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THE FOOD INSECTS NEWSLETTER

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Beekeeping, Caterpillars, Agriculture and Conservation in Malawi

A recent study

Munthali, Simon M.; Mughogho, Daniel E.C. 1992. Economic incentives for conservation: bee-keeping and Saturniidae caterpillar utilization by rural communities. *Biodiversity and Conservation* 1:143-154. Department of National Parks and Wildlife, PO Box 3013 1, Lilongwe, 3 Malawi, and Kasungu National Park, PO Box 43, Kasungu, Malawi.

This study is recommended reading for anyone concerned with agriculture, rural incomes and conservation in Africa. The authors' summary is as follows:

The economic viability of the wildlife based enterprises (bee-keeping and caterpillar utilization) in Malawi is discussed in relation to conventional agricultural enterprises (maize, beans and ground-nuts). A strong incentive emerges for rural people to adopt wildlife management as an adjunct to subsistence agriculture, and therefore, to promote conservation of natural ecosystems and wildlife habitats in the face of growing human population and demand for land. Dependence on agriculture has depleted the wildlife resource outside protected areas and has been less effective in improving the wealth and living standards of most rural people. This study illustrates that the Malawi Department of National Parks and Wildlife needs to introduce economic incentives that integrate biological conservation with economic development for the rural people. The management programme involves the adoption of a rotation burning policy that

promotes vegetation coppicing, eases harvesting and promotes high caterpillar yields.

The study was conducted in Kasungu National Park (2316 km²) and 16 human settlements adjacent to its eastern boundary. These settlements are populated mainly by families and their descendants who were resettled outside the Park when it was established in 1930. Park vegetation consists mainly of *Brachystegia/Julbernardia* woodland with short to medium grass cover. Soils are of low quality. There is a good diversity of wildlife ranging from elephants to two emperor moth (Saturniidae) species, *Gonimbrasia belina* (L.) and *Gynanisa maia* (L.) which occur abundantly, the larvae being in season from about mid-October to December every year. Fire is used extensively as a management tool with the following regimes each accounting for one-third of the Park: early annual burn (June/July), late annual burn (September/October), and no annual burn.

The authors state that extensive agriculture is the main cause of the rapid dwindling of Malawi's rich biodiversity, even though 22% of its total area (compared to a world average of 3%) is legally protected as national parks, wildlife and forest reserves. Land adjacent to the Park is mainly occupied by smallholder farmers (50%) and tobacco estates (26%), with the remaining 24% in forest reserves, graveyards and leeway land for tobacco expansion or reserved fuel-wood for curing tobacco. Tobacco is the main cash crop and estates occupy several thousand hectares. Smallholder

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Ants Used as Food and Medicine in China

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Ants are well known for their complicated social organization, their altruistic behavior, and their impact on the terrestrial environment. Many published papers have reported their use as biological control agents. For example, the use of the weaver ant, *Oecophylla smaragdina*, for control of insect pests of citrus in ancient China was recorded as early as 304 A.D. in a work on regional botany, called *Nan Fang Cao Mo Zhuang* (Plants and trees of the southern region) by Ji Han. Since then the use of weaver ants, *Polyrhachis vicina*, *Oecophylla smaragdina*, and the pavement ant, *Tetramorium bicarinatum* (*T. guineense*), for plant protection in China has been referred to occasionally by entomologists (Doutt 1964; Konishi and Ito 1973; Simmonds *et al* 1976; Huang and Yang 1987; Li and Chen

1992). However, the fact that ants are commonly used as food and medicine throughout China is very poorly documented (Li and Chen 1992). This article describes the ancient and recent practice of using ants as food and of the use of ants as a medicine in treating various kinds of illnesses in China. Thus, while Berenbaum (1993) warns against eating insects that might have ingested toxins from plants, this article shows that ants may contain materials beneficial to human health as well as being a food item. Some of the situations described are not scientific, but are presented here so you might gain some insight into the use of ants in China.

