THE IMPACTS OF MINERAL EXPLOITATION AND ASSOCIATED TRADE ON WILDLIFE IN THE DJA-BOUMBA MINING AREA EAST CAMEROON

Ecological monitoring team in the Kongo village © M.L.

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1. PARTICIPATORY COMMUNITY BASED ECOLOGICAL MONITORING PROGRAMME

Community based ecological monitoring data collection in the project area has been facilitated by the hunters showing their daily returns to the monitoring team. The effective data collection has been linked to the awareness meetings organized by the monitoring team and wildlife environmental clubs of the project. The conservation awareness programme encourages local cooperation to sustainably manage wildlife resources in the mining area. The local communities now possess the capacities to manage their wildlife resources. With the local management capacity that exists, the ecological monitoring team is able to monitor bushmeat harvest so that extraction must meet the socioeconomic needs and aspirations of the people harvesting the resource while limiting the losses in biodiversity and environmental degradation to acceptable levels.

1.2 MATERIALS AND METHODS

1.2.1 MATERIALS

These consist amongst others of:

Map of the area;

Lists and posters of wildlife species;

Data collection tools (data sheets, pens, pencils, exercise books, plastics to cover data during rain);

Rain coats, numeric camera and backpacks.

1.2.2 METHODS

In the forest: The ecological monitoring team has given exercise books and posters of wildlife to local hunters who do extensive stay in the forest to register the number and types of wildlife species captured daily. Team members whose swidden agricultural areas are close to hunting sites follow hunters during hunting expeditions to collect data on bushmeat harvested.

In the villages: The team interviews and discusses with hunters to obtain an overall picture of bushmeat harvested daily.

Data are also collected by direct observation of the vendors or bushmeat middlepersons and drivers who come in from the urban areas to trade on bushmeat. The team regularly visits the markets to take account of the number and species of wildlife in the trade. Households in turn provide data on the consumption of bushmeat to the monitoring team.

Action to sustainably manage wildlife in the mining area has been stepped up in collaboration with the ministry of forestry and fauna by the creation of a control post at the entrance of the mining zone. The forestry guards are also involved in the collection of the ecological monitoring data.

Information on bushmeat trade and consumption are also got orally from one person to another, in schools, churches, in meetings, through the various structures and age grades.

2. RESULTS

Table. 1. Comparative analysis of wildlife killed between 2011 and 2012

Month	**Number of animals killed (2011) X_1**	**Number of animals killed (2012) X_2**	**Difference $d_1 = X_1 – X_2$**
March	105	201	96
April	36	22	14
May	42	71	29
June	46	58	12
July	41	113	72
August	-	98	98
September	55	107	52
October	48	88	40
November	15	-	15
Total	**388**	**765**	**428**
Mean	**48.5**	**95.6**	**47.6**

Table. 2. Percentage of wildlife killed between 2011 and 2012

Month	**% of animals killed (2011) X_1**	**% of animals killed (2012) X_2**	**% difference $d_1 = X_1 - X_2$**
March	27.1	26.5	0.8
April	9.3	3.0	6.3
May	10.8	9.4	1.5
June	11.8	7.6	4.2
July	10.5	14.8	4.3
August	-	13.5	12.8
September	14.2	13.7	0.5
October	12.4	11.5	0.9
November	3.9	-	3.9
Total	**100**	**100**	

Table. 3. Comparative analysis of bushmeat sold between 2011 and 2012

Month	**Number of animals sold (2011) X_1**	**Number of animals sold (2012) X_2**	**Difference $d_1 = X_1 – X_2$**
March	42	78	36
April	12	18	06
May	20	10	10
June	20	32	12
July	28	25	03
August	-	94	94
September	19	80	61
October	24	08	16
November	7	-	7
Total	**172**	**345**	**269**
Mean	**21.5**	**43.1**	**30.0**

Table. 4. Percentage of bushmeat sold in the project area in two sessions

Month 2	**% of animals sold (2011) X_1**	**% of animals sold (2012) X_2**	**% difference $d_1 = X_1 - X_2$**
March	23.9	21.6	2.3
April	9.1	9.2	0.1
May	11.4	2.8	8.6
June	11.4	8.9	2.5
July	15.9	7.0	8.9
August	-	26.1	26.1
September	10.7	22.2	11.5
October	13.6	2.2	11.4
November	4	-	4
Total	**100**	**100**	

