

## Chapter 18

### CENTRAL AND EASTERN AFRICA: KENYA, MALAWI, TANZANIA, UGANDA

See **Regional Taxonomic Inventory** (Chapter 15)

#### KENYA

**Odhiambo (1978)** mentions several kinds of insects used as food in Kenya:

The long-horned grasshopper, 'nsenene', is an important item of diet in certain parts of Uganda and Kenya, as recent swarms in many parts of East Africa have shown this year. Lake flies are collected by many ethnic groups living around Lake Victoria and the great lakes along the Western branch of the Rift Valley; and these are made into large balls marketed in rural market-places, thus providing an important source of animal protein. Termites on the wing are collected throughout most of Africa as a sort of snack, but in some places, especially in the semi-arid savannah zones, termites do indeed provide an essential element of the diet among the non-livestock keeping groups.

**Massam (1927)** describes primitive beekeeping by the Elgeyo tribe in the highlands of Kenya (pp. 122-123) and their methods of harvesting termites (pp. 123-126). The Elgeyo live principally on the grain they grow and on the milk, blood and meat provided by their livestock, i.e., cattle, sheep and goats. Stock is practically the only form of wealth recognized or desired. Massam states that white ants and honey are distinctly luxury foods to the natives and that honey is "especially esteemed when eaten with pounded 'white ants.'" At lower elevations, termite mounds may be 20 feet high and, at the beginning of the rains, termites are an important part of the Elgeyo food supply. They are harvested soon after the rains begin by digging a hole near the base of the mound, then knocking the mound over and lighting a fire near the hole. The emerging winged termites are stupefied by the smoke and fall into the hole, from which they are scooped and stuffed into leather bags to suffocate. They are then dried in the sun, the wings are removed, and the bodies pounded into a paste which is either eaten alone or with honey. Massam states that it is a very fattening food.

At elevations of about 6,000 feet the termites are smaller and do not build tall mounds. They are harvested differently. A hole is dug about 9 inches in diameter and 9 inches deep, about a yard from where the termites are expected to emerge. It is lined with smooth, neatly overlapping leaves. A piece of hide, to exclude the sunlight, is supported by twigs from the termite exit hole to the pit that has been dug. The emerging sexuals, unable at first to use their wings, crawl toward the light at the end of the hide-covered tunnel and fall into the pit, from which they are unable to escape because of the smooth leaf lining. They are gathered in bags and taken away to dry. Termites from yet higher elevations are not collected as they are very small and said to be bitter. Massam notes that these day-flying termites can emerge in clouds on sunny days following heavy rain and are a great nuisance by their numbers. He noted also that they were attracted more to dark-blue jerseys than to lighter khaki.

**Ominde's (1988)** African Cookery Book offers authentic African recipes representing a cross-section of East African cuisines -- Kenyan, Tanzanian and Ugandan. It includes recipes for insects eaten as delicacies, such as fried white ants and fried grasshoppers and locusts.

It is indicative of the revival of interest in food insects in Africa that the The Research and Development Forum for Science-Led Development in Africa (RANDFORUM) held an Africa-wide Exhibition on Indigenous Food Technologies in Nairobi, Kenya, December 13-17, 1995 (see *The Food Insects Newsletter* 8(3): 10, 1995). This was part of the larger Exhibition on Innovative Technologies for Food Production and Processing that are Commercializable. Under the aegis of a center for indigenous knowledge, the exhibition included a food fair as well as displays of living insects in their natural habitats and the processed end-products ready for consumption. Posters and diagrams provided information and there was a one-day symposium on the subject.

#### Diptera

##### Chaoboridae (phantom midges)

Lake flies (see Odhiambo 1978 in the Introduction).

#### Hymenoptera

## Apidae (honey bees)

According to **Hollis (1905: 318)**, among the Masai, "old men eat the [honey] comb full of grubs." See also Massam (1927) in the Introduction.

## Isoptera

### Termitidae

*Odontotermes* sp., winged adults

**Bryk (1927;** vide Bodenheimer 1951: 151-152) states that the swarming sexuals of *Odontotermes* are caught in almost unbelievable quantities and are an important food in the Mt. Elgon region where several methods are used for harvesting them. Both winged and wingless forms are collected and they are eaten either raw or roasted, although Bryk himself thought the taste was insipid. Although the big harvest begins with the onset of the rains and swarming of the sexuals, some termites could be induced to emerge early by beating sticks together to simulate the sound of rain and by pouring water down the emergence holes to strengthen the impression of rain. Bryk notes that only a small proportion of the emerging termites are captured; many become the prey of birds.