Distribution and biology of the weaver ant, *Polyrhachis vicina*.

The ant primarily used as food and medicine in China is the weaver ant, *Polyrhachis vicina*, a relatively large and black creature which is widely distributed in southern China. It is also known as the black

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Malawi (from page one)

farmers average about one hectare per family and mainly grow maize, beans and groundnuts for subsistence and cash. A survey revealed that the average annual cash income of families in the sampled communities ranged from MK 80-300 for 50%, MK 301500 for 17%, and MK 501 or more for 33%. This compares with the national per capita income of about MK 425 (about US \$170).

Formerly, 100% of sampled families practiced beekeeping and utilized Saturniidae 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 was lack of year-round vegetation or "bee pasture." Caterpillars are non-existent outside the Park because of the absence of

4 in class. The authors therefore recommend a rotation burning policy that promotes both good caterpillar yield and vegetation coppicing with more stems in the 1-3 in height class. This height class has the added advantage that it puts the caterpillars within easy reach for harvesting. Cutting trees to pick caterpillars is prohibited in the Park.

Relative to beekeeping productivity, the yield of both honey and wax was found positively correlated with the hive occupation rate which ascends from years 1 through 5, then declines. Beekeeping requires modest investments in new hives and other equipment in year one and after the fifth year. Fifth year peaks in honey and wax production were 191.1 kg/ha and 15.3 kg/ha, respectively. Market price for honey and beeswax was 7 MK/kg and 6 MK/kg, respectively.

Munthali and Mughogho used gross margin analysis as a measure of each

forage tree species.

Management policies for protected areas have so far stressed nonconsumptive utilization through ecotourism and law enforcement. For neighboring rural people, however, 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 earned from ecotourism goes into the central treasury, rural people view the management policies as favoring the most affluent rather than addressing their own socioeconomic dependence on wildlife. They manifest their antagonism through illicit encroachment into protected areas. The Department of National Parks and Wildlife (DNPW) has recognized that these nonconsumptive policies and the attitudes they have spawned may critically cripple efforts in preserving the country's biodiversity. Therefore, it has started allowing the rural people to use the parks and reserves sustainably.

In 1990, the DNPW 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. In Kasungu National Park, caterpillars and honey are harvested to provide direct economic benefits to the rural communities.

It was found during the study that significantly greater yield of caterpillars was obtained from plots that were burned early every year, followed by no burn, and lowest yield from late burn. Late burning obviously is destructive to the eggs, larvae and foliage on which the caterpillars depend for food.

Yields also varied significantly with for-age tree height, with highest yield from height class 1-3 in, followed by 3-10 in and 0-1 in, and lowest yield at heights greater than 10 in. For example, dry weight caterpillar yields for the four height classes under early burn were, respectively, 9.83, 6A8, 5.81 and 4.07 kg/ha; for no burn, yields were 4.16, 2.74, 2.46 and 1.73, respectively; for late burn, they were only 2.48, 1.63, 1.47 and 1.03, respectively. The average market price for caterpillars during the study was 29 MK/kg.

The authors cite another study that protection from burning produces dense coppice growth with a high density of stems in the 0-4 in height class, while early burning produces fewer stems in the 0-

enterprise's economic efficiency, and a demonstration of the economic viability of bee-keeping and caterpillar utilization in relation to other rural enterprises. Gross margin is defined as the enterprise's output minus the variable costs associated with it, expressed in money terms. The gross margin values (MK/ha) for caterpillars was 418.47, for beekeeping 596.65, for tobacco (flue cured) 2272.00, for maize (all types) 173.95, for beans (all types) 92.00, and for groundnuts 151.40. muscaterpillars and beekeeping had more than twice to several times the gross margin values of maize, beans and ground nuts.

