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Drills and Diets, Consumption and Conservation— the Role of Primate Meat in Local Diets in and Around Cross River National Park, Nigeria*

Agnes ANDERSSON DJURFELDT, Edu O. EFFIOM, Magnus JIRSTRÖM and
Ola OLSSON**

Abstract: The study uses household level data from four villages in and around Cross River National Park (CRNP), Nigeria to assess the role of primate meat in local livelihoods and diets. Okwangwo is an enclave community within the national park, Butotong houses the CRNP headquarters. Kanyangl and Abo Ebam are located farther away from the park. 149 respondents were surveyed. Sale of bushmeat contributed 4 percent of total cash income on average, but is important as a source of protein in the context of poorly developed livestock systems. 98 percent of the households ate bushmeat during the past year and 74 percent hunted for consumption. 77 percent ate meat from primates, although this varied from 53 percent in Butotong

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to 97 percent in Okwangwo. Differences emerge among the villages with less reliance on bushmeat, less hunting and a dietary shift towards poultry in Butatong. There is no correlation between income levels and consumption of primate meat. The overwhelming motive for eating primate meat was taste preferences. Solutions to unsustainable extraction of primate meat must be sourced in relation to local consumption. Improving access to animal source foods, through widening the livestock basis of local agrarian systems therefore comes across as a primary conservation measure.

Keywords: Bushmeat, Livelihoods, Hunting Consumption, Conservation, Livestock

Introduction

Discussions of community conservation approaches tend to focus on the possible trade-offs between local livelihoods and conservation interests, where biodiversity concerns are often perceived to be at loggerheads with development objectives (Adams and Hulme, 2001; Pfeifer et al., 2012). The assumption has been that local sources of income generation based on forest products conflict with protection of wild resources. In relation to preservation of large, colorful mammal species, such as elephants, lions and primates the primary focus has therefore been on mitigating income losses and preventing poaching for commercial purposes (Arjunan et al., 2006; Barrett and Arcese, 1995).

Trade-offs and resolutions of conflicting interests may, however be different depending on the character of livelihoods and what types of resource extraction occurs. In this sense, any study of community conservation efforts needs to ask the right questions: not simply if forest resources are used, but also *how* and perhaps especially *why*. It is only in relation to these latter questions that context specific policies can be developed.

While studies of community conservation efforts tend to equate restrictions in local livelihood opportunities with the loss of income from hunting or crop destruction by wild animals, less attention has been paid to the nutritional implications of preventing bushmeat extraction in situations where such meat constitutes a crucial part of local diets. Whether bushmeat is used in the first instance as a source of food or income in turn carries important implications for conservation measures.

The present article therefore has three aims: firstly, a general aim is to shed some empirical light on the role of bushmeat (and primate meat¹ especially) in local diets, given a paucity of data on wild foods in general (Powell et al., 2011). Secondly, we will reconsider some of the key assumptions made in the literature on community based conservation viz. primate meat being important primarily as a source of income, rather than food. Thirdly, and following from this, we will suggest that if local resource extraction of primate meat is based on hunting for consumption, rather than sale, then solutions related to finding alternative sources of protein, rather than income, are relevant. In this sense, the conservation question needs to be contextualized and phrased according to local conditions: If the key conservation challenge is to wean local diets of primate meat and provide alternative sources of protein the policy measures tied to this are related to improving food security and widening the livestock basis of agrarian systems. Conversely, if illegal hunting provides a large share of income, substituting such income sources becomes the major focus in a local livelihood context.

The paper uses data from 149 households in four villages in and around Cross River National Park, Cross River State, Nigeria to situate the role of bushmeat, and meat from primates especially in the context of local incomes and diets.

Literature Review

Although the importance of wild foods to local food security is documented in the literature, the distinction is often falsely made between hunting and gathering on the one hand and agricultural production on the other. As suggested by a recent review by Bharucha and Pretty (2010) wild foods need to be considered in the context of local agricultural systems, where gathered or hunted food complements own production. The evidence showing how forest foods are connected to wealth, gender and proximity to forests is conflicting, however (Powell et al., 2011) suggesting the strong contextual nature of access to and use of wild foods in local diets.

¹ In the context of our study, the consumption of primate meat involves meat from apes (gorillas and chimpanzees), drills and monkeys (notably putty nosed monkey and Mona monkey). Bushmeat covers these types of primate meat and also includes duikers/antelopes, pigs/hogs, cane rats (grasscutters), porcupines, squirrels, smaller rodents, fowl, other birds and other.

With respect to bushmeat specifically, even less is known. Studies at a general level point to potential conflicts between conservation aims and diets based in part on bushmeat (Fa et al., 2003; Powell et al., 2011; van Vliet and Nasi, 2008). Much work, however, concludes that empirical evidence is lacking, with literature reviews pointing to the presumed importance of bushmeat often on the basis of largely anecdotal evidence. Other studies are based on projections of consumption and resource stocks for large scale ecosystems (Fa et al., 2003).

A number of hypotheses are tested in the literature, particularly with respect to income and wealth, location (rural or urban settings) and proximity to protected areas. Consumption of bushmeat may increase with remoteness from urban areas, as transportation costs increase and access to alternative sources of meat is limited, as reported for Gabon (Abernethy and Effa, 2002 cited in Milner-Gulland et al. 2003). Similarly, the construction of a road in the Brazilian Amazon led to a fall in bushmeat consumption as a result of increases in availability of beef (Ayres, 1991 cited in Milner-Gulland et al. 2003). Ibarra et al. (2011) discuss the consequences for traditional food systems of the introduction of Payment for Environmental Services (PES) in Mexico's Indigenous and Community Conserved Areas and note an effect on bushmeat consumption when hunting bans were introduced as a part of these projects. Work on Western Tanzania by Mgawe et al. (2012) suggest that attitudes towards protection and consumption of bushmeat vary with proximity to protected areas.

The link between wealth and bushmeat consumption is not straightforward, however and bushmeat consumption is positively correlated with income in some urban settings (Bowen-Jones et al., 2002) but the evidence on this is conflicting with consumption varying also with ethnic group (Fa et al., 2002) and religion (East et al., 2005; Njiforti, 1996). Consumer preferences are also discussed in the literature (Schenck et al., 2006). De Merode et al's (2004) study of the interaction between extreme poverty and wild foods in the Democratic Republic of Congo, suggests that bushmeat consumption is driven by poverty, rather than wealth. Wilkie et al.'s (2005) comparison of rural and urban meat consumption in Gabon, shows that wealth is strongly related to meat consumption in general, regardless of location. Here small increases in wealth among poorer households lead to relatively large increases in consumption, when compared with the effect of such increases on the diets of wealthier households.

