

# COMMERCIAL BEETLES OF SOUTH WEST CAMEROON

A PRELIMINARY STUDY REPORT

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## **ABBREVIATIONS AND ACRONYMES**

**ACBIODEV:** Cameroon Association of Research on Biodiversity and Development

**CITES:** Convention on International Trade in Endangered Species

**FAO:** Food and Agricultural Organisation

**IRD:** Institut de Recherche pour le Développement

**IUCN:** International Union for Conservation of Nature

**NTFPs:** Non Timber Forest Products

**WCMC:** World Conservation Monitoring Centre

## ABSTRACT

As part of efforts towards sustainable development, the Cameroon Association of Research on Biodiversity and Development (ACBIODEV) in collaboration with the Institut de Recherche pour le Développement (IRD), carried a preliminary study on commercial beetles and the insect trade in Southwest Cameroon. Results from this study revealed that in addition to some morphologically varied populations, 19 beetle species are exploited for commercial purpose. The exploitation of these resources provides those involved with complementary household income, but the sector however, remains informal and less sustainable. Local collectors lack good knowledge on sustainable harvesting techniques, good preservation methods and the real market value of commercial beetle species. Market prices fluctuate in function of species, locality, abundance, quality, size and demand. The market circuit involves middlemen who buy from the local collectors and resell to local exporters or foreigners who periodically come to country to traffic beetles. Though this sector seems to be lucrative, none of the exporters or the foreign collectors owns an exploitation license or is officially recognized by forest administration. Large stocks of beetles are therefore smuggled out of Cameroon and taxes are not paid. This anarchic exploitation of beetles and the continuous destruction of their habitat for agriculture and logging are resulting to continuous reduction in the population of some species, especially those endemic to Cameroon. Alert on the increasing scarcity of some species like the different varieties of *Goliathus goliatus*, *Furnasinius aureosparsus*, *Stephanocrates preussi* and *Mecynorrhina kraatzi* were made by respondent during field data collection. The distribution range of these Cameroon endemic macro beetle species is quite restricted, with localized spot like habitats known in the humid forest regions. Regarding the socioeconomic pressure on these resources and their habitats, beetles and other beneficial insects need to be valorized and modalities for their exploitation and trade fixed, so as to maximize benefits from their harvests, as well as assure their effective conservation.

## RESUME

Pour contribuer au développement durable, l'Association Camerounaise de Recherche sur la Biodiversité et le Développement (ACBIODEV), en collaboration avec l'Institut de Recherche pour le Développement (IRD), a mené une étude sur les insectes commerciaux dans le Sud-ouest Cameroun. Les résultats de cette étude ont révélé qu'à l'exception des populations morphologiquement variables, 19 espèces de Scarabée y sont commercialisées. L'exploitation de ces ressources fournit aux populations locales des revenus complémentaires non négligeables. Mais ce secteur reste informel et organisée de façon non durable. Les exploitants locaux manquent de connaissances notamment sur les techniques de récolte durables, les méthodes de préservation et la valeur marchande réelle des scarabées. Les prix sur le marché fluctuent en fonction de l'espèce, de la localité, de l'abondance, de la qualité, de la taille et de la demande. Le circuit du marché implique des intermédiaires, qui s'approvisionnent chez les collecteurs locaux, qui revendent aux exportateurs locaux ou aux expatriés dont les visites sont périodiques. Bien que ce secteur semble être lucratif pour ses acteurs, aucun exploitant local ou expatrié n'est officiellement reconnu par l'administration forestière camerounaise : les stocks importants de Scarabées sont frauduleusement exportés (exploitation non contrôlés et taxes impayées). De cette exploitation anarchique, à laquelle s'ajoute la destruction de leurs habitats notamment par l'agriculture et l'exploitation forestière, résulte une réduction continue de certaines de ces espèces, notamment, celles qui sont endémiques au Cameroun. Les alertes sur la rareté de quelques unes de ces espèces telle que les différentes variétés de *Goliathus goliatus*, *Fornasinius aureosparsus*, *Stephanocrates preussi* et *Mecynorrhina kraatzi* ont été signalées pendant la collectes des données. La répartition de ces espèces de macro Scarabées endémiques au Cameroun est très restreinte et localisée seulement dans les forêts humides. Considérant la pression socio-économique sur ces ressources et leurs habitats, les Scarabées et autres insectes forestiers méritent d'être valorisés et les modalités de leur exploitation commerciale fixées afin de maximiser les bénéfices de leur exploitation et d'assurer leur conservation.

# **I-INTRODUCTION**

## **I-1 BACKGROUND AND JUSTIFICATION**

The forest ecosystems of Southwest Cameroon are home to many species of forest insects, some of which are highly localised and/or endemic. According to FAO (1995), forest insects are important Non Timber Forest Products (NTFPs) that are gathered by the poor for livelihood. They contribute a lot to poverty reduction and food security in Sub-Sahara Africa. However, the appreciation of the actual level to which these resources contribute to food security and poverty alleviation needs to be reconsidered (De Follart, 1992). Beetles are gathered by many rural people in Southwest Cameroon for trade. The beetles are exported to Europe, Asia and America, through local exporters who negotiate deals through the internet or foreign collectors who periodically come to Cameroon in search of beetles. This trade that has lasted for over two decades is gradually becoming an important source of rural income in most parts of Southwest Cameroon, as well as in other regions across the country. With increasing access to new technologies, the demand for beetles and the number of exporters is rising. The exploitation of these under-looked Non Timber Forest Resources provides both the collectors with complementary income, but remains informal and less sustainably managed.

In recent years, forest management has recognized the role of Non Timber Forest Products in livelihoods. Numerous actions to valorise and ensure the sustainable management of these resources have been undertaken by various actors, but very few deals with forest insects. Nonetheless, a few studies on forest insects have however focused on their distribution, abundance, pest activities and the ecological services they provide (Barbault, 1997; Hunter; 1999). While the fundamental contribution of forest insects to pollen dissemination and honey production is well known, their economic contribution to the livelihoods of both rural and urban people has often been acknowledged, but proper assessments are rare. Very little has been documented on their commercial value, their population status and trading circuits. Forest insects are less mentioned among Non Timber Forest Products, as well as in the case of food and income alternatives around protected areas. However, the reasons for such exclusion have not been made known and the question on whether forest insects are not worth being considered as forest resources remains unanswered. According to Mathur and Shiva (1996), Non Timber Forest Resources include all products obtained from plants of forest origin and host plant species, yielding products in association with insects and animals or their parts and items of mineral origin except timber. FAO looks at Non Timber forest products as ‘goods of biological origin other than wood derived from

forests, other wooded lands and trees outside forests (FAO, 1999). Both definitions reveal that forest insects are equally NTFPs that needs to benefit from any measure that aims at valorizing, promoting and conserving forest resources.