The wildlife-based enterprises not only produce earnings that exceed those from agriculture, but they do not directly compete for labor with the existing agricultural enterprises. When asked if they would find time to practice bee-keeping and/or harvest caterpillars even during crop season, 84% of families replied affirmatively, while 16% said they would find time only during crop off-season. Of the small-holder families in the study area, 50% run out of food stocks by November, which is, coincidentally, when caterpillars and honey are in season.

The authors conclude that "the advantages of bee-keeping and caterpillar utilization are strong incentives for the rural people to adopt wildlife management as an adjunct to conventional subsistence agriculture, and therefore, promote conservation of natural ecosystems and wildlife habitats in the face of growing human population and demand for land." Because the local people's negative attitudes stem from their removal from the Park and their denied access to protected wildlife resources, Munthali and Mughogho believe that the utilization of honey and caterpillars by the rural people in the Park 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 traditional land use practices."

(Ed.: For more reading on caterpillars and forest conservation in Africa, see the July 1991 Newsletter.)

A Swarm of Tasty Treats

by Kevin Krajick

Food: Industrial-scale cultivation of beetles, water bugs and other edible insects might (gulp) help tame worldwide hunger and malnutrition.

It was May, and time for the annual ant harvest in Barichara. Juan Gonzalez, a 24-year-old day laborer, headed for the arid, red-dirt hillsides near the small central Colombian town to scoop up fat, inch-long queens by the bucketful as they swarmed out of their holes to mate. Later he would strip the *hormigas culonas* (big-assed ants) of wings and legs, fry them in oil and salt, and sell them—a sort of rich, acrid popcorn with eyes. "You make good money," he says, "and the ants are tasty."

Food with more than four legs is just part of home cooking in rural Africa, Asia, the Middle East and Latin America. In Mexico, where many Indian tongues include no separate word for insect, people consume at least 308 species. The Thais fix a zesty hot-pepper sauce with ground-up water bugs. In Cameroon a dish for special guests is palm grubs with salt, pepper and onion, cooked slowly inside a coconut. The Nepalese squeeze live bee larvae through cloth and fry the resulting liquid like scrambled eggs. You don't want to know what folks in Venezuela do with giant tarantulas.

But entomophagy has never gained global acceptance, partly because ancient hunter-gatherer methods limit harvests, and because the only insect most Westerners eat is the accidental fly in the mashed potatoes. Now a growing number of scientists and businessmen want to make insects a main course for the masses, using industrial-scale cultivation. According to recent studies by Third World entomologists, this most plentiful of creatures - rich in nutrition and agricultural potential - could substantially cut malnutrition in poor countries. "This resource has hardly been exploited," says Gene DeFoliart, a University of Wisconsin entomologist and editor of *The Food Insects Newsletter*. "Once insects gain the respectability they deserve, they could really take off."

This study of edible insects is a growing specialty: African and Asian

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livestock can't digest, such as wood and manure. Crickets may be smaller than cows, but they convert plants into biomass five times faster.

Researchers can claim some early successes. Faced with shortages of agave worms, an expensive delicacy, scientists at Mexico's National Autonomous University recently increased per-acre yields 20 times over by raising them on plants the creatures do not eat in the wild. They have also boosted crops of ant larvae and "Mexican caviar" (water-bug eggs). University entomologist Julieta Ramos says campesinos could use the new methods not only to feed themselves but to earn cash from rich countries like Japan, which imports the agave worms. Nutritionists are experimenting with insect-fortified tortilla flours and talking up insect cuisine.

They must fight Western acculturation ("People want to eat what they see on TV," says Ramos) as well as crop farmers. Pesticides and clearing of forests have reduced many species. But some farmers are finding they can protect crops - and boost profits - by collecting insects, not spraying them. Pesticides once devastated South Korean *metdugi*, edible rice-field grasshoppers, but some farmers stopped spraying in 1989 in order to grow organic rice; now *metdugi* are surging and farmers sell them at good prices. Entomologists say that low-tech bug catchers, like light traps and tractor-hauled vacuums now used to remove pests from some organic crops, could easily be adapted to increase insect yields.