A number of studies show the importance of relating bushmeat

consumption to other protein sources (East et al., 2005; D. S. Wilkie et al., 2005), both at the macro-level (Milner-Gulland and Elizabeth, 2003; Rowcliffe et al., 2005) and in national and local contexts (Mgawe et al., 2012). Wilkie et al. (2005) demonstrate how bushmeat consumption is related to alternative sources of protein and their cost, and suggest that prices of poultry and livestock had little effects on levels of wildlife meat (fish and bushmeat) consumption. Instead consumption of either wildlife meat source (fish or bushmeat) was related to the price of the other, with the two functioning as substitutes. The prices of non-wild meats therefore had little influence on the consumption of wild meat. The study adds to literature from Latin America showing the interaction between wild meat consumption, wealth and prices of substitutes (Apaza et al., 2002; D. Wilkie and Godoy, 2001 cited in Wilkie et al. 2005), but also concludes that results are likely to obscure local level patterns. Livestock rearing for own consumption may also constitute alternative protein sources, with data from the Serengeti showing that households who are rich in livestock are less involved in hunting of bushmeat than those who are not (Loibooki et al., 2002).

While insights related to placing bushmeat in the context of alternative sources of protein and their prices are clearly relevant, the assumption is often made that the drivers of consumption are the same for *all types* of bushmeat, regardless of species. The cultural and symbolic value of particular types of meat varies however and may also be strongly related to particular local practices. In general, therefore there is a dearth of studies wedding the assessment of broader structural conditions with localized perspectives related to agricultural production, cultural practices and dietary preferences.

For primates specifically, only a handful of studies point to their importance as sources of food (Evan Bowen-Jones and Enthwistle, 2002), with the focus instead being placed on their role as sources of income, with commercial hunting and secondary incomes generated from trade in meat from primates described as highly lucrative in many studies (Anadu et al., 1988; Clayton and Milner-Gulland, 2000; Hill, 2002). While studies of primate meat consumption (and to a lesser extent hunting) in general are lacking, the understanding of the drivers of such consumption may be all the more topical, given the highly endangered situation of many large-bodied primates especially, their slow reproduction rates and their wider ecosystem function as important dispersal agents of many forest trees.

Methods

The research presented in the article is part of data collected for an interdisciplinary project on consequences of bushmeat hunting in tropical forests for forests, wildlife, primates and local livelihoods (see Effiom, 2013). Although the project is interdisciplinary combining perspectives from biology and human geography this article uses a social science, mixed methods approach, drawing on both quantitative and qualitative data. The discussion is based primarily on information from a household survey and to a lesser extent on qualitative key informant interviews and focus group discussions. Sites were selected to provide variety in terms of protection strategies and proximity to the Cross River National Park (see further below). Within each village households were sampled randomly using village lists of households. The purpose and methods of the study were introduced through public meetings facilitated by the village leadership. Survey respondents were informed that they could at any time refuse to participate in the survey, while they were also guaranteed anonymity. The survey was administered by a group of five university students and graduates who were trained and supervised by two senior researchers. Senior researchers carried out the focus group discussions as well as the key informant interviews with chiefs and chief councils. Two separate focus group discussions were arranged for female and male village residents in the villages. The latter groups did not overlap with the survey respondents, since the purpose was to triangulate the survey data, while gaining an understanding of processes related to local livelihoods and use of forest resources broadly speaking.

The survey adapted a method used by Arjunan et al (2006) in the context of tiger conservation efforts in India. The connection between livelihood interests and support of conservation is shown in this study, where support is strongest among those whose livelihood interests conflict the least with conservation efforts. While attitudinal surveys have been widely used to evaluate conservation programs (Infield and Namara, 2001), this approach was complemented with a set of questions detailing the role of primates in local diets. Moreover, bushmeat – unlike tigers – takes on the dual role of food and income source and retrospective questions capturing both aspects of income generation as well as dietary patterns over time were included in the survey.

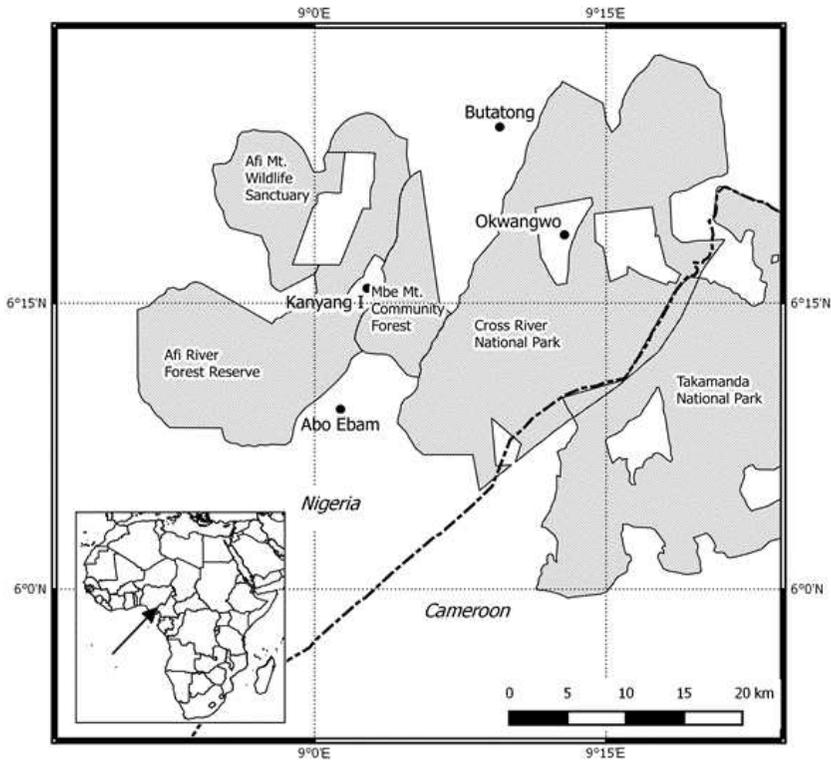
The analysis is based on analysis of variance of means (ANOVA) with Tamhane's T2 post hoc test used to test for statistical significance in differences of means between the villages. Data has been treated with the IBM Statistical Package for the Social Sciences (IBM SPSS) software.

