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Forest Management for the Protection of Edible Caterpillars in Africa

In this issue of the *Newsletter*, a report by Dr. Stein Holden urges that edible caterpillars become an active focus of agroforestry research in Zambia (page 3), and Dan Turk reviews Tango Muyay's book (page 5) which emphasizes the increasing importance of edible insects in Zaire, particularly some of the edible caterpillars. As brief backgrounding for their contributions, attention is called to two earlier and very valuable studies, one by Malaisse and Parent (1980) on the specific identity of caterpillars used as food in southern Zaire, and one by Leleup and Daems (1969) on the timing of bush fires in relation to the survival of edible caterpillars.

Numerous reports make it evident that scores of species of caterpillars (mostly larvae of the giant silk moths, Family Saturniidae) are important items of food throughout much of sub-Saharan Africa. Unfortunately for scientific progress, the caterpillars have usually been referred to only by their vernacular names. Malaisse and Parent (1980), however, not only determined that at least 35 species of caterpillars are used as food in the southern Shaba region of southern Zaire, but they determined the taxonomic identity of 26 of the species. They further reported the host trees and the seasonal occurrence of harvesting for each species. In their analyses of the nutritional value of 22 species of these caterpillars, kcal/100 grams dry weight averaged 457, ranging from 397 to 543, and crude protein content averaged 63.5%, ranging from 45.6% to 79.6%. Most species proved an excellent source of iron, 100 g averaging 335% of the recommended daily allowance. Their study stands as a model for the kinds of species-specific basic information which is needed, but not available, in most parts of Africa.

The study by Leleup and Daems (1969) in the Kwango District of northern Zaire (one of the poorest regions of the country from the standpoint of protein reserves) was commissioned by the territorial administration of Feschi to investigate whether recent fluctuations and reduced tonnage of the most economically important caterpillars might be due to badly timed brush-burning. The authors state (translation, p. 1): "Large game having become very scarce, it is fish, and especially caterpillars, of which certain species abound, that constitute the most important sources of protein for local consumption Caterpillars are not only an important source of protein for local consumption, but they also bring in a substantial income to these disadvantaged regions Commercialized dried caterpillars in the Kwango district averaged 185 tons per year for the five-year period, 1954-1958. To this must be added tonnage, sold privately to Bapende retailers, as well as local consumption, bringing the dried caterpillar production to an estimated 280-300 tons per year."

We cite the work of Leleup and Daems here because it explains why, when the biology of the insects is considered, the timing of bushburning is of critical importance. Of the more than 30 species of caterpillars consumed in the Kwango and Kwilu districts, only three (all saturniid larvae) account for most of the exports. *Cirina forda forda* larvae, called 'Makoso' by both the Kipende and the Kitshok people, are found in wooded savannah where they feed on the tree 'Mikoso' (Kipende) or 'Mikwatshi' (Kitshok) (*Erythrophleum africanum?*). The larvae are abundant and are harvested in September. Pupation is underground.

"Masese" larvae (scientific name not specified) feed on the "Masese" tree. (*Burkea africana?*) in wooded savannah and are harvested in February. Pupation is underground. These larvae are very abundant and together with the "Makoso" are collectively known as "Mangola."

The third most important species for export is *Bunaeopsis aurantiaca*. The larvae are known as "Mambula" (Kipende) or "Makunga" (Kitshok) and feed on a low perennial woody plant known as 'Mikia' (Kipende) or "Mitongo" (Kitshok), which occurs in the steppes biotope (open high plateau). Harvest is in October. Pupation is underground.

Fires can be set only in the dry season which, in the region studied, extends from the beginning of May to the end of August (Fig. 1). The authors conclude that, in wooded savannah, the optimum dates for setting brush fires are June 5 in areas where "Makoso" predominates, and June 10 where "Masese" predominates. Fire setting should be banned after June 15. The underground pupae, about 5 cm deep, are somewhat protected from fire if (1) the ground surface is relatively denuded, which is usually the case at the base of the trees where the pupae are located, and (2) if the heat is not too great. This is why, according to the authors, in the wooded savannah where fires have much stronger intensity than on the high plains, fires in July-August when the undergrowth is very dry must be outlawed. This is all the more urgent because this is the time when the "Makoso" are in the egg or young caterpillar stage (Fig. 1) and they are subject to destruction *en masse*. Because the adults appear in the second half of June, this justifies the ban on setting fires in the wooded savannah after 15 June.

SEE FOREST MANAGEMENT, p. 2

Forest Management (from page one)

Figure 1: Recommended bush-burning dates in relation to seasonal occurrence of the life stages of the three edible caterpillars of greatest nutritional and commercial importance (adapted from Leleup and Daems 1969)

because they spend the entire dry season in the pupal stage. They would suffer from fires in July and August, however, because of the high heat intensity of fire in wooded savannah during those driest months.

In addition to optimum times for burning, Leleup and Daems made several other recommendations aimed at avoiding the dwindling of the "Mangola" biologic stock: (1) to enforce the ban on felling trees in order to harvest the caterpillars; (2) to forbid the increasing practice of harvesting pupae; (3) to encourage resowing attempts on a massive scale by collection of eggs prior to burning; and (4) to create "reserves" of some small wooded savannahs, in which all harvest for purposes of consumption would be forbidden.

