in plain English but, if necessary, were translated into the respondents'
200 local language by the Indigenous co-researchers. The questionnaire consisted of four parts: 1)
201 questions on age and education, 2) questions on the frequency with which people stayed overnight
202 in the community and on country each year, 3) what activities they do on country, including natural
203 and cultural resource management, 4) questions on employment, ranger activities and whether they
204 have been paid for CNRM.

205

206 The second part of the questionnaire was used to construct a measure of mobility. Respondents
207 were asked how much time per year they were present in their community and what proportion of
208 the year they spent on country (categories: no nights on country, a few nights a year, about a week
209 each month, half the year or more). We were interested primarily in the amount of time respondents
210 spent outside the communities and potentially engaged in CNRM. We did not try to distinguish
211 whether the time away from the communities was spent on their own traditional country or
212 belonged to other traditional owners. Such knowledge, while important, was not necessary for the
213 current study. We defined 'being away' as 'not in the community for the night'. Days on which
214 respondents said that they were on country for the entire day but returned in the evening were
215 counted as being in the communities. Even though this may have included short journeys away
216 from the communities, the poor quality of roads means mobility is constrained, especially for
217 CNRM which, in a tropical climate, is largely carried out in the morning and late afternoon. Given
218 the objectives, we confined our interest to the time spent on country as compared to the time spent
219 in the two communities, and not in other communities or cities. We defined people who spend a lot
220 of time on their country and outside the community as highly mobile and those who spend most
221 nights in their community (Ngukurr or Maningrida) as less mobile.

222 2.3. *Statistical analysis*

223 We analysed 2011 census data to obtain a profile of the labour force in Indigenous communities,
224 particularly the research areas, and to see how many people are employed in the land and sea
225 management sector according to the census (codes ‘Hunting and Trapping’, ‘Forestry’ and ‘Nature
226 Reserves and Conservation Parks Operation’). We also used data from the Indigenous
227 representative group, the Northern Land Council, on the numbers of rangers employed in ranger
228 groups operating in Arnhem Land.

229

230 To analyse the survey data, we used independent sample t-tests to compare the means of two
231 independent groups of interest (e.g. rangers vs. non-rangers; people in Maningrida vs. people in
232 Ngukurr). The Shapiro-Wilk test was used to check for normality (Shapiro and Wilk 1965). The
233 null hypothesis for this test is that the data are normally distributed. When the hypothesis was
234 rejected, we used the non-parametric Mann-Whitney test (U) instead. For multiple categorical
235 variables, we used the Kruskal-Wallis test (H). The software R (R Development Core Team 2011)
236 was used for all analyses.

237 **3. Results**

238 *3.1. What does the census tell us about Indigenous involvement in land and sea* 239 *management?*

240 *3.1.1. Indigenous and non-Indigenous labour force in the NT*

241 The population in the NT was about 212,000 (109,500 males and 102,500 females) in 2011, up
242 from 193,000 in 2006 (+10%). 56,800 (27%) identified themselves as Indigenous in 2011 of which
243 38,000 (67%) were of working age (15-64). From these, 33% were employed, 8% were unemployed
244 and seeking employment, 51% unemployed and 8% did not state their employment situation in the
245 census. Between 2006 and 2011 the proportion of Indigenous people working full-time increased

246 from 42% to 56% but those working part-time fell from 51% to 36%. About 8% of Indigenous
247 people said that they were employed away from home.

248

249 In Maningrida, more Indigenous men were employed than women whereas in Ngukurr almost as
250 many Indigenous women were employed as men (Figure 2).

251

[Figure 2]

252 3.1.2. *Employment in the land and sea management sector in the NT*

253 Of the three relevant employment categories in the census, very few Indigenous people stated that
254 they were employed in the forestry sector and none identified themselves as being engaged in
255 'Hunting and Trapping' (Table 1) but, in 2011, 233 non-Indigenous and 208 Indigenous people in
256 the NT worked for 'Nature Reserves and Conservation Parks Operation' (Table 1). The figure of
257 208 is slightly lower than the number of people currently employed as 'rangers' under the
258 government-funded programmes in the NT (242; Department of the Environment 2013). For
259 comparison, nearly 3,000 non-Indigenous and 274 Indigenous people in the NT worked in mining,
260 around 1,400 Indigenous people worked in the construction sector, 1,300 in the health and
261 community sector and 600 in education (Table 1).