Site Selection and Description

The study was carried out in May 2012 in four communities in and around Okwangwo division of Cross River National Park, Cross River State, Nigeria. Okwangwo division borders the Takamanda Forest Reserve in Cameroon and contains 40 percent of Nigeria's remaining forest, alongside a number of endangered species such as the Cross River Gorilla and the Nigerian Cameroon Chimpanzee (Bassey et al., 2010; Ezebilo and Mattsson, 2010). The total population of the Okwangwo Division is around 36000 people, distributed among 66 villages, while an additional 2500 people live in two villages (Okwa and Okwangwo) inside the Cross River National Park (Ite and Adams, 2000). Okwangwo Division (OD) extends over around 1000 square kilometers and has been repeatedly gazetted since the early 1930s, with the Cross River National Park (CRNP) established by the Federal Government of Nigeria and the World Wildlife Fund in 1991 (Ewah, 2012). The CRNP is mandated to conserve and protect the national park.

Four study sites, within varying distances from the CRNP were purposively selected for the study: the intention was to provide variety in terms of access and reliability on forest resources for local livelihoods as well proximity to protected forest areas. Four villages, Abo Ebam, Kanyang1, Butatong and Okwangwo, were selected. The villages are located at varying distances from a number of protected areas with different restrictions on hunting and resource use. In principle hunting is restricted in all these areas, but hunting of some common species, e.g. porcupines, is allowed in Afi River Forest Reserve. There is complete ban on hunting in Mbe Mt. Community Forest backed by traditional norms and bylaws of the Mbe group of communities. All forms of hunting are also prohibited in the state managed Afi Mountains Wildlife Sanctuary. It is not allowed to hunt any primates in any of the areas, and the large primates – gorilla, chimpanzee and drill – are protected by federal law of Nigeria that has jurisdiction over the National park and the Cross River State Forestry law.

Abo Ebam and Kanyang 1 are along the Ikom-Obudu highway and as such can be described as highly accessible. Butatong is a few kilometres off the highway. Okwangwo village which lies inside the CRNP is by far the least accessible (see map 1).



Map 1: Location of Study Sites

While three of the study sites are located at varying distances from the park, *Okwangwo* village is an enclave community within the park. A resettlement process of the villagers was initiated with the establishment of the park in 1991, but has been deadlocked by the withdrawal of the major funders, the EU, from Nigeria following human rights abuses by the then government in the mid-1990s. Following the suspension of funding by the EU in 1995, the World Wildlife Fund which had been involved in the establishment of the park also pulled out. The Federal Government is now looking for funds for resettlement, since, according to the conservator general land is available elsewhere and all the enclave communities want to leave the park (Personal communication conservator general Ntufam Richard Effa, May 1, 2012). This was also reaffirmed by the focus group discussions in *Okwangwo*, where rising population pressure on a constrained land resource was a grave cause for concern – the feeling was that the village was trapped inside the CRNP, with

road access and health care being especially problematic. Indeed, the village was only possible to reach by motorcycle on dirt track 18 kilometers from Butatong.

Butatong stands out with respect to the other villages, since the CRNP divisional headquarters for Okwangwo division are in Butatong. This location has in earlier studies been connected to possibilities for income earning opportunities related to community based tourism and conservation projects (Ezebilo and Mattsson, 2010). *Abo Ebam* diverts from the other villages in the sense of having relatively large community forest reserves, which can be used by the villagers for hunting for instance, provided endangered species are not extracted.

The demographics of the villages in terms of household headship and age of head of household vary. Whereas the share of female headed households with 10 percent was the lowest in the most remote community of Okwangwo, in the neighbouring Butatong as many as 50 percent of the sampled households were headed by women. For the sample, 30 percent of households were headed by women and the difference in means between Okwangwo and Butatong was statistically significant ($p=0.000$, full ANOVA $p=0.001$, $F=5.450$, $df=148$). In terms of age and educational levels of head of households there are no significant differences between the villages. The average age of head of household was 44 years for the total sample and the average year of schooling of households is, at least in an African context, remarkably high at 10.4 years.

One striking demographic difference between the villages is the size and age composition of households, with *Kanyang 1* especially having large households, with age distribution skewed towards children below the age of 15. Even when only the productive age groups (16-60 years) are considered, households in *Kanyang 1* on average contained nearly 8 adult household members, compared with only five in Okwangwo. When the demographic composition of the households is controlled for through calculating the number of adult equivalents per household, the households in *Kanyang 1*, with nearly eleven adult equivalents on average contain four more adult equivalents than do the households in Okwangwo, which divert in the other direction. The differences in adult equivalents are however only statistically significant between *Kanyang 1* and Okwangwo ($p=0.008$, full ANOVA $p=0.008$, $F=4.100$, $df=141$).

Results

Local Livelihoods, Forest Resources and Bushmeat

The composition of livelihoods is strikingly similar among the villages: all households reported collecting fruits and nuts from the forest and more than 90 percent of the households gathered timber, medicinal plants and other non-timber/non-food products from the forest. Collection of bushmeat was slightly lower, with 83 percent of the households gathering bushmeat, with no statistically significant differences among the villages. Households reported nearly identical retrospective patterns with respect to overall bushmeat use and generally there were only minor differences in the use of forest resources ten years prior to data collection and at the time of data collection. The differences in forest resource use between the villages hence have been stable over the past decade.

Although there are no statistically significant differences in participation rates in gathering of bushmeat, the importance attached to bushmeat among those households that do hunt differs among the villages (full ANOVA $p=0.005$, $F=4.436$, $df=147$). In Butatong and Okwangwo 5 percent and 3 percent respectively of the households reported that bushmeat was the most important product collected from the forest, whereas in Abo Ebam and Kanyang1, 24 percent and 23 percent of households respectively ranked bushmeat as the most important forest resource. The difference between Kanyang1 and Okwangwo is statistically significant ($p=0.044$).

In all villages, the importance of bushmeat had fallen over time, however, again from a higher level in Kanyang1 and Abo Ebam, where 30 percent and 34 percent respectively of the households reported bushmeat as the most important forest product collected ten years ago. This is compared with 10 percent and 13 percent respectively for Butatong and Okwangwo (full ANOVA $p=0.021$, $F=3.344$, $df=147$), although the post hoc tests showed no statistically significant differences between the villages. Again, fruits and nuts are by far the most important forest product for all villages, both at present and historically.

In all villages, more than 90 percent of the households responded that the main occupation of the head of household was farming, hence the difference in use of forest products reported above is not directly reflected in the occupational structure of the villages. In terms of income structure, the villages again, are largely similar, with cash incomes being dominated by farm incomes (48 percent) in combination mainly with forest based incomes (32 percent) and

to a lesser extent nonfarm income (20 percent). The share of farm income in total income is likely to be higher if total (rather than cash) income is considered. There are no statistically significant differences between the villages in terms of income composition. One remarkable difference pertains to the *level* of income in Kanyang 1 which at 6109 naira is more than three times as high as in the remaining villages (full ANOVA $p=0.000$, $F=13.558$, $df=141$). This is likely to be related to the very much larger household size in Kanyang1, when compared with the remaining villages.