### Family uncertain

**Karp and Karp (1977)** describe the dietary staples, meal patterns, and the meaning of food in Iteso culture. The Iteso are an Eastern Nilotic-speaking people who live in the northern part of Busia district in the Western Province of Kenya. There are about 250,000 Iteso in Kenya and about 500,000 in Uganda. The authors mention the use of termites as a snack food (p. 105):

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.ã7|7|"%ÿÿÿÿÿÿl,r:r:r:8ª:<r from 1976 to 1978, saw winged termites picked off of mounds upon emergence during the daytime and eaten raw (pers. comm. **1987**). His observations were made on the Luo (and perhaps the Luhya also) in Nyanza Province, Siaya District, near Yala and Nyangweso as well as closer to Maseno and Kisumu. Roth was assured by his amused host country nationals that they did indeed eat termites or "white ants" as they called them. (This has the amusing ring of Western condescension in reverse!). Roth also mentioned being offered, in a small local restaurant in Malawi, Zambia or Tanzania, a part of a compressed brown "brick" of termites, about 3 x 3 x 6 inches in size.

**Uma Bhalt and David Newman**, Peace Corps volunteers from 1983 to 1985, reported (pers. comm. **1987**) that winged termites were collected in the Nandi District at the beginning of the wet season, about April-May, dewinged and eaten raw or "roasted over a fire for a tasty delight." Their cat also enjoyed termites.

**Mark Mankowski (1994)**, a Peace Corps volunteer, mentions that the Taita people collect the large flying alates (called KumbiKumbi in Swahili) and fry them over a fire. In Wundanyi, he was "delighted" to taste his first roasted termites. "The taste was like greasy-burnt popcorn but wasn't bad at all."

See also Massam (1927), Odhiambo (1978) and Ominde (1988) in the Introduction.

## Orthoptera

**Acrididae (short-horned grasshoppers)**

See Ominde (1988) in the Introduction.

**Tettigoniidae (long-horned grasshoppers)**

"Nsenene" (see Odhiambo 1978 in the Introduction).

**Insects as Animal Feed****Orthoptera****Acrididae (short-horned grasshoppers)**

**Hemsted (1947)** investigated the use of the red locust (Orthoptera: Acrididae) as a protein source for pigs. Proximate analysis revealed a crude protein content of 63.5%, or 58.4%, or 18.7% on a dry-matter, sundried, and wet matter basis, respectively. Total protein content of the mix fed to pigs was 20%. The growth rate was "very satisfactory," but the fresh meat and bacon both had a definite fishy taint. Removal of the locust meal from the diet three weeks prior to slaughter reduced the taint but did not completely eliminate it.

**MALAWI**

A wide variety of insects are still consumed in quantity in Malawi (Dr. **Kenneth Ruddle**, pers. comm. 1987).

**Shaxson et al (1985)** describe methods of preparation and cooking for a number of species. These are included under the appropriate taxa below. The section on insects (pp. 21-23) begins by saying: "It is not generally known in the Western world that insects are a very good and cheap source of protein. Taxonomically, these insects are not far removed from shrimps which are considered a great delicacy in the West."

A study involving emperor moths and honey bees conducted by **Munthali and Mughogho (1992)** in Malawi's Kasungu National Park and in human settlements adjacent to its eastern boundary demonstrates the advantages of introducing economic incentives that integrate biological conservation with economic development for the rural people. It shows that opening national parks and other wildlife preserves to controlled sustainable use by local populations can reduce the problems of poaching. Prior to the study, management practices for Kasungu and other protected areas stressed non-consumptive utilization through ecotourism and law enforcement. For neighboring rural people, however, most of them families and their descendents who were resettled outside the Park when it was established in 1930, outdoor recreation is of low priority in their hierarchy of needs, and the cost of entry to parks and reserves is more than they can afford. Further, as the money from ecotourism goes into the central treasury, rural people view the management policies as favoring the most affluent rather than addressing their own socio-economic dependence on wildlife. They manifest their antagonism through illicit encroachment into protected areas.

In 1990, Malawi's Department of National Parks and Wildlife allowed 173 families (about 10% of all households around the Park) to harvest caterpillars in the Park, and simultaneously initiated modern bee-keeping in the Park in order to diversify the rural communities' income base and to win their support for wildlife conservation programs. The caterpillars involved are two species of emperor moths (Saturniidae), *Gonimbrasia belina* and *Gynanisa maia*, which occur abundantly, the larvae being in season from about mid-October to December every year. Formerly, 100% of families practiced beekeeping and utilized saturniid caterpillars and other products of the forest such as game animals, small mammals, medicine, mushrooms, firewood and poles. Now, only 33% practice beekeeping outside the Park, the main reason given by those who don't being lack of bee forage. Caterpillars are non-existent outside the Park because of the absence of forage tree species. According to the investigators, extensive agriculture (tobacco estates, and maize, beans and groundnuts grown by smallholder farmers for subsistence and cash) is the main cause of the rapid dwindling of Malawi's rich biodiversity, even though 22% of its total area is legally protected as national parks, wildlife and forest preserves.

It was found during the study that significantly greater caterpillar yields were obtained from plots that were burned early every year, followed by no burn and with lowest yield from late burn which obviously is destructive to the eggs and larvae as well as the foliage on which the caterpillars feed. Yields also varied significantly with forage tree height, with highest yield from height class 1-3 meters. The authors therefore recommend a rotation burning policy that promotes both good caterpillar yield and vegetation coppicing with

more stems in the 1-3 m class. This height class has the added advantage that it puts the caterpillars within easy reach for harvesting. Relative to beekeeping productivity, both honey and wax yields were found to ascend from years 1 through 5, then decline, thus requiring modest investments in new hives and other equipment in year 1 and after the fifth year.