Insect cultivation may also help the environment. Scientists in Colombia, El Salvador and China are feeding pollutants such as coffee pulp and livestock manure to beetles and flies, whose larvae provide cheap, high-protein feed for livestock and fish. "We can get rid of more serious contaminants and make meat more affordable at the same time," says Jose J. Castro, a Bogota biologist who is doing some of the experiments.

In the squeamish West, entomophagy is still largely a matter of fad. Riding a

researchers are documenting insects' role in human diets and pushing governments to promote them. Analyses of Mexican and African food species show that some contain 60 or 70 percent protein, carry more calories than soybeans or meat and offer vitamins and minerals lacking in plant-dominated Third World diets. Insects comprise as much as two thirds of the animal protein eaten in parts of southern Africa. Says John Lupien, director of the U.N. Food and Agriculture Organization's Food Policy and Nutrition Division, "If we could find ways to increase intake, it might solve a lot of nutrition problems."

Fantastic yield: Supplies are unpredictable, though. Most species must be gathered wild and are hard to capture. A swarm of African locusts weighs 30,000 tons: 'Just think if you could catch them all,' says DeFoliart. "By studying how to breed insects," says University of Wisconsin entomologist Richard Lindroth, "we could achieve the fantastic yield increases we've seen with hybrid plants." Many insects grow more efficiently than mammals - often on materials that

new fascination with native food, Australian restaurants are serving Aborigine tasties like grilled index-finger-size witchetty grubs. The Dong Shan Restaurant in Guangzhou, China, sports fancy creations like fried silkworm with cashews and scorpion fermented with 100 flowers. This month the San Francisco Zoo plans an insect cook-off with celebrity chefs, but perhaps the only U.S. eatery regularly serving insects is Washington, D.C.'s Insect Club, which successfully put its *raison d'être* on the menu in March: chef Mark Nevin is now buying 25,000 live crickets and mealworms from a California grower each week.

Protein factory: Part of Nevin's success may be that most of his six-legged victims ("euthanized" by freezing) are ground up with other

SEE TASTY TREATS, P. 4

Recent Technical Papers

Parajulee, M.N.; DeFoliart, G.R.; Hogg, D.B. 1993. Model for use in mass-production of *Achetadomesticus* (*Orthoptem Gryllidae*) as food. *J. Econ. Entomol.* 86(5):1424-1428. Department of Entomology, University of Wisconsin, Madison, WI 53706.

Authors' Abstract A production model was developed that simulates the harvest of a predetermined number of eggs of house cricket, *Achetadomesticus* (L.), per day by regulating the numbers and ages of adults in the breeding colony. With a discard age of 24 d, the production model predicted a sustainable harvest of 4000 (4440) and 6000 (6660) crickets per day when four or six pairs, respectively, of newly emerged adults were added per day to an initial breeding colony of 50 pairs. Natality was based on the number of nymphs surviving to 7 d per surviving female, after which little nymphal mortality occurred. Ovipositional surface area available was not a limiting factor in egg production.

This research was done relative to a mass rearing system being developed at the time by the authors. The system was designed to

harvest 6000 crickets per day, but is expandable depending on the daily production desired. Previously, it had been difficult to seed rearing cages with the proper number of eggs per day without daily sorting and counting of thousands of eggs from the oviposition medium.

Glofcheskie, B.D.; Surgeoner, G.A. 1993. Efficacy of Muscovy ducks as an adjunct for house fly (Diptera: Muscidae) control in swine and dairy operations. *J. Econ. Entomol.* 86(6):1686-1692. Department of Environmental Biology, University of Guelph, Guelph, Ont., Canada N1G 2W1.

