LEIBNIZ CENTRE
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WORKING PAPER SERIES

Analyzing potential effects of migration on coastal resources in Southeastern Ghana

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Working Paper # 2

July, 2017
DOI:10.21244/zmt.2017.003

Abstract

Coastal areas are under increasing pressure from rapid human population growth, yet empirical research on the effect of migration (as one major element of population dynamics) on coastal and marine resources is scarce. We contribute to this literature with a household survey in a coastal region of Southeastern Ghana in which environmental attitudes and values toward coastal resources of 277 migrants and non-migrants were measured. In addition, respondents took part in a one-shot common-pool resource (CPR) experiment. Results suggest that migrants were less concerned about the utilization of coastal resources than non-migrants. Migrants were also found to behave less cooperatively in the CPR experiment. Further analysis, however, reveals that these findings hold true only for the subgroup of fishers, and could not be found for other occupational groups. These findings support the hypothesis that migrants do not per se value coastal resources less or cooperate less in CPR situations, but that socioeconomic characteristics, and particularly their occupational status and their relation to the resource, matter.

Keywords

Coastal resources; Migration; Ghana; CPR experiment

Content

I. Introduction

Marine and coastal ecosystems are among the most diverse in the world and provide numerous benefits. At the same time, they are under increasing pressure from a large and rapidly growing human population (Curran 2002), and currently nearly half of the world population lives within 150 km of the coast (Foresight 2011).

More than two centuries ago, Thomas Malthus argued that uncontrolled population growth would ultimately be limited by a depletion of natural resources (Malthus 1798). These Malthusian predictions, however, have not been consistently supported by empirical evidence (Templeton & Scherr 1999; Leach & Fairhead 2000; Chenoweth & Feitelson 2005). The mixed evidence on the link between population and environment and a growing concern that the complexity of this link was not fully taken into account, led to the emergence of theories and empirical research in the 1990s that has not only focused on general population growth but also on the special case of localized population increase due to migration (Bilsborrow & Okoth-Ogendo 1992; Marquette 1997; Curran 2002). This line of inquiry emphasizes that human migration plays an important role in shaping the use and management of natural resources in ways that go beyond simple population growth (Curran et al. 2002).

More specifically, migration is hypothesized to impact natural ecosystems in several ways. First, it is clear that migrants are not a random sample of the population but rather highly selective representatives. Not just anyone makes the decision to migrate and particular individuals are more likely to move away than others. There are surprisingly consistent results across many different contexts in different parts of the world, and in general, it is found that age and human capital predict migration decisions well (e.g. Stark & Taylor 1991; Greenwood 1997; Massey et al. 2010). However, there are also many other reasons for migration, including environmental push and pull factors (Piguet 2013; Castles 2002), which highlight the reciprocal character of the link between migration and the environment. Altogether, this observable migrant selectivity emphasizes the importance of non-random characteristics of migrants in understanding their impacts on the environment. Consequently, different characteristics of migrant populations will most likely lead to different environmental consequences in otherwise similar ecosystems. Furthermore, migrants might sort themselves into specific areas that are characterized by open-access and high biodiversity, and which are attractive destination areas for mobile people. Once migrants settle in these areas, social networks may lead to the appearance of more migrants, resulting in a positive feedback loop, which increases pressure on these areas (Cripps & Gardner 2016; Carr 2009).

Even though this issue has hardly been considered until now (Curran & Agardy 2002), it is supported by several empirical findings. Bremner and Perez (2002), for example, highlighted the importance of selectivity issues in migration–environment relationships after analyzing the in-migration of Asian fishers on the Galapagos Islands that was often blamed for the subsequent sea cucumber crisis in the mid-90s. In 1998, a law was passed that greatly restricted migration to the islands because government and communities were concerned about the ongoing deterioration of natural resources. However, Bremner and Perez (2002)

concluded that it was not the number of additional fishermen that caused the sea cucumber to disappear but rather the particular characteristics of the incoming migrants, which were generally young, male, with very good fishing skills and stable financial background who could afford to introduce new gear and technologies. Another case study from Goa showed that selective in-migration related to the tourism boom in the 1990s and the selective out-migration of young men to the Gulf States has resulted in a significant change of land use, from artisanal agriculture to intensive tourism with many constructions on the coast (Noronha et al. 2002). Nawrotzki et al. (2012) examined migrants' and non-migrants' access to natural resources in Madagascar and found that in areas of high natural resources, migrants were much better educated than non-migrants. Better educated people had moved to these regions to "apply innovative knowledge of techniques for natural resource extraction" (Nawrotzki et al. 2012, p. 16).

A second argument for the potentially differential effect of migrants on the environment compared with local residents that have over time developed place-based values and cultural connections is based on the assumption that migrants will value local resources less—regardless of their selective nature. Migrants' practices may have worse environmental outcomes, which often lead to the assumption that migrants are "exceptional resource degraders" (Cripps & Gardner 2016; Codjoe & Bilsborrow 2012; Pichón 1997). This could be due to a general difference in attitudes toward the environment or due to a shorter time horizon of migrants when they intend to stay only temporarily. This makes them fail to consider the long-term effects of resource conservation, causing them to invest less into long-term productivity and sustainability of local resources. Freely accessible resources, for example, are often considered to be prone to roving banditry, a concept introduced by Mancur Olson. Mobile resource users can move from location to location, sequentially exploiting local resources. Such a roving banditry is mostly explained by missing attachments to a place, which is considered to be necessary for a sustainable management of the resource. Berkes et al. (2006) suggest that this rapid exploitation outpaces the ability of local institutions to respond and eventually leads to ecological deterioration. In addition, "when new users arrive through migration, they do not share a similar understanding of how a resource works and what rules and norms are shared by others" (Ostrom et al. 1999, p. 280). Thus, migrants might also use more unsustainable technologies due to a lack of knowledge of the specific context of their destination area.

There is only limited evidence that migrants differ from local people in inherently valuing local resources less. Codjoe and Bilsborrow (2012) came to the conclusion that migrant farmers in Ghana do not expand the land used for agriculture more than non-migrants and they found weak evidence for the use of more land-intensive practices that degrade agricultural land over time. In another study in Ghana, migrant farmers were also found to engage in harmful "soil mining," which is detrimental to the long-term sustainability of the Ghanaian agricultural ecosystem. This difference between migrant and non-migrant farmers, however, was found to be mainly driven by a shorter time horizon of migrants due to tenure insecurity (Codjoe 2006). Kramer et al. (2002) examined human migration and marine resource use in coastal villages in Indonesia and found that the migration status had no significant impact on the weekly fish catch. Cassels et al. (2005), on the other hand, found that migrant households in Indonesia are significantly more likely to be located near coral reefs of poor quality than to be located near any other coral reef type. Even though causality is unclear, they concluded that

migrant status is associated with lower quality coral reefs. Further investigation revealed that there is also a strong and positive relationship between migrant status and fishing effort. Cinner (2009) found that migrants in Papua New Guinea were less involved in fishing activities. However, he acknowledged that this might result from different tenure rights, which prevent migrants from accessing the resource in the first place.