Munthali and Mughogho used gross margin analysis (defined as output minus the variable associated costs expressed in money terms) as a measure of each enterprise's economic efficiency. Caterpillars and beekeeping had more than twice to several times the gross margin values of maize, beans and ground nuts. These wildlife-based enterprises not only produced earnings that exceed those from agriculture, but they do not directly compete for labor with the existing agricultural enterprises as most families affirmed that they would have time to practice beekeeping and/or to harvest caterpillars even during crop season. Of added importance, of the smallholder families in the study area, 50% run out of food stocks by November, which is, coincidentally, when caterpillars and honey are in season.

Munthali and Mughogho conclude that the utilization of honey and caterpillars in the Park by the rural people is an important turning point in the history of wildlife management in Malawi. While taking full cognizance of the Park's primary purpose of preserving the country's representative biotic communities, "The DNPW needs to take full advantage of the rural people's willingness to be allied with wildlife management programmes and consolidate it through the validation of sustainable land use practices."

## Diptera

### Chaoboridae (phantom midges)

*Chaoborus edulis* Edwards, adult

Known as *Nkhungu*, these occur only on the Lake (Nyassa) and swarm once a month at the time of the new moon (**Shaxson et al 1985**). They form huge clouds over the lake which are visible from many miles away. Lake fly are extremely nutritious, being high in protein and calcium and containing six times as much iron as ox liver. Ingredients and preparation: 1 cake dried lake fly; 1 tomato chopped; 1 onion chopped; salt; 1 cup ground nuts, fried and pounded; a little oil. Break the cake of lake fly into pieces and boil in a little salted water until soft. Add the tomato, onion, oil and groundnuts. Cook gently for a few minutes and serve with nsima or rice.

## Ephemeroptera

### Caenidae (mayflies)

*Caenis kungu* (author?)

**Bodenheimer (1951: 194)** cites Daguin (in 1900) that D. and C. Livingstone observed the collection and consumption of immense swarms of gnats known as *kungu* along the northern shores of Lake Nyassa. They were formed into cakes about one inch thick, and the taste was compared to caviar or salted locusts. According to **Fladung (1924: 8)** the paste known as *kungu* is composed of the mayfly, *Caenis kungu* (Ephemeroptera) and mosquitoes (Diptera: Culicidae), but see Chaoboridae above and under Uganda.

## Hemiptera

### Family uncertain

*Nezara robusta* (author?), adult

*Sphaerocoris* sp., adult

The shield bug, *Sphaerocoris*, known as *Nsensenya*, is prepared by washing them, and frying with a little salt until brown (**Shaxson et al**). Serve as a relish. The large green shield bug, *Nezara robusta*, known as *Nkunguni*, is prepared as for *Dziwala* (see below).

## Homoptera

### Cicadidae (cicadas)

*Loba* sp., adult

*Monomotapa* sp., adult

*Orapa* sp., adult

*Platypleura* sp., adult

*Pyona* sp., adult

Known collectively as *Nyenje*, these are large cicadas and most conspicuous during the early rainy season. Remove the wings and fry with a little oil and salt. Serve as a relish (**Shaxson et al**).

**Hymenoptera****Apidae (honey bees)**

Wild bee larvae, known as *Ana a Njuchi*, are removed from the comb and dried. Fry with a little salt, dry again if desired and serve as a relish or appetizer (**Shaxson et al**). See Munthali and Mughogho (1992) in the Introduction relative to beekeeping and honey production in national parks.

**Formicidae (ants)**

*Carebara vidua* Sm., winged adult?

This ant is known as *Mafulufute*. Fry with a little salt, but no fat. Serve hot or cold as a relish (**Shaxson et al**).

**Isoptera****Termitidae**

*Macrotermes* spp., winged adults

**Shaxson et al (1985)** give two methods of preparation for these large termites, known as *Inswa* or *Mbulika* (or flying ants). Method 1: Heat a pan and fry the ants dry. Remove them, dry them in sun, winnow to remove wings, and check carefully to remove any stones. Heat a pan with or without a little fat, add the flying ants and a little salt, and fry until done. Serve with nsima or as an appetizer. Method 2: Wash the flying ants in water and allow to drain for a short while. Add salt and fry them without oil, stirring constantly until wings are burned. Remove from heat and keep them in a warm place for about 5 minutes, until completely dry. They may be fried again in oil if desired. Var.: If oil is used, add a little chopped onion and chopped tomatoes to the pan. Groundnut flour may also be added.

**Lepidoptera****Saturniidae (giant silkworm moths)**

*Gonimbrasia belina* Westwood, larva

*Gynanisa maia* (Klug), larva

See Munthali and Mughogho (1992) in the Introduction relative to saturniid caterpillar harvest in national parks.

**Miscellaneous Lepidoptera**

**Quin (1959: 114)** cites Barker (in 1951) that several species of caterpillars are used as food in Malawi. They are named after their food trees, e.g., *mphalabungu*, *kawici*, *mabwabwa*, *katondo*, etc.