The legal tool for biodiversity conservation in Cameroon (Law N°. 94/01 of 20 January 1994 and decree N°. 95/466/PM of 20 July 1995) provides provisions for the sustainable management of wildlife resources, irrespective of its nature. In addition, there are international obligations for nations to provide legal protection for various listed taxa, irrespective of the national or regional conservation status of those taxa. Nonetheless, the implementation of these frameworks have shown some limits in integrating forest insects and specific measures have never been taken to valorize and conserve forest insects and their habitats. Consequently, there is increasing uncontrolled extraction of many endemic species for insect trade and the destruction of their habitat for the purpose of rural and industrial development. Given the engagement of the Cameroon government to conserve her biological patrimony, it is however clear that such limit is probably due to lack of appropriate knowledge in their socioeconomic benefits. Information on this subject is therefore vital to awake the minds of conservation stake holders and find possibilities of integrating beetles and other forest insects to biodiversity conservation and poverty reduction strategies.

## **I-2 OBJECTIVE OF THE STUDY**

The general objective of this work consist of studying the trade chain of the insect trade, so as to provide vital information which can initiate the incorporation of these resources to poverty alleviation and biodiversity conservation strategies in Cameroon. Specifically, it consists of:

- Studying the commercial species of beetles in Southwest Cameroon
- Evaluate harvesting and preservation techniques of commercial beetle
- Assessing the socioeconomic potential of the beetles,
- Evaluating the contribution of insect trade to the livelihoods
- Determining the occurrence period of commercial beetle species
- Appreciating the impact of insect trade on biodiversity conservation

## **II- WHAT ARE BEETLES?**

Beetles are a group of insects with hard forewings called elytra. They are the most diversified group of living organisms in the terrestrial ecosystems and constitute about 24% of

the global biodiversity (WCMC, 1992). Most species of beetles reproduce large numbers of offspring and adult beetles have extremely variable lifespan (from weeks to years), depending on the species. They are classified as follow:

Kingdom: *Animalia*

Phylum: *Arthropoda*

Class: *Insecta*

Subclass: *Pterygota*

Order: *Coleoptera*

### III- METHODOLOGY

#### III-1 PRESENTATION OF THE STUDY SITE

Six villages where insect trade is currently being practiced in Southwest region of Cameroon were selected for the study. These villages include: Nyasoso, Mbulle, Ebonemin, Konye, Ediki and Attuleh. In total, three divisions out of six in the region were studied. Nyasoso (4°57"N and 9°34"E), Mbulle (4°58"N and 9°36"E) and Ebonemin (5°00"N and 9°45"E) are found in the Kupe Manenguba division, Konye (5°00"N and 9°25"E) and Ediki (4°49"N and 9°25"E) in the Meme division and Attuleh (5°27"N and 9°55"E) in the Lebialem divisions of southwest region of Cameroon (Figure 1).

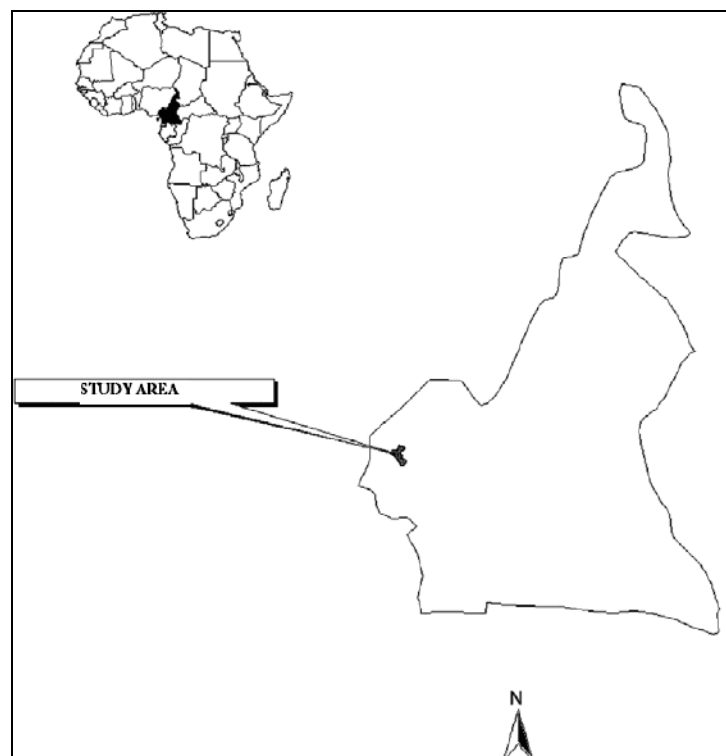


Figure 1: *Map of Cameroon, showing the study area*  
Source: Wilcox and Diangha (2007)



The study area falls within the Cameroon-Nigeria cross-border forests which are well-known for their high level of species diversity and endemism. The area falls within the Cameroon volcanic belt that spans an altitudinal range from sea level to 4095 m. It includes Mount Cameroon, the highest peak in West Africa and part of a mountain chain that extends northwest-southeast into the Gulf of Guinea (Forboseh *et al.* 2007). Temperatures are relatively constant with monthly mean minima and maxima, respectively of 22–24°C and 24–32°C (Fraser *et al.* 1998). Annual rainfall varies between 2000–3500 mm. These elevational and climatic factors result in a variety of vegetation types (Oates *et al.* 2004). Low altitude areas comprise a coastal area of mangroves and inland dense humid evergreen Guinean-Congolian forest of the Atlantic Biafran type, dominated by plant families like *Caesalpinaceae*, *Euphorbiaceae*, *Olacaceae* and *Sterculiaceae* (Letouzey 1968). At higher altitudes there are submontane and montane forest types which are dominated by species like *Adenocarpus mannii* Hook.f, *Agauria salicifolia* Hook.f, *Gambeya Africana* Pierre, *Schefflera barteri* Harms and *Carapa grandifolia* Sprague (Cable and Cheek 1998, Focho *et al.* 2009).