Space limitations prevent more than passing mention of two other pertinent papers. Malaisse *et al* (1969), noting that the notodontid caterpillar, *Elaphrodes lactea* (Gaede), is an



The situation is different in the high plains where the vegetation is lower, the fire moves more rapidly, and the ground does not heat up as much. The optimum date for setting fires in the steppes, relative to "Makunga," is July 10 with a leeway of 10 days earlier or later. Bush fires in the steppes must be banned (1) from July 20 to August 31 in order not to destroy the freshly emerged adults or their eggs, and (2) from May 11 to June 30, so that foliage after the fire is not too advanced (host leaves get too tough) when the young caterpillars emerge.

Leaf toughness is also a factor relative to the "Makoso." To burn in the month of May would make the reconstituted foliage of the "Mikoso" too tough by the time the young caterpillars emerge during the second half of July. The "Masese" are much less sensitive to fire

important protein/fat source for the rural people, questioned on biological and social grounds the necessity of foresters' campaigns aimed at destroying the caterpillars which annually cause massive (but not lethal) defoliation of *Brachystegia boehinii* and other Caesalpiniacees in parts of Zaire and Zambia. Turk (1990) lists 42 species of leguminous trees that are fed upon by edible caterpillars in Africa, and suggests preservation or development of management practices that would help preserve caterpillar production.

Gene DeFoliart, Editor.

References cited

Leleup, N.; Daems, H. 1969. Les chenilles alimentaires du Kwango. Causes de leur rarefaction et mesures preconisees pour y remedier. *J. Agric. Trop. & Botany Appl.* 16:1-21.
Malaisse, F.; Malaisse-Mousset, M.; Evrard, A. 1969. Aspects forestiers et sociaux des pullulations de Tunkubiu. Faut-il détruire ou protdger *Elaphrodes lactea* (Gaede) (Notodontidae)? Problèmes sociaux congolaise, Bull.trim.C-E.P.SJ.No.86:27-36.

Malaisse, F.; Parent, G. 1980. Les chenilles comestibles due Shaba meridional (Zaire). *Les Nat. Belges* 61(1):2-24.

Turk, D. 1990. Leguminous trees as forage for edible caterpillars. Nifal Project [Nitrogen Fixing Tree Research] Reports 8:75-77.

Last call for the 1991 Directory!

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Edible Caterpillars - - A Potential Agroforestry Resource?

They are appreciated by local people, neglected by scientists

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Edible caterpillars are a highly appreciated relish by local people in *miombo* woodland areas of Zambia. They are extremely nutritious with 60-70% protein on a dry matter basis, becoming available at a period when other high-protein foods are becoming scarce. Dried, they store for months and for a long period they can be found in local markets fetching high prices. No research has been done on them so far, but they may have considerable development potential. Caterpillar husbandry on a communal basis could probably increase the production of this valuable foodstuff very much if properly managed. Another fascinating aspect is that they might be used to reduce the number of late bush-fires, the reason being that in areas where the caterpillars are found people make sure they burn early because late bush-fires destroy the caterpillars. In areas where the caterpillars are not found late fires do considerable damage by killing trees, lengthening the regeneration period and increasing the damage caused by erosion. Since these caterpillars are found only in certain areas, they could be spread to new areas to give people there a good reason for early burning.

Mumpa

The edible caterpillar responsible for these impressive facts is the most important type found in the Northern Province of Zambia. It is called *mumpa* in the local language (Bemba) and

However, in the areas where the mumpa are now found in largest quantities north and east of Kasama, there is not much regrown *miombo* woodland left. Most of the bush consists of 1-3 meter high coppicing trees and bushes. This seems to be the perfect environment for the caterpillars and for human beings harvesting them without any cutting or climbing of trees. The *mumpa* has a very dynamic history which needs more investigation. It has spread from the west in an eastern and northern direction. Twenty years ago it was not found in the areas where it is now most common. And it is not found in large areas where it should have good sources of food, since the *mutondo* is found almost everywhere.

Traditional Laws and Beliefs

The main threat to the *mumpa* is probably human beings, who are too clever at harvesting the large spiny snack. This must somehow be understood by the local people because there are beliefs and laws regulating the picking season. The picking season is regulated by opening and closing dates which are usually 15th November and 15th December, giving a one-month picking season. The opening date is obviously to make sure that the caterpillars become big and fat before they are picked. The closing date is to secure enough "seed" for next season. The dates may, however, vary from year to year and the decision is made by the chief or even the paramount chief Chitimukulu. If somebody dares to start picking too early, it is said that he/she either will be bitten by a snake or killed by lightning. If somebody is caught, he/she will be brought to the chief and given punishment.

