

ASSOCIATION FOR TROPICAL LEPIDOPTERA

NOTES

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From Emperor Moths to Zulu Kings: Early Entomophagy and Charlotte's Web of Missionary Letters

Introduction

Entomophagy, the human consumption of insects, has doubtlessly occurred for at least several centuries in Africa, but the earliest recorded accounts go back to the late 1700's for locusts and winged termite consumption in South Africa (Sparman 1786; Backhouse 1844; Defoliart 1999). A comprehensive list of insects as human food has been compiled (more than 1000 species, Defoliart 2002; on web) including larvae of moths, especially the large Saturniidae. The earliest written records (in 1840) of caterpillar collection and consumption are reported here for the first time, below.

While consumption of insects in human diets has been known and documented for 200 years, the unusually high nutritional value of insects has only relatively recently been analyzed and recognized. High concentrations of lipids, amino acids/protein, carbohydrates, as well as vitamins, minerals, and trace elements have been documented in various insects (Chavanduka, 1975; Slansky and Scriber 1985; Mattson and Scriber 1987; Zinzombe and George 1994; Bukkens 1997; Defoliart 1989; 1992; 1999; Glew et al. 1999; Fageria and Scriber 2001). In his missionary travels and research in South Africa, Livingstone (1857) describes entomophagy of white ants (winged termites) and also a large caterpillar fed to children (Defoliart 1999). These larvae may have been mopane worms since they were mentioned on mopane trees. Cloudsley-Thompson (1953) also describes caterpillar consumption by Zulus.

However, this paper reports the original documentation of the earliest known written description of caterpillar collection and consumption by Africans (in the recently discovered personal letters of Charlotte Grout 1840, see below). The records of a Zulu man and children collecting and roasting "worms" for consumption were discovered in the correspondence of Charlotte Grout, wife of American missionary Aldin Grout from the Umvoti Mission at Groutville, about 40 miles north of Port Natal (now Durban), South Africa. The full collection of transcribed letters of the Grouts (1840-1869) from Africa (and some after their return to the USA; 1870-1894) will be published (J. Adams and J. M. Scriber, in prep.).

Caterpillar Consumption and African Silkmoth Stamp Images

The importance of saturniid caterpillars as a traditional food ('phane') in Africa has been celebrated with numerous postage stamps (Congrove 2008). A picture of mopane larvae being harvested by a woman was issued March 18, 1985 (50 c) in Botswana (**Fig 1**) and a mopane "worm" [*Acanthocampa* (= *Gonimbrasia*) *belina* (Westwood)] was previously illustrated on a 45t stamp (issued Feb 23, 1981; **Fig. 1**).

Larvae of the Emperor moth, (*A. belina*; Lepidoptera: Saturniidae) are known as mopane worms, named after the mopane tree (*Colophospermum mopane*), which is one of its favorite host plants in southern Africa, including Mozambique, Zimbabwe, Botswana, Namibia, Angola, Zambia, Tanzania, and South Africa (see Illgner and Nel 2000; Simpanya et al. 2000). It has been and is still used as a regular human dietary item as well as a delicacy across this region (Dryer and Wehmeyer 1982; Defoliart 1999; Glew et al. 1999). Other larvae of Saturniidae moths that are commonly eaten in southern



Fig. 1 Traditional foods issue, showing mopane worm (larvae) being harvested (Botswana March 18, 1985) and a mopane "worm" (*Acanthocampa belina*) on Botswana stamp (issued Feb 23, 1981).

Recd May 22, 1841

Umlazi Nov. 27. 1846.

My dear Parents, Events are every day occurring here which are new and interesting to me and I often think if I could but tell my dear parents, brothers & sisters they would be as much interested as myself. For this reason I propose writing such things as they occur and send when an opportunity presents itself other things that I speak of although interesting are at the same time painful facts, exhibiting as they do the degradation of these poor people. I shall tell you by and by.