### III-2 DATA COLLECTION AND ANALYSES

Data were collected using both quantitative and qualitative social science methods described by Acharya (2005). In order to identify potential insect collectors, a free listing exercise was administered to 10 people in each of the villages (ages between 25 to 50 years old), following the approach of Weller and Romney (1988). They were interviewed with an open-ended question that required them to list potential households where insect collection and trade is practiced. A total of 96 households were identified in the 6 villages and in each of the households, men, women and children of age above 18 years were interviewed using questionnaires and open discussion (Photo 1&2).



Photo 1: Interview with an insect collector at Attuleh village



Photo 2: Stock of beetles seen with a collector

Questions like what species of beetles are harvested for trade, where are the beetles harvested, who harvests the beetles, how are harvested beetles preserved, where are the beetles sold, how much are the beetles sold and how much does the insect trade contribute to households annual income were asked to obtain socioeconomic information on the beetle trade. Some beetle exporters were equally identified and interviewed (Photo 3).



*Photo 3: Interview with a local beetle exporter at Buea (stock of beetles on the table).*

Themes emerging from the respondents were coded. For each question, we kept a separate running list of codes, creating new codes as new themes emerged. To eliminate conceptual redundancies, the same codes were used for similar themes or issues. This coding process allowed the answers given in narrative form to be listed in the form of one word or a short phrase, in order to facilitate analyses using Microsoft Excel 7.0. Samples of commercial forest insects were collected from the traders (participative approach) and identified using taxonomic manuals (Allard 1985, 1986 and 1991, Rigout 1989, Rigout and Allard 1992).

## IV- RESULTS

### IV-1 COMMERCIAL BEETLE SPECIES IN SOUTHWEST CAMEROON

We found that 19 beetle species (excluding morphologically varied populations or sub species of some species) are currently being commercialized in Southwest Cameroon. However, studies are required to determine if the morphologically varied populations are sub species or simply forms (variety) of the same species. The commercial beetles sampled and their distribution range are given below, following the description of Allard (1985, 1986 and 1991), Rigout (1989), Rigout and Allard (1992).

#### 1) *Goliathus goliatus* (Drury, 1770)



Photo 4: *Goliathus goliatus* (Drury, 1770)

This is the ordinary brown African Goliath beetle, ranging between 50 to 110 mm in size. It is the biggest beetles in Africa. It has a wide distribution range and known to exist in southern Nigeria, Cameroon, Central Africa, Gabon, Congo and the Democratic republic of Congo. However, it is locally not abundant and localized. Their population is highly declining due to habitat destruction and exploitation of adults for insect trade. This species has five morphologically varied populations which are endemic to the humid evergreen forests of Cameroon.

#### 2) *Goliathus goliatus apicalis* Kraatz, 1889



Photo 5: *Goliathus goliatus apicalis* Kraatz, 1889

This is a morphologically varied form or sub species of the Goliath beetle, ranging between 50 to 110 mm in size. It is known to exist only in the humid forest region of Cameroon and locally not abundant. However, there are suspects that this form of the Goliath beetle could be found in Gabon and Congo. Their population is highly declining due to habitat destruction and exploitation of adults for insect trade.

**3) *Goliathus goliatus conspersus* Kraatz, 1889**



Photo 6: *Goliathus goliatus conspersus* Kraatz, 1889

This is a morphologically varied form or sub species of the Goliath beetle, ranging between 50 to 110 mm in size. It is known to exist only in the humid evergreen forest of Southwest Cameroon and locally rare. Their population is highly declining due to habitat destruction and exploitation of adults for insect trade.

**4) *Goliathus goliatus albatu*s Kraatz, 1889**



Photo 7: *Goliathus goliatus albatu*s Kraatz, 1889

This is a morphologically varied form or sub species of the Goliath beetle, ranging between 50 to 110 mm in size. It is known to exist only in the humid evergreen forest of Southwest Cameroon and locally very rare. Their population is highly declining due to habitat destruction and exploitation of adults for insect trade.

**5) *Goliathus goliatus undulus* Sjostedt, 1927**



Photo 8: *Goliathus goliatus undulus* Sjostedt 1927

This is a morphologically varied form or sub species of the Goliath beetle, ranging between 50 to 110 mm in size. It is known to exist only in the humid evergreen forest of Southwest Cameroon and locally very rare. Their population is highly declining due to habitat destruction and exploitation of adults for pet trade.



6) *Goliathus goliatus quadrimaculatus* Kraatz, 1889



Photo 9: *Goliathus goliatus quadrimaculatus* Kraatz, 1889

This is a morphologically varied form or subspecies of the Goliath beetle, ranging between 50 to 110 mm in size. It is known to exist only in the humid evergreen forest of Southwest Cameroon and locally very rare. Their population is highly declining due to habitat destruction and exploitation of adults for insect trade.

7) *Fornasinius aureosparsus* Van de Poll, 1890



Photo 10: *Fornasinius aureosparsus* Van de Poll, 1890

This species is about 40 to 70 mm large and endemic to Eastern Nigeria and Cameroon. There is however suspects that this species might equally be found in Gabon, but no evidence have ever been gotten. In Cameroon, this species is limited to the humid evergreen forest zone and they are locally very rare. Their population is highly declining due to habitat destruction and exploitation of adults for insect trade.

8) *Mecynorrhina kraatzi* (Moser 1905)



Photo 12: *Mecynorrhina kraatzi* (Moser 1905)

This species of about 45 to 75 mm large is endemic to the humid mountain forest ecosystems of West Cameroon. Their distribution is much localized and they are locally rare. Their population is highly declining due to habitat destruction and exploitation of adults for insect trade.

9) *Mecynorrhina polyphemus confluens* (Kraatz, 1890)



Photo 12: *Mecynorrhina polyphemus confluens* (Kraatz, 1890)

This species that measures between 45 to 75mm is a common species with a wide distribution range in West and Central Africa. It is found in the humid forest zones of Cameroon. Though this beetle is locally less abundant in Cameroon, they occur in very large numbers in neighboring countries like Congo for example. Their population is however threatened from habitat destruction and exploitation of adults for insect trade.