is an emperor moth species [Saturniidae], which lays its eggs on the most common indigenous tree in Zambia, <i>Julbernardia paniculata</i> or <i>mutondo</i> in Bemba. The caterpillars are feeding on this tree in the beginning, but later also on 3-4 of the other most common trees in the <i>miombo</i> woodland (<i>mutobo</i> [<i>Isobertlinia angolensis</i>], <i>muombo</i> [<i>Brachystegia boehmii</i> and <i>Brachystegia longifolia</i> and <i>mpasa</i> [<i>Julbernardia globisbra</i>]). The caterpillars eat the young leaves coming out just before the rains start. Trees may be completely defoliated, but new leaves come out when the rains have started. Forestry people have considered the caterpillars more as a pest - not so much because of the defoliation as for the damage done by people collecting them illegally in the National Forests, cutting down trees to pick them. Many watchmen are hired to protect forests from this kind of damage.	The same is the case for the closing date, but here the discipline among the people is much less and the picking in some areas tends to continue as long as caterpillars are found. "It is very difficult to stop picking this sweet relish! " People come from far away to pick caterpillars and they do not listen much to the local laws and, therefore, the local people are discouraged and also continue the picking. It must become of major importance to re-establish the closing date of the picking season in order not to over-consume and destroy the caterpillar resource. However, most local people think that the caterpillars are a gift from God or the spirits and do not understand that they themselves may influence the abundance of the caterpillars.
*We thank the author for permission to print this report (translated by the author) which was originally prepared as an unpublished mimeo in 1986. The author's current address is Department of Agricultural Economics, Box 33, 1432 AS-NLH, Norway.	Importance as a Food and Income Source It is mainly the women who pick the caterpillars since the men are busy with cultivation of the land at this time though they might also go and collect caterpillars in the afternoons or even for whole days. SEE CATERPILLARS, p. 4

CATERPILLARS (from page 3)

One person can pick about 20 litres per day if the bush is rich in caterpillars, the value of which in 1985 was K20. Thus 7 days' picking should give K140 if all are sold and this is a month's salary for a general worker in Zambia. Not strange that people travel 200-300 km to pick caterpillars. And traders come from Lusaka and the Copperbelt (900 km) to buy the foodstuff and sell it at a much higher price when they go back.

The caterpillars are no doubt the most important source of animal protein in the areas where they are found in abundance, protein deficiency being a major malnutrition problem in the area. Analyses have shown that they contain 60-70% protein on a dry matter basis.

Picking, Preservation and Eating

The *mumpa* has to be picked with care since it has spines, giving the collectors sore fingers. A special technique is used to squeeze out the guts in cleaning the caterpillars. The caterpillars die quite fast, dying on top of each other because of the spines. If they are eaten fresh they are fried, usually with onions and tomatoes and eaten as relish with nshima (ughali) - maize/cassava-stew. The frying process softens the spines so that eating is possible. They taste a lot better than those who are not used to them would think. Most of the caterpillars are preserved by boiling them for a short time and then sun-drying them for 1-2 days. They can then be stored for months.

Damage by Late Fires

The *miombo* woodlands in Zambia are largely affected by fires, causing a more or less fire-resistant vegetation. Still, fires late in the dry season, when it is very dry and the trees have started to produce new leaves, can do a lot of damage by killing trees, reducing regrowth and causing increased erosion. Protection by early burning is found to be the best way to avoid damage by late bush-fires. Complete protection is a lot more hazardous since people have so many good reasons to use fire, which then may easily go wild. In many areas it is difficult to encourage people to do early burning; they remember the laws forced on them during the colonial time. In 1985 I observed that there were very few late bush-fires in the areas where the caterpillars are found. Once, however, late in the dry season when I was driving through this area with some Zambians we saw a bush-fire. ("A stupid guy has put it on fire, he wants to destroy our caterpillars!")

When I traveled in other areas I saw a lot of damage by late bushfires. I investigated this further and found that in the caterpillar areas people make sure to burn early to protect their valuable relish from destruction.

been carrying out research in Zambia. The reasons are probably that most research in Zambia is carried out by expatriates and they have looked upon these insects more as a curiosity which they could not even think of eating or consider as an important foodstuff. Educated Zambians, however, agree that research should be carried out on the caterpillars. The question is which research field it should belong to. Agroforestry seems to me the best choice, since the caterpillars are a product feeding on trees which are a part of the local farming systems.

Questions research should try to answer:

1. Micro- and macro-studies of caterpillar ecology:
 - Geographical appearance and importance.
 - Dynamics. Why they are found in some areas and not in others?
 - Life cycles: Lethal factors, climatic effects, multiplication.
2. Potential for development:
 - Can caterpillars successfully be spread to new areas? Transportation of eggs is probably the best method.
 - Could caterpillars this way be used as a tool to reduce the number of late bush-fires?
 - Could caterpillar husbandry become a new established production organized on a community level (or will the resource be depleted as a typical "tragedy of the commons"?)

Postscript. In a letter dated April 22, 1991, Dr. Holden provided additional information on his caterpillar proposal, in part as follows:

I spent most of the time 1985-1989 in Zambia, working as a junior researcher on a project, Soil Productivity Research Programme, where I was responsible for agroforestry research. I tried to forward a proposal for caterpillar research within the project but it landed on infertile soil among soil scientists and agronomists. "Serious researchers cannot come up with such things!" I ended up doing some private investigations and learned quite a lot about the life cycle of these insects (primarily the *mumpa*), about their geographical distribution at that time and in the past, how they easily could be transferred to other areas (as eggs) (we did a couple of transfer experiments but I have been unable to follow up and see if they were successful). I tried to make an agreement with a local chief (Chief Chimbola) to introduce caterpillars in his area but found it somewhat difficult to break through between my own scientific perspective of these insects and the local cultural perspective of the caterpillars. They were afraid of starting to experiment with them, they feared they would be punished by the spirits (the caterpillars are protected by strong spirits).