This morning I collected me to a tree a short distance from the house where a man and several children were busy in collecting worms for food. The man ascended the tree where the worms had been left undisturbed for the purpose of growing and with a stick dislodged them when they fell to the ground. They are about three inches in length, black spotted with red & white. I should think there were a quart upon the ground they all set immediately to pre-chewing them for eating (which consisted in stripping from them the green leaves they had last eaten). I soon left them but am told they roast them upon the coals before eating. I am sure I do not feel to this for they have now plenty of green worms. Last night we walked over to the hut of this same man which is but few rods from here and they were at their evening meal which consisted of green calabash boiled. It was served upon a mat which lay on the ground, and they sat around it flat upon the ground. Their fork & knives were quite original being nothing more than their fingers which they used quite handily in stuffing their food into their mouths. The family consisted of the man, his wife & three children.



Fig. 2. Excerpt from one letter from Charlotte Grout to her parents in Massachusetts, 1840 (before USA postal stamps), discussing caterpillar consumption.
Figs. 3 - 5 Common emperor moth (*Bunaea alcinoe*) images, from: 3) Uganda, 4, 5) Mali.

Africa include: *Gonimbrasia zambesina* Walker; *Cirina forda* (Westwood); *Gynasia maja* Klug (called “mumpa” in Zambia); and the Cabbage tree Emperor moth (or African Emperor moth) *Bunaea alcinoe* Stoll (Defoliart 1999).

Charlotte's Letters:

[excerpt from letter from Charlotte Grout to her parents in Holden, MA...started November 27, 1840 and completed Jan. 7, 1841. Arrived in USA, May 22, 1841; see also **Fig. 2 with original handwriting**]

Umlari (Umvoti?) Nov. 27, 1840

My dear Parents....

This morning Mr. G. (Aldin Grout, the founder of the mission schools, and Charlotte's husband) called me to a tree a short distance from the house where a man and several children were busy in collecting worms for food. The man ascended the tree where the worms had been left undisturbed for the purpose of growing and with a stick dislodged them, when they fell to the ground. They are about three inches in length, black, spotted with red and white. I should think there were a quart upon the ground. They all set immediately to preparing them for eating, which consisted of stripping from them the green leaves they had last eaten. I soon left them, but am told they roast them upon the coals before eating. Hunger does not compel to this for they have now plenty of green corn.

The species described by Charlotte (above; 3 inches long, black with red and white spots) was almost certainly *Bunaea alcinoe* Stoll, the Cabbage tree Emperor moth. Comparisons of worldwide web (www) photos of the other common larvae of silkmoth species (by Leroy Simon and Kirby Wolfe of *Gynanisa maja*, *Gonimbrasia zambesina*, *A. belina*; and by Bart Wursten of *Cirina forda*), while beautifully colored, lack the red and white spots that are so distinctive in *Bunaea alcinoe*.

African Silkmoth Stamp Images

Of the most common silkmoth species eaten in Africa, *Bunaea alcinoe* is the most frequently figured on stamps (18 stamps; 14 countries; Congrove 2008; see also **Fig. 3-11**). This is certainly the species reported here by Charlotte Grout. Also common as foods are *Acanthocampa belina* (8 stamps, 3 countries; **Fig. 1**) and *Gynanisa maja* (5 stamps, 3 countries; **Fig. 12**).

Such conspicuous “warning (aposematic) coloration” (e.g. red and white on black/blue, or orange with white/black) typically suggests that the larvae are distasteful to visually-hunting enemies, such as birds.

Edibility/toxicity:

Charlotte Grout described how the green leaves in the caterpillar guts were finger-stripped from head to anal region, and this practice is still utilized today (Illgner and Nel 2000). This presumably removes potential distasteful or toxic phytochemicals (allelochemicals) from the partially digested food such as resin-flavored mopane worms (Defoliart 2002 on line; Chap. 12). Compounds that are sequestered in larval

(or adult) tissue may also be undesirable or unhealthy (the assumption of distasteful model species is the foundation of mimicry concepts in Lepidoptera; Brower 1958; Sime 2002). However, the subsequent roasting of larvae on coals that Charlotte notes would likely break down certain harmful enzymes or allelochemicals that would be eaten with the larvae.