Table .5. Total number of bushmeat between consumed between 2011 and 2012

Month	**Number consumed (2011) X_1**	**Number consumed (2012) X_2**	**difference $d_1 = X_1 - X_2$**
March	63	123	60
April	24	04	20
May	22	61	39
June	26	26	0
July	13	88	75
August	-	04	04
September	36	27	09
October	24	80	56
November	8	-	08
Total	**216**	**413**	**271**
Mean	**27**	**52**	**30.1**

Table 6. Percentage of bushmeat consumed at site in 2011 and 2012

Month	**% consumed (2011) X_1**	**% consumed (2012) X_2**	**% difference $d_1 = X_1 - X_2$**
March	29.2	29.7	0.5
April	11.1	1.0	10.1
May	10.2	15	4.8
June	12	6.3	5.7
July	06	21.2	15.2
August	-	1.0	1.0
September	16.7	6.5	10.2
October	11.1	19.3	8.2
November	3.7	-	3.7
Total	**100**	**100**	

Table 7. Frequency distribution of twenty five species of animals killed in 2012

Status IUCN / MINFOF	**Class interval between status**	**Frequency of species killed**	**Relative frequency**
Class B	0 – 5	3	0.0666
Class A	6 - 10	8	0.1777
EN	11 -15	7	0.1555
LRnt	16 - 20	11	0.2444
DD	21 - 25	16	0.3555

2.1 CONSERVATION STATUS IUCN AND CAMEROON LEGISLATION

The species identified as threatened by IUCN are assigned a category indicating the degree of threat as follows:

EN = Endangered;

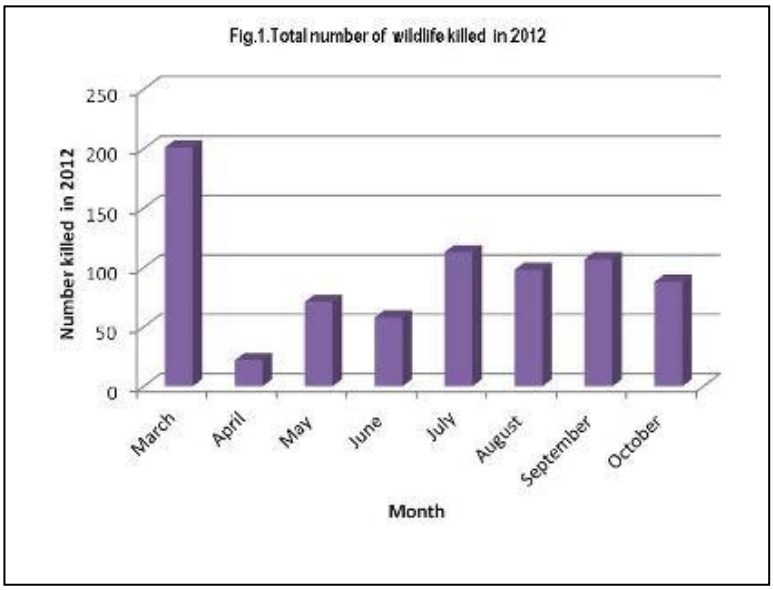
LRnt = Lower risk, but near threatened;

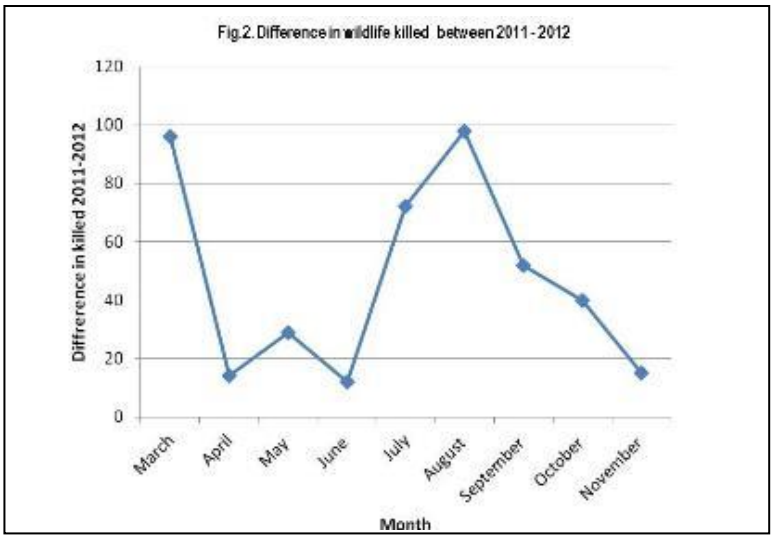
DD = Data Deficient.