Authors' Abstract Field studies were conducted using Muscovy ducks, *Cairina moschata* L., to control house flies, *Musca domestica* L. in swine and dairy facilities. In fly-proofed pens, one Muscovy duck per pen reduced the adult fly numbers by 96.8% when compared with pens without a duck. The maggot population was reduced by 98.7% when compared with pens without a duck. In an enclosed calf room, fly populations on animals were reduced by 84 and 93% when compared with the times when ducks were not present. However, in open areas of the dairy facility which

allowed for immigration and emigration of house flies, statistically significant reductions were not observed. Ducks reduced fly populations on animals by 91% in an enclosed swine farrowing room. In an open dry sow facility, ducks reduced the house fly population by up to 86%. Female ducks consumed house flies up to three times faster than the males. During most experiments, duck health was maintained without any supplementary feedings. Ducks had access to flies, water, and spilled (wasted) feed. On conclusion of the studies, the least valuable ducks were sold for twice the invested cost (\$2 cost versus \$4 sale) yielding a 100% return on investment. Farmer acceptability was good.

This follows an earlier study by these authors on house fly control with Muscovy ducks (see summary in November 1990 *Newsletter*). It is emphasized that the use of ducks must be considered a supplement to good sanitation. In addition to the profit realized when the ducks were sold at the end of the season, cooperators saved \$100-\$300 by not having to purchase chemicals. The authors note that all of the cooperators indicated that they would use ducks in the following season.

New Book Notice

Poultry Feed from Waste: Processing and Use. Edited by A.R. El Boushy (Poultry Nutrition) and A.F.B. van der Poel (Feed Science and Technology, Dept. of Animal Nutrition, Agricultural University, Wageningen, The Netherlands), Chapman & Hall (2-6 Boundary Row, London, SE1 8HN, U.K. Telephone: 071865 0066; Fax: 071-522 9623). April 1994, 448 pp., 85 illus., £95.00 + shipping.

This is a textbook based on the use of some neglected vegetable and animal wastes as a poultry feedstuff. The contents include a section on Dried Poultry Waste: biological conversion of layer manure by means of house fly larvae, earthworms, aerobic fermentation, oxidation ditch and algae. The authors emphasize the following points: 1. Minimizing the competition between humankind and poultry on grains and soybeans. It means using the waste by-products instead of cereal grains like maize, wheat and of pulses such as soybeans. The latter products can be used in human nutrition, when needed in developing countries. 2. Producing cheap animal protein (eggs and poultry meat) as a food in the developing countries where there is a great shortage and low income. 3. Reducing pollution of the environment by recycling wastes such as poultry manure and industrial agricultural wastes from potato, citrus, wine, beer, apples, tannery waste, slaughter waste, etc. 4. Creation of new industries and reducing unemployment rate. 5. Lowering the imports of feedstuffs with unavailable foreign currency and recycling the local waste. 6. Stimulating the exchange of knowledge and know-how of the technology of waste processing and its use as a feedstuff in the nutrition of poultry in the developing countries. 7. The developing funds may be delivered to the developing countries in a form of machineries to use in the processing of their wastes.

Tasty Treats (from page three)

ingredients into comforting dishes like wontons, veggie burgers and chocolate desserts. Robert Kok, an agricultural engineer at McGill University in Montreal, has taken the idea to its logical end; he wants to build a factory to raise insects in "true industrial quantities" 10,000 tons a day - for processing into familiar forms, say simulated hamburger or chicken breast. Kok says that in the crowded, hungry planet of the future, 100 huge factories could supply much of the world's protein, replacing mammalian livestock. Using a scaled-down model, he's started small: a tent-caterpillar meat loaf, a few flour-beetle hot dogs--"every bit as bad as the real ones," he claims.

Will sausages someday be made from bugs, while cows are listed as contaminants? Attitudes will need adjusting. Dama Dufour, a University of Colorado anthropologist who has eaten grubs and termites with the Tukanano Indians in the northwest Amazon, says her hosts retched when she mentioned the insane idea of cow's milk. "To them, it's a secretion from an animal it's like drinking saliva," she says. She has a point; it depends on what you're used to. One hopes that if we do adapt to eating insects, it won't be because we are starving - but because we've discovered they taste good.