As you see from my mimeo, I was not interested in the management of these caterpillars only due to their importance as food but also due to their favourable impact on woodland

Caterpillar Research Very little is known about the ecology of the edible caterpillars. More basic studies are definitely necessary to determine if the potential is as promising as it seems. So far, the caterpillars have been totally neglected by the foresters and agriculturists who have	management since they created the incentive for people to burn early and thereby enhance woodland regeneration...
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Book Review <i>Les Insectes comme Aliments de l'Homme.</i> [Insects as Food for Man.] Tango Muyay. CEEBA Publications Série II Vol. 69, 1981, Bandundu, Zaire, 177 pp. Review by Dan Turk.¹ Tango Muyay describes the 50+ species of insects eaten by the Yansi, a group of people living in an area of central Zaire stretching approximately 200 km southeast from the city of Bandundu. It is the first detailed account of the insects consumed in this area. The area comprises parts of what used to be Banningville and Kikwit territories, where Gomez <i>et al.</i> (1961, p. 728) reported annual protein production from insects to be 10,426 kg and 259,069 kg respectively, accounting respectively for 3% and 60% of total animal protein production. Aided by his mother and wife, Tango Muyay spent over a year gathering information about each species' life and habits, and their roles in Yansi diet and culture. As rationale for undertaking the study, he quotes from two entomology books that fail to recognize the importance of insects as food. <i>Les Insectes comme Aliments de l'Homme</i> is a valuable contribution toward setting the record straight. In the introduction, the author discusses the importance of edible insects to the Yansi, methods used for conserving insects, and the commercial importance of caterpillars. That the Yansi recognize the nutritional value of insects is illustrated by an old Yansi saying: "caterpillars and meat play the same role in the human body" (p. 9). The author emphasizes that unlike large game animals, insects are easy to catch and readily available throughout the year. Hence the saying: "As food, caterpillars are regulars in the village but meat is a stranger" (p. 10). A table (p. 28) lists many of the species available each month. The main season is December-January. Several methods are described for conserving insects (p. 11). Some species are preserved alive for weeks or even months. "Mimpoo,, caterpillars are placed in the thatch roofs of houses where they make their "nests" and can be kept alive for up to 6 months. Beetle larvae are sometimes kept in pots where they fatten on manioc flour for 3 or 4 weeks. Three species of caterpillars ("misa," "inkukabi," and "mindan") are sometimes taken from the forest at a young age to be raised on village trees to maturity. "Nseol" palm grubs can be kept alive in oil where they grow fatter and fatter until ready to be eaten several weeks later. Beetle larvae, grasshoppers, black crickets, termites, and many caterpillars are dried in the sun, then over a fire for long-term preservation. Drying in this manner appears to be the preferred method for preparing insects for sale to commercial vendors. The author warns that poorly-preserved caterpillars are subject to attack by maggots (p. 12). In preserving insects or preparing them for direct consumption, the intestines of species with a lot of excrement are first purged. Species without excrement are highly esteemed (p. 21).	Tango Muyay emphasizes the increasing importance of insects in commerce, particularly the contribution of certain caterpillar species. One of the species for sale in the Bandundu market in January 1981, "mingwel", was purchased from merchants in Kikwit, over 250 km to the southeast (pp. 12-13). Tango Muyay reports that "mingwel" come from the Tshokwe and that the original Yaka and Mbala name for this species is "mangolu" (p. 34). It is interesting to note that Leleup and Daems (1969) report that "mangolo" is the name used for two similar caterpillars exported from the Kwango district which lies to the south and west of Kikwit. The form that matures in September is <i>Cirina forda</i> (Attacidae = Saturniidae) which feeds on <i>Erythrophleum africanum</i>. Tango Muyay relates that in years gone by the ancestors walked "for days and days to go collect mingwel in Yaka territory" (p. 34). The author notes that some of the species described in this book have relatively recently become adopted into Yansi cuisine due to the influence of their neighbors the Mbala (p. 13). Included in this category are "makul" larvae, "kebamwe" beetles, and a number of grasshoppers (p. 147). The main part of the book is a species by species description of the insects eaten by the Yansi, divided into separate chapters on caterpillars, larvae, adult beetles, crickets, grasshoppers, aquatic insects, and termites. The author provides a wide range of information related to each species' use as food, including notes on food plants, behavior, abundance, and periods of availability. Considerable attention is devoted to how and by whom each species is collected, cooked and consumed. Carefully recorded songs (a total of 70), stories, and sayings illustrate the importance of each species within Yansi culture. Songs and sayings are recorded in the Yansi language, accompanied by a French translation and explanation. Line drawings are provided for most species. Unfortunately no scientific names are included. Over three-fifths of the book is devoted to caterpillars; approximately 33 species are described. Tango Muyay reports that most caterpillar species feed on one or more species of trees and shrubs, a few feed on grasses, and one each on a fern and on a couple of species of palm trees. In contrast to other peoples in Africa who base the names of edible caterpillars on the names of their specific host plants (Malaisse and Parent, 1980; Silow, 1976), the Yansi often refer to trees by the caterpillars that feed on them. For example, the tree that the "musa" caterpillar feeds on is called "muthe musa" (p. 19). For the most part caterpillars are collected by women and children. Men participate when trees are too tall for women and children to climb. However, men are beginning to harvest caterpillars for sale in cities. In 1981 over 20 men supplied Bandundu with 2 or 3 sacks of caterpillars per month, transporting them by bicycle from the villages into town (p. 12). SEE BOOK REVIEW, p. 6.
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Book Review (from page 5) Tango Muyay emphasizes the importance of caterpillars in the diets of children. In at least eight species descriptions he mentions that most of the caterpillars are either specifically reserved for children or eaten mostly by them. He notes that caterpillars that are not abundant are preferentially given to	Tango Muyay reports that adult beetles are very important to the Yansi. Four types are described: "kial", "kwer", "kebamwe", and "bensim" (pp. 120-135). Kial, which appear to be <i>Augosoma</i> sp. (drawing p. 109), are described as well-liked. They appear in the dry season and can be collected around street lights or by cutting down a particular vine to which they are attracted. A palm wine collector is