Even when subdividing income sources further into more specific sources of income, few differences emerge among the villages. There are only two statistically significant differences in forest based income sources: firstly, with respect to fruits and nuts where Okwangwo (with 21 percent of income sourced from sale of these products) diverts positively from Abo Ebam ($p=0.014$) and Kanyang1 ($p=0.025$) (full ANOVA $p=0.005$, $F=4.418$, $df=138$), where 11 percent and 12 percent of cash incomes respectively were based on this source. This finding is not surprising given the location of Okwangwo as an enclave community within the CRNP.

The second difference in income sources relates to income from bushmeat. Generally speaking the role of bushmeat as a source of income is minimal, despite the importance accorded to commercial bushmeat hunting and trade in the literature. Sale of bushmeat constituted only 4 percent of average household cash income for the sample. Differences between the villages exist ($p=0.002$, $F=5.407$, $df=138$), however: Abo Ebam, where 6 percent of cash income was raised through sale of bushmeat relies on this income source than households in Butatong ($p=0.024$) where only 1 percent of cash income on average was gained in this way. The difference between households in Okwangwo (7 percent of cash income) and Butatong in terms of share of household income raised through sale of bushmeat is also statistically significant ($p=0.005$). The access of households to the (non-protected) community reserve forest in Abo Ebam is likely to influence the possibility of hunting for sale in this village positively. By contrast, the finding that incomes in the enclave community of Okwangwo than the remaining two villages rely on income from bushmeat is surprising, given the protected status of the CRNP. While this may attest to the poor possibilities for enforcement in the remote enclave communities, the low share of income derived from bushmeat hunting in Butatong (1 percent) suggests that conservation attitudes as well as reliance on income from CRNP-related projects in the community may be higher in Butatong than in the remaining villages. The large share of female headed

households in Butatong may also deflate the share of hunters, since hunting is dominated by men. Indeed, Butatong diverts remarkably from the other three villages in many respects.

A very large majority in all villages reported higher cash incomes today when compared with ten years ago, ranging from 73 percent in Butatong to 95 percent in Okwangwo. Although income composition is nearly identical among the villages, large differences emerge in terms of the increased importance of particular forest resources as sources of cash income. Here Butatong diverts strongly from the remaining villages, with only 5 percent of the households reporting increased incomes from bushmeat hunting, compared with 44 percent in Okwangwo, 53 percent in Kanyang1 and as much as 60 percent in Abo Ebam. Similarly, for non-timber products, only 5 percent of households in Butatong reported increased incomes from this source during the past decade, compared with 23 percent, 48 percent and 40 percent respectively for the other three villages. These differences are most pronounced for bushmeat (full ANOVA $p=0.000$, $F=11.395$, $df=148$), fruits and nuts (full ANOVA $p=0.001$, $F=6.068$, $df=148$) and other forest products (full ANOVA $p=0.000$, $F=8.800$, $df=148$), where there are statistically significant differences between Butatong and all other villages. For bushmeat, the differences are strongly significant ($p=0.000$) between Butatong and all the three remaining villages. For timber (full ANOVA $p=0.000$, $F=10.626$, $df=148$), medicinal plants (full ANOVA $p=0.000$, $F=8.621$, $df=148$) and non-timber products (full ANOVA $p=0.000$, $F=7.739$, $df=148$) there are statistically significant differences between Butatong and one or two villages, with households in Butatong having a significantly lower share of income based on these sources than in the other villages.

Differences in average land size explain some of the differences in total cash incomes, although the former are not statistically significant. Households in Okwangwo had an average cultivated area of 2.0 hectares, whereas in Butatong this was slightly higher at 2.1 hectares. Abo Ebam with 2.6 hectares again had slightly higher land size, whereas Kanyang 1 with 3.1 hectares on average had the largest land size. Two extreme values were removed in Kanyang 1 and one in Abo Ebam, confirming the trend towards generally larger farm sizes. Curiously, given the stress placed on shrinking farm sizes in the group interviews, the large majority in each village had experienced increasing farm sizes, with this tendency being the most pronounced in the enclave community of Okwangwo, where nearly 90 percent of the households claimed to have increased their cultivated area in the past ten years. Butatong diverts

negatively, where “only” 60 percent of the households claimed to have increased their farm size during the past decade.

The finding that farm sizes have indeed increased is confirmed also by the data on how households accessed land when they formed their households: in Abo Ebam, Kanyang1 and Okwangwo more than 80 percent of the households reported being allocated virgin land, whereas in Butatong 68 percent of the households were given virgin land. In terms of possibilities for current land expansion, however the situation appears to have developed differently in the villages: again, Butatong diverts negatively, with 65 percent of respondents stating that expansion into virgin land would be the most appropriate means of accessing land for their household. In the remaining villages, more than 90 percent of the households stated that this would be the most likely way of accessing additional land if the household had had the means for expansion. Such differences are strongly statistically significant (full ANOVA $p=0.000$, $F=12.180$, $df=146$). Future land constraints upon generational shifts can however be surmised in the responses: around 60 percent of households in Kanyang 1, Okwangwo and Abo Ebam replied that their children would obtain virgin land when forming their households, whereas the figure for Butatong was 35 percent, although these differences are not statistically significant. These findings suggest that in Butatong land size constraints are more forthcoming than in the other villages.

In terms of expenditure patterns, the villages have one striking characteristic in common: school fees constituted the single largest expense in all villages, with 62 percent of households ranking it as most important in Abo Ebam, Butatong and Kanyang 1 and 67 percent in Okwangwo. The importance attached to education was also a strong feature of all the group discussions and key informant interviews and is confirmed by the high levels of education among household heads noted in the demographic description of the villages.

Dietary Patterns

We will now consider the role of bushmeat in local dietary patterns. A special focus will be given to the role of meat from primates, since this aspect is generally understudied, while the protection of large bodied primates especially constitutes one of the main conservation objectives of the CRNP. The nexus between local dietary patterns and conservation aims in this sense constitutes a relevant analytical prism for assessing possible conflicts as well as resolutions to such conflicts. Asking the right conservation questions in this way relates

very much to understanding local livelihoods, attitudes and cultural practices.