10) *Mecynorrhina savagei* (Harris, 1844)



Photo 13: *Mecynorrhina savagei* (Harris, 1844)

The distribution ranges of this species that measure between 40 to 75mm extends from Central to West Africa. However, it is relatively less common. It is found in the humid forest zones of Cameroon and locally less abundant. Their population is threatened from habitat destruction and exploitation of adults for insect trade.

11) *Dicronorhina micans* (Drury, 1773)



Photo 14: *Dicronorhina micans* (Drury, 1773)

The species that measures about 40-45mm has a wide distribution range. It is found everywhere across Central, as well as in some West African countries like Uganda. It is found in the humid forest zones of Cameroon, but relatively less common. Their population is threatened from habitat destruction and exploitation of adults for insect trade.

**12) *Stephanocrates preussi* Kolbe, 1892**



Photo 15: Green *Stephanocrates preussi* Kolbe, 1892

This species of about 45 to 55 mm large is endemic to the humid mountain forest ecosystems of Cameroon. Their distribution is much localized and they are locally rare. Their population is highly declining due to habitat destruction and exploitation of adults for insect trade. There are other four morphologically varied populations or sub species (with red, blue, brown and black color) which occur in different spots across the humid montane forest of Southwest Cameroon.

**13) *Stephanocrates preussi* (blue form or sub species)**



Photo 16: *Stephanocrates preussi* (blue form or sub species)

Just like the red, brown and the black *Stephanocrates preussi*, this species of about 45 to 55 mm large is endemic to the humid mountain forest ecosystems of Cameroon. Their distribution is extremely localized and they are locally extremely rare. Their population is extremely few and threatened from habitat destruction and exploitation for of adults insect trade.

**14) *Mecynorhinella torquata* (Drury 1782)**



Photo 17: *Mecynorhinella torquata* (Drury 1782)

This species that measures between 50mm to 85mm has a wide distribution range. It is found in Cameroon, Congo, Gabon, Central African Republic and the Democratic Republic of Congo. It is found in the humid forest zones of Cameroon and relatively common. Their population is however threatened from habitat destruction and exploitation of adults for insect trade.

**15) *Megalorrhina harrisi eximia* Aurivilius, 1886**



Photo 18: *Megalorrhina harrisi eximia* Aurivilius, 1886

The species that measures about 40mm has a relatively wider distribution range. It has been reported to occur in humid highland forest zones in Cameroon, Congo and the Central African Republic. Though they are relatively locally abundant, their population is however threatened from habitat destruction and exploitation of adults for insect trade.

**16) *Gnorimimelus batesi* (Rutherford, 1879)**



Photo 19: *Gnorimimelus batesi* (Rutherford, 1879)

The species that measures about 30mm in length has a relatively wider distribution range, but it is rare. It has been reported to occur in few numbers in some humid highland forest in Cameroon, Congo, the Central African Republic and the Democratic Republic of Congo. Their population is highly threatened from habitat destruction and exploitation of adults for insect trade.

**17) *Eudicella morgani* White, 1839**



Photo 20: *Eudicella morgani* White, 1839

This species that measures about 40mm occurs in the humid forest zones some parts of Central and West Africa. However, they are locally less common, but their population is threatened from habitat destruction and exploitation of adults for insect trade.



**18) *Eudicella gralli* ( Buquet, 1836)**



Photo 21: *Eudicella gralli* ( Buquet, 1836)

This species that measures about 40mm exists across Central and West Africa. However, they are locally less common, but their population is threatened from habitat destruction and exploitation of adults for insect trade.

**19) *Eudicella daphnis* (Buquet, 1885)**



Photo 22: *Eudicella daphnis* (Buquet, 1885)

This species that measures about 40mm exists across Central and West Africa. They are locally common, but their population is threatened from habitat destruction and exploitation of adults for insect trade.

**20) *Mesotopus regius* Swederus 1787**



Photo 23: *Mesotopus regius* Swederus 1787

This species that measures between 60 to 90mm is the biggest stag beetle in Africa. It exists across Central and West Africa, but it is locally less common. Their population is threatened from habitat destruction and exploitation of adults for insect trade.

**21) *Homoderus mellyi* Parry, 1862**



Photo 24: *Homoderus mellyi* Parry, 1862

This stag beetle that measures between 45 to 60mm is found in many places in Central and West Africa. Locally they are relatively common, but their population is threatened from habitat destruction and exploitation of adults for insect trade.

**22) *Homoderus gladiator* Jakowleff, 1895**



Photo 25: *Homoderus gladiator* Jakowleff, 1895

The distribution range of this species that measures between 40 to 60mm is localized in some humid highland forest in Central However, they are locally rare and their population is threatened from habitat destruction and exploitation of adults for insect trade.

**23) *Prosopocoilus estallae* Desfontaine & Moretto 2003**



Photo 26: *Prosopocoilus estallae* Desfontaine & Moretto 2003

This stag beetle that measures between 40 to 45mm is endemic to Cameroon and highly localized. They are locally very rare and their population is extremely threatened from habitat destruction and exploitation of adults for insect trade.

**24) *Prosopocoilus faber* Thomson, 1862**



Photo 27: *Prosopocoilus faber* Thomson, 1862

The distribution range of this species that measures between 30 to 45mm is localized in some humid highland forest in Central and West Africa. However, they are locally not common and their population is threatened from habitat destruction and exploitation of adults for insect trade.

**25) *Prosopocoilus antilopus* Swederus, 1787**



Photo 28: *Prosopocoilus antilopus* Swederus, 1787

This stag beetle that measures between 35 to 45mm is found in many places in Central and West Africa. Locally, they are relatively common, but their population is threatened from habitat destruction and exploitation of adults for insect trade.

**26) *Prosopocoilus senegalensis* Klug, 1835**



Photo 29: *Prosopocoilus senegalensis* Klug, 1835

This stag beetle that measures between 35 to 45mm is found in many places in Central and West Africa. Locally, they are common, but their population is threatened from habitat destruction and exploitation of adults for insect trade.