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children (p. 56). That children enjoy eating caterpillars is revealed through several children's songs. For example: "Father you have to give me some "milee" caterpillars Look at all the other children with milee caterpillars that their fathers gave them I'm going to bother you until you give me some" (p. 57). The major method employed by the Yansi to insure an abundant supply of edible caterpillars appears to be the regulation of the onset of harvest through the use of a fetish called "kehal" (pp. 24, 76). When the chief notices young caterpillars of important species beginning to develop, he places the kehal in the forest where they are found. No one is allowed to harvest the caterpillars until the kehal is removed when the caterpillars have reached near-maximum size. Tango Muyay reports that in cases where the kehal was violated, the chief levied heavy fines. Regulation of the start of the caterpillar season also occurs in Zambia (Holden, 1986). In some cases Yansi laws have been enacted that prohibit the cutting of tree branches as a means of harvesting caterpillars from certain species of trees (p. 73). Yansi women sometimes set fires in the savanna to promote fresh regrowth that will serve to promote an abundance of "minsweyi" caterpillars (p. 45). Other authors (Leleup and Daems, 1969; Gomez <i>et al.</i>, 1961) have likewise recognized the importance of fires in regulating edible caterpillar populations. Although many caterpillar species are described as well-liked or tasting delicious (e.g., "minsweyi" p. 44, "mimen" p. 50, "mitoon" p. 113), some edible caterpillars are not esteemed by all Yansi. Tango Muyay reports that some people eat "mibam," which taste sour, only because they are abundant and appear at a time of year when other foods are scarce (p. 73). Adults refrain from giving species with dangerous hairs ("misweswe" p. 29, "mimpoo" p. 29, and "nkool nzil" p. 111) to children. The hairs of these species must be singed off prior to cooking. Failure to do so can provoke swelling of the throat leading to death according to one story (p. 32). One caterpillar species is reported to cause headaches (p. 22). Five types of edible larvae are described (pp. 114-119). Four are beetle larvae, of which two ("makul ba" and "nseol") are associated with palm trees, one ("makul makul") with dead trees and the other ("bengweri") with swamp plants. 'Makul ba' develop into 'kebamwe' beetles which appear to be <i>rhynchophorus</i> sp. (drawing p. 109). Makul makul are described as eaten in large quantities and reported to be liked by everybody as are bengweri larvae. As with caterpillars and adult beetles, when larvae are found in small quantities, they are generally given to children. Nseol and makul makul can be detected by their characteristic odors and sounds, or by their feces. Bengweri develop into "bensiiim", adult beetles which are also eaten, mostly by children. Children also eat "bentiey," which appear to be spittlebugs (drawing p. 105).	quoted as saying "Kebamwe and their larvae are our preferred food. We also like to give them to our children because they contain a lot of protein" (p. 126). Two kinds of edible crickets are described (pp. 136-146). One is probably <i>Brachytrupes membranaceus</i> (drawings, pp. 125, 127). It has several different names, depending on the growth stage. They are found around villages and in fields. Tango Muyay reports that they are especially abundant where women have left manioc root peelings on which the crickets feed. Children dig up some young crickets; most are captured after they reach maturity in November and December and when a second generation matures in May. <i>Brachytrupes</i> crickets are captured by digging them out of their burrows with hoes, by hunting at night with lamps, and by sliding a small noose down their burrows. A woman can reportedly catch 50 to 80 crickets per day. The intestinal contents are removed prior to cooking. The other edible crickets are called "betel musir," which means black crickets. Tango Muyay reports that these are found in large quantities in the forests in February after the main caterpillar harvest is over. It is said that the droppings of the caterpillars promote the apparition of black crickets. Black crickets are captured during the day and at night. To capture the crickets at night, men first clear pathways in forests where caterpillars were abundant; women catch the crickets by hand as they feed on manioc leaves previously left along the trail. In a single night a woman can catch 300 or 400 crickets or more. When many black crickets are caught, some are preserved by smoke-drying. Traders buy them for sale in large towns. Tango Muyay reports that grasshoppers (pp. 147-150) are not an important source of food for the Yansi. Until recent times, they ate only four species. Now, however, under the influence of their neighbors the Mbala, who eat many more species of grasshoppers, the Yansi eat additional species. The new species are collected dead following savanna fires. They do not have specific names but are simply called "mpay", which means "grasshopper." The four named species are all migratory. One of them, mayaay, is no longer found in the area. Another, mieyi, has become quite rare such that some young people are no longer aware of its existence. The other two are mostly eaten by children. Tango Muyay reports that the Yansi eat four types of aquatic insects (pp. 151-158) including a waterscorpion (drawing, p. 144). Aquatic SEE BOOK REVIEW, p. 8
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The following appeared recently (March 1991) in <i>The Food Insects Newsletter</i> 4(1):7: "Walkingstick Insects - A Query: Thomas Slone (1617 Berkeley Way, Berkeley CA 94703-1237 [USA]) is trying to determine whether it's fact or fancy that there are (or were) people in Southeast Asia who feed (or fed) guava leaves to walkingsticks (Order Phasmatodea) and then eat (or ate) the walkingstick excrement. He would appreciate hearing from anyone with pertinent information." Before responding to the specific question as best I can, I would ask anybody who knows anything about eating stick-insects to let me know also! I have a fairly extensive file on the human consumption of orthopteroid insects generally, from which it is apparent that Phasmatodea do not frequently feature as articles of diet - at least not in the literature - though the practice has been known in the Far East for a considerable time. The first mention in western literature of which I am aware is an observation by one Valentinus (or Valentini, 1704), who is cited, as "Valentyn" without source or date, by Houttuyn (1766:138) as stating that the "[Oost-]Indiaanen," i.e.,	Bragg, P. 1990. Phasmida and Coleoptera as food. <i>Amateur Entomologists' Bulletin</i>, 49:157-158. [The subject is also mentioned by the same author, same year, in <i>Journal of the Derbyshire Entomological Society</i>, 100: 16.] Houttuyn, M. 1776. <i>Naturkundige Beschrijving der Insekten ...Natuurlijke Historie</i>, Amsterdam, 1 (10). Lichtenstein A.A.H. 1802. Dissertation on two Natural Genera hitherto confounded under the Name of Mantis. <i>Transactions of the Linnean Society</i>, London 6:1-39, pl. 1, 2. Mitsuhashi, J. 1984. [Edible Insects of the World] (In Japanese). Tokyo:Kokinshoin: 270 pp. Nadchauram, M. 1963. The winged stick insect <i>Eurycnema versfasciata</i> Serville (Phasmida. Phasmatidae), with special reference to its life history. <i>Malayan Nature Journal</i>, 17:33-40, pl. XIII, XIV. Redtenbacher. J. 1908. Tribus Phibalosomatini - Tribus Necrosiini. In: Brunner von Wattenwyl, K., & Redtenbacher, J., 1906-08. . <i>Inschenfamilie der Phasmiden</i>, Leipzig: 339-572, pl. XVI-XXVII. Valentini, M.D. 1704. <i>Museum Museorum, oder vollstaendige Schau=Byhne aller Mwerialien und Specereyen nebst deren natuerlichen Beschreibung ...</i> Frankfurt am Maeyn: [XXVI] + 520; [IV] + 76; [IV] + 119 +	