From newspapers here, there and everywhere chronologically

Papua New Guinea Post-Courier, July 30, 1993 (Reuter). By Anton Ferreira. Sent in by Tom Slone, Berkeley, California.

Jan Crafford popped a locust into his mouth and extolled the virtues of the insect lightly fried in olive oil with just a hint of crushed garlic. ... The occasion was a cocktail party for delegates to a meeting of the South African Entomological Society. The snacks, appropriately, were four kinds of insects. Latecomers missed out on the apparently irresistible stinkbugs and termites, but only small dents were made in the piles of locusts and mopanie worms. "Just pop the heads off like this," an insect expert explained, expertly decapitating a mopanie worm before placing it in his mouth. "With the locusts, you just eat the abdomen

As the evening wore on, and with regular cleansing of the palate with beer, the mopanie worms took on the addictive properties of peanuts. Especially after being dipped in sour cream. Unfortunately the locust bellies tasted like locust bellies throughout the evening. "The bigger locusts are better," said Marcus Byrne, mastermind of the bug banquet.... My favourite way of cooking them is with garlic butter and peri peri sauce." Byrne said the serious message was to educate people on the importance of insects [and] that "they are themselves an important food source." Mopanie worms ... are widely eaten by Africa's peasant communities, usually after being dried. "Stinkbills are a delicacy in Natal," said Crafford. "The chemical which gives them their name is quite harmless and actually tastes like coriander." He said "Some black communities obtain 80 percent of their protein from insects."

Crafford is researching the role in insects in the diet and folk lore of the Venda tribe in northern South Africa. "It's a pity there's a psychological resistance to eating insects," said Crafford, who is gathering material for a South African Gourmet Insect Cook Book. "In fact they're closely related to prawns and crayfish." His favorite insect dish is mopanie worms with tomato and onion sauce.

(Ed.: The mopanie worm is the larva of *Gonimbrasia belina*, one of the giant silk moths or Emperor moths (Lepidoptera: Saturniidae). The stinkbug eaten in S. Africa, and also in Zimbabwe, is *Euchosternum delegorguei* (Hemiptera: Pentatomidae). Several species of termites and locusts are eaten in S. Africa, but the brown locust, *Locustana pardalina*, is probably the major locust species of food interest.

The Baltimore Sun, September 5, 1993. By Happy Eater columnist Rob Kasper. Sent in by Will Werley, Stevenson, Maryland.

It happened at the state fair ... I swallowed sauteed crickets served during a demonstration at the Maryland State Fair on the fairgrounds in Timonium. The crickets tasted like onions, which is what they had been cooked with. I ate several. They were OK. But I didn't run home and say "Honey, we gotta have crickets tonight." ... I was encouraged to eat the crickets by Linda Scott and Gaye Williams. They work in the plant-industry and pest-management division of Mary-

land's Department of Agriculture in Annapolis Ms. Scott said she and her colleagues periodically saute the crickets and attempt to feed them to school kids and other eaters. They do this, they said, to show that insects have a variety of uses. Insects, they said, are an excellent source of protein, and are a major part of the diet of residents of many countries.

[Kasper uses several paragraphs to describe reactions of two samplers, one good, one bad.] [The crickets] "cost about \$14 for 500 crickets." To give them a distinctive flavor, the crickets had been fed apple slices. After a few days the apple-fed crickets were frozen ... They were then baked on thick cookie sheets for half an hour in a 350-degree oven. Finally they were sauteed in a frying pan with butter and chopped onions.

This year was the first time crickets had been served at the state fair. After Tuesday's demonstration and attempted giveaways, there were a lot of leftovers. It seemed uncertain whether the cricket cooking experiment would be repeated at next year's state fair.

Wisconsin State Journal, September 29, 1993 (AP).