**Shaxson et al (1985)** state that "green caterpillars" are used, and that these caterpillars (known as *Mofa*, *Mphalabungu*, *Kawichi*, *Mbwabwa*, *Katondo*) appear about March and feed on grass (but see Barker above). They are common in the Central Region. Remove the stomach and intestines, then wash the caterpillars. Boil for 5 minutes in water, then dry in sun. Heat a frying pan, fry the caterpillars with a little oil and salt. Serve as a relish. Variation: add 1 chopped tomato, 1 chopped onion and a little groundnut flour to the pan. The authors note that after sun drying the caterpillars may be stored for up to three months.

**Orthoptera****Acrididae (short-horned grasshoppers)**

*Acanthacris ruficornis* (Fabr.), adult

*Cyrtacanthacris aeriginosa* (author?), adult

*Cyrtacanthacris* (= *Nomadacris*) *septemfasciata* (Serville), adult

*A. ruficornis* and *C. aeriginosa* are known as *Dziwala*, *C. septemfasciata* as *Dzombe* (**Shaxson et al 1985**). Remove wings and horned part of legs. Boil in water for 5 minutes, then dry in sun. Winnow off any remaining wings, and fry in a pan with a little salt. May also be fried with a little fat. Serve as a relish. If frying with fat, a little chopped onion, chopped tomato and/or groundnut flour may be added to the pan.

### **Gryllidae (crickets)**

*Brachytrupes membranaceus* (author?), nymph, adult

After digging crickets (*Nkhululu*) from their burrows, remove wings (if any), the stomach and intestines (very important) and wash them. Heat a frying pan and fry the crickets with a little salt, and a little fat if desired. If fat is used, chopped onions may also be added. Allow crickets to dry and serve as a relish (**Shaxson et al 1985**).

### **Tettigoniidae (long-horned grasshoppers)**

*Ruspolia* (= *Homorocoryphus*) *vicinus* Walker, adult

These large green bush crickets are known as *Bwammoni* (**Shaxson et al**). Remove wings and horned part of legs. Boil in water for 5 minutes, then dry in sun. Winnow off any remaining wings. Fry with a little salt and a little fat if desired. Serve as a relish.

## **TANZANIA**

**Harris (1940)**; vide Bodenheimer 1951: 139-141) emphasized that many insects are eaten regularly as part of the diet by various tribes in Tanzania. His discussion is summarized below under the appropriate orders and families.

### **Coleoptera**

#### **Curculionidae (weevils, snout beetles)**

*Sipalinus aloysii* (= *Sipalus aloysii-sabaudiae*) (author?), larva

Beetle grubs in general are not popular (**Harris 1940**). The large coconut beetle grubs are ignored. Only the larvae of the weevil, *Sipalinus* (= *Sipalus*) *aloyisii* (= *aloyisii-sabaudiae*), which are common in abandoned ceara-rubber plantations, are regularly eaten. The ceara trees are split open at the proper season and yield a good harvest of grubs. The grubs are boiled or roasted.

### **Diptera**

#### **Chaoboridae (phantom midges)**

*Chaoborus edulis* Edwards, adult

Lakes Victoria and Nyassa produce untold numbers of the lakefly, *Chaoborus edulis*. They are collected by rushing into the dense clouds of midges, swinging hemispherical baskets attached to the end of long handles. The midges are squashed into solid masses, molded into cakes and dried in the sun. According to **Harris**, the lakefly is an important food in the limited areas where it occurs (see Chapter 17, Table 2 for data on the nutritive value of *C. edulis*).

### **Hymenoptera**

#### **Apidae (honey bees)**

*Apis mellifera adansonii* (= *adansoni*) Latr., larva

The honey of *Apis adansoni* is in great demand, and, according to **Harris**, most natives also have a taste for the larvae which are usually eaten raw, ingested with comb and honey. On occasion, the bee larvae are shaken out and added with honey to the stiff meal porridge which forms the basis of the native meal. **Irvine (1957)** states that, in Tanzania, "bee grubs" are commonly eaten in the process of chewing beeswax to remove the honey.

## Isoptera

### Termitidae

*Macrotermes* spp., winged adults, queens

*Pseudacanthotermes* (= *Acanthotermes*) spp., winged adults

*Termes* spp., winged adults, queens

The flying sexuals and queens of a variety of termites, *Acanthotermes* spp., *Macrotermes* spp., and *Termes* spp. are used. The larger species are eaten casually, according to **Harris**, only the *Acanthotermes* being widely sought after. They are eaten raw, often alive, or they are dried for storing. In the western parts of the country, dried termites are offered for sale in the local markets during the season. Queen termites, especially those of *Macrotermes*, and to a lesser extent, *Termes*, are sought. They are roasted and "highly appreciated." The termite harvest method involves building a supporting framework of branches over the low mounds of *Acanthotermes* and covering this with banana leaves, bask cloth or blankets. A single opening is left and the emerging sexuals, attracted by the light, head for the opening. Few manage to fly straight out and escape.