A third way the literature has considered the impact of migration on the natural environment are the differences in the rules and norms of migrants and locals. Thus, social capital is considered to be an important mediating factor for understanding the effect of migration on natural resources. Social capital—such as trust, reciprocity, common rules and norms—can help to overcome collective action problems associated with common-pool resources (CPRs), which are often found in coastal and marine ecosystems (Ostrom et al. 1999; Pretty & Ward 2001). It is frequently assumed that in-migration diminishes social capital because it disrupts social bonds of solidarity, reciprocity and trust within communities, which are critical for limiting free-rider problems. A breakdown of these important institutions is of particular concern because it can cause locals to also abandon their rules and norms and join the excessive exploitation of resources. Such a breakdown could cause the "tragedy of the commons" (Ostrom et al. 1999; Hardin 1968).

Even though social capital is expected to be an important intervening factor, few studies of the migration–environment literature have focused on it. Katz (2000), for example, focused on resource-mining at the agricultural frontier in Guatemala and concluded that communities with in-migrants had weakened social bonds and decreased capacity to take collective action. Similar results have been found in Mexico (Izazola et al. 1998) and Ecuador (Bilsborrow 1992). In a more recent study, Cripps and Gardner (2016) concluded that a collapse of social capital seems to have happened in a Madagascan marine protected area. An influx of migrants not only led to lack of respect of indigenous customary institutions among these outsiders but also contributed to a weakening of these institutions among locals. Considering the social embeddedness of migrants, Aswani (2002) found that when migration into communities of the Solomon Islands was combined with intermarriage, social ties within the community were stronger and enabled the sanctioning of individual non-compliance with fishing rules. Communities with less intermarriage among migrants and locals, however, were more likely to experience weakened social bonds, which lead to de facto open-access resource regimes.

This finding emphasizes that migration might not necessarily affect the environment in a negative way. Effects of in-migration depend especially on the extent migrants are embedded in the set of social relations of the local population. Migrants who feel part of the community and those who intend to remain are more likely to invest in the long-term productivity of local resources (Codjoe & Bilsborrow 2012). Although we focus on the effects on natural ecosystems of in-migration, we are of course aware that migration of individuals also influences resources in the areas they emigrate from. Out-migration reduces pressures on local resources at least temporarily and might thus serve as an adaptation strategy to prevent overexploitation of resources (Cripps & Gardner 2016; Andersen et al. 2014). At the same time, remittances received by households in the home community can help to switch to alternative, less resource-dependent livelihoods and practices (Gammage et al. 2002). This paper, however, continues to focus on the potential effects of in-migration in coastal areas.

Despite the predominance of CPRs in marine and coastal ecosystems and the increasing rates of migration to coastal regions, migration has rarely been discussed in the conservation literature and the knowledge about impacts of migration remains poorly developed—especially in marine and coastal environments (Cripps & Gardner 2016). One reason for the mainly land-based literature on migration and environment is that links between terrestrial resources and migrants are easier to notice whereas changes in marine and coastal resources tend to be less easily accessible (Cassels et al. 2005).

Given the limited empirical research on migration and coastal ecosystems, this study contributes to the literature by testing several hypotheses. We explore, first, whether migrants' environmental attitudes (EA) toward coastal and marine resources are worse than those of non-migrants and, second, whether migrants behave less cooperatively in a CPR experiment, which, while constrained by the limitations of transferability, can be seen as a proxy for environmental behavior. In addition, we test whether differences, if any are found, are driven by the migrant status per se or rather are confounded by the fact that migration is correlated with specific demographic characteristics.

II. Methodology

Because it is difficult to link individual actions to specific impacts on marine and coastal resources, this study instead evaluates whether migrants in general value marine and coastal resources differently than locals. According to the theory of planned behavior, positive environmental attitude toward these resources can be seen as a precursor to a favorable environmental behavior (Fishbein & Ajzen 1975; Ajzen 1991). Thus, we tried to assess how far EA differ between non-migrants and migrants who originally come from the same region. In a second step, this study aims to acknowledge that migrants do not necessarily impact resources because they have inherently worse attitudes toward the coastal environment but because migrants might disrupt institutions that are necessary for formal and informal collective action of individuals within open-access resource regimes. As argued previously, cooperation is crucial for regulating CPRs and is a key pathway toward collective environmentally beneficial behavior. Therefore, we conducted a standard CPR experiment to test for the respondents' willingness to cooperate toward limiting their appropriation from the common pool. Other socioeconomic characteristics of respondents were collected to help to account for the potential impact of the selective nature of migration.

III. Study site and sampling

Ghana's coastline of more than 500 kilometers is home to a quarter of the total population, and an important economic resource for the whole country (National Development Planning Commission Ghana 2010). However, it faces serious threats, which mostly result from "anthropogenic activities such as overexploitation of fisheries resources, illegal and unregulated fishing methods, population increase, agriculture, pollution, erosion and sand winning" (Lawson 2016, p. 899). This study, thus, was conducted in one coastal area of rural Southeastern Ghana. The selected study region, Keta municipality, has a population of about 100,000 inhabitants with the great majority belonging to the Anlo-Ewe, which is the main ethnic group in the Volta

region. Keta experiences a highly dynamic migration landscape. West Africans *per se* are extremely mobile populations (Randall 2005) with Ghana, next to Côte d'Ivoire, being the key traditional country of migration (Adepoju 2003). Keta municipality is situated on a small sand strip between the sea and the Keta lagoon, which leaves little arable land. Thus, marine resources are important economic and dietary resources for the local population. We utilized a household survey to determine whether migrants leaving the study area have different EA or a different level of cooperation than respondents who stayed in Keta. In seven communities of the Keta municipality, households were selected using a systematic random sampling[1] strategy. In every selected household, the enumerator first interviewed the household head, before she used the generated household roster randomly to select a household member above the age of 18 years.[2] This selected household member, who could also be the household head, was then asked to participate in the main part of the survey. Because we were interested in migrants originating from the same coastal setting, for households reporting out-migrants, a randomly selected out-migrant was also interviewed.