262

[Table 1]

263

264 In total, employment in the land and sea management sector in the NT has increased by 39% from
265 2006 to 2011 with a slightly higher increase for females. The number of Indigenous men employed
266 in this sector almost doubled (from 80 to 154), and more than doubled for Indigenous females (from
267 24 to 54). For non-Indigenous people employment increased by about 20% for women but only
268 slightly increased for men (Figure 3). The sector is one of the fastest growing Indigenous
269 employment sectors, particularly in Indigenous communities. While mining increased its
270 Indigenous employment by about 75% and the construction industry more than quadrupled it
271 between 2006 and 2011 (Table 1), Maningrida and Ngukurr have no mines and little construction

272 activity. Sectors that do have local employment, such as the health and community sector and the
273 education sector, both lost about a third of their Indigenous labour force (Table 1).

274 [Figure 3]

275 *3.2. Age, gender and level of education of respondents*

276 In total 126 people were interviewed: 66 in Ngukurr and 60 in Maningrida. In Ngukurr we were
277 able to interview six more people within the constraints of time and budget. One questionnaire from
278 a respondent in Maningrida could not be used for data analysis because more than half of the
279 questions were not answered.

280

281 About half of the respondents were between 31 and 55 years old (52%), 38% were between 16 and
282 30 and only a few (10%) were older than 55. This is comparable to a national median age of 37, a
283 national median age of 21 among Indigenous Australians and a median age of 31 of the population
284 in the Northern Territory and (Australian Bureau of Statistics 2010). More women than men were
285 interviewed (61% female) because a higher proportion of interviews were undertaken by women.
286 The level of education did not differ greatly across respondents in the two communities. Thirty-two
287 percent of respondents in Maningrida and 35% of those in Ngukurr went to high school. Fifty-four
288 percent of respondents in Maningrida and 59% of those in Ngukurr stopped schooling after primary
289 school. Fourteen percent in Maningrida and 5% in Ngukurr had not been to a formal school at all. In
290 comparison, 16% of Indigenous students in the NT complete high school (year 12), compared to
291 54% of non-Indigenous students (Australian Bureau of Statistics 2011).

292 *3.3. Mobility and time spent on 'country'*

293 Based on responses to the question about how much time (measured in nights away) people spend
294 on country as compared to within the community, we grouped respondents into three classes: those
295 with high mobility, low mobility and medium mobility. Overall, slightly more than half of the
296 respondents (54%) had a low mobility, i.e. they spend no nights away from the community on

297 country (Table 2). Most of these respondents spent the entire year in their community although
298 some occasionally visited Darwin or other larger communities. About a quarter of respondents
299 (27%) were highly mobile, spending at least half the year on country (away from the community).
300 Many respondents said that they spent the wet season in the community and the dry season moving
301 around country, camping or staying in small settlements ('homelands' or 'outstations'). Some
302 respondents said that they spend more than half of the year on country, including some periods in
303 the wet season. Ten percent either spent one week of each month (25% of the year) on country or a
304 few nights of the year. These were classed as people with 'medium' mobility. There was no
305 significant difference in mobility across the two research areas (Table 2).

306 [Table 2]

307
308 Older people (>55) were more likely to be highly mobile (58% compared to 24% for the 31-55 year
309 old and 24% for the 16-30 year olds) ($U = 6.45$; $p\text{-value} < 0.05$). In Ngukurr, 64% of older people
310 were highly mobile, but only 30% of the 31-55 year olds and 23% of the 16-30 year olds ($U = 5.71$;
311 $p\text{-value} < 0.1$). There was no significant effect of gender on the time spent on country, overall or in
312 each community.

313 *3.4. Ranger employment and mobility*

314 Twenty percent of respondents were employed as rangers at the time of the interviews. In both
315 communities, respondents who were employed as rangers were more likely to have a low mobility
316 ($U = 4.90$; $p\text{-value} < 0.05$; Table 2): Overall 78% of rangers did not spend any nights on country
317 whereas 51% of non-rangers did spend nights on country and away from the community.

318 Respondents not employed as rangers were more likely to be highly mobile ($U = 2.73$; $p\text{-value} <$
319 0.1): 31% of non-rangers were on country at least half the year but only 11% of the rangers spent
320 this long away from the communities. Being employed as a ranger had no significant impact on the
321 medium level of mobility.