### Family uncertain

**Hegh (1922;** vide Bodenheimer 1951: 151) described the method of collecting termites in "Tanganyika-Moero" (this may be a district in Zaire, actually). Openings are driven into the center of the mound; a stick with a palm oil-soaked cotton pad at its end is introduced and upon its withdrawal, the termites adhering to the pad are collected. They are placed in rotang baskets which are then vigorously shaken to cause the wings to detach.

## Lepidoptera

### Notodontidae (prominants)

*Anaphe panda* (Boisd.) (= *infracta*), larva

The gregarious caterpillars of *Anaphe panda* (= *infracta*) are eaten in several parts of Tanzania. They build communal nests of silk on the branches of *Bridelia micrantha*, each nest containing many larvae. They are cooked fresh, or are dried and ground to powder for storage (**Harris 1940**).

### Saturniidae (giant silkworm moths)

*Bunaea alcinoe* Stoll (= *caffraria*), larva

Larvae of the giant silkworm moth, *Bunaea alcinoe* (= *caffraria*), 10 cm in length when fully grown, are collected in large numbers by the Matengos near Lake Nyassa. They are prepared by roasting (**Harris 1940**).

## Orthoptera

### Acrididae (short-horned grasshoppers)

*Cyrtacanthacris* (= *Nomadacris*) *septemfasciata* Serville, nymph, adult *Locusta m. migratoria* Linn., nymph, adult

*Schistocerca gregaria* Forskal, nymph, adult

Both the adults and young hoppers of locusts such as *Cyrtacanthacris* (= *Nomadacris septemfasciata*, *Locusta migratoria*) and *Schistocerca gregaria* are widely eaten in Tanzania (**Harris 1940**). The wings and hind legs of the adults are removed before roasting. Fried in butter, the flavor is reminiscent of shrimps. Some are sun-dried for storage and eaten as a flavoring with porridge.

### Gryllidae (crickets)

*Brachytrupes* (= *Brachytrypes*) *membranaceus* Drury, adult

The giant cricket, *Brachytrupes* (= *Brachytrypes*) *membranaceus*, which is a common pest of garden roots, is dug up, roasted, and eaten as a relish (**Harris 1940**).

### Tettigoniidae (long-horned grasshoppers)

*Ruspolia* (= *Homorocoryphus*) *vicinus* Walker, adult

Near Lake Victoria, the green grasshopper, *Ruspolia* (= *Homorocoryphus*) *vicinus* is eaten in large numbers. They are eaten fresh or dried (Harris 1940).

According to Mors (1958), grasshoppers known as *nсенene* appear in Buhaya-Land in the district of Bukoba twice a year, April and November. They are in such vast swarms that they obscure the light of the moon. They alight in the morning, however, and are easily caught in the cold, wet grass. In addition, fires may be lit in the fields so the smoke will keep them from flying. Young and old, especially the women and children, go out to collect them. According to Mors, all land is communal for catching *nсенene* where they fall, and owners cannot exclude trespassers who come for that purpose.

Says Mors: "The *nсенene* are the greatest delicacy of the Bahaya." They are known by many different names depending on color (Mors lists these), and are part of many "sayings"; for example, *Kafwe nсенene igwire* is a malediction against an enemy denoting the wish that he may die without having time to fetch *nсенene*.

The *nсенene* are prepared at home by the women and girls by first removing the wings and legs and then roasting them or cooking them in salt water. According to Mors, the women are allowed to drink the water in which the *nсенene* have been cooked, but they are forbidden to eat them even though there may be a large supply. This is to show deference to the masters of the household. Women and girls refrain from eating the meat of goats for the same reason. There are many other rules governing the use of *nсенene*. For example, children must give to their father the hoppers caught in the morning and to their paternal uncle those caught in the evening; those caught in the afternoon they can keep for themselves. The *nсенene* are esteemed as gifts. Mors mentions that in addition to the *nсенene* (which he says do not eat grass and leaves), large grasshoppers (*enzige*) are eaten in some regions of the country.

## UGANDA

Owen (1973: 132-136) provided most of the available information on insects as food in Uganda, and also provided an excellent discussion of nutrition alternatives in Africa. Relative to insects specifically, Owen stated (p. 132):

Most people in tropical Africa who are no longer dependent on wild foods collect insects for food. The habit is especially well-developed among the cultivators of the forest region whose normal diet is deficient in protein, but it is uncertain whether insects are eaten because of their nutritional qualities. In some areas there is much ritual associated with the seasonal appearance of certain desirable species of insect. The eating of insects may in some ways be compared with the European tendency to eat marine molluscs and crustaceans. The aversion to insects as human food among Europeans is probably based on nothing more than custom and prejudice; insects are indeed good to eat and some taste as good as the best lobster or crab.