IV. Data

In line with the Foresight report (2011), migration was understood as a movement from one place to another for a period of three months or more. Because Curran et al. (2002) have already argued that "migration should be defined in the broadest sense" (p. 267) when analyzing migration–environment issues, this study did not focus on international migration only but considered everyone a migrant who left the community within the last 10 years.

Ultimately, 190 households participated in the survey out of which 101 (53.16%) had at least one migrant. As migrants have moved to many different places outside their home community, they were contacted and interviewed in a time- and cost-efficient way by phone. Phone numbers were provided by the household head. In total, migrants from 14 households could not be contacted due to missing, incomplete or obsolete numbers. Once the enumerator was able to talk to the migrant, however, every migrant agreed to participate in the survey, which took between 20 and 30 minutes.

Table 1. Destination of migrants

Destination	% of migrants
Within Keta	6.98%
Within Volta region	20.93%
Within country - to Accra	65.12% - 36.78%
International	6.98%

[1] This was done by randomly selecting a first household followed by approaching every next k^{th} household from the starting one, with k, the sampling interval, being calculated as: k = total number of households in community/ total number of desired households interviewed in that community. Furthermore, the number of households surveyed from every community was proportional to the community's population within the Keta municipality.
[2] This was done by assigning a number to every household member and selecting one of them by rolling a twelve-sided die until an assigned number was rolled.

As Table 1 shows, the great majority of interviewed migrants moved internally, mostly to the Greater Accra Region in which both Accra, Ghana's capital, and Tema, Ghana's biggest harbor city, are situated. Only 7 percent of migrants actually left the country while another 7 percent moved within the municipality of Keta. The relatively low movement of people within the municipality of Keta is not surprising as land is scarce and the economic situation and employment opportunities are very similar across the municipality. Figure 1 shows a flow map of sampled out-migrants and further illustrates their different destinations, mainly along the Ghanaian coast.

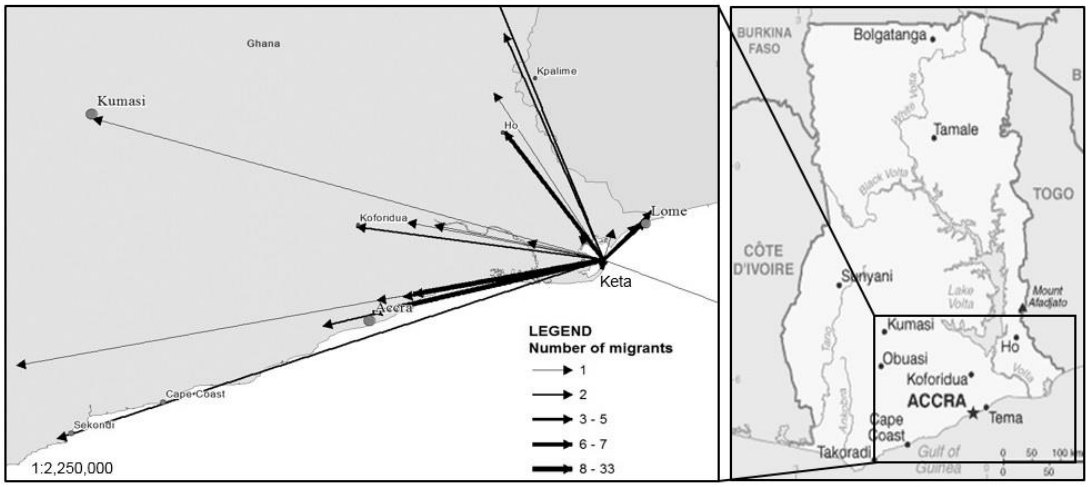


Fig. 1 Flow map of migrants from Keta, Ghana

Environmental attitudes

Environmental attitudes—an important measure in the environmental psychology literature—were collected as it is commonly assumed that they underlie ecological behavior (Milfont & Duckitt 2004). The EA construct—as defined by Schultz et al. (2004, p.31)—is "the collection of beliefs, affect, and behavioral intentions a person holds regarding environmentally related activities or issues." Traditionally, they were seen as a unidimensional construct that ranges from "concerned about the environment" to "unconcerned" (Milfont & Gouveia 2006; Dunlap et al. 2000; Dunlap & Van Liere 1978). Recently, however, EA is often viewed as a multidimensional construct based on two or three dimensions (Milfont & Duckitt 2006). We followed the two-dimension tradition as it accounts for the dilemma people are facing when trying to balance environmental protection with the need for some exploitation of the environment. Thus, Wiseman and Bogner (2003) proposed the two-dimensional Model of Ecological Values (2-MEV) that has been validated in different geographical areas, including West Africa (Borchers et al. 2014; Binngießer & Randler 2015), and focuses on two key aspects of the EA, *Preservation* and *Utilization*. The first dimension is biocentric and reflects conservation and protection of the environment, while the latter is a more anthropocentric dimension that reflects the consumption of natural resources. Because this study focuses on coastal communities, we adapted the EA measures to the specific context of marine resources.[3]

[3] Therefore, we added the term "marine" to the different attitudes questions proposed by Wiseman and Bogner (2003) to specify the resources under consideration.

For *preservation* aspects, we were interested in whether participants believed (i) that marine resources will last forever (regardless of human impact), (ii) that marine resources are not valuable for their own sake, (iii) that conservation of marine resources is important, (iv) whether it makes them sad to see marine environments destroyed and (v) whether they enjoy spending time at the coast just for the sake of being out in nature.

For the *utilization* dimension, we were interested in whether the participants believed that (vi) it is all right for humans to use marine environments as a resource for economic purposes, (vii) that people have been giving far too little attention to how human progress has been damaging the marine environment, (viii) that economic development is more important than marine conservation, (ix) whether human happiness and human reproduction are less important than a healthy ocean and (x) whether marine resources will collapse if human activities continue on their present course. For summary statistics of these items please see Table 2 in the Appendix.

All these items were measured with a five-point Likert response format ranging from "disagree strongly" to "agree strongly" including a "neutral" category. A pretest in the study region indicated that respondents were very motivated to participate in a survey and considered each item carefully. Therefore, we included the "neutral" option fully to cover respondents' opinions; on average 9.6% of respondents selected the neutral option. Items were both positively and negatively worded to reduce the potential effect of acquiescence bias (Nunnally 1978). Items were reverse coded as necessary and combined into two averaged scales representing *preservation* and *utilization*. For representation purposes, we normalized the scales to a 0 to 1 range, with 1 indicating the most environmentally concerned attitude.