322 *3.5. Natural and cultural resource management activities and mobility*

323 *3.5.1. Activities*

324 Overall, 90% said that they undertook CNRM activities/looked after country to educate their
325 children about their country (Table 2), 76% fulfilled cultural responsibilities, 72% undertook fire
326 management, 60% controlled feral animals, 54% weeds and 51% of respondents said that they
327 undertook coastal management (multiple answers were allowed). Participation in CNRM was
328 generally lower in Ngukurr than in Maningrida. Overall, highly mobile respondents were more
329 likely to undertake fire management ($H = 4.41$; $p\text{-value} < 0.1$). In Ngukurr, the level of mobility had
330 a greater impact on activities than in Maningrida. In Ngukurr, highly mobile respondents were more
331 likely to carry out fire management ($H = 4.93$; $p\text{-value} < 0.1$, Table 3), coastal surveillance ($H =$
332 7.89 ; $p\text{-value} < 0.05$) and to fulfil cultural responsibilities ($H = 9.80$; $p\text{-value} < 0.01$). In
333 Maningrida, highly mobile people were less likely to control feral animals ($H = 5.66$; $p\text{-value} <$
334 0.05) while the other activities were not significantly different across different levels of mobility.

335 [Table 3]

336
337 Across both communities 59% of people thought that fulfilling cultural responsibilities and
338 education were the two most important activities. Those with high mobility thought that education
339 and cultural responsibilities were the most important activities to carry out when ‘looking after
340 country’ ($U = 4.94$; $p\text{-value} < 0.1$). Of highly mobile people 74% would only fulfil cultural
341 responsibilities and educate their children compared with 63% of people with medium mobility and
342 51% of the least mobile people.

343
344 Mobility was decoupled from the location where people carried out CNRM activities. We asked
345 respondents where most activities were undertaken and 33% said they did them around the
346 communities, 36% up to two hours drive from the communities and 12% only undertake CNRM
347 activities far away (defined as at least one day’s drive). Many (20%) would undertake activities in

348 all three locations—around the community, at a moderate distance and far away. There was no
349 significant relationship between the activities and distance and between peoples' mobility and
350 distance. Rangers were more likely to undertake CNRM far away ($U = 12.98$; $p\text{-value} < 0.01$)

351 *3.5.2. Rewards for cultural and natural resource management*

352 The question on preferred payment or rewards for CNRM activities/looking after country arose
353 against a background in which people who are currently not being paid for environmental service
354 provision might be in the future under market-based schemes that pay for environmental service
355 (PES). With a new carbon trading scheme established for savanna burning (Australian Government
356 2013), Indigenous people can be engaged and earn money in Indigenous carbon farming initiatives
357 or existing similar schemes (e.g., Whitehead et al. 2009). When asked if people think they should be
358 rewarded for CNRM activities in general, 61% said yes. Of the 39% who thought that they should
359 not be rewarded in any form for their CNRM activities, 23% would nevertheless accept
360 remuneration when offered, leaving 16% who would actively refuse rewards (Table 4). The most
361 preferred form of reward was a salary such as that received by rangers (30%) or cash payments
362 (27%), although non-monetary compensation, such as communal benefits, were mentioned by about
363 a quarter (27%) of respondents. There was a rather weak relationship between the preferred form of
364 reward and the research area and the preferred form of reward and the degree of mobility (Table 4).
365 Respondents in Maningrida were more likely to prefer a salary ($U = 7.33$; $p\text{-value} < 0.01$). The
366 preference for non-monetary communal benefits differed significantly between people of different
367 mobility ($H = 5.97$; $p\text{-value} < 0.05$) with mostly people with medium mobility preferring non-
368 monetary rewards (Table 4). Highly mobile and people with low mobility were more likely to prefer
369 a salary ($H = 4.59$; $p\text{-value} < 0.1$). The fact that people with a low mobility preferred salary could be
370 because these are mostly the rangers who have been paid salaries already and are accustomed to
371 receiving them. Those people with low mobility who are not rangers may have wanted salaries to
372 become more mobile and to be able to pay for transport to move around their country. Those people
373 already highly mobile could prefer salaries to be able to maintain such movements.