The distribution of these beetles within the national territory is specialised. Information on species exploited revealed that different species are harvested in different localities, depending on the occurrence of species and their market values. Table 1 indicates the different commercial beetles found in each of the villages studied.

Table 1: *Species of commercial beetles in Southwest Cameroon*

<i>SPECIES (Authors)</i>	<b>VILLAGES</b>					
	<b>NYASOSO</b>	<b>MBULLE</b>	<b>EBONEMIN</b>	<b>KONYE</b>	<b>EDIKI</b>	<b>ATTULEH</b>
<i>Goliathus goliatus</i>				X	X	
<i>Goliathus goliatus apicalis</i> *				X	X	
<i>Goliathus goliatus conspersus</i> *				X	X	
<i>Goliathus goliatus albatu</i> *				X	X	
<i>Goliathus goliatus undulus</i> *				X	X	
<i>Goliathus goliatus quadrimaculatus</i> *				X	X	
<i>Fornasinius aureosparsus</i>	X	X			X	
<i>Mecynorhinella torquata</i>	X	X				
<i>Mecynorrhina kraatzii</i>			X			X
<i>Mecynorrhina polyphemus confluens</i>	X	X	X			
<i>Mecynorrhina savagei</i>	X	X	X			
<i>Stephanocrates preussi</i> ,						X
<i>Stephanocrates preussi</i> , (brown)*						X
<i>Stephanocrates preussi</i> (blue)*						X
<i>Gnorimimelus batesii</i> ,			X			
<i>Megalorrhina harrisi</i> ,	X	X	X			X
<i>Eudicella morgani</i>	X	X				
<i>Eudicella gralli</i>						X
<i>Eudicella daphnis</i>						X
<i>Dicronorhina micans</i>	X	X				
<i>Mesotopus regius</i> ,	X	X			X	
<i>Homoderus mellyi</i>	X	X				

<i>Homoderus gladiator</i>			X			X
<i>Prosopocoilus estallae</i>	X	X				
<i>Prosopocoilus faber</i>	X	X				
<i>Prosopocoilus antilopus</i>	X	X				
<i>Prosopocoilus senegalensis</i>	X	X			X	

(\*) Morphologically varied communities of the same species, (x) Presence of species

Most species with limited distribution are only found in few villages, providing a restricted opportunity for their harvest. In villages where species diversity is high, insect collectors mostly target species which are sold at high market prices.

#### IV-2 HARVESTING AND PRESERVATION TECHNIQUES

Current harvesting methods are less sustainable and may lead to forest destruction. Harvesting begins with the location of the adult insects host plant species in the forests and farmlands. Some of the plant species that commonly attract beetles are *Vernonia amygdalina Delile*, *Vernonia conferta Benth*, *Carapa grandifolia Sprague* and *Nobotonia mannii Benth*. The bark of located stems is removed at the base level and allowed for some weeks to provoke the production of fermented phloem which attracts insects (Photo 30 & 31).



*Photo 30: Tree bark removed to attract beetles in a newly created farmland*      *Photo 31: Beetles attracted by a phloem producing plant stem*

In sunny weather, harvesters carefully observe each of the prepared stems to collect insect specimen by hand-picking them or with an insect net. For very large species like the *Goliathus*, located specimens are best harvested at night (with the use of fire or light) or very



early in the morning before sunrise by shaking the tree for the beetle to fall. Harvested beetle specimens are preserved by injecting them with alcohol at 50° concentration, after which they are exposed to sunlight for about 30 minutes (photo 32). Well-dried specimens of valuable species are then wrapped in toilet tissue and stored in well-dried closed containers, while specimens of highly abundant less valuable species are simply stock in a well closed container (Plate 33 & 34). Live specimens are preserved in perforated plastic cups in which pieces of sugar cane are weekly introduced as food (Photo 35).



*Photo 32: Dead stock of beetles exposed To sunlight*



*Photo 33: Valuable beetle specimens being rapped for storage*



*Photo 34: Preserved stock of dead less valued beetle species*



*Photo 35: Samples of life beetles in their preservation cups*

These life beetles are exported in closed perforated small plastic cups in small carton boxes. In order to export dead beetles, the specimens are sealed with nylon paper on a piece of rectangular cut carton (Photo 36a&b). The sealed packages are then arranged in a small carton box and shipped with a false label.



Photo 36a&b: Parcelled beetles, ready for shipment (exportation)

### IV-3 MARKET VALUE OF COMMERCIAL BEETLES

Market prices for commercial beetles vary depending on species, locality, quality and size of the insect. Endemic species are generally more expensive than widely spread species. Male specimens with large horns are more expensive than female specimens which generally lack horns. Good quality specimens (clean specimens with no scratch or fracture on any part of the body) are more expensive than faded specimens. For the same species, large size specimens are sold at better prices than smaller sized specimens. However, the sizes of female specimens are usually not taken into consideration. In the course of this study, the price ranges for paired good quality dead specimens of commercial beetle species were recorded (Table 2).

Table 2: Market prices of high-quality dead paired specimens of commercial beetle species

SPECIES	FAMILY	BEETLE SIZE (mm)	AVERAGE PRICE IN FCFA (1\$=480FCFA)
<i>Goliathus goliatus</i>	<i>Scarabaeidae</i>	95-110	3000-7000
<i>Goliathus goliatus apicalis</i>	<i>Scarabaeidae</i>	95-110	5000-10000
<i>Goliathus goliatus conspersus</i>	<i>Scarabaeidae</i>	95-110	15000-35000
<i>Goliathus goliatus albatus</i>	<i>Scarabaeidae</i>	95-100	35000-65000
<i>Goliathus goliatus undulus</i>	<i>Scarabaeidae</i>	95-100	40000-70000
<i>Goliathus goliatus quadrimaculatus</i>	<i>Scarabaeidae</i>	95-100	45000-75000
<i>Fornasinius aureosparsus</i>	<i>Scarabaeidae</i>	55-70	40000-70000