This short item, datelined Ames, Iowa, notes that the Iowa State University Entomology Club will again be offering unorthodox fare at its annual Insect Horror Film Festival October 6-9. Fairgoers can sample banana worm bread or chocolate chirpie chip cookies. The worm bread is described as a traditional banana bread with dryroasted army worms substituted for the nuts. Roasted crickets are added to the chirpie cookies.

The Wall Street Journal, October 29, 1993. By Miriam Jordan. Sent in by Jennifer Henderson, Chicago, Illinois.

This article, datelined Chiang Mai, Thailand, is about the Kaithong Restaurant which touts itself as a purveyor of "authentic jungle food." For the famished, there's the house favorite, a "mixed jungle steak" of three meats - cobra, python and croc -with a heap of steaming corkscrew-shaped bamboo worms on the side. The menu also lists mountain frog, ground lizard and soft-shelled turtle, in curry, stewed in lemon-grass soup or simply fried. "Some days we get so many people, there aren't enough seats," says manager Sayan Uphaphar. "Most are Americans, Europeans, Chinese and Japanese. Only 5% are Thais." The Thais, he says, like their cobra local-style, sizzling with garlic and pepper.

(Ed.: We keep hearing about "bamboo worms" in Thailand and China. I think it is probably alepidopteran, but am not sure. Anyone know the identity?)

The Globe and Mail (Canada), November 10, 1993. By Margo Pfeiff and Jim Hutchison. Sent in by Dr. Yves Prevost, Thunder Bay, Ontario.

This nearly full-page article is subtitled: Australia/Snubbing their noses at traditional fare, Aussies are discovering the joys of 'bush tucker' or bush food. Or throwing another grub on the barbie. We've extracted a few paragraphs:

SEE NEWSPAPERS, P. 10

Letters

Canadian entomologists and public alike gobbling up those insects

From Dr. Yves Prevost of Lakehead University, Ontario, in part:

This is to report on our insect tasting at the Entomological Societies' meetings in Sault Ste. Marie, Ontario. Enclosed find two newspaper articles and a menu of insects served.

When more than 200 entomologists from Canada, USA and England get together with wine, cheese and insect snacks, the hall buzzes with anticipation, nervousness and accomplishment. Yes, at the Icebreaker of the Annual Joint Meeting of the Entomological Societies of Canada and Ontario [at the Waterlower Inn, week beginning September 19, 1993], my graduate students and I offered Spicy silkworm bisque, Tenebrio balls, Cricket newburg, and Waxworm popcorn. The majority of entomologists and guests tried at least one dish. Then there were those who could not get enough.

The best dishes were the "Tenebrio balls and the Cricket newburg [Ed. See recipe for Tenebrio balls] ... The waxworms and Tenebrio were also

(Ed.: The exhibition on edible insects ran from February 4-20 with the free treats offered on weekends only. The *Institut de tourisme et d'hôtellerie du Québec* prepared more than 60,000 crunchy, tasty tidbits for those weekends. On Sunday, February 6, the Insectarium marked its fourth birthday by offering visitors a free slice of birthday cake - "made from mealworm flour, naturally!" The menu was very much international in flavor.)

Menu	
<i>Hors d'oeuvres</i>	
Mealworm canapes	
A light, savoury spread	
Crickets Rumaki	
Marinated crickets and chestnuts, wrapped in a slice of bacon	
Crunchy migratory locusts	
A light entree with a Mexican flavor	
<i>Main course</i>	

delicious raw (live) . . . Some even tried live crickets... Since the event my phone has not stopped ringing for interviews and advice on how to cook insects. Apparently other groups want to use insects as part of their snack items at wine and cheeses.

Insect recipes have hit the air waves in Canada. I have been invited as a regular feature on a national radio program on CBC called *Basic Black* It airs in Canada from 10:00 to 11:30 a.m. Saturday mornings.