Dietary patterns in all villages are dominated by cassava, plantains, rice and yams, with a smaller role for maize. With the exception of rice and to a lesser extent maize, households are largely self-sufficient producers of the major staple crops, with only 15 percent and 18 percent reporting buying cassava and plantains, despite near universal consumption (99 percent and 97 percent respectively) of both crops. Rice however is bought by the very large majority of the villagers.

Although dietary patterns in terms of staple crops, beans, groundnuts and vegetables are largely similar between the villages, major differences emerge in terms of access to proteins and animal source foods (ASF) especially. A general point that can be made in this context is the much lower self-reliance on animal source foods, compared with staple foods. This is keeping with data on livestock kept in the villages, which shows no ownership of either cattle or oxen among the households and only minor ownership of goats/sheep and poultry. Around a third of the sampled households reported ownership of one goat or sheep and just under a half owned one chicken. In total four pigs were found among the sampled households and access to protein through milk and meat therefore is largely restricted to market based access or hunting and fishing.

Whereas milk is sourced entirely through the market, meat and fish are also accessed through gathering of products in the forest or nearby streams, as suggested by figures 1 through 5. This pattern varies, presumably by access to forests and fishing waters. Here it can be noted that the deliberate pollution of the Oyi River in March 2009 poisoned aquatic life and suppressed fish stocks in the river dramatically (Ewah, 2012). Access to fish for the communities in Okwangwo and Butatong who live closest to the river has therefore fallen remarkably, although households reported eating fish from the river, despite suspicions of high pesticide content. Butatong differs from Kanyang 1 ($p=0.007$) and Okwangwo ($p=0.013$) with respect to households who reported buying fish, with this share being much higher in Butatong than the other two villages (full ANOVA, $p=0.007$, $F=4.171$, $df=147$). The differences in market based consumption of meat were not statistically significant, however.

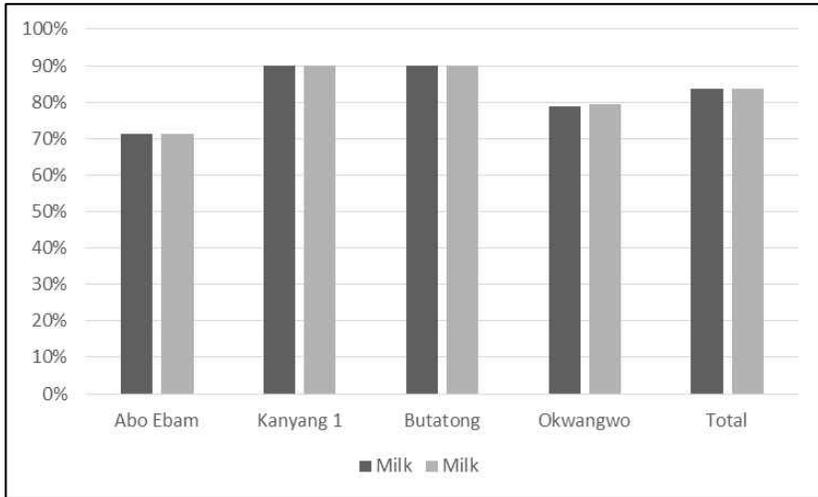


Figure 1. Share of Households that Consumed and Bought Milk During the Past Year, by Village

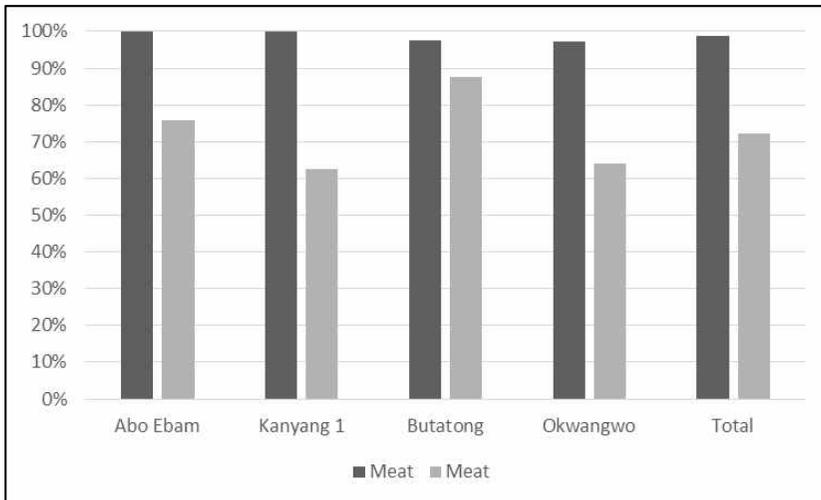


Figure 2. Share of Households that Consumed and Bought Meat During the Past Year, by Village

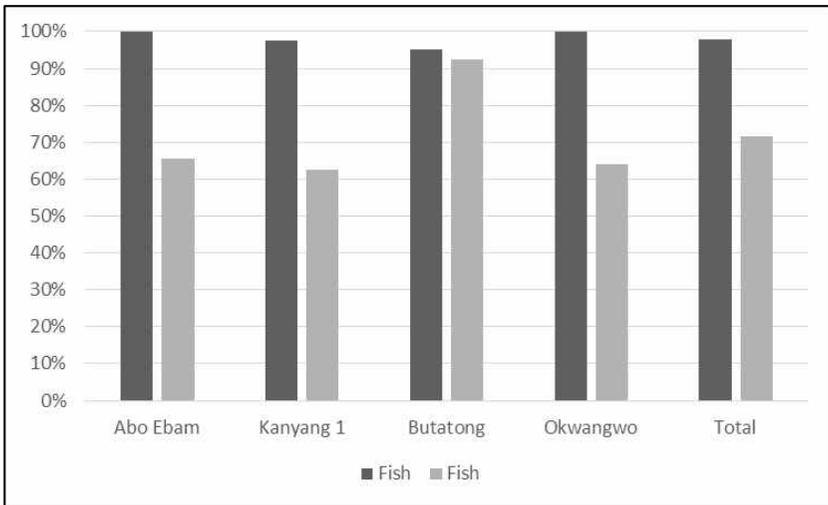


Figure 3. Share of Households that Consumed and Bought Fish During the Past year, by Village