<i>Mecynorhinella torquata immaculicollis</i>	<i>Scarabaeidae</i>	80-85	3000-7000
<i>Mecynorrhina kraatzi</i>	<i>Scarabaeidae</i>	70-75	6000-10000
<i>Mecynorrhina polyphemus confluens</i>	<i>Scarabaeidae</i>	70-75	1000-2500
<i>Mecynorrhina savagei</i>	<i>Scarabaeidae</i>	70 -75	500-2000
<i>Stephanocrates preussi (green)</i>	<i>Scarabaeidae</i>	40-45	8000-15000
<i>Stephanocrates preussi (brown)</i>	<i>Scarabaeidae</i>	40-45	15000-30000
<i>Stephanocrates preussi (blue)</i>	<i>Scarabaeidae</i>	40-45	25000-40000
<i>Gnorimimelus batesi</i>	<i>Scarabaeidae</i>	30-35	1000-2000
<i>Megalorrhina harrisi eximia</i>	<i>Scarabaeidae</i>	35-40	300-700
<i>Eudicella morgani camerounensis</i>	<i>Scarabaeidae</i>	35-40	300-800
<i>Eudicella gralli</i>	<i>Scarabaeidae</i>	35-40	300-600
<i>Eudicella schultzeorum</i>	<i>Scarabaeidae</i>	35-40	300-600
<i>Dicronorrhina micans</i>	<i>Scarabaeidae</i>	40-45	400-900
<i>Mesotopus regius</i>	<i>Lucanidae</i>	80-85	8000-15000
<i>Homoderus mellyi</i>	<i>Lucanidae</i>	45-50	500-1000
<i>Homoderus gladiator</i>	<i>Lucanidae</i>	45-50	1000-2000
<i>Prosopocoilus estallae</i>	<i>Lucanidae</i>	35-40	1500-3000
<i>Prosopocoilus faber</i>	<i>Lucanidae</i>	35-40	800-2000
<i>Prosopocoilus antilopus</i>	<i>Lucanidae</i>	35-45	200-500
<i>Prosopocoilus senegalensis</i>	<i>Lucanidae</i>	35-45	200-500

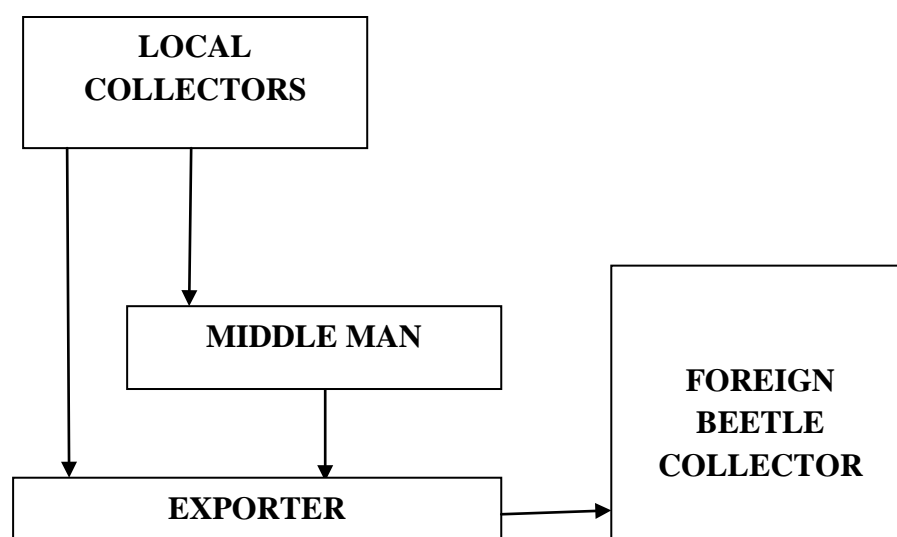
The white forms of *Goliathus goliatus*, *Fornasinus aureosparsus* and the blue *Stephanocrates preussi* are amongst the most expensive (45000-75000FCFA, 40000-70000FCFA and 25000-40000FCFA) respectively. Though the diversity of insects is probably high in the forests of this region, only species belonging to 2 families (*Scarabaeidae* and *Lucanidae*) are currently being exploited for trade. Live specimens are sold at prices higher than mentioned above. However, exports of live insect specimens risk reducing the market value of the species, since this gives opportunity for foreign beetle traders to rear and reproduce these beetles for trading in their own countries. This is the case reported for



*Mesotopus regius*, which in the years 2005-2007, large stock of live specimens were locally sold at prices above 70,000 FCFA each, but the market value and demand has today dropped considerably, due to the successful rearing of this species in Europe and Asia.

#### **IV-5 MARKETING CHAIN**

The marketing chain of these resources within Cameroon needs to be studied further in detail, since our study is preliminary and does not cover the entire territory or provide complete details due to the difficulties encountered in obtaining information on this informal sector. However, data collected reveals that the commercialization is done through series of middlemen (intermediaries) who buy specimens from forest dependent people and resell them to exporters based in major towns like Buea, Douala, Yaoundé and Bamenda. Beetle exporters sell the collected specimens to beetle traders in Europe, America and Asia. In some cases, foreign collectors travel to Cameroon and buy reasonable stocks of beetles without obtaining legal permits or pay taxes on the resources they exploit. Business negotiations are done through the net and the parcel shipped via express mail services once a deal is agreed. In case the foreign buyer has to transport the beetles himself, he simply presents puts them in his travelling box which he embarks into the plain without any strict verification. The beetles are either transported alive or dead, depending on the nature of the demand and at times in very unsustainable quantities, since there are no specific legislation that regulates the collection and trading of insects in Cameroon. This market chain of beetles in Cameroon is summarised in figure 2 below:



*Figure 2: The beetle trade chain*

#### IV-6 CONTRIBUTION OF THE BEETLE TRADE TO LIVELIHOODS IN SOUTHWEST CAMEROON

The exploitation and trade of beetles is an important income generating activity in each of the villages studied. The percentage of households that are practicing insects gathering and trade in each of the villages is given below (Table 3).

Table 3: *Percentage of households practicing insect trade in each of the villages studied*

Village	Number of households practicing insect trade	Total number of households	Percentage of households practicing insect trade (%)
Nyasoso	25	113	22.1
Mbulle	16	87	18.4
Ebonemin	10	19	52.6
Konye	23	108	21.3
Ediki	7	43	16.3
Attuleh	15	24	62.5

About 24.4% of households practice both agriculture and beetle collection, while 75.6 % depend uniquely on agriculture for livelihood. However, household dependence on this activity for livelihood varies from one village to the other, depending on the availability of commercial insect species and agroforestry preferences. In each of the villages, most households depend on agriculture as their main activity for livelihood; others practice agriculture and beetle trade throughout the year, while others only periodically exploit beetles when they are abundant. An indication of the number of households that permanently or occasionally complement their household income with money obtained from the gathering and trade of beetles in each of the villages was established (Figure 3).