Cooking would also destroy most of the microbes that might be harmful, such as those described by Amadi et al. (2005), including 20 different bacterial isolates belonging to *Staphylococcus*, *Bacillus*, *Micrococcus*, and *Acinetobacter* found in *Bunaea alcinoe* larvae. *Bacillus cereus* and some strains of *Staphylococcus aureus* are known to produce enterotoxins (Bryant et al. 1988) and their endospores may be resistant to high temperatures, with *B. cereus* more resistant to heat than *S. aureus* (Amadi et al. 2005). Deaths in Namibia have been attributed to putative *Clostridium botulinum* poisoning from caterpillars (Marais 1996).

Across Southern Africa, boiling of Saturniidae larvae for 20-60 minutes has been practiced, with the cooked worms subsequently laid out to dry (Illgner and Nel 2000). Mopane caterpillars have 3 times the protein content of beef by unit weight and can be stored for many months (Menzel and D'Alusio as cited by Illgner and Nel 2000). These caterpillars are so valuable for local food and economic trade that a “season” (Nov. 15- Dec. 15) for hunting/collecting has been designated in Zambia (Defoliart 1999). Canning factories have been built, and caterpillar hunters often walk hundreds of kilometers. Drought, fire, and removal of trees have led to concerns about endangered sustainability of caterpillars in the wild throughout the 9 countries in southern African (Defoliart 1995; Marais 1996; Styles 1996).

Another health issue related to the consumption of some wild silkmoth larvae in Nigerian rainforests relates to the heat resistant thiaminase enzymes found in caterpillars of *Anaphe* spp. (Notodontidae) that cause acute seasonal cerebellar ataxia (Nishimune et al. 2000). Acute thiamin deficiency that results from eating undercooked larvae has caused impaired consciousness of humans in this region annually for more than 40 years. This (Nishimune et al. 2000) was the first report of the occurrence of thiaminase (that breaks down thiamin) in an insect, although the negative effects of thiaminase in plant leaves (including bracken ferns; Evans 1975) has been known for sheep and cattle (Ramos et al. 2003). Higher concentrations of these phytochemicals are seen in younger leaves, as is the case for cyanogenic glycosides and phytoecdysteroids (Mattson and Scriber 1987).

Earliest Pioneer Missionaries in Zululand

On December 20, 1835, Rev. Aldin Grout with two other missionaries arrived at Port Natal (presently called Durban) and went to get permission from the Zulu king (Dingane) to work among his subjects. In 1836, Rev. Grout and Rev. Champion were allowed to open a mission (called “Ginani”) at a site on the Umsuuduzi River. Between 1837-1838, Aldin Grout (with Newton Adams and George Newton) published the first Zulu Christian booklet and explained the spelling of Zulu words.

Under this Zulu chief, war lasted from 1836-1840 until the

chief's half brother Mpande joined forces with the Voortrekkers to defeat Dingane (SAHO, Dingane, on line). Rev. Aldin Grout missed most of this bloody period because his first wife, Hannah, died in February 1836, and in December 1837 Grout sailed back to the USA with his young daughter, Oriana. While in the USA, Grout married Charlotte Bailey in November 1838 and the couple went to South Africa in June 1840.

The original mission at Ginini was destroyed during the fighting between the Zulus and the Dutch Boers. Grout therefore obtained permission from Mpande (Dingane's half-brother successor as Zulu King) and started a mission, which he fled in 1842 after some local killings ordered by the King in order to reassert his authority and to discourage his people from following Rev. Grout more loyally than him (described by Charlotte in her letters). Some of the Zulus had begun to call themselves people of the missionary, Aldin Grout, and refused to obey the chief. To complicate things further, the reading instruction that Charlotte had provided to the Zulu children led to an interesting and significant contradiction to the Chief's repeated statements that he didn't consider his people capable of learning to read. She conducted an exercise that proved the Chief wrong. Charlotte described how she wrote selected words of the Chief on paper, and then took the paper over to some children who shocked the chief and his wives by saying these words aloud. The Chief had Charlotte repeat the process, but assigned one of his soldiers to take the children further out of hearing distance. After they repeated the Chief's words again, he exclaimed "I have been defeated today".