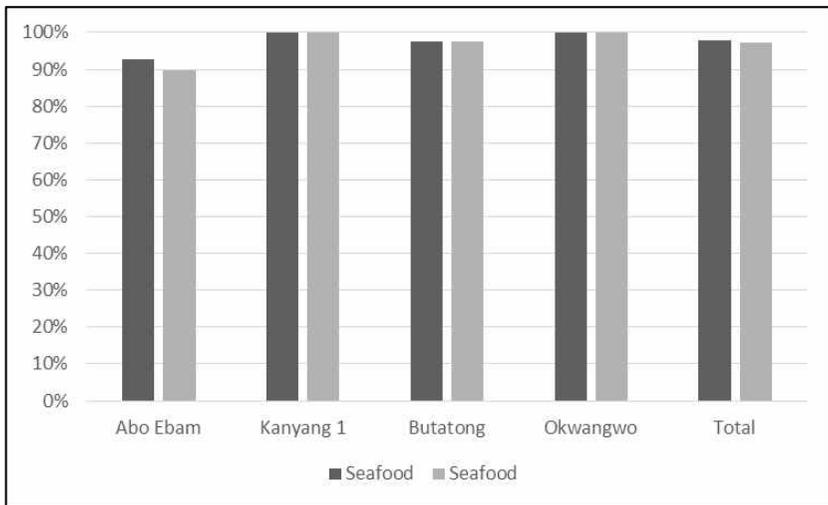


Figure 4. Share of Households that Consumed and Bought Seafood During the Past Year, by Village

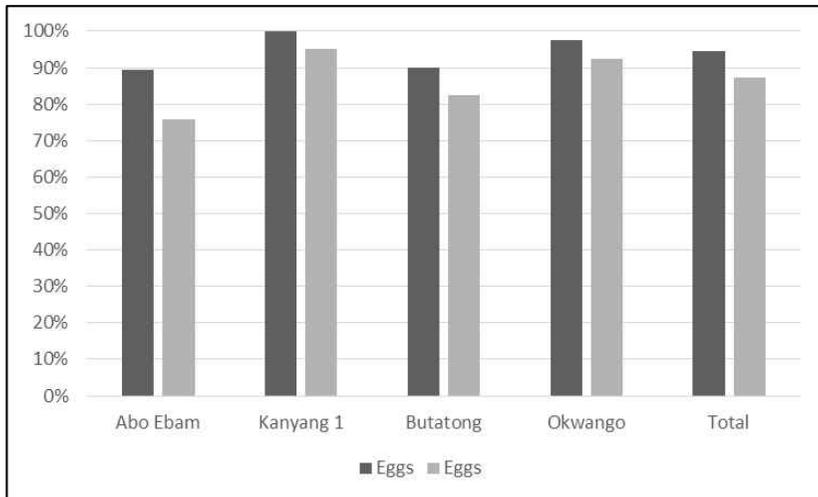


Figure 5. Share of Households that Consumed and Bought Eggs During the Past Year, by Village

Arguably, an indication of whether the household had eaten meat over the past year (as shown in figure 2) is not a sufficient reflection of general nutritional status or access to animal source foods in particular. The frequency of meat consumption gives further clues to differences in access to meat and the importance of bushmeat in addressing food constraints. Here stark differences emerge among the villages, as seen in table 1. Kanyang 1 diverts positively from Butatong ($p=0.003$) and Okwangwo ($p=0.000$) in terms of access to meat on a daily basis, and as such has the most frequent consumption of meat. For weekly consumption, there are statistically significant differences between Okwangwo and Kanyang1 ($p=0.002$) and Butatong ($p=0.027$), respectively. Butatong stands out negatively in terms of less than weekly consumption of meat when compared with Abo Ebam ($p=0.001$) and Kanyang1 ($p=0.006$). The patterns of meat consumption reaffirm the earlier differences between Kanyang1 as characterized by relatively higher incomes and land sizes, and that of Butatong as relatively speaking poorer with a higher share of female headed households, smaller land sizes and lower incomes than the remainder of the sample.

Table 1.
Share of Households Who Reported Consumption of Meat Daily, Weekly and Less than weekly

	Daily	Weekly (but less than daily)	Less than weekly	N
Abo Ebam	34%	66%	0%	b 29
Kanyang 1	51% a	46% b	3% b	39
Butatong	15% b	55% b	30% a	40
Okwangwo	5% b	84% a	11%	38
Total	26%	62%	12%	146

a and b denote between which villages statistically significant differences are found, such that values denoted by a are statistically different from values denoted by b

Full ANOVA daily meat consumption, $p=0.000$, $F=9.795$, $df=4,141$

Full ANOVA weekly meat consumption, $p=0.004$, $F=4.679$, $df=4,141$

Full ANOVA less than weekly meat consumption, $p=0.000$, $F=7.554$, $df=4,141$

In terms of particular patterns of meat consumption among households (see table 2), again the villages are largely similar, with a mix of types of meat consumed. The reliance on the market for beef and pork is near universal in all villages, whereas bushmeat is eaten by almost all households, with around a third of the households reporting eating but not buying bushmeat.

Table 2.
Types of Meat Consumed and Bought (Share of Households per Village)

		Poultry	Beef	Pork	Bushmeat	Other
Abo Ebam	Consumed	79%	79%	48%	100%	97%
	Bought	72%	79%	48%	66%	75%
Kanyang 1	Consumed	90%	95%	78%	100%	100%
	Bought	50%	90%	70%	70%	78%
Butatong	Consumed	93%	88%	50%	93%	95%
	Bought	68%	85%	50%	80%	90%
Okwangwo	Consumed	95%	92%	51%	100%	100%
	Bought	67%	82%	49%	62%	67%
Total	Consumed	90%	89%	57%	98%	98%
	Bought	64%	84%	55%	70%	78%

There are no statistically significant differences among the villages in terms of either eating or buying any of the types of meat. Although the data

do not reveal the volumes consumed, clearly bushmeat is a crucial part of local diets, with 98 percent of households reporting consumption of bushmeat during the past year.

Hunting for Own Consumption

Whereas patterns of consumption and market access to bushmeat are largely similar for the villages, some differences emerge in the extent of bushmeat hunting for own consumption, with this being highest in the enclave community of Okwangwo where 92 percent of households reported hunting for own consumption over the past year. The lowest share was in Butatong where 51 percent of respondents claimed to be hunting. The difference between the two was strongly statistically significant ($p=0.000$, full ANOVA $p=0.000$, $F=6.392$, $df=145$). For the other two communities, the large majority of households, 79 percent for Abo Ebam, and 75 percent for Kanyang1, claimed to have hunted bushmeat during the past year. Butatong again, therefore diverts from the general picture with one possible explanation being the presence of the CRNP headquarters in the village.

The location for hunting provides further support for this interpretation: only 13 percent of respondents reported hunting deep in the forest in Butatong, compared with 60 percent or more in the other villages, a difference that is strongly statistically significant ($p=0.000$, full ANOVA $p=0.000$, $F=12.069$, $df=146$).