374

[Table 4]

375 **4. Discussion**

376 Census data reveals that employment of Australian Indigenous people in land and sea management
377 is increasing rapidly in line with government and philanthropic investment. The latest Australian
378 census from 2011 also shows that Indigenous people are highly mobile. However, while part of the
379 movement is to urban areas, particularly among women and young people (Taylor and Carson 2009,
380 Taylor 2011), many Indigenous people are mobile in a sense that they spend much of the year on
381 country, camping or in small settlements. The survey results reported here suggest that this mobility
382 is both complex and interacts with the form of participation in CNRM.

383

384 In particular there appears to be a bimodal pattern of movement depending on whether people are
385 employed as rangers or not. Those who are rangers tend to reside in communities overnight for
386 much of the year, hardly spending any nights out on country, unless when doing activities more
387 than a day's drive away. Then, mostly during the dry season because access is difficult during the
388 wet season, they will sometimes drive for at least a day to carry out CNRM activities such as weed
389 and feral animal control, quarantine control as well as fire management. Those who are not rangers
390 do still look after country, particularly through fire management, but travel smaller distances from
391 the communities, presumably because they have less access to transport. However, this means that,
392 when they do move to homelands away from the communities, they tend to stay there for extended
393 periods. While this study can conclude that non-rangers spend more time on country overnight, we
394 cannot exactly say how much time people then spend doing CNRM activities. Nor is it necessarily
395 appropriate to do so since simply being on country is a form of cultural management (Povinelli
396 1993).

397

398 These patterns of mobility are likely to have two main consequences. First the greater residential
399 stability among rangers is likely to be to the advantage of health, education and infrastructure

400 planners. High Indigenous mobility increases uncertainty about investment decisions—there is a
401 danger that investment in a school or a clinic will be wasted if populations fluctuate greatly. Thus
402 investment in salaries for rangers is consistent with policies that wish to reduce Indigenous mobility
403 in the interests of state planning (see Scott 1998).

404

405 The second consequence of the dichotomy in mobility is the way in which CNRM is carried out,
406 particularly in sites distant from the communities. The mobility of rangers gives them access to
407 areas that are distant from the communities and allows them to undertake CNRM in areas more than
408 a day's drive from communities, but they do so rarely since most return to the communities at night
409 and largely during the dry season when roads are passable. This is in contrast to the management by
410 people who are not rangers, particularly those living on country, who tend to stay at locations once
411 they are reached, though these may be closer to communities. These are likely to result in different
412 styles of CNRM practice. While rangers and non-rangers undertake similar activities (apart from
413 weed and feral animal control for which special equipment is needed; Zander et al. 2013), non-
414 rangers can undertake actions in their own time with high flexibility even if they take more time for
415 certain activities to achieve the same output because they lack transport and have to walk.

416

417 However this is likely to result in finer scale management applied to a relatively small area than is
418 likely to be possible for rangers commuting long distances from a central hub. In particular people
419 living on their own country can light smaller less intense fires in the cool of the evening so they do
420 not get too hot before extinguished by the dew. Fires lit on day trips must necessarily be lit during a
421 hotter time of day. This mode of performing fire management may affect not only the nature of the
422 fires lit (timing, location, frequency, scale, intensity) but also its social function. Fire is fundamental
423 to the social construction of landscape (Head 1994) and has been described as one of the
424 fundamental responsibilities that Indigenous people have to their country (Rose 1992). The process
425 of lighting fires by people travelling on foot is likely to be a different social activity than groups of

426 paid rangers travelling by fire. Also people who spend at least half the year on their country are
427 likely to have a more detailed knowledge of local environmental dynamics than those trying to
428 cover a much larger area through occasional visits or even frequent day-trips (Gagnon and Berteaux
429 2009; Lyver et al. 2009).

430

431 The fact that 16% of respondents actually prefer not to receive a reward or payment for looking
432 after country suggests that there is a strong appreciation of the effect rewards are likely to have on
433 the way in which management is performed. While most respondents said that their primary
434 motivation for looking after country was to fulfil cultural responsibilities and educate children,
435 regardless of whether they were being paid as rangers, there is evidently a suspicion among some
436 that accepting a reward or payment for CNRM will compromise their capacity to look after country
437 in the way they wish to (see Zander et al. 2013). Certainly the contracts for rangers to provide
438 environmental services do not acknowledge that a part of their role is to pass on their knowledge to
439 a new generation of managers or to ensure that the cultural motivations for undertaking that
440 management are maintained. We found a weak relationship between the preference for monetary
441 rewards and the degree of mobility, although access to money can facilitate the use of motor
442 vehicles, allowing more time to be spent on country. On the other hand the use of motor vehicles
443 can reduce the time people spend on country overnight and increase the number of long drives
444 between communities and homelands to make day-long visits.