Malaysians, "wonneer zy" (wonder be!) ate a certain large species of stick-insect ("sodanige Insekten" - viz. "Mantis gigas") after removing legs (which were very spiny) and wings. The species involved was recognized, but incorrectly named. Its correct name at present (though there has been much confusion) would seem to be <i>Platycrana wridana</i> (Olivier, 1792). Among a number of synonyms, was the appropriate name <i>Phasma edule</i> Lichtenstein, 1796. Lichtenstein (1802:14) later cited Valentini and Houttuyn ("Malasiis pro cibo inservit") and this was carried forward (in English) by Westwood (1859:112) and then (in German) into the present century by Redtenbacher (1908:369). It was merely stated that the insects (presumably themselves and not their faeces!) were eaten as food by East Indians or Malays - nothing more. I do not recollect any other reference to the human consumption of this species, though Mitsuhashi (1984) does briefly mention that Phasmodotea (species not indicated) may be eaten. Very recently, however, Bragg (1990:157) has mentioned how, in Sarawak, the eggs of the stick-insect <i>Haanielia grayi grayi</i> (Westwood) are eaten as a delicacy by the local people - and that he himself had partaken of them. Now, to go back to the question asked, I would refer Mr. Slone to a paper by Nadchatram (1963:35-36) on the Malaysian stick-insect <i>Eurycnema versifasciata ta</i> (Audinet-Serville). Among other interesting "folkloric" observations, the author notes that Malayan Chinese believe in the healing powers of the droppings of this insect and that they rear them accordingly. It is claimed that the dried excreta mixed with herbs will cure a number of ailments, such as asthma, stomach upsets and muscular pains. A brew is also made from the droppings and drunk like tea. It is claimed that this will cleanse the body. I do not know what are the particular virtues of guava leaves.	13 pp., 16 pl. [There was also a second edition, 1714; neither yet seen in original.] Westwood, J.O. 1859. <i>Catalogue of the Orthopteran Insects in the Collection of the British Museum Part 1. Phasmidae</i>. London: iv + 195 pp., XL + 8 pl. D. Keith McE. Kevan, 20 Woodridge Crescent, Beaconsfield, Quebec, Canada, H9W 4G7 Open House at the San Francisco Insect Zoo The San Francisco Zoological Society's Insect Zoo held its 12th Annual Open House on May 18th this year. It's called "What's Bugging you? Day," and, as usual, "Edible Insects" with Norm Gershenz as chef was one of the dozen or so attractions. Visitors to the event can not only partake, which most of them do, but are given a sheet with recipes and instructions for preparation of the insects. The recipes described are Jumping Jubilee, Flying Frittata and Chocolate Chip Chirpies (using crickets and mealworms), which are excerpted and adapted from the book, <i>Entertaining With Insects</i>, by Ronald L. Taylor and Barbara J. Carter (which is unfortunately still out-of-print; see the review in the March 1989 <i>Newsletter</i>). Ms. Leslie Saul supplied information about the Open House. The trouble with a newsletter that appears only at 4-month intervals is that even though we are sometimes notified in advance of an event, it is usually over before our readers can be alerted. But you in the San Francisco area are now alerted for next year. Being a supplier of insects for this event is a good enough recommendation for the <i>Newsletter</i>. Sources used by the Insect Zoo are: Rainbow Mealworms Bassetts Cricket Ranch P.O. Box 4907 535 North Lovers Lane 126 E. Spruce Street Visalia, CA 93277 Compton, CA 90220 (800) 332-2445 (213)-635-1494
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Book Review (from page 6)