We then used confirmatory factor analysis to check the validity of the structure of the two EA scales and find a tolerable fit to the data. All but one item turned out to affect significantly ($p < 0.1$) the respective scale. The insignificant item 6 ("It is all right for humans to use marine environments as a resource for economic purposes") was thus excluded from the index. The reliability of measures was checked by assessing the internal consistency through Cronbach's alpha and the homogeneity through average interitems correlations (Briggs & Cheek 1986). Though a Cronbach's alpha value of 0.7 is often used as a cutoff (Nunnally 1978), coefficients of around 0.60 are also characterized as good (see Clark & Watson 1995) and coefficients greater than 0.4 can be considered acceptable if the sample size exceeds 100 (see Milfont & Gouveia 2006).

Table 3. Reliability measures for the two EA indices.

	Mean	Standard deviation	Cronbach's alpha	Average interitem correlation
Index: Preservation	0.528	0.199	0.587	0.303
Index: Utilization	0.561	0.182	0.624	0.277

The results indicate quite reliable constructs. The relatively low alphas may also result from a short scale, as it has been shown that the alpha coefficient increases with the number of items, and that especially indexes composed of less than seven items will have rather moderate coefficients (Spiliotopoulou 2009; Voss et al. 2000). Average interitem correlations—as another reliability indicator and homogeneity measure—are

generally considered to be optimal when ranging between 0.2 and 0.4 (Milfont & Gouveia 2006; Piedmont 2014). This study's EA scales' average interitem correlations of 0.303 and 0.277, therefore, indicate acceptable homogeneity. Items are well related but not too similar to each other to make single items redundant.

CPR Game

Questionnaires asking about EA can only capture stated preferences. Nevertheless, ultimately revealed preferences in terms of actual behavior finally matter for the environment. Because data on real-life environmental behavior were not available, we complemented the EA data with a standard one-shot CPR game. To understand respondents' cooperation behavior in marine resource settings better, the CPR game was used to describe their behavior in situations in which the individual outcome did not only depend on the respondent's own decision but also on the decisions of others. The level of cooperation shown in those experiments can be generally seen as a proxy for proenvironmental behavior (Ostrom et al. 1994; Fehr & Leibbrandt 2011). Even though the validity of such experiments is controversially discussed (Torres-Guevara & Schlüter 2016), the measured level of cooperation can still be seen as a precondition for the preservation of CPRs. In addition, the experiments were incentivized to trigger people to behave as in real life, where income is also at stake (Camerer & Hogarth 1999; Hertwig & Ortmann 2001).

In this standard one-shot CPR game, the respondents decided how much they wanted to extract from a CPR that they shared with three other members from the community they live in. Because static CPR games require simultaneous but independent decisions, the inclusion in a survey is relatively easy to handle (see also Fehr et al. 2003). The groups of four players were ex-ante matched before the enumerator carefully explained the experiment to each respondent. Instructions and provided examples were identical across respondents who were not aware of the identity of the other group members. The game itself was simplified to ensure that the setting is understandable via mobile phone and to minimize confusion about the intentions of other group members. In addition, non-migrants were interviewed by phone to avoid an influence of the mode of interview. After the game had been explained to respondents, they were asked two control questions, which 88% of respondents answered correctly.

Regardless of whether the respondent answered the control questions correctly, the main points of the game were summarized and the respondent was asked to make a decision. To reduce confusion about the setting and to facilitate the comprehension of the game via phone, it was framed as a fisheries extraction scenario from a common pond that contained 80 units of fish (following Werthmann et al. 2010). Each group member could decide about the allocation of 20 units that could be either left in the pond or extracted from the common resource. Fish units extracted by an individual generated a private gain of one token (where one experimental token = 0.5 GHS or 50 Pesewas = 0.13 USD). Every fish unit not withdrawn from the CPR, however, generated two tokens, which were shared equally among the group members. Thus, fish units not appropriated from the common pond increased in value and benefited the whole group by yielding a reward to each player in the form of 0.5 tokens. Therefore, the individual payoff function for this experiment can be described by equation (1):

$$\pi_i = e_i + 0.5\left(80 - \sum_{j=1}^{4} e_j\right) \quad (1)$$

where e_i indicates the number of fish units extracted by individual *i* from the common pool.

In this setting, free riding and extracting the maximum possible number of fish units are the dominant strategies. However, all players would reach the social optimum if everyone were to abstain from extracting. Once the enumerator received the individual decisions from all four group members, she calculated the individual payoffs and informed the respondents about the decisions of the other group members and their ultimate payments. Payments were then transferred via mobile phone, which is a very common procedure in Ghana. On average, after completing the questionnaire and taking part in the experiment, respondents earned roughly 11.5 GHS (about 3 USD). At the time of the survey, the official daily minimum wage was 7 GHS which makes the average payouts relatively large and meaningful.

V. Results

First, we looked at the EA index by comparing scores received by migrants and non-migrants. Figure 2 shows the distributions of scores for both the preservation and utilization dimensions, which seem to be quite similar for both groups. A *t*-test confirms that migrants' EA scores do not differ significantly from non-migrants'.