445

446 Nevertheless, with increasing investments in market-based incentives for conventional land and sea
447 management on Indigenous-owned lands (e.g., carbon farming schemes), it is likely that many more
448 Indigenous people will be employed as rangers. Unlike many Indigenous employment schemes,
449 ranger jobs tend to be over-subscribed. In many ways this can be seen as justifiable compensation
450 for services that have been traditionally delivered to the wider society at no cost (Muller 2008;
451 Zander and Garnett 2011; Zander 2013). However, it will also be important to manage the potential

452 unintended consequences of rewards or payments if they affect the way in which the services are
453 delivered (Muradian et al. 2013a,b). This could include variations in the ways in which
454 compensation for environmental service delivery is provided to cater for those who do not want
455 salaries, the dispersal of ranger jobs away from a central hub, and recognition of the different
456 motives for conducting CNRM within service provision contracts. However these changes would
457 also need to be accompanied by changes in service provision so that those who want to live on
458 homelands and can now be employed to do so are not disadvantaged in terms of education, health
459 and housing over those moving to communities or to urban centres.

460 **5. Conclusions**

461 We showed, in two communities, that there is a negative relationship between mobility measured in
462 time spent staying overnight on country away from the central community and formal engagement
463 in CNRM. Provision of paid ranger jobs in central service hubs is likely to reduce the frequency
464 with which those employed stay away from communities. This may affect the ways in which
465 environmental management is performed, with long term ecological consequences, but could
466 improve the efficiency of service provision. The same effect is likely to arise from policies that
467 centralise services at the expense of dispersed homelands. Policies that support both homeland
468 services and payments for CNRM in homelands, particularly unencumbered support for caring for
469 country in a way that recognises the essential cultural component of Indigenous CNRM, may result
470 in environmental management that more closely resembles traditional patterns and ultimately be
471 more effective at delivering CNRM across the whole landscape.

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476

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669 **Tables**670 **Table 1: Number of people in the Northern Territory (NT) employed in the cultural and natural resource**
671 **(CNRM) sector compared to other key sectors**

	2006		2011	
	Indigenous	non-Indigenous	Indigenous	non-Indigenous
Hunting and Trapping	0	0	0	0
Forestry	0	18	0	15
Nature Reserves and Conservation Parks Operation	104	214	208	233
Mining	156	1762	274	2999
Education	917	6350	618	7708
Health and community	2016	6597	1295	7556
Construction	329	5888	1436	8595

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Table 2: Percentage of respondents and their degree of mobility based on the time they spend on their country overnight (%)

Amount of time spent on country overnight	Level of mobility	Overall (N=125)	Maningrida (N=59)	Ngukurr (N=66)	Level of significance
No nights spent on country	Low	53	58	49	-
Half the year or more	High	27	21	33	-
One week in each month	Medium	10	14	6	-
A few nights per year	Medium	10	7	12	-
		Rangers (N=25)	Non-rangers (N=100)		
No nights spent on country	Low	78	49		**
Half the year or more	High	11	31		*
One week in each month	Medium	11	9		-
A few nights per year	Medium	0	11		-

Levels of significance: *** = 1%, ** = 5%, * = 10%, - = not significant

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683 **Table 3: Percentage of respondents carrying certain CNRM activities—overall and in each community (%)**

Activities	Overall (N=125)	High mobility (N=34)	Low mobility (N=67)	Medium mobility (N=24)	Level of significance
Fire management	72	82	64	79	*
Coastal surveillance and quarantine control	51	65	45	50	-
Feral animal control	60	53	67	50	-
Weed control	54	53	57	50	-
Fulfilling cultural responsibilities	76	85	72	75	-
Education	90	94	87	92	-
Ngukurr:	All in Ngukurr (N=66)	High mobility (N=22)	Low mobility (N=32)	Medium mobility (N=12)	
Fire management	63	77	50	75	*
Coastal surveillance and quarantine control	32	54	19	25	**
Feral animal control	41	45	40	33	-
Weed control	39	50	34	33	-
Fulfilling cultural responsibilities	60	86	44	58	**
Education	86	95	78	92	-
Maningrida:	All in Maningrida (N=59)	High mobility (N=12)	Low mobility (N=35)	Medium mobility (N=12)	
Fire management	81	92	77	83	-
Coastal surveillance and quarantine control	73	83	69	75	-
Feral animal control	81	67	91	66	*
Weed control	71	58	77	67	-
Fulfilling cultural responsibilities	93	83	97	92	-
Education	93	92	94	92	-