insects are eaten almost exclusively by women, who catch them mostly in small quantities while fishing or soaking manioc in streams. Following Yansi classification, Tango Muyay includes in his discussion several species of shrimps, 2 species of crabs, and a spider.

Tango Muyay explains that the Yansi word for termite, "twe," means "let's go." Yansi ancestors gave them the name in recognition of the need for quick action to catch winged termites as they precipitously leave their mounds (p. 159).

The Yansi recognize several categories of termites, corresponding to different species and castes. "Twe musiem" (pp. 159-166) are imago nymphs found in large old mounds. Tango Muyay's informer states that only women are allowed to harvest twe musiem. Mounds are suspected of containing nymphs ready to be harvested when workers can be seen reconstructing the mound. Most mounds are dug in August. To get the termites, women break the mound open with hoes. Two or three buckets-full can be collected from a single mound, weighing 10 to 15 kg each. Sometimes mounds contain less than half a bucket-full.

Tango Muyay affirms that "nymphs are so delicious. With their protein and their taste, nymphs constitute a good meal for children."

Because twe musiem are generally found in sufficient quantity to last for several meals, those that are not consumed right away are boiled in small packages. These can keep for two or three days without going bad. To keep twe musiem for longer the boiled packets are preserved by drying. Dried termites can be kept for several months. Some people sell dried twe musiem in cities.

"Twe ndeol" (pp. 166-168) are described as imagos that emerge from soil, not from tall mounds. They are collected for eating as they emerge in swarms during the rainy season. The

cooked with mushrooms or manioc leaves. According to the author, they make mushrooms and manioc leaves taste delicious.

Most of the available literature on the use of insects as food in Africa comes from non-native observers. *Les Insectes comme Aliments de l'Homme* is perhaps the most comprehensive documentation of the dietary and cultural importance of edible insects written from within that culture. It is clear from this work that the consumption of insects by the Yansi is not a vestige of the past but an integral part of Yansi culture and an important source of food in the present. Especially relevant in this regard are the increasing importance of insects in commerce, the current consumption of a number of species not eaten in the past, and th

t. 1980. Les chenilles comestibles du Shaba meridional (Zaire). *Les Naturalistes Belges* 61(1):2-24.

Silow, C.A. 1976. Edible and other insects of Mid-western Zambia.

Occ. Pap. 5. Inst. Allm. Jamforand Etnogr., Uppsala, 223 pp.

¹ About the reviewer: This fall Dan Turk, currently at the University of Hawaii, will become a Ph.D. candidate in Agroforestry at North Carolina State University. As part of his Ph.D. research, he will spend two years in *Madagascar* and will be trying to learn as much as possible about entomophagy in that country. He would be glad to hear from anyone with pertinent information. His address is 1000 Holomua Avenue, Paia, HI 96779.

Tarsal pads down, ants prefer silkworm pupae

If ants can be trusted as gourmets (they certainly show up often enough at picnics), more people should be sampling the

quantity collected is usually less than a full pot. Young men collect two ndeol for use in attracting birds which are caught with a sticky substance applied to perches arranged near the exposed termites. 'Benseami" imagos (pp. 168-173) are found in small red termite hills. They are caught in April and May, after two ndeol have finished swarming. Like two ndeol they are used to catch birds and are usually found in such small quantities that there is no need to preserve them for more than a day or two. The queen termite (p. 174) is captured when women dig two musiem. It is usually presented to one of their husbands who in turn gives it to the little children. If there is a nursing child in the family, the queen is usually reserved for him/her. Two types of soldiers are eaten (p. 174), a black type found in the forest and a brown type found in the savanna. To collect soldiers, women dig around the mound with hoes, using fire to kill the termites as they emerge to attack their assailants. Soldiers are often	delights of silkworm pupae (<i>Bombyx mori</i>). Dr. Ted Shapas recently brought it to our attention that, since 1987, the American Cyanamid Company has had a patent on the use of the pupae in insect bait products, including its Pharaoh Ant Killer. Preferred compositions range from 30-50% of dry pupae on a weight basis. When 36 bait compositions were tested experimentally, the three containing ground dry silkworm pupae were far more attractive than any of the others. The "others" included such delectables as ground krill, dried daphnia, dried shrimp, cheese, meat extract, blood meal, bone meal, corn grits, soybeans, flour and 17 formulations of fishmeal. The initial screening was on the ant <i>Monomorium pharaonis</i>, but the fantastic results held up when tested on three other species, <i>Lasis</i>,, <i>niger</i>, <i>Pheidole nodus</i> and <i>Tetraporium coespitum</i>.
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Letters