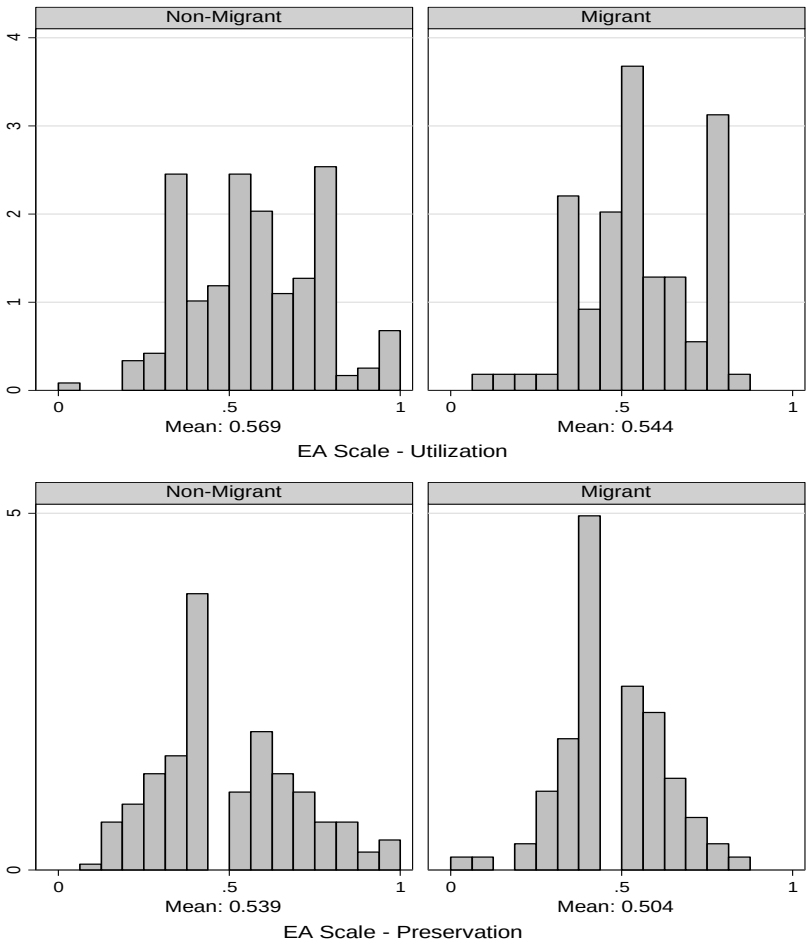
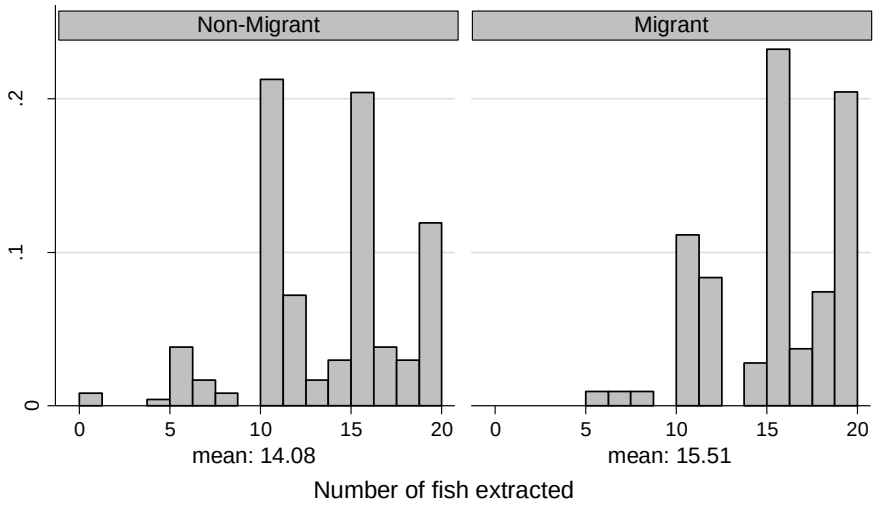


Figure 2. EA Index for Non-migrants and Migrants

These results indicate that migrants and non-migrants in our sample do not necessarily differ in terms of preservation and utilization EA toward marine resources. [4]

Next, we focused on the extraction decisions in the CPR experiment. Figure 3 shows the distribution of extracted fish units among migrants and non-migrants. For both groups, we find peaks around 10, 15 and 20 units, which were chosen more often than numbers not divisible by five. Because the experiment was played by phone, it is not unexpected that respondents tended to choose numbers that are easily relatable to the maximum amount of 20 units. Interestingly, we find that the peak around 10 units is less pronounced in the migrants' subsample and that migrants are leaning toward higher extraction rates. A *t*-test shows that migrants acted less cooperatively than non-migrants and on average extracted around 1.5 fish units more.[5]

Figure 3. Numbers of extracted fish in the CPR game, by migrant status



While migrants do not seem to have different EA than non-migrants, they were still found to show a different extraction behavior in the CPR game. These results are not necessarily contradictory because lower proenvironmental attitudes are not necessarily a prerequisite for acting less cooperatively in a CPR game. Furthermore, as mentioned previously, migrants generally differ from non-migrants in many ways. This is also the case in our sample; we found these migrants to be more likely to be young, male and more willing to take risks than non-migrants (Goldbach & Schlüter 2016). Thus, the difference in extraction rates between migrants and non-migrants might be related to socioeconomic characteristics rather than to a difference in willingness to cooperate.

Therefore, we further investigated both EA and extraction decision through Ordinary Least Squares (OLS) regression analysis. We successively add several control factors that might help to explain the EA scores or

[4] Utilization: Non-migrants: M = 0.57, SD = 0.19; Migrants: M = 0.54, SD = 0.17; $t(274) = 1.06$, $p = 0.29$ Preservation: Non-migrants: M = 0.54, SD = 0.21; Migrants: M = 0.50, SD = 0.16; $t(275) = 1.38$, $p = 0.17$
[5] Migrants: M = 15.51, SD = 4.5; Non-migrants: M = 14.08, SD = 5.28; $t(225) = -1.96$, $p = 0.051$

CPR extraction behavior of the respondents (see also Table 2 in the Appendix for summary statistics and please note that educational level and income of migrants relate to their time of migration).

All models were adjusted for clustering at the household level because the independence of observations cannot be assumed and individuals from one household are expected to be more similar.

Table 4. OLS regression models for EA Index

	Preservation dimension			Utilization dimension			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Migrant status	–0.036	–0.025	–0.013	–0.025	**–0.038***	**–0.047****	–0.036
	(0.02)	(0.02)	(0.03)	(0.02)	**(0.02)**	**(0.02)**	(0.02)
Age		0.001	**0.002****		–0.001	–0.000	–0.000
		(0.00)	**(0.00)**		(0.00)	(0.00)	(0.00)
Gender (Female = 1)		–0.040	–0.015		–0.010	0.022	0.023
		(0.03)	(0.03)		(0.02)	(0.02)	(0.02)
Spouse from community (= 1)			0.015			**–0.051****	**–0.051****
			(0.03)			**(0.03)**	**(0.03)**
Household size			–0.002			–0.007	**–0.007***
			(0.00)			(0.00)	**(0.00)**
Education, years†			**0.004***			**0.007****	**0.006***
			(0.00)			**(0.00)**	**(0.00)**
Income†							
<100 GHS			(dropped)			(dropped)	(dropped)
100–200 GHS			0.020			0.041	0.046
			(0.04)			(0.03)	(0.03)
200–300 GHS			0.002			**0.088****	**0.092*****
			(0.04)			**(0.03)**	**(0.03)**
>300 GHS			0.033			**0.052***	**0.058****
			(0.04)			**(0.03)**	**(0.03)**
Fisher (= 1)			0.060			–0.049	–0.008
			(0.07)			(0.04)	(0.05)
Connection to community			0.014			0.015	0.015
			(0.02)			(0.01)	(0.01)
Trust in community			–0.014			–0.007	–0.007
			(0.01)			(0.01)	(0.01)
General risk aversion			–0.004			**–0.022****	**–0.23****
			(0.01)			**(0.01)**	**(0.01)**
General patience			**0.031****			0.006	0.006
			(0.01)			(0.01)	(0.01)
Migrant × Fisher							**–0.114***
							(0.06)
Constant	**0.539*****	**0.514*****	**0.320*****	**0.569*****	**0.609*****	**0.525*****	**0.537*****
	(0.02)	**(0.04)**	**(0.12)**	**(0.01)**	**(0.04)**	**(0.09)**	**(0.09)**
Community Dummies	No	No	Yes	No	No	Yes	Yes
R^2	0.007	0.024	0.106	0.004	0.009	0.178	0.186
AIC	–106.322	–107.127	–97.577	–155.735	–153.217	–170.700	–170.474
N	277	277	277	276	276	276	276