Levels of significance: *** = 1%, ** = 5%, * = 10%, - = not significant

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Table 4: Percentage of respondents preferring different types of rewards for carrying out CNRM activities—overall and in each community and by rangers and non-rangers (%)

Preferred reward / payment	Overall (N=116) ⁺	Maningrida (N=54) ⁺	Ngukurr (N=62) ⁺	Level of significance
Don't need reward	8	7	10	-
Would not accept reward	7	7	7	-
Salary	30	43	19	***
Cash payment	28	23	32	-
Non-monetary reward / community benefits	27	20	32	-
	High mobility (N=32) ⁺	Low mobility (N=62) ⁺	Medium mobility (N=23) ⁺	
Don't need reward	10	8	9	-
Would not accept reward	3	7	13	-
Salary	29	37	13	*
Cash payment	29	29	22	-
Non-monetary reward / community benefits	29	19	43	**

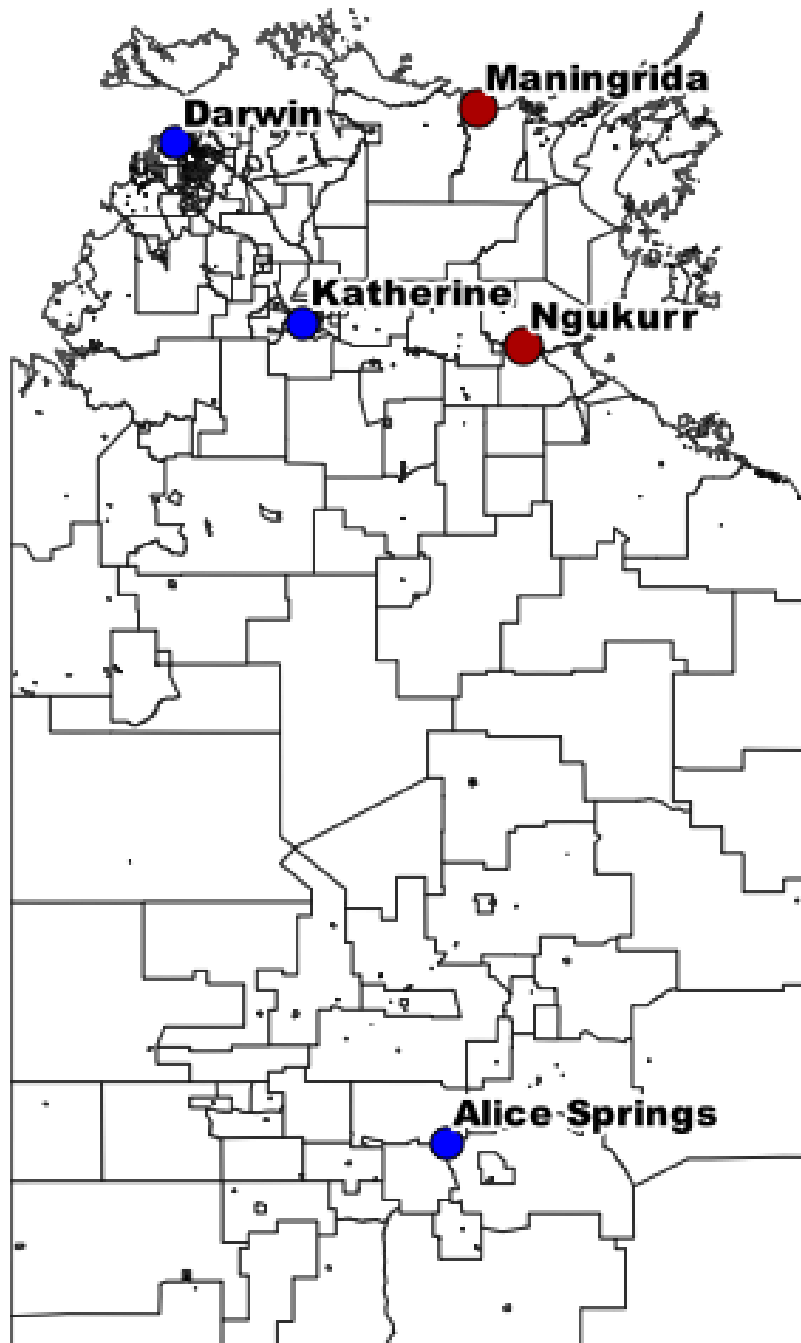
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⁺ A few people (4 in Ngukurr and 5 in Maningrida) did not state their preferred payment/reward