Bushmeat Consumption Over Time

The changing role of bushmeat in local diets over the past decade shows a general diversification in diets away from bushmeat in the villages – 77 percent of the households reported that bushmeat was their most important source of meat eaten ten years ago, compared with 60 percent at present. There are strong village level variations however, both with respect to retrospective patterns ($p=0.025$, $F=3.194$, $df=148$) as well as consumption today. Indeed, the data suggest that differences between the villages have increased remarkably over time, with variation between villages being strongly statistically significant ($p=0.000$, $F=15.585$, $df=148$) showing the movement away from bushmeat consumption in most villages and a slight increase only in one village. In Okwangwo 87 percent of households reported that bushmeat was their most important source of meat

in terms of volumes consumed, a share that had risen slightly from 85 percent when households were asked to compare with their largest source of meat ten years ago. For Kanyang 1 the corresponding figures were 78 percent and 65 percent respectively, and for Abo Ebam 87 percent and 67 percent. The most striking drop had taken place in Butatong, however, with bushmeat being largely replaced by poultry: here only 23 percent of the households stated that bushmeat was their most important source of meat, compared with 60 percent ten years ago. The difference between Butatong and the remaining villages in terms of reliance on bushmeat at present is strongly statistically significant ($p=0.000$) when compared with Kanyang1 and Okwangwo and slightly less significant ($p=0.001$) when compared with Abo Ebam.

Types of Bushmeat Consumed

In terms of particular bushmeat sources used for own consumption, the data show a general fall in bushmeat of primate origin, with consumption of drills and apes being considerably lower than monkeys both at present and retrospectively, as suggested by figures 6 through 8. For the sample as a whole 77 percent reported eating primate meat, but this varied considerably among the villages (full ANOVA $p=0.000$, $F=10.522$, $df=148$) from a low of 53 percent in Butatong to 97 percent in Okwangwo. In Abo Ebam 67 percent of households ate meat from primates, while the corresponding figure for Kanyang1 was 88 percent. The differences between Okwangwo and Butatong are highly statistically significant ($p=0.000$), while the difference between Butatong and Kanyang1 is also statistically significant but at a lower level ($p=0.003$) and the difference between Abo Ebam and Okwangwo is significant at the lowest level ($p=0.011$). There are no statistically significant differences between Butatong and Abo Ebam.

The consumption patterns for the other types of bushmeat are nearly identical among the villages, with duikers/antelopes, pigs/hogs, cane rats, porcupines, squirrels, fowl and other birds being consumed by at least 98 percent of the households in the total sample both at present and ten years ago. There are some notable differences for primate source meat, however. With regards to consumption of ape and drill meat this is significantly higher in Kanyang1 when compared to Abo Ebam and Butatong, while for monkeys Butatong has significantly lower consumption than Kanyang1 and

Okwangwo. Again, Butatong (and to a lesser extent Abo Ebam) diverts from the rest of the sample through less consumption of primate meat.

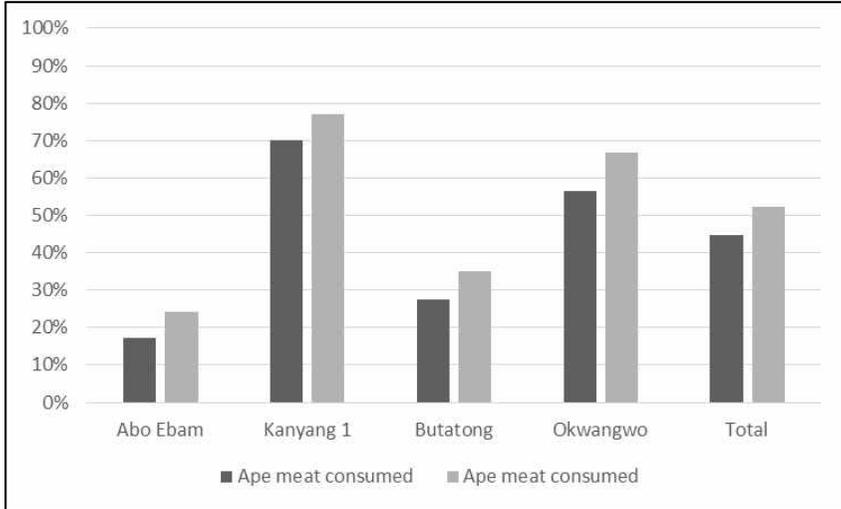


Figure 6. Share of Households Who Reported Consuming Meat from Apes During the Past Year and Ten Years Ago (by Village)

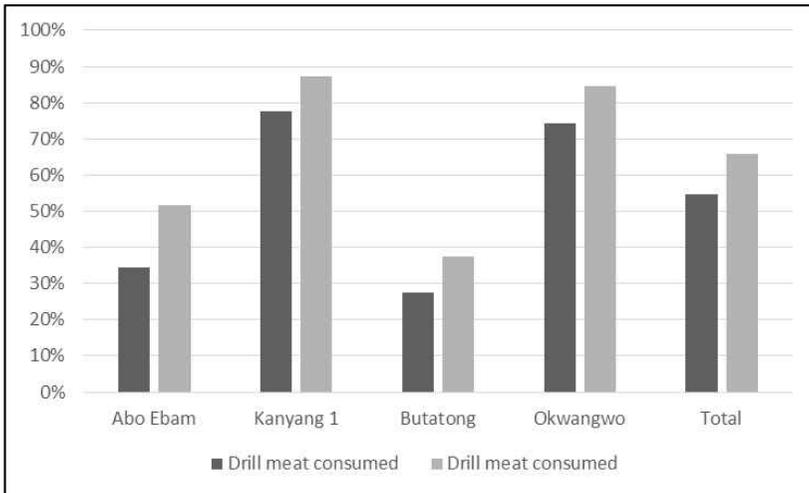


Figure 7. Share of Households Who Reported Consuming Meat from Drills During the Past Year and Ten Years Ago (by Village)