Note: Cluster-robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, † measured at time of migration

Regression results indicate that only a few variables help to explain the *preservation dimension* of the EA index. Specification (3) shows that there is weak evidence that older, better educated or more patient respondents have a slightly higher EA score once the full set of control variables had been added.

Focusing on the *utilization dimension*, we also find that some control factors help to explain differences among the respondents. Those, for example, who were married to someone from their current community are unexpectedly found to have a lower score and thus less environmentally favorable attitudes than those whose spouse is not from the current community. Premigration educational level and income, however, increase the *utilization score* significantly, whereas self-reported general risk aversion decreases the score. Once these control variables are added in specifications (5) and (6), being a migrant becomes significantly associated with

a lower utilization score, even though no significant link can be detected in the univariate specification (4). As this might be caused by interaction effects, we tested whether the effect of the migrant status varies with one of the control variables. Indeed, we find that migrant fishers have a much lower average utilization score (0.43) than migrants who are not fishers (0.55) or fishers who are non-migrants (0.55). Therefore, in specification (7), we include an additional interaction term that accounts for this non-linear relationship. We conclude that migrants do not necessarily have a lower EA *per se* when it comes to the utilization of marine resources, but that the effect of migration on EA also depends on whether the migrant is a fisher.

Because the socioeconomic characteristics of respondents seem to matter for the effect of migration on environmental outcomes, we also further analyze the CPR extraction rates. Thus, in the next OLS regressions, we use the number of extracted fish units as the dependent variable and include the same set of control factors. However, only respondents that passed the control questions were included, leading to a reduced sample size of 227 respondents.

The univariate regression in specification (1) supports the *t*-test results: migrants were found to significantly extract around 1.6 fish units more than non-migrants ($p < 0.05$), thus, acting less cooperatively toward their community than non-migrants. However, when successively including control factors, the significance of this effect either vanishes (specification (2) and (3)) or decreases to the 10% level. The inclusion of control variables, nevertheless, helps to explain different extraction behaviors of respondents. For example, there is evidence that age, being female and household size are negatively correlated with the respondent's extraction decision. Interestingly, we also find that fishers took around three fish units less than non-fishers. As expected, specification (4) shows that respondents who had a higher trust in their community took significantly fewer fish units out of the commonly shared resource. As one would expect, the opposite is found for relatively risk-averse respondents.

The inclusion of control factors leading to (mostly) insignificant effects of migrant status on extraction behavior indicates that the significant effect found in the univariate analysis might be driven by the fact that the migrant subsample differs systematically from the overall population. Therefore, the correlation between migrant status and extraction decision might be an indirect proxy for underlying factors like age, gender, being a fisher or risk attitude.

We include interaction terms, as it might be the case that the relationship between migration status and behavior in the CPR scenario depends on whether one is a fisher (as suggested by the EA findings) or on other mediating factors, like on the respective trust people have in their community. Specification (5) shows that, indeed, while being a fisher is correlated with less extraction, migrant fishers are found to extract considerably more. Different levels of trust in the community or other interaction terms, however, did not mediate the impact of migrants.

Table 5. OLS regression models for extraction decision in CPR game

	Extraction decision in CPR game					
	(1)	(2)	(3)	(4)	(5)	(6)
Migrant status	**1.645****	0.796	0.811	**1.410***	1.164	–0.097
	(0.65)	(0.71)	(0.72)	**(0.74)**	(0.77)	(1.62)
Age		**–0.044****	**–0.045****	**–0.050***	**–0.046****	**–0.051****
		(0.02)	**(0.02)**	**(0.02)**	**(0.02)**	**(0.02)**
Sex (Female = 1)		**–2.291*****	**–2.272*****	**–2.272*****	**–2.465*****	**–2.540*****
		(0.65)	**(0.70)**	**(0.69)**	**(0.67)**	**(0.66)**
Spouse from community (= 1)			0.122	–0.098	–0.126	–0.001
			(0.69)	(0.65)	(0.65)	(0.66)
Household size			**–0.242****	**–0.325*****	**–0.327*****	**–0.329*****
			(0.10)	**(0.10)**	**(0.10)**	**(0.10)**
Education, years†			0.055	0.089	0.107	0.084
			(0.08)	(0.07)	(0.08)	(0.07)
Income†						
<100 GHS			(dropped)	(dropped)	(dropped)	(dropped)
100–200 GHS			–0.542	–0.557	–0.671	–0.596
			(0.99)	(0.95)	(0.95)	(0.96)
200–300 GHS			–0.442	0.448	0.369	0.470
			(0.95)	(00.92)	(0.93)	(0.93)
>300 GHS			1.004	0.847	0.588	0.751
			(0.86)	(0.84)	(0.85)	(0.85)
Fisher (= 1)			**–3.055****	**–2.713****	**–4.352*****	**–2.730*****
			(1.20)	**(1.14)**	**(1.60)**	**(1.18)**
Connection to community				–0.427	–0.455	–0.440
				(0.39)	(0.38)	(0.38)
Trust in community				**–0.603*****	**–0.585*****	**–0.702*****
				(0.19)	**(0.19)**	**(0.23)**
General risk aversion				**0.741*****	**0.752*****	**0.748*****
				(0.25)	**(0.25)**	**(0.25)**
General patience				**–0.589***	–0.544	**–0.607***
				(0.34)	(0.34)	**(0.34)**
Migrant × Fisher					**5.591****	–
					(2.07)	
Migrant × Trust in community					–	0.504
						(0.49)
Constant	**13.943*****	**17.142*****	**20.260*****	**23.012*****	**20.074*****	**23.386*****
	(0.40)	**(0.97)**	**(2.45)**	**(3.44)**	**(3.06)**	**(3.44)**
Community Dummies	No	No	Yes	Yes	Yes	Yes
R^2	0.017	0.096	0.218	0.285	0.297	0.291
AIC	1366.721	1353.170	1346.169	1327.916	1327.126	1328.880
N	227	227	227	227	227	227

Note: Cluster-robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, † measured at time of migration

Furthermore, we test whether differences in attitudes or CPR extraction decisions are more pronounced between non-migrants and those migrants which have left not only the community but also the Volta region. Therefore, we exclude every migrant who has just moved within the Volta region and thus has not left the Anlo-Ewe dominated region. However, results do not change notably, which indicates that the distance of the move does not play a major role in our sample (tables included as supplementary material).