Owen continued:

The species utilized....are those that are locally or seasonally abundant. Examples are locusts and other Orthoptera which at times can be extremely abundant, the winged reproductives of termites which occur in immense numbers with the onset of the rains, and the gregarious larvae of moths, particularly members of the Saturniidae. As with some other foods there are often ceremonies and beliefs as well as discriminatory taboos built into the collecting and eating of species that are locally important. Thus almost everywhere certain segments of the community are forbidden to eat insect delicacies: sometimes the women are not allowed to eat them, sometimes the children, sometimes sick people, pregnant women, and so on. It appears that some insects are held in high esteem and are therefore reserved by custom for the more important and senior members of the community, and if someone is found eating insects that are by custom taboo there may be unpleasant consequences for that person.

Owen's information on specific insect groups is summarized below by insect order.

Dr. G.S. Ibingira (pers. comm. 1987) stated that winged termites and cone-headed grasshoppers (*R. nitidula*) "are great delicacies among many tribes in Uganda and other Eastern and Central African countries."

## Coleoptera

The larvae of many species of the larger beetles are sought and eaten, but according to **Owen**, they are not as important as termites and grasshoppers in the diet because few species are found in large numbers.

## Diptera

### Chaoboridae phantom midges)

*Chaoborus edulis* Edwards, adult

Lake fly (*Chaoborus*) cakes are eaten and are possibly an important source of protein in Uganda (**Owen 1973**).

**Gullan (1995)** discussed the species composition of *Chaoborus* cakes or *kungu*, citing several references and personal communication from Dr. Peter Cranston who had examined several cakes of *kungu* in the Natural History Museum in London. The following, quoted from **Armitage et al (1995: 372)**, was written by Cranston:

We know from other entomologically and anthropologically skilled observers that the cake is also termed '*kungu*' and is prepared from aquatic insects emerging *en masse* from other Ugandan lakes. Examination of an example of the cake preserved in the Natural History Museum showed that a major component is actually a species of fly belonging to the family Chaoboridae, *Chaoborus (Sayomyia) edulis* Edwards (Cranston, unpubl.). This species undergoes lunar periodic emergence from Lake Victoria, and moves in large numbers towards lakeside lights. As the specific name implies, F.W. Edwards knew of the edibility of the species when he described it. It is uncertain whether the allergic disorders of white residents of Entebbe were due to the chaoborids or the small tanytarsine midges also present.

The following paragraph from Armitage et al (pp. 430-431) was also largely written by Cranston:

Swarming dipterans are also used as food by humans living around some large African lakes. Most records are anecdotal and refer to chaoborids as being the main source (Beadle, 1974). The flies are attracted to lights and fall to the ground. They are collected, boiled and made into small cakes (*Kungu* cake) which are said to taste similar to caviar or salted locusts. Large numbers of chironomids emerge at the same time as chaoborids (MacDonald, 1956) and they also constitute a proportion of the midges collected for food. . . .

According to Gullan, regarding the likely presence of the mayfly *Caenis kungu* and mosquitoes in *kungu* (as claimed in 1924 by Fladung), Cranston said that it is possible the adults of a number of aquatic insects may be incorporated into *kungu*, but he strongly suspects that the reference to mosquitoes is a misidentification of the chaoborids.

**Bergeron et al (1988)** determined the nutrient composition of a sample of flour consisting of adults of three genera of aquatic insects, Chironomidae [*sic*] [*Chironomus?*], *Chaoborus* and *Povilla*, harvested and prepared by local residents from the islands and shores of Lake Victoria, Uganda. After harvest, the insects are sun-dried and then ground into the flour for subsequent use. Insect cake is prepared by mixing the flour with water and allowing the mixture to sun dry. Unfortunately, the investigators were unable to specify either the species or proportions of the different insects comprising the flour sample which they analyzed.

Proximate analysis of the flour revealed the following values: moisture 9.8%, crude protein 67.0%, fat 4.2%, crude fiber 6.7%, ash 11.6%. A 100 g portion of the flour would provide well over 100% of the FAO-recommended daily intake of protein. Caloric value of a 100 g portion of the flour was determined to be 1.9 MJ. Amino acid analysis revealed cysteine to be the limiting amino acid. The estimated *in vitro* digestibility of the protein was 91% with a discriminant computed protein efficiency ratio (DC-PER) of 2.1. Vitamin content was found to be (mg/100 g): niacin 26.0, thiamin 1.6, riboflavin 8.0. Thus a 100 g portion of the flour would provide more than 100% of the FAO recommended daily intake of the vitamins, based on 65 kg moderately active adult male. Vitamins A and C were not detected. Of minerals, the flour was an excellent source of phosphorus (1.1 g/100 g) and iron (1.3 g/100 g), contained substantial amounts of calcium (267 mg/100 g), magnesium (169 mg/100 g), zinc (13.1 mg/100 g) and had a potassium (997 mg/100g) to sodium (390 mg/100 g) ratio of 2.6:1.0. The authors note that "this flour is a major dietary constituent" and they conclude from their study that aquatic

insects "which can be harvested in large quantities, dried, and made into a flour have the potential to furnish substantial amounts of high quality protein, vitamins, and minerals to the diets of native Africans and residents of other third world areas."

## Hymenoptera

### Apidae (honey bees)

**Owen** states that, in addition to honey, bee larvae are collected as food although it is not clear whether his statement refers specifically to Uganda or to Africa in general.