Cameroon Legislation (Law No. 0648 of 18 December 2006, Articles 2(1) and 3(1) laying down forestry and fauna regulations:

Class A = Rare or Endangered species with full protection.

Class B = Species where by hunting and export should be regulated or monitored.





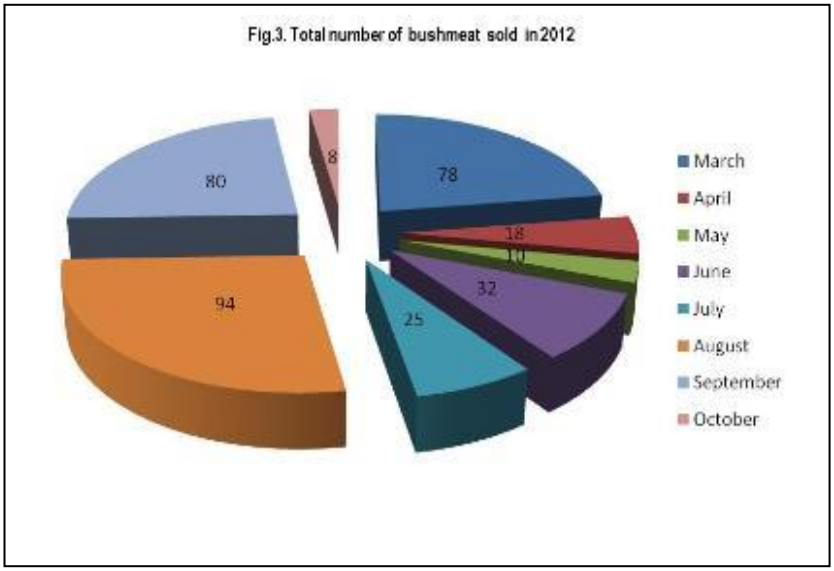


Fig.3. Total number of bushmeat sold in 2012
80
8
78
18
10
32
25
94
March
April
May
June
July
August
September
October

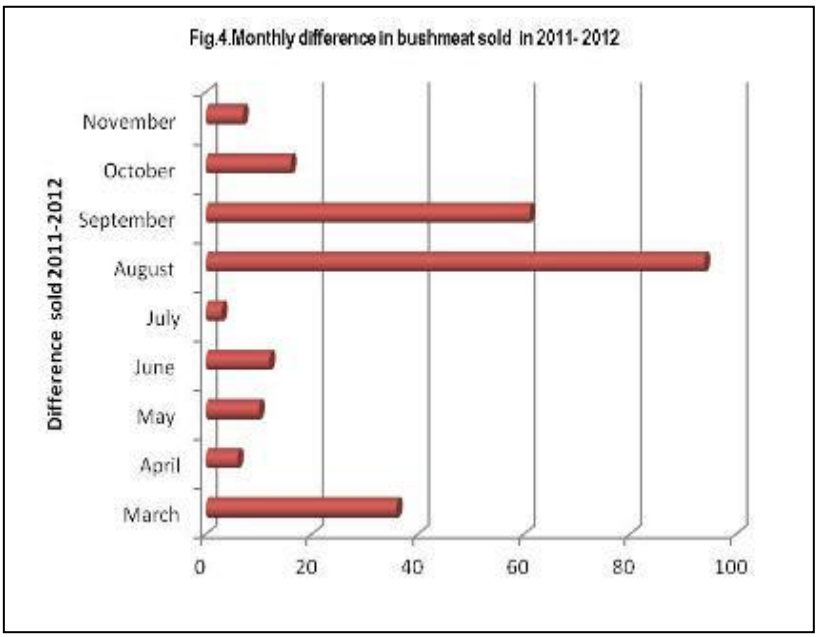


Fig.4.Monthly difference in bushmeat sold in 2011- 2012
Difference sold 2011-2012
November
October
September
August
July
June
May
April
March
0
20
40
60
80
100