VI. Discussion

Altogether, we do not find convincing evidence for a different extraction behavior of migrants, or a worse cooperative behavior toward their community, per se. We rather find that the highly selective nature of migrants is the underlying driver of the difference in behavior in the CPR experiment.

While there was no detectable difference in the preservation dimension of the EA index, we found a negative correlation between migrants and the utilization dimension of the index once all control variables are considered. This indicates that, on average, migrants have stronger preferences to dominate marine and coastal resources. However, a check of potential interaction effects revealed that the link between migrant status and utilization dimension is influenced by being or not being a fisher: While the average utilization score of both fishers (0.55) and migrants (0.55) was only slightly lower than the score for the reference category of non-migrant/non-fisher (0.57), a migrant-fisher's score was significantly lower (0.43). The significant effect of migrant status on the EA score was, therefore, mostly driven by the few migrant fishers and does not hold for migrants in general. Fishers had a different preference toward the utilization of resources, most notably when they were not working in their home community. This finding cannot confirm that migrants have inherently different attitudes toward the environment, as some papers suggested, but rather that their attitudes depend strongly on their respective socioeconomic background, as for example, suggested by Bremner and Perez (2002).

Findings from the CPR experiment went in a similar direction. While migrants were found to act less cooperatively by extracting more than non-migrants, this linkage was mostly driven by factors associated with both migration decisions and CPR extractions. Once we controlled for these variables, such as age, gender and general risk aversion, no robust difference between migrants and non-migrants could be detected. This finding highlights that there can be characteristics differentiating migrant groups from non-migrants, and supports studies emphasizing the importance of migrant selectivity: migrants extracted more than non-migrants from the commonly shared resource because of their different socioeconomic composition. They were generally younger, male, and more willing to take risks—all attributes that were found to affect the extraction decision positively. Therefore, we cannot confirm that migrants from our study region cooperated less than non-migrants at home and, thus, negatively affected social capital because they are migrants. Rather, results suggest that the factors associated with acting less cooperatively are also associated with individuals who are disposed to migrate.

Another striking finding was again related to the occupation of respondents: we found that non-migrant fishers extracted much less than respondents with different occupations. An interaction effect revealed a considerable difference between migrant fishers and non-migrant fishers. The effect of being a migrant was thus especially pronounced for the subsample of fishers. While fishers extracted around 4.4 units less than non-fishers in the home communities, migrant fishers extracted on average 1.2 units more than other migrants. One potential explanation for the fact that fishers cooperated more and extracted less than non-fishers at home might be the mode of fishing commonly applied in the region. Fishers in Keta mostly use

beach seine nets, which need to be operated in larger groups and whose catch is commonly shared among the crew. Therefore, fishers might be more used to cooperate in resource extraction dilemmas than non-fishers (Gehrig & Schlüter 2016). Because cooperation is a common behavior in their fishing community, they might apply the same heuristic in the experimental setting. For migrated fishers, however, this link turned around and they acted less cooperatively than non-fishers. Here, the cooperation problem often experienced by fishers, might have rather led to a race to the bottom.

These differences in EA toward utilization of coastal resources as well as in extraction behavior both indicate that migrant fishers behaved less proenvironmentally than fishers in their home communities. These findings are in line with Mancur Olson's concept of "roving bandits," which suggests that mobile fishers move from one unprotected resource to another without having the incentive to invest in conserving institutions. Already existing local institutions are often unable to respond to this roving banditry in time with the consequence of ecological deterioration (Berkes et al. 2006). This is the case in West Africa, where migrant fishers are common, but where nearly no institutions capable of managing these fishers are in place (Duffy-Tumasz 2012). Duffy-Tumasz (2012) found that there is a very distrustful environment between Ivorian government officials and Ghanaian migrant fishers that prevented successful resource governance. In other case studies, however, Ghanaian migrant fishermen were found successfully to replicate the fishing institutions that regulate responsibilities and access in their home communities (Overa 2001; Marquette et al. 2002). Nevertheless, it was also found that those dynamic institutions are fragile and broke down when demands for the resource increased or tensions rose (Marquette et al. 2002).

However, results based on whether the respondent was a fisher must be interpreted cautiously because only 7% of our randomly selected sample worked as a fisher, which is not enough to make generalizations toward the whole population (statistics on the percent of fishers among the working population are unavailable). Despite that, it gives an indication of how the relationship between migration and attitudes toward natural resources might differ based on the occupation of the respondent. This heterogeneous sample could be the reason why we did not find a general direct effect of migrant status, but only a rather indirect one via their different socioeconomic characteristics and occupations. Furthermore, instead of using a neutral framing, this CPR experiment was framed as a shared fishing site. Framing, however, is also known to influence decisions of participants (see, e.g., Levin et al. 1998; Cookson 2000; Liberman et al. 2004), and might, thus, have also partly influenced the difference in extraction behavior between fishers and non-fishers because fishers are more familiar with this coordination problem and employ different heuristics than non-fishers. However, while framing could help to explain the difference between fishers and non-fishers, it does not necessarily explain the difference between migrant-fishers and fishers at home.

Future research should, thus, limit the sample to fishers who have a direct impact on coastal and marine resources to validate whether there is indeed a difference between migrant and non-migrant fisher people from Keta and to make sure that findings are not driven by framing the experiment as a fishery-specific context. Furthermore, future studies could try to improve the quantitative measure of a migrant's embeddedness in the set of social relations that help to diminish the effect of migration upon natural resources.