## Isoptera

### Termitidae

The larger species of termites [probable species are *Macrotermes bellicosus*, *M. falciger*, and *M. subhyalinus*, all of which occur in Uganda and have been reported as food elsewhere] "are much favoured as food" in many areas of East Africa. **Owen** states that the termite mounds are individually owned and anyone caught collecting from a mound that he does not own is likely to be regarded as a thief. The winged sexuals emerge in enormous numbers with the first heavy rainfall marking the onset of the wet season. Various types of traps are used. In eastern Uganda, the winged termites are induced to emerge by beating the nearby ground with sticks, simulating heavy rainfall. The termites are eaten raw or lightly fried in their own fat. Owen states that there is a considerable trade in termites in some areas and that sun-dried termites are found at the right season in the local markets in many East African towns and villages. They are sometimes transported long distances to markets.

The Baganda who live around the northern shore of Lake Victoria in Uganda use termites and fried grasshoppers as snacks between the main meals, one or more of which consists each day of steamed cooking bananas or plantains (known locally as matoke or matooke) accompanied by side dishes which are mainly sauces incorporating tomatoes, beans, eggs, fish or meat when available.

### Family uncertain

**Osmaston (1951)** observed "drumming" to induce termite emergence near Namwendwa in Bulmogi county of Busoga. The drumming was "low, rhythmical and all-pervading," and it seemed to come from the ground. The "drum," half buried in the ground of a termite mound, was a horizontal piece of wood about 20 inches long by 4 inches in diameter, while the "drumsticks" were about 12 inches long by 1 1/2 inches in diameter. Either rolled-up banana leaves or clay pipes were inserted into the exit holes. The termites crawled out through these tubes and fell into containers.

Osmaston describes the flavor of raw termites as follows:

To my surprise I found them excellent, with a delicate flavour somewhere between fried whitebait and hazelnuts. But to catch this flavour it is no good nibbling at a single insect, a fair mouthful must be chewed [as he had seen the drummers do]. Since then I have never looked back and regard them as one of Uganda's cheapest luxuries. I have also tried them boiled and fried; but these methods seemed to kill the initial delicate flavour and I think it is true to say that most African habitues of the termite prefer them raw. In many Bantu-speaking parts of the country boiled and dried termites are on sale in the markets at some seasons of the year, but this method of preparation in my opinion makes them rather dull and tasteless, though I have no doubt they still provide a valuable protein element in the diet.

According to Osmaston, drumming is usually timed to synchronize with the end of a heavy shower, and it appears to be a rather frequently used means of inducing swarming in Buganda and Bunyoro. The other main method involves building a dome-shaped framework of sticks or elephant grass, which is then covered with banana leaves or a blanket, leaving a single exit so that the emerging termites fall into a pit or container. If it is after dark a light is used to help lure them through the opening.

Osmaston mentions that birds, especially swallows, martins and bee-eaters, are conspicuous predators of the termites. A small hawk and a kite were also seen taking their share. He notes that his dog was also very fond

of them. Finally, he mentions seeing soldier termites for sale in a market near Pakwach, and that most Nilotics seemed to enjoy eating the live queens. Osmaston tried fried queens, but was not much impressed with their flavor. He concludes, saying, "I foresee the day in the development of Uganda when the establishment and care of vast termitaria may be an important commitment of some government department."

Also see Ibingira (1987) in Introduction.

### Lepidoptera

Moth larvae are collected and roasted, and may often be bought in the markets. **Owen** gives no clue, however, to their identity.

### Orthoptera

#### Acrididae (short-horned grasshoppers)

*Cyrtacanthacris* (= *Nomadacris*) *septemfasciata* Serville, adult

*Locusta m. migratoria* Linn., adult

*Schistocerca gregaria* Forskal, adult

The three locust species that are especially injurious to crops in tropical Africa (presumably including Uganda) are esteemed as food by many people. The species are the migratory locust, *Locusta migratoria*; the red locust, *Cyrtacanthacris septemfasciata*; and the desert locust, *Schistocerca gregaria* (**Owen**, p. 91). They are usually fried but may be pounded up and added to sauces. They resemble shrimps in flavor.

#### Gryllidae (crickets)

*Brachytrupes* (= *Brachytrypes*) *membranaceus* Drury, adult

*Brachytrupes membranaceus*, a large, fat cricket which is destructive to root crops, is regarded as a particular delicacy and is collected by digging them up from their burrows in the ground (**Owen 1973**).

#### Gryllotalpidae (mole crickets)

*Gryllotalpa* (= *Curtilla*) *africana* Palisot, adult

**Fladung (1924: 6)** reported that the mole cricket, *Gryllotalpa africana*, is kept for both its chirping and as food.

#### Tettigoniidae (long-horned grasshoppers)

*Ruspolia* (= *Homorocoryphus*) *nitidula* (Scopoli) (= *nitidulus*)

The long-horned bush cricket, *Ruspolia nitidula* (Scopoli) occurs in immense swarms with the onset of the rains in East Africa. In Uganda the species is known as *nsenene* and the Abdim's stork as the *nsenene*-bird because it tends to follow the swarms. Flights of the birds herald arrival of the *nsenene* and in some areas a special watch is kept for them. The introduction of electric street lights into towns in East Africa has revolutionized *nsenene* collecting as the insects are nocturnal and attracted in vast numbers to the lights. Owen states that in Kampala, Uganda, "the streets may be completely blocked to traffic by people who come in from rural areas to collect *nsenene*."