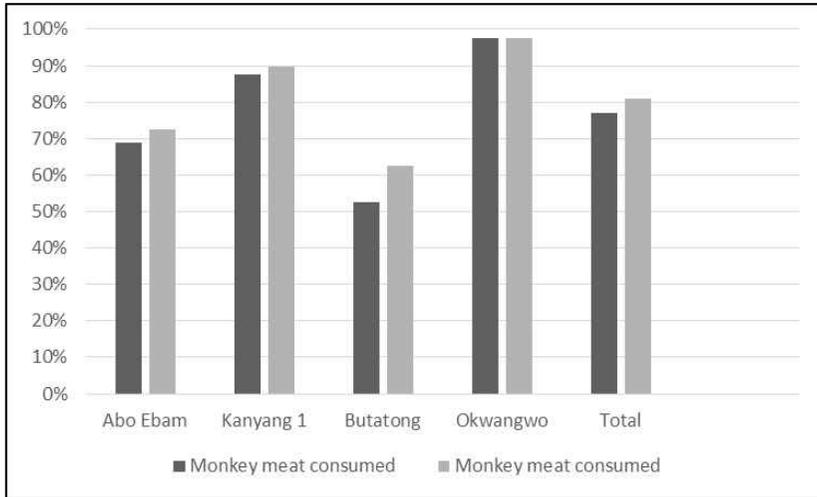


Figure 8. Share of Households Who Reported Consuming Meat from Monkeys During the Past Year and Ten Years Ago (by Village)

When the households were asked to consider their most important source of bushmeat, both at present and in a ten-year perspective, Kanyang1 presents a striking contrast to the other villages both in terms of present dietary patterns as well as retrospective ones: here meat from drills and apes constituted the most important type of bushmeat eaten for 20 percent of the households, compared with 50 percent ten years ago. In Butatong and Okwangwo by contrast 10 percent of the households reported this type of meat as their most important source of bushmeat, while in Abo Ebam it was as low as 3 percent.

While the results suggest that the role of primate meat (and especially meat from apes and drills) was declining in local diets, the drivers of this decline are likely to be found both in the forest themselves as well as among local communities. On the one hand, they may be reflective of diminishing stocks of primate meat, but they may also be suggestive of changes in local livelihood and expenditure patterns and attitudes. The support for this notion can be sought in the varied village level patterns of meat consumption, with respondents in Butatong diverting strongly from the rest of the sampled households with respect to the smaller role of bushmeat consumption generally, and the lower consumption of primate meat specifically. While meat consumption in Butatong in general is less frequent than in the other villages, poultry especially is used to substitute for other types of meat.

Why Eat Bushmeat from Apes, Drills and Monkeys?

While the literature stresses the role of wealth or poverty in bushmeat consumption, the data show no significant correlation (negative or positive) between income levels and bushmeat consumption. The same holds for consumption of meat from primates, suggesting that explanations for primate consumption may need to be sought elsewhere. While it should be stressed that primate consumption varied by village, the reasons for eating primates are largely the same, regardless of the village.

For those households that ate primate meat the overwhelming motive (96 percent) was taste preference, with a secondary motive (61 percent) being cultural perceptions tied to strength. Only one of the key motives was related to wealth or income, and here the connection between low incomes and consumption is clearly more dominant than wealth, with 61 percent of household reporting eating primate meat because it is inexpensive. The only significant difference between the communities was in relation to the notion that meat from primates is relatively inexpensive, with responses in Butatong diverging from those in Kanyang1 ($p=0.018$, full ANOVA $p=0.021$, $F=3.368$, $df=113$).

Motives for eating primate meat, hence verge on perceived quality differences and symbolic values as much as incomes.

Knowledge and Attitudes

While the key informants (the chiefs and local headmen) as well as the women's focus group discussions in many instances stressed that households in their villages were not hunting bushmeat, only killing trespassing hogs or other wildlife that mistakenly entered gardens or fields, the survey results point in a completely different direction. For the sample as a whole 74 percent of the households reported hunting bushmeat for their own consumption and freely admitted to eating a range of highly endangered species.

In relation to this it should again be noted that Butatong, where the CRNP has its headquarters stands out with respect to lower consumption of bushmeat and less participation in hunting. Here also the village chief is employed by the CRNP and therefore the official and unofficial version may be less divergent. One possible source of the discrepancies between what people say in an open discussion and what type of information they volunteer in an anonymous survey may be related to issues of selection bias. The key informants were selected by

the village leadership and therefore likely to be keen to exhibit compliance with existing regulation, whereas survey participants were randomly sampled.

The connection between livelihood interests and support of conservation is shown in a number of studies (see Arjunan et al., 2006 for instance) where support is strongest among those whose livelihood interests conflict the least with conservation efforts. Attitudinal surveys have been widely used to evaluate conservation programs (Bradshaw Durrant and Durrant, 2008; Infield and Namara, 2001) but attitudes towards conservation may be different, depending on the nature of livelihood interests: if bushmeat is used primarily as a source of income or food could influence the view of species protection.

With respect to attitudes towards protection of primates specifically there were no statistically significant differences between the villages with nearly all respondents (99 percent) stating support for protection in the survey, despite engaging in hunting of protected species. This in turn may point to low levels of knowledge regarding the stock of primates in general and the resilience of this stock to hunting among local communities, rather than negative attitudes towards conservation measures as such.

Conclusions

As stated at the outset this article had three key aims: the first one being to assess the role of bushmeat, and primate meat especially in local diets. As suggested by the findings, the role of bushmeat and meat from primates in particular was shown to have declined in the villages over the past ten years. There was also variation among the villages, with Butatong deviating in the sense of having diets that are less based on wild meat than the remaining villages. These results point in somewhat divergent directions: on the one hand a general decline could be related to a depletion of meat resources in surrounding forest, while on the other, the dramatic decline in Butatong especially points to the potential importance of protection as well as attitudes in preventing bushmeat extraction. While the potential benefits of the CRNP may be more directly felt in Butatong, enforcement of protection measures may also be more forthcoming than in the enclave communities.

We also aimed to consider the role of bushmeat in diets in relation to that of local incomes, where the results again suggest a minimal and falling role of commercial hunting as a source of cash income. While bushmeat is hunted, therefore it is extracted primarily for consumption, rather than sale, which leads us to suggest that solutions to unsustainable extraction of primate meat should

be sourced in relation to local consumption rather than income generation. Alternative sources of protein were few, but poultry had replaced bushmeat as a source of protein in Butatong. Improving food security and widening the livestock basis of local agrarian systems therefore comes across as a primary conservation measure. Given problems with diseases in poultry based systems, extension and veterinary services are clearly vital to the success of improving access to livestock. The substitution between fish and bushmeat noted in the literature, may also suggest a possible scope for fish farming, which would reduce the reliance on wild fish (and diminish the likelihood of poisoning local rivers) and relatively expensive frozen fish.

Finally, the eating of primate meat specifically, among those who eat it is tied primarily to taste preferences and cultural perceptions of quality. Paradoxically attitudes towards protection were universally positive, also among households who consume primate meat. Dietary preferences are notoriously difficult to change and therefore improving protection standards and enhancing knowledge (rather than changing attitudes) related to the crucial ecological role of endangered species especially may be more fruitful.

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