During the next months, Aldin and Charlotte feared for their lives, and finally left, immediately after the men, women, and children in the three huts closest to the Grout's were executed by soldiers on orders from Chief Mpande in a surprise attack at dawn on July 25, 1842 at the Mhlatutusi River. The Grouts fled the community to the American Mission in Natal (Durban). In addition to our original copies of Charlotte's letters to her parents (Adams and Scriber in prep.), these reports were also described by Porterfield (1997), citing "Mrs. Grout's Journal" in the Letters and Papers of the American Board of Commissioners for Foreign Missions (= ABCFM) in Houghton Library, Harvard University. In 1846, Grout and his wife, Charlotte, resumed work for the ABCFM and established the schools at the Umvoti Mission and began to build a church (eventually completed in 1863; Williamson 1970). In 1878, the Umvoti Mission Station was officially renamed Groutville as a tribute to Aldin and Charlotte. It remains there today.

Aldin Grout returned to the USA and died in Springfield Massachusetts 12 February 12, 1894 at the age of 90 years (Williamson, 1970). Charlotte died on Dec. 26, 1896 in Springfield, Massachusetts.

Zulu Chief wins Nobel Peace Prize; attributes source of democratic election of chiefs and freedom fighting to his Grandparents' conversion by the Grouts

The most famous Zulu (Albert Luthuli: Nobel Peace Prize winner, 1960; Nobel prize.org on line) was the grandson of the Grout's first Christian converts, Ntaba Luthuli (elected chief of Groutville) and his wife. John Bunyan Luthuli was the son of Ntaba and father of Albert John Mvumbi Luthuli (or Lutuli, as

Albert preferred). Albert was born in 1898, and educated at the Groutville Mission School. He was eventually elected Zulu chief in 1935 and eventually became the beloved President General of the African National Council (South Africa) in 1952 where he served until his death in 1967. As a practicing Christian, his dedication to the fight against racial discrimination via non-violence resulted in the Nobel Peace Prize Award in 1960, which he accepted, wearing the ceremonial clothes of Zulu Chiefs. In the non-violent spirit of Gandhi, he issued a joint statement in 1962 with the USA's King (Martin Luther King) for an appeal for action against Apartheid (Haberman 1972).

In 1963, while still banned from publishing anything, and confined to a 15-mile radius of his home in Groutville after arrest for high treason by the (apartheid) government of the Republic of South Africa for his political activity (i.e. respected spokesperson for South Africa's 14 million oppressed people), he was interviewed by Studs Terkel near Durban, South Africa. Albert Luthuli pointed out that he was elected chief of the Zulus, who have had the privilege of electing their chiefs since the influence of the American missionaries, Aldin and Charlotte Grout, back in the 1840's. After the Grouts taught the Zulu people democratic principles (after the conversion to Christianity of Albert's grandparents), the Zulus soon demanded the right to elect their Chiefs. Albert Luthuli's commitment to non-racialism gives abundant credit to women leadership in the struggle for freedom, described in his autobiographical book "Let My People Go" (see Motshekga, 2007).

In 1966, while still banned by the government in South Africa, Chief Lituli was visited by Senator Robert Kennedy. In preparation for his candidacy for President of the United States, Kennedy insisted (against severe objections of the South African government) on visiting Groutville and Chief Lithuli to get his personal perspective on apartheid and racial issues in South Africa. Under "mysterious circumstances," Chief Lithuli was killed in 1967 by a train while walking on the tracks over a trestle bridge over the Umvoti River near his home in Groutville (Nobel lectures 1972; and Albertinah Lithuli, 2007; who was a daughter of Chief Albert Lithuli and ANC Member of Parliament). Robert Kennedy was assassinated in 1968, and Martin Luther King (who issued a joint statement with Chief Lithuli in 1962) was also assassinated in 1968.