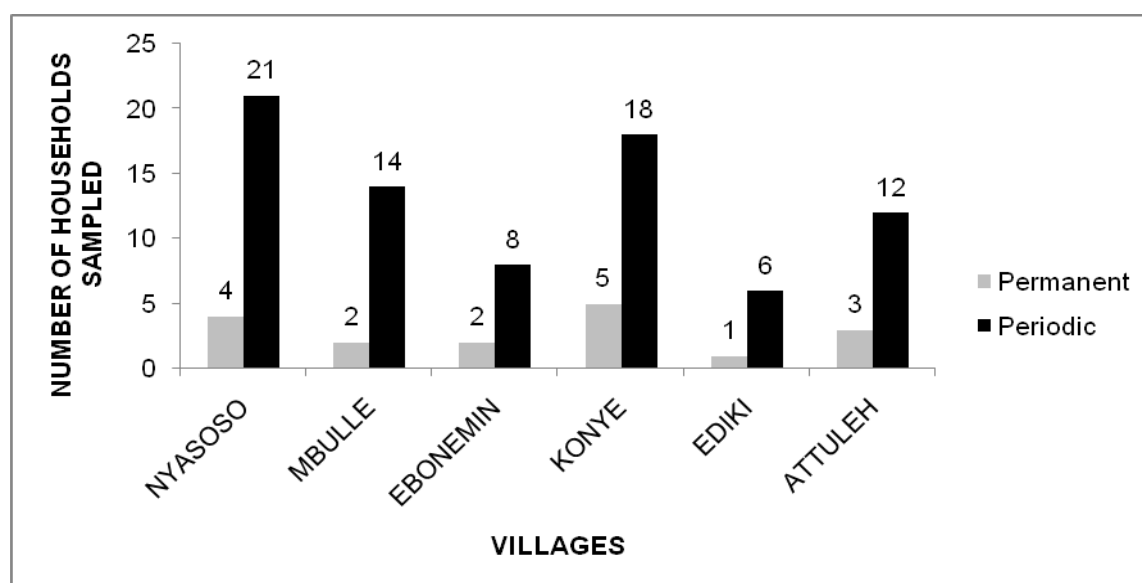


Figure 3: *Dependence of households on beetle trade for household annual income*

In general, 17.7% of households that practice the gathering and trade of beetles in the six villages depend on agriculture and beetles exploitation for livelihood while 82.3% periodically exploit beetles, in times of high species occurrence and demand. About 5.2% of the respondents generate incomes between 700 000 FCFA and 800 000 FCFA, representing more than 70% of their annual household income. Close to 9.4% of the respondents generate incomes between 400 000 FCFA to 600 000 FCFA, representing 35 to 60% of their annual household income. About 3.1% of households generate incomes between 200 000 FCFA and 300 000 FCFA, representing about 30% of their annual revenue. On the contrary, 52.2% of households earn less than 100 000 FCFA from insect gathering and trade, representing less than 10% of their household’s annual incomes. The trend of complementary annual income generated by collector’s households from insect trade is summarized below (Figure 4).

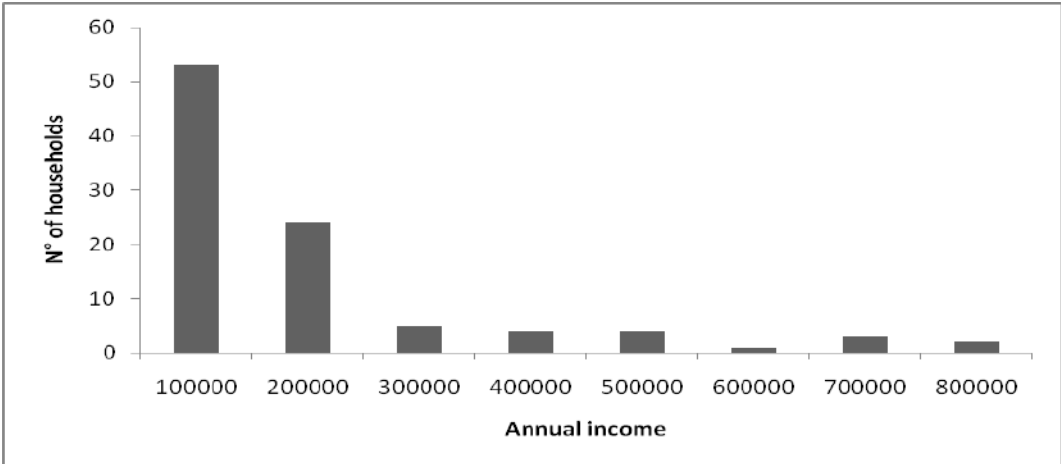


Figure 4: Annual income generated by households from insect trade (in FCFA)

Whatever the households generate annually from beetle exploitation for their livelihoods, the contribution of these resources to local wellbeing in Southwest Cameroon cannot be ignored. Such income supports the fulfilment of basic households needs for feeding, education and healthcare, and also facilitates the acquisition of some farming inputs.

**IV-7 SEASONALITY OF COMMERCIAL BEETLE COLLECTION IN SOUTHWEST CAMEROON**

The gathering and marketing of beetles is done throughout the year. However, different species are harvested at different periods of the year (Table 4). In most of the villages, collectors have the possibility of harvesting different species of beetles over the year. The harvest of specimens from natural forests strongly depends on seasonal variation. The

months of March and October are generally the start of the harvest season for most species and exploitation can last for at least four months. These periods are generally the beginning of the rainy and dry season periods respectively and characterized by abrupt changes in environmental biotic and abiotic conditions that favour the development of larvae to adult insects. The abundance of each species increases to a peak, after which they decrease suddenly when conditions and food availability become less favourable.