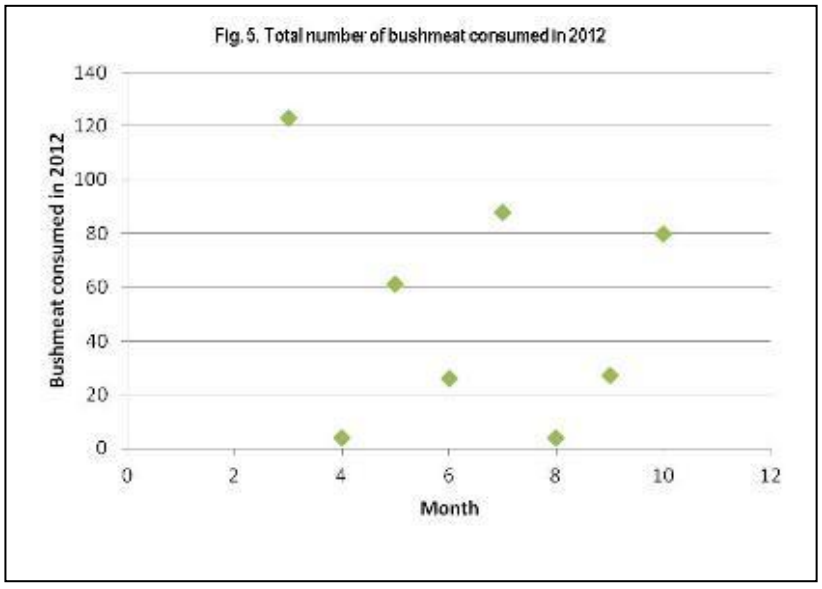


Fig. 5. Total number of bushmeat consumed in 2012
Bushmeat consumed in 2012
140
120
100
80
60
40
20
0
0
2
4
6
8
10
12
Month

3. INTERPRETATION OF RESULTS

Data on the ecological monitoring of harvest and trade on wildlife in the mining area was collected from March to October, 2012. This empirical indicator would enable the local community to have knowledge on the carrying capacity of their forest and to manage and conserve their natural resources.

Hunting activities in the three villages of the project area varies with seasons. It reaches a maximum in the rainy seasons and during the holidays (March, July, September and October). The Dja-Boumba mining area has four seasons: a major raining season from September to November, a minor rainy season from March to mid-July, a major dry season from December to mid-March and finally a minor dry season from mid-July to August.

Within the period of eight months, 765 animals were harvested as compared to 388 in 2011. The present rate of harvest and trade in wildlife in the project area is twice that of last year. A monthly mean of 95.6 wildlife were harvested for income and for consumption in the project area. The results are presented in table 1, figures one and two respectively. These results should be treated with caution reason being that; the mining area have surrounding forests as; the forest management unit 10041, 10039, 10037, community forests and the multiple used zone which act as wildlife refuge although poor protected. These forests are easily accessible, and local immigrants enter the area to hunt, thereby increasing the number in wildlife harvested per month in the project area. The highest percentage difference (12.8%) in the bushmeat was recorded in the month of August due to the fact that, data was not collected in August for 2011.

The results showed that more bushmeat were sold in the months of March, August and September. There is a significant difference in the sale of bushmeat between the months (see tables 3 and 4, figures 3 and 4). These differences in the sale of bushmeat could be linked to the fact, the local communities are involved in other income generating activities such as cocoa production, gathering of non-timber forest products (*Irvinga gabonensis, Coula edulis, Garcinia kola*), oil (*Elaeis guineensis,*

Baillonella toxisperma), spices (*Scorodophloeus zenkeri, Afrostyrax lepidophyllus, Ricinodendron heudelotti*) and food crops production in certain months of the year.

The highest reported bushmeat consumption (mean number of days per month) were in the months of March, July and October (Tables 6 and 7 and Figure 5). These results are consistent with expectations of increased demand for bushmeat during the holiday period where increased number of persons per household was observed. Bushmeat consumption is reinforced by the increasing population, leaving the towns because of bitter economic situation and coming back to their villages to search for employment in the mining industries. However, comparisons of the three villages showed that no significant variation in bushmeat consumption.