Lepidoptera: another African connection (Insect Zoos and Butterfly Houses)

With more than 350 permanent Butterfly houses and insect zoos internationally (Scriber et al. 2000), it is important to have close and effective communication between the farmers/producers and the displays/users. The International Consortium of Butterfly Exhibitors and Suppliers (ICBES) is an important organization in this regard. We had a conference in South Africa in 1999 near the Kruger National Game Park (north of Groutville). At Sephapane Lodge in Phalaborwa where the meeting took place, we observed the mopane worm (silkmoth) in its native habitat while we waited for our Zulu guide, Jeremiah. Actually the town of Mopane was just a little east of us inside the Kruger National Park. We were officially on a post-conference "butterfly and moth safari", but also witnessed many other large herbivores and their carnivorous

enemies during this week.

Among the most impressive days were our visits to the Zulu village, a Mozambique refugee camp, and Jeremiah's hometown. Education is still highly valued in South African Zulu areas (Jeremiah had studied at Oxford, and his parents were both local teachers) emphasizing again the importance of the Grout's historical work to develop the Zulu alphabet and grammar back in the 1840's. Aldin Grout (and Newton Adams, and George Newton) published the first Zulu Christian booklet and explained the spelling of Zulu words (1837-1838).

Postal policy before stamps (South Africa to USA before 1860)

These missionary letters were discovered by the author, Mark Scriber, in a box of correspondence from the mid-1800's that were given to him by his uncle, Frank Buscall. These letters presumably came from Buscall's father (Robert)/grandfather (Isaac) who lived in Springfield, Massachusetts, as did Charlotte Bailey's parents. The Buscall Nursing Home (Sanatorium) opened in 1891, and was run by Dr. Isaac Buscall (M.D.). Charlotte died in 1896.

The postal history associated with these original letters (all transcribed in a publication by James Adams and Mark Scriber; in prep.) over the years involved several 4-day (and 80 mile) return trips of a boy mail runner from Groutville to the Natal port and ships to the USA. Here postal marks and transfers from Boston to Springfield have also been examined and described in more detail from ink cancel stampings to the first paper postal stamps after 1847 (see Adams 2011, in prep.).

First Butterfly image on a stamp, and Charlotte's brother in Hawaii

One interesting coincidence has also emerged from these discoveries: the first butterfly figured on any stamp, worldwide, is clearly visible in the hairpiece of the Hawaiian Queen Lili'oukalanani in 1891. After her overthrow in 1893, the stamp was used ("overstamped") by the Provisional Government (see National Geographic story about the recent recovery of the Queen's hairpiece jewelry in the shape of a butterfly; May 2009; Vol. 215: No.5). This is the first-ever Lepidopteran image to occur on any postal stamp (Fig. 15). Before the 1950 detailed appearance of the Rajah Brooke's Birdwing butterfly (Sarawak postage), only 6 stamps worldwide depicting Lepidoptera were known (Berenbaum, 1995). There are now approximately 10,000 butterfly and moth images on postage stamps of the world (Congrove, 2008).

The Hawaiian Islands was the location of early Christian missions in the 1830's and 1840's, and Charlotte Grout's younger brother, Edward Bailey, is perhaps the most famous of missionaries there. The Bailey House Museum was designated as a Maui Historical Site in 1951. Edward Bailey arrived (married for 1 week, and at 22 years of age) and was stationed from 1840-1848 at the Wailuku Female Seminary until it closed due to financial difficulties. Edward worked in education and became superintendent of government schools. A surveyor and naturalist, he made drawings and paintings that provide a detailed historical portrayal of Maui in the 1800's, including the growing of sugar cane, which has also been important from the

1830's to the present day in Groutville, Africa.

The Bailey House Museum (now on the National List of Historic Places) was originally built in 1833 at the mouth of the Iao Valley within the royal estate of Kahekili II (the last ruling chief of the Maui) as one of the earliest western-style houses in Wailuku. It became the Wailuku Female Seminary in 1837 until it went broke in 1847, but Edward and Carolyn Bailey purchased it in 1850 and subsequently lived there. It now houses parts of the valuable national collection of indigenous land snails of David Dwight Baldwin (collected before the invasive alien snails invaded and drove these native endemics to extinction).