VII. Conclusion

The results of this study have relevant implications for the environment–migration literature, for future research in this field and for coastal management in the study region. Even though coastal areas are under increasing pressure from a rapidly growing human population (McGranahan et al. 2007; Neumann et al. 2015), empirical research on the effect of migration on coastal and marine resources is scarce. This study found no direct evidence for a difference between migrants' and non-migrants' attitudes and values toward coastal environments, and only limited evidence for a difference in their cooperation behavior in a CPR situation. Results rather highlighted that socioeconomic differences between migrant and home populations play an important role in migration–environment relationships.

With regard to research methods, this study complemented the existing empirical literature by using the 2-MEV as well as a standard one-shot CPR experiment which have, to our knowledge, not been used in the migration–environment literature before. These established tools can help to provide new insights into two important factors—EA and values, and cooperative behavior—which are considered to be crucial for actual ecological behavior. An extension of these tools to other populations or to specific resource user groups could help to improve future research, to complement qualitative data and to get a clearer picture of the migration–environment nexus.

Finally, these findings could have implications for policies in the study region. The results of this study suggest that policy initiatives aiming to reduce potential effects of migrants on natural resources could focus especially on those subgroups found to have more extractive EA and less cooperative behavior, for example, migrant fishers. Furthermore, local and national governments could build on existing institutions of fishers to improve trust and to include small-scale fishers in the implementation of conservation policies. Ecosystem-based management should accommodate the movements of mobile small-scale fishers in the region as they seem to have very different attitudes and values than immobile fishers.

VIII. Funding

This work was supported by the Volkswagen Foundation (application A110040).

IX. Acknowledgments

We would like to thank Mariama Awumbila, Joseph Teye and Gertrude Dzifa Torvikey from the University of Ghana, Accra, for their assistance in the field. We are also very grateful to the team of students for their excellent research assistance. Most importantly, we thank all the Ghanaian respondents who patiently participated in the interviews and in the experiment because without their help this research would not have been possible.

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XI. Appendix

Table 2. Summary statistics

Variable	Mean	Std. Dev.	Min.	Max.
Migrant (Yes = 1)	0.31	0.46	0	1
CPR extraction	14.58	4.91	0	20
Age (years)	37.83	16.72	18	88
Sex (Female = 1)	0.53	0.49	0	1
Spouse from community (Yes = 1)	0.34	0.47	0	1
Household size	5.82	2.81	1	15
Education, years†	9.94	4.81	0	21
Fisher (Yes = 1)	0.06	0.25	0	1
Connection to community	4.21	0.89	1	5
Trust in community	2.90	1.46	1	5
Risk aversion	2.77	1.33	1	5
General patience	4.13	0.98	1	5
	Percentage (%)			
Income (in GHS)†	<100 (51.26%)	100–200 (17.33%)	200–300 (11.19%)	>300 (20.22%)

EA (in %)	Disagree strongly	Disagree	Neutral	Agree	Agree Strongly
Preservation items					
(i) Marine resources will last forever (regardless of human impact). (R)	10.83	18.05	5.42	31.41	34.30
(ii) Marine resources are not valuable for their own sake. (R)	12.64	44.77	6.86	17.69	18.05
(iii) Conservation of marine resources is important.	7.94	38.63	12.64	21.66	19.13
(iv) It makes me sad to see marine environments destroyed.	2.53	6.86	2.89	38.63	49.10
(v) I enjoy spending time at the coast just for the sake of being out in nature.	5.66	15.87	5.22	33.90	39.35
Utilization items					
(vi) It is all right for humans to use marine environments as a resource for economic purposes. (R)	1.45	5.43	2.54	47.10	43.48
(vii) People have been giving far too little attention to how human progress has been damaging the marine environment.	4.33	11.19	7.22	42.96	34.30
(viii) Economic development of communities is more important than marine conservation. (R)	3.62	22.83	17.75	35.14	20.65
(ix) Human happiness and human reproduction are less important than a healthy ocean.	4.69	35.02	22.38	19.13	18.77
(x) Marine resources will collapse if human activities continue on their present course.	8.33	21.74	9.06	23.91	36.96

Note: (R) reverse coded items for index, † measured at time of migration

XII. Experimental Instruction

Task 3. This is the last task we have for you today: Again, there is no right or wrong answer. Maybe you want to get a pen and paper in case you want to write down a detail.
You are in a group with three other persons. You don't know their identity and they don't know yours. Please imagine now that there is a pond in your neighborhood that contains 80 fish. You have the possibility to catch a maximum of 20 fish. Every fish you don't want to catch will stay in the pond. The other three members of your group have to make the same decision.
Please note, that you can only catch fish once!
After your decision, we will estimate how much money you have earned. Your jearnings will be composed of two things:

- 1. Your private earnings: For every fish you take, you will earn 0.5 GHS. No one except you earns anything from the fish you took out of the local pond. If you extract, for example, 6 fish you would get 3 GHS. If you decide to catch 11 fish you would get 5.5 GHS and so on.

- 2. Your group earnings: Every fish left in the pond by your group is worth 1 GHS, which you have to share equally with the other three group members from your community. For example: If 20 fish are left, your group earns 20 GHS. You share it, which means that you would get 5 GHS on top of your individual earnings. If 50 fish are left in the pond, your group would earn 50 GHS, and you would get 12.5 GHS and so on.

Now just two short questions, which do not affect your earnings:

- Does the amount of money you get depend on the decisions of your group members?
  - ☐ Yes
  - ☐ No
  - → The right answer is yes: The more fish your group members leave in the local pond, the more money the group earns, and the higher is the amount of money you get on top of the fish you caught. But this means also: The more fish your group members take, the less fish will be left in the pond and your group earnings will be reduced.

- Please imagine: After everyone in your group decided how much he or she wants to take out, there are 40 fish left in the pond. How much do you earn from these fish (on top of your private earnings)?

→ The right answer is 10 GHS. The 40 fish would bring your group 40 GHS, which you have to share with the other group members. Therefore, you have your private earnings from whatever you took out of the pond, plus the 10 GHS from what your group left in the pond.

To summarize:

- Every fish you take will bring you, and only you, 0.5 GHS.
- Each of the 80 fish, which is not taken out by you or your group members, will bring 1 GHS to the group and will be shared equally.
- All four members will decide at the same time, so you don't know what the others did.

Any questions?

Please answer them as discussed in the training. If you don't know how to answer, please ask me.

F3a. How many fish do you want to take?
It is okay to take your time to think about it.

Any number between 0 and 20 is allowed.

→ ☐

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ZMT LEIBNIZ CENTER for Tropical Marine Research

Working Paper Series

ISSN 0000-0000
July, 2017

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Published by

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