#### References Cited (An \* denotes reference not seen)

**Armitage, P.D.; Cranston, P.S.; Pinder, L.C.V. (eds.). 1995.** The Chironomidae: Biology and Ecology of Non-biting Midges. London: Chapman and Hall, pp. 371-372, 430-431. (Uganda: Chaoboridae)

**Beadle, L.C. 1974.** The Inland Waters of Tropical Africa -- An Introduction to Tropical Limnology. London: Longman. (Uganda: Chaoboridae)

**Bergeron, D.; Bushway, R.J.; Roberts, F.L. et al. 1988.** The nutrient composition of an insect flour sample from Lake Victoria, Uganda. *J. Food Composit. Anal.* 1: 371-377. (Uganda: Chaoboridae)

**Bodenheimer, F.S. 1951.** Insects as Human Food. The Hague: W. Junk, 352 pp. (All countries)

- Bryk, F. 1927.** Termitenfang am Fusse des Mount Elgon. *Entomol. Rundschau* 44: 1-3.\* (Kenya: Termitidae)
- Fladung, E.B. 1924.** Insects as food. Maryland Acad. Sci. Bull. 4(4): 5-8. (Malawi: Caenidae; Uganda: Gryllotalpidae)
- Gullan, Penny. 1995.** [Letters.] *Food Insects Newslet.* 8(2): 6. (Uganda: Chaoboridae)
- Harris, W.V. 1940.** Some notes on insects as food. *Tanganyika Notes and Records* 9, Dar es Salaam.\* (Tanzania: Introduction and most orders and families)
- Hegh, E. 1922.** Les Termites. Bruxelles, pp. 669-678. (Tanzania: Isoptera, Family uncertain)
- Hemsted, W.R.T. 1947.** Locusts as a protein supplement for pigs. *East Afr. Agric. J.* 1947, pp. 225-226. (Kenya: Acrididae)
- Hollis, A.C. 1905.** The Masai: Their Language & Folklore. Oxford: Clarendon Press. p. 318. (Kenya: Apidae)
- Irvine, F.R. 1957.** Indigenous African methods of beekeeping. *Bee World* 38: 113-128. (Tanzania: Apidae)
- Karp, I.; Karp, P. 1977.** Social aspects of Iteso cookery. In: The Anthropologists' Cookbook (J. Kuper, Ed.), New York: Universe Books. p. 105. (Kenya: Isoptera, Family uncertain)
- MacDonald, W.W. 1956.** Observations on the biology of chaoborids and chironomids in Lake Victoria and on the feeding habits of the 'elephant-snout fish' (*Mornyrus kannume* Forsk.). *J. Anim. Ecol.* 25: 36-53. (Uganda: Chaoboridae)
- Mankowski, M. 1994.** [Letters.] *Food Insects Newslet.* 7(2): 7. (Kenya: Isoptera: Family uncertain)
- Massam, J.A. 1927.** The Cliff Dwellers of Kenya. London: Seeley, Service & Co. LTD, pp. 123-126, 134. (reprinted 1968) (Kenya: Introduction)
- Mors, P.O. 1958.** Grasshoppers as food in Buhaya. *Anthropol. Quart.* 31: 56-58. (Tanzania: Tettigoniidae)
- Munthali, S.M.; Mughogho, D.E.C. 1992.** Economic incentives for conservation: Bee-keeping and Saturniidae caterpillar utilization by rural communities. *Biodivers. Conserv.* 1: 143-154. (Malawi: Introduction)
- Odhiambo, T.R. 1978.** The use and non-use of insects. Nairobi: Centre Insect Physiol Ecol., 17 pp. (Kenya: Introduction)
- Omende, Mary. 1988.** African Cookery Book. Nairobi: Heinemann Kenya, 152 pp.\* (Kenya: Introduction)
- Osmaston, H.A. 1951.** The termite and its uses for food. *Uganda J.* (Kampala) 15: 80-83. (Uganda: Isoptera, Family uncertain)
- Owen, D.F. 1973.** Man's Environmental Predicament. An introduction to human ecology in tropical Africa. London: Oxford Univ. Press, pp. 91, 132-136. (Uganda: Introduction and most orders and families)
- Quin, P.J. 1959.** Foods and Feeding Habits of the Pedi. Johannesburg: Witwatersrand Univ. Press, pp. 114-115. (Malawi: Miscellaneous Lepidoptera)
- Shaxson, Annabel; Dickson, P.; Walker, J. 1985.** The Malawi Cookbook. Zomba, Malawi: Blantyre Printing and Publishing Co., Ltd., pp. 21-23. (Malawi: Introduction and most orders and families)

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