Charlotte Grout in Africa frequently lamented the lack of correspondence from her younger brother in Hawaii, especially that gap occurring for more than a year in 1842 when they were fearing for their lives in Africa, while Edward was only getting established in Hawaii. Also, from March 3, 1849 to Oct 2, 1849 when she "had not heard a syllable" from him, this was during a difficult period after the Wailuku Female Seminary closed (with his subsequent separation from ABCFM) and during the period he was turning to surveying, education, painting, etc. (Maui Museum, on line). At age 83, Ed Bailey's last letter written to his sister (Nov. 1896) was sent from the Hawaiian Islands (Fig. 13). He was a Hawaiian missionary just before the famous missionary stamps of 1851-1853 (Fig. 14). His last letter was sent shortly after the 1891 (first butterfly image stamp) and its reissue in 1893, overprinted "Provisional GOVT" (Fig. 15). In this 1896 letter he lamented the loss of "grand old forests" due to cattle grazing, and he spoke of potential annexation of Hawaii if McKinley were to be president of the USA. Edward died in 1910, and until then was still a trustee of the Wailuku Union Church.

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Figs. 6-11 Common emperor moth (*Bunaea alcinoe*) images, from: 8) Togo, 9) Somalia 10) Rwanda, 11) Comoro Islands, 12) Congo, P.R.

Fig. 12 *Gynasia maja* moth image (issued in Mali on June 1, 1964).

Fig. 13. Last letter from Ed Bailey in Hawaii to sister Charlotte Grout (1896)

Fig. 14. Hawaiian missionary stamps (1851-1853)

Fig. 15. Ruby and Diamond butterfly brooch worn as a hairpiece by Queen Lili'uokalani, worn at Queen Victoria's 1887 Golden Jubilee (see May 2009 issue of National Geographic 215: issue no. 5). This was figured as the first image of a butterfly ever shown on a postal stamp (Hawaiian, 1891; also shown with the overstamp of "Provisional GOVT" in 1893).



A letter from the field: Not a Paradise*, but pretty darn close

Antonio de Leon Pinelo's 17th century theory placed the Garden of Eden in South America, somewhere in what's now Brazil. Two years ago, I came close to finding it, when I visited Vitor Becker's place in the state of Bahia. Following his retirement from professional entomology, Vitor not only continued his explorations in moth taxonomy and conservation efforts, but took them to a new level. He and his wife, Clemira Souza, created a reserve that encompasses over 5,000 acres of Atlantic forest - the habitat that today has practically disappeared - by purchasing small parcels of land. They also built a station for education and research and one of the most hospitable lodges that I have ever stayed at. Offering complete privacy and independence to visitors, the hosts are very effective in bringing people in contact with nature and with other biology students, researchers and naturalists. Even during my short stay, I developed friendships with researchers from France, U.S., and Brazil, which continue today.

The setting of the station takes your breath away, especially early in the morning, when one can see for miles down the valley where a town of Camacan is located, and the rays of the rising sun are reflected from the clouds. Hundreds of foraging humming birds are the only distraction from the serenity of this sight.

When I arrived, I intended to stay for a couple of days and move on in my travels, but ended up staying a week - I simply could not leave. My short stay there allowed me to photograph many of the Atlantic Rainforest butterflies, which can be viewed at www.lepidopterist.org/Serra-Bonita-butterflies/ and www.lepidopterist.org/Serra-Bonita-skipper/ Following my trip, I was delighted to learn that Vitor and Clemira received the National Geographic Society/Bufett Award for Leadership in Conservation. For more information about the reserve, visit www.uiracu.org.br/en/serrabonita.html

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Life at Serra Bonita, Brazil: *Myscelia orsis* (Nymphalidae); Green-headed Tanager, *Tangara seledon*; *Automeris* sp. (Saturniidae); Tree frog; Harlequin Beetle, *Acrocinus longimanus* (Cerambycidae); Vitor cooking a farewell BBQ (Brazilian style); Sunrise at Serra Bonita.

* **Paradise** (Old East Iranian: *pairidaeza*) is a place in which existence is positive, harmonious and timeless. It is conceptually a counter-image of the miseries of human civilization, and in paradise there is only peace, prosperity, and happiness. Paradise is a place of contentment, but it is not necessarily a land of luxury and idleness. (from Wikipedia)