Indigenous insect treats titillate the palate of Americans abroad (but there can be exceptions).

Free-lance writer **Marge Knorr** of Reno, Nevada, writes in part: I've just returned from a trip to Mexico (I'm primarily a travel writer) where I ate roasted grasshoppers in the mercado in Oaxaca. Delicious! As I remember I paid 300 pesos (about 10 cents) for a small plastic baggie-full. Several Indian women watched me and giggled at the lady Gringo eating *chapulines*.

Thomas Slone, Berkeley, California: I tried two new insects while I was in Papua New Guinea last February: cicada and stink bug. The cicada was quite good when fried with garlic (I was the insect chef for our group). I tried one of them live, which was also good, kind of like cashew butter, but it made my throat itch later. The stink bug, I was told was a popular snack among some Papua New Guineans who would eat them live! I spit mine out; it had a very chemical taste. Cicadas are popular among the Huli people, but an Anga (a.k.a. Kukukuku) friend of mine said that Anga do not eat them because they "talk," though he enjoyed eating them with us Americans.... Also, I'm considering throwing a public fried cricket party using Fluker's Cajuns.

William Campbell Douglas, M.D., of Clayton, Georgia, wrote in part: I would like to subscribe to your *Food Insects Newsletter*. I have an AIDS clinic in Uganda and am familiar with a few choice bugs there such as the termites (delicious roasted) and the grasshoppers - a real delicacy. Uganda desperately needs foreign currency and I have considered importing a few billion insects to help Out. Do you think the time is right?

Late Flash! New Product! Tequila-flavored lollipops containing beetle larvae are being sold at Mexican restaurants around the country. Thanks to Tom Slone of Berkeley for sounding the alert.

A sample sent by the company to *Newsletter* headquarters failed to arrive before press time, so everyone will have to do their own taste testing. Call 1-800-EAT-WORM or write Hot Lix, 179 Palmeroy, Pismo Beach, CA 93449.

Invertebrates account for 90% of the animal biomass of our planet and 95% of all animal species. They drive the world's biological systems. **E.O. Wilson (Harvard University) and The Xerxes Society.**

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Recent Technical Paper

Ramos-Elorduy, Julieta, and Jose M. Pino Moreno. 1990. Contenido calorico de algunos insectos comestibles de Mexico (Caloric content of some edible insects of Mexico). *Rev. Soc. Quim. Mex.* 34(2):56-68. Instituto de Biologia, UNAM, Apdo. Postal 70:153, Mexico, C.P. 04510.

Data from proximate analyses were used to calculate the energy value of 94 of the insect species used as food in Mexico. Caloric values ranged (dry weight basis) from 2827 kcal/kg (1000 g) to 7769 kcal/kg. Caloric values were generally higher for immature stages (eggs, larvae, pupae) than for adult insects.

Excluding pork, which is very high in fat, soybeans at 4660 kcal/kg was the highest ranking non-insect Mexican food, plant or animal. Maize (corn) had a caloric value of 3700 kcal/kg. Of the 94 insect species analyzed, 50% had a higher caloric value than soybeans, 87% were higher than corn; 63% were higher than beef, 70% were higher than fish, lentiles and beans, and 95% were higher than wheat, rye or teosintle.

The five highest Lepidoptera (caterpillars)(of 16 species examined) averaged 6594 kcal/kg; the five highest coleoptera (beetle grubs)(of 17 species examined) averaged 5964 kcal/kg; the five highest Hemiptera (mixed nymphs and adults)(of 14

examined) all were ants (samples varied from adults to mixtures of immatures) and averaged 5361 kcal/kg; while the five highest Orthoptera (grasshopper nymphs and adults)(of 20 species examined) averaged 4168 kcal/kg.

In attempting to develop food self-sufficiency in populations suffering from protein-calorie malnutrition, obviously, from this and similar studies elsewhere, insects constitute a rich source of calories and protein that warrants a serious look from agricultural officialdom.

GRD

Second Annual Insect Horror Film Festival coming up at Ames, Iowa

Robin Pruisner, President of the Undergraduate Entomology Club at Iowa State University sends along the information that the Second Annual Extravaganza is planned for September 6th and 7th. See the November 1990 *Newsletter* for details of the very successful event held last year. This year, there will be a large display dealing with insects and human consumption and focusing on the nutritional value of insects. According to Robin, they are also looking for more recipes.

species examined) averaged 5646 kcal/kg; the five highest
Hymenoptera (of 24 species