The relative frequencies of the twenty five species of wildlife killed in the project site are all greater than zero, and their sum is equal to 1. The highest number of animals killed was those described as data deficient with relative frequency of 0.3555. These wildlife species are presented in table 8.

Table.8. Wildlife species assigned category as data deficient

Scientific name	**Common name**	**Conservation status (IUCN, 2010)**
Philantomba monticola	Blue duiker	DD
Thrynomys swinderiianus	Cane rat	DD
Atherurus africana	Brushtail porcupine	DD
Cricetomys emini	*Giant rat*	DD
Phatoginus tricuspis	Tree pangolin	DD
Uromanis tetradactyla	Long-tailed pangolin	DD
Cercopithecus nictitans	spot nose monkey	DD
Cercopithecus cephus	Moustached monkey	DD
Herpestes naso	Long nose mongoose	DD
Pithon sebae	Python	DD
Genetta servalina	Servaline genet	DD
Nandinia binitat	Two spotted palm civet	DD
Atilax paludinosus	Marsh mongoose	DD
Hyemoschus aquaticus	Water chevrotain	DD
Miopithecus ogouensis	Talapoin monkey	DD
Viverra civetta	African civet	DD

These wildlife species are not threatened but their harvest must be sustainable in order to avoid the depletion of biodiversity in the project area.

3.1 DISCUSSIONS

In the study area, the mean number of harvest increases from 48.5 in 2011 to 96.6 in 2012 with a mean difference of 47.6 in two years. The increase in harvest yield for sedentary hunters clearly demonstrates that the project area still contain a substantial wildlife population. This increase in yearly harvesting of wildlife for income and consumption was demonstrated by Ngandjui (1998) in the Lobeke National Park in East Cameroon. 47.7 % of the bushmeat was sold for subsistence, 54% of the bushmeat was consumed locally. Takforan (2000) reported a similar case in isolated villages in eastern Cameroon, where 74% of harvested game was consumed locally, 15% was sold and 11% was given away or left to putrefy. According to Lahm (1991) 70% of the village hunters in north eastern Gabon stated they has sold two-thirds of their hunt and eaten the rest.

The harvest and associated trade in wildlife reaches its peak in during the holidays (March and July). There is a link between behaviour patterns and economic benefit to gain immediate cash for institutional support by parents and household subsistence due to population influx during this period. In spite of food being available through gardens cultivation, wildlife continue to be a major food source, particularly when external subsides fail to appear; wildlife is increasingly used as an economic fallback to meet these needs as well (Redford and Esienberg, 1992).

3.2 LESSONS LEARNED

- The integration of MINFOF staff in the ecological monitoring team is a milestone towards the sustainable management of wildlife in the mining area.
- The project has capitalize on the wisdom and expertise of the local communities, harness their support and cooperation, thus making every effort to balance their requirements with the need to protect wildlife and the environment.
- The stakeholders and the local communities are actively making conservation compatible with local economic development.

- The combat to break the bushmeat trade circuits and the middlepersons transactions must be set up, because they are the principal processors and distributors of bushmeat and associated trade. They purchase the meat and other natural resources from the illegal immigrant hunters and sell to the public.

3.3 CONCLUSIONS

The awareness and sensitisation programme developed by the women groups, old hunter association and the wildlife environmental clubs in the project area have caused the changes in the extent and form of wildlife harvesting that have resulted in a mile stone towards the sustainable management of natural resources. The local communities now concentrate on the hunting of small mammals and there is little hunting of endangered species or large mammals of ecological importance. The stakeholders in the mining sector have also been sensitised to combine development with exploitation of wildlife without compromising for the future generation. The created alternatives (rabbits rearing and rapid growing vegetables gardens) for the local hunters families is progressively substituting the financial incentive that bushmeat trade affords them. The programme needs to be long term and sustainable for the communities surrounding the mining area.

4. REFERENCES

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Ministry of forest and fauna staff analyzing data with the local communities © M.L.

Old hunter association raising awareness on the importance of ecological monitoring © L.S.