Table 4 Seasonal availability of commercial beetles in Southwest Cameroon

SPECIES	MONTHS											
	Dry season		Rainy season								Dry season	
	J	F	M	A	M	J	J	A	S	O	N	D
<i>Goliathus goliatus</i>												
<i>Goliathus goliatus apicalis</i>												
<i>Goliathus goliatus conspersus</i>												
<i>Goliathus goliatus albatu</i>												
<i>Goliathus goliatus undulus</i>												
<i>Goliathus goliatus quadrimaculatus</i>												
<i>Fornasinius aureosparsus</i>												
<i>Mecynorhinella torquata immaculicollis</i>												
<i>Mecynorrhina kraatzi</i>												
<i>Mecynorrhina polyphemus confluens</i>												
<i>Mecynorrhina savagei</i>												
<i>Stephanocrates preussi (green)</i>												
<i>Stephanocrates preussi (brown)</i>												
<i>Stephanocrates preussi (blue)</i>												
<i>Gnorimimelus batesi</i>												
<i>Megalorrhina harrisi eximia</i>												
<i>Eudicella morgani camerounensis</i>												
<i>Eudicella gralli</i>												
<i>Eudicella daphnis</i>												
<i>Dicronorhina micans</i>												
<i>Mesotopus regius</i>												
<i>Homoderus mellyi</i>												
<i>Homoderus gladiator</i>												
<i>Prosopocoilus swanzianus</i>												
<i>Prosopocoilus faber</i>												
<i>Prosopocoilus antilopus</i>												
<i>Prosopocoilus senegalensis</i>												

## **V- IMPACT OF INSECT TRADE ON BIODIVERSITY CONSERVATION**

Insects are present in every segment of forest land, no matter how small the land may be. This characteristic of insects is vital for the survival of species even in highly fragmented ecosystems. However, indigenous species are likely to disappear if relict forest patches are completely wiped out. The impact of insect trade on biodiversity conservation could be negative or positive. This activity may affect both the health of the forest as well as the composition of insect populations if not properly managed. Current harvesting techniques are quite rudimentary and unsustainable. It involves the removal of trees barks and the use of fire in the forest. This does not only risk the sporadic death of amputated trees, but also possibilities of fire devastation in the forest and thus, destruction of the forest and biodiversity and their habitats. The beetle trade leads to the reduction in the possibility for some beetle species to reconstitute their populations, due to the removal of sexually matured adult individuals. Unsustainable exploitation prevents forest insects to normally reproduce off springs and replenish their populations. As consequence, the population of some species keeps reducing at a rate that extinction may occur in the near future.

Though this activity might impact negatively the forest and the survival of some species, it is however important to valorise and assure the sustainable management of these resources to reinforce efforts towards poverty alleviation and community based conservation in both protected and unprotected forest ecosystems. In unprotected forest areas where habitat fragmentation is predominant, sustainable insect gathering and legalised trade could be used as a major tool for the protection of relict forest patches. The habitats of some endemic and valuable species are found in forests ecosystems outside protected areas. Valorising commercial beetles and educating resident population on sustainable harvest practices and the necessity for protecting the habitat of commercial beetle species will contribute a long way in saving our remaining unprotected forest patches. In protected ecosystems all anthropic encroachment for commercial beetle collection should be strictly forbidden, regarding the status of protected areas. Nonetheless, modalities for regulated collection of commercial beetle specimens in farmlands need to be developed and used as an alternative source of income to populations around protected areas.

## VI- CONCLUSION AND RECOMMENDATIONS

The insect trade is an important source of income in Southwest Cameroon, contributing therefore to poverty alleviation and livelihood improvement in the region. While a sustainable harvesting and legalized trade of beetles could be valorized, the trade of life specimens must be forbidden because life beetle trade is a form of genetic drainage which brings in near term a drastic devaluation of species. Once a beetle is shipped life, western beetle traders undertake rearing and domestication attempts. Some species which were originally imported life from Cameroon for breeding are currently being produce in large numbers in Europe and Asia. These breded specimens are equally sold at the same value as those exploited from the natural forests. Though this sector is quite booming, no control on the exploitation and marketing of these resources is done. This has given way to high level trafficking and unsustainable exploitation of beetles in Southwest Cameroon, risking the extinction of some endemic and/or rare species. Despite the fact that forest insects are both ecologically and socioeconomically important, none of the commercial insect species are found in the Convention on International Trade in Endangered Species (CITES) or the International Union for Conservation of Nature (IUCN) red list categories. The valorisation and the sustainable management of these resources could serve as an alternative solution to the problem of poverty, poaching and illegal timber exploitation. However, it is early to conclude on the true impact of beetle exploitation and trade since additional studies need to be conducted to understand species diversity, ecology, biology and vulnerability. In order to effectively benefit from these resources while assuring their survival, the following recommendations need to be considered:

- Beetles and other groups of forest insects should be integrated to both national and international frameworks for biodiversity conservation in Cameroon.
- Valuable, highly demanded and threatened beetle species should be included to the CITES categories.
- Endangered beetle species should be identified and included to the IUCN red list categories.
- Be it in protected or unprotected ecosystems the harvesting of beetle for export should be prior to the acquisition of an exploitation license and regularized to assure the sustainable exploitation of these resources.
- A good management plan for the exploitation and commercialization of beetles and other forest insects should be established to assure the sustainable management of these resources.

- A detail study of commercial beetles should be done across the national territory in order to improve knowledge on these resources.

## ACKNOWLEDGEMENT

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## ANNEX

### SOME BEETLE SHOPS AROUND THE WORLD

<b>COMPANY</b>	<b>COUNTRY</b>	<b>WEBSITE</b>
Thornes Insect Shoppe	Canada	<a href="http://www.thornesinsects.com">www.thornesinsects.com</a>
Butterflies and Things	USA	<a href="http://www.butterfliesandthings.com">www.butterfliesandthings.com</a>
Insect-Sale.com	Taiwan	<a href="http://www.insect-sale.com">www.insect-sale.com</a>
Insect Collectors Shop	Canada	<a href="http://www.insectcollectorshop.com">www.insectcollectorshop.com</a>
Bugmaniac	Belgium	<a href="http://www.thebugmaniac.be">www.thebugmaniac.be</a>
Sierra Entomology	France	<a href="http://www.sierraentomology.com">www.sierraentomology.com</a>
Entomologie Coleoptères	France	<a href="http://www.entomologiescoleoptères.com">www.entomologiescoleoptères.com</a>