694 **Figures**

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696 **Figure 1: Study area (Maningrida and Ngukurr) in northern Australia**



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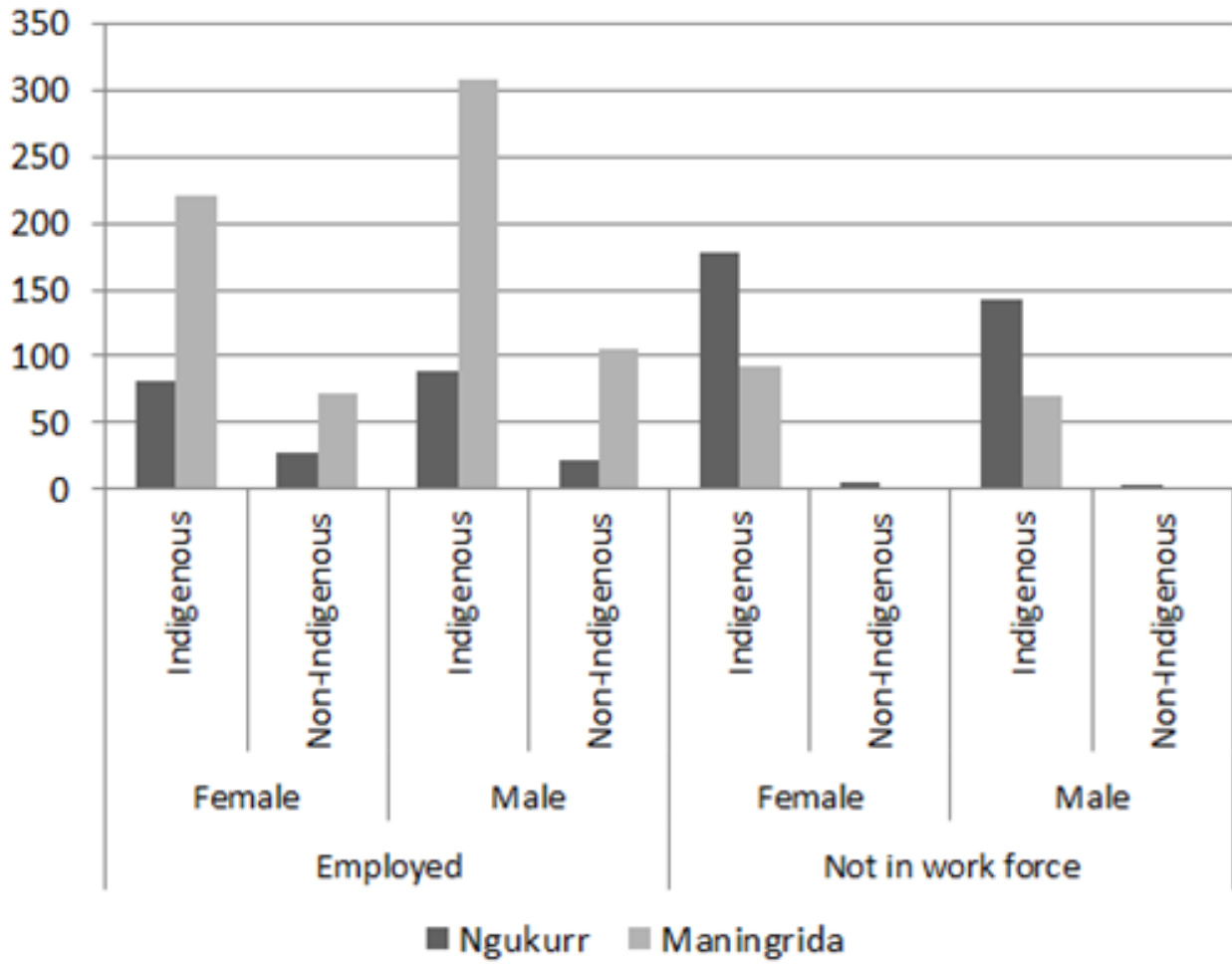
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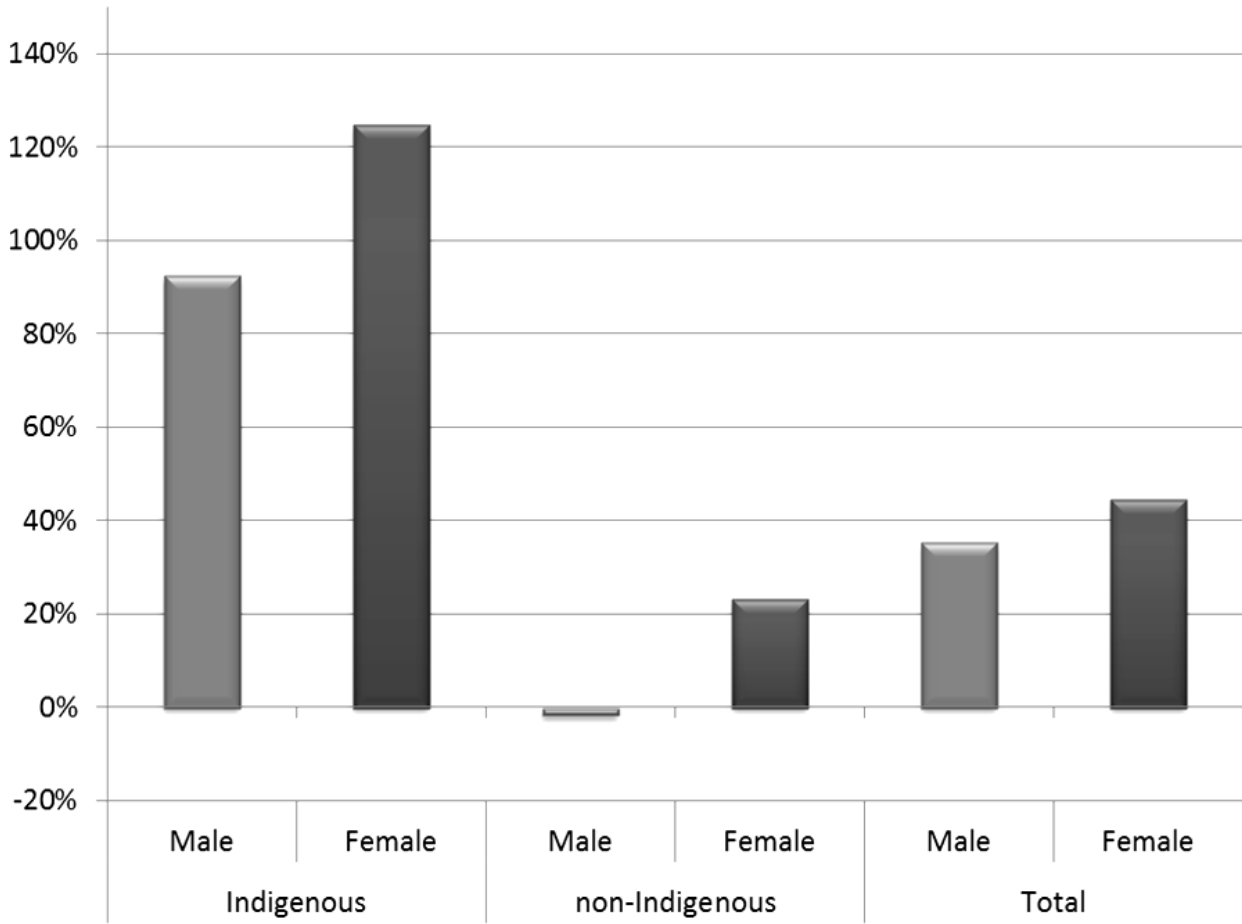
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702 **Figure 2: Indigenous and non-Indigenous labour force in the research area (Ngukurr and Maningrida)**



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705 **Figure 3: Change in filled jobs in the CNRM sector in the Northern Territory (NT) from 2006 to 2011**



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