Tenebrio Balls

	1/8 teaspoon red pepper
1 beaten egg	6 tablespoons cornstarch
2 minced garlic cloves	1 cup finely-ground mealworms
tablespoons minced onion	vegetable oil
1 teaspoon salt	flour

sauces

Methods --- Combine eggs, garlic, onion, salt, pepper and cornstarch. Add ground mealworms and mix until smooth. Flour your hands and shape one-inch balls from the mixture. Heat oil to 3750 and saute until golden. Place balls on napkin, spear with a toothpick and offer to guests with dipping sauces.

From **Marjolaine Giroux**, Montreal Insectarium, in part:

Enclosed please find some information about the event CROQUEINSECTES 1994. We are very happy because we had a good response from the public which seems to be interested in entomophagy.

Also, I want to thank you for the advance notice given in the *Food Insects Newsletter*. I received a lot of letters from people of different countries....

Bakuti

Bee larvae, Nepalese style
Chien tam con -- Fried silkworm pupae
A delicacy brought to us straight from China
Chitoum stew
Shea butter tree worms in tomato sauce, an African specialty

Desserts (extra charge)

Healthy mealworm cookies
Chocolate-covered crickets
Mealworm lollipops

Newsletter gets very nice compliment from reader

Roger Grande, Jamaica Plain, Massachusetts, wrote in part:

Thanks for continuing to send me your terrific publication.... Whereas I do not have a background in science, my interest in your publication lies primarily in its subtle anti-colonialist theme. That colonialism is so complete as to destroy fundamental elements of indigenous peoples' cultures, including diet, is, unfortunately, all too often omitted from political writings.... I find in your newsletter a splendid (and unconventional) respect for cultural diversity, without, of course, any sectarian axes to grind.

Attention, stamp collectors!

From **Mark Rose**, 9037 Palatine Ave. N., Seattle, Washington, 98103, in part:

On another matter, I write a monthly column on Africa and its postage stamps for the magazine *Global Stamp News*. For some time, I have been thinking about devoting a column to the edible insects, and perhaps insects in general, that appear on many of Africa's stamps. While I either possess or can obtain the stamps without difficulty, I was wondering if any of the membership had undertaken a stamp collection with this theme, and if they would be willing to share their collecting story with the readers of *GSN*. Just a thought.

PCV gets first taste of termites in Kenya

From **Mark Mankowski**, Shimba Hills, in part:

I am a Peace Corps volunteer doing agroforestry in Kenya. I also hold an M.Sc. in Entomology from Oregon State University. Two months ago was delighted to taste my first-roasted termites in Wundanyi, Kenya. The Taita people there collect the large- flying alates (called KumbiKumbi in Swahili) and fry them over a fire. The taste was like greasy-burnt popcorn but wasn't bad at all.

Since I am interested in insects as a food source, I'm requesting a subscription to your newsletter I look forward to receiving it and possibly giving any input on related topics when and if I can.

They eat insects in New Zealand, too

From **Dr. John Edwards**, Zoology Department, University of Washington, Seattle:

As along-time entomophage, I was pleased to find your publication. I did my Masters in New Zealand on a cerambycid whose delicious larvae were a favorite of mine, and were prized by the Maori in pre-European times.

(Ed.: Dr. Edwards didn't mention species, but this is presumably *Prionoplus reticularis* (Wh.), which was prized by the Maori and also is the largest of all New Zealand beetles, the adults measuring up to 2 inches in length and the larvae to more than 2 1/2 inches.)

More about naturally protein-fortified guava juice

In response to a question in the Letters section of the November 1993 *Newsletter*, **Dr. Ed Dresner**, Vernon, Connecticut, wrote in Part:

My very strong guess is the larvae in the cited letter are Trypetids. In Hawaii and much of the Far East, *Dacus dorsalis* gets the nod. In Central America the genus is probably *Anastrepha* or the Medfly, *Ceratitis capitata*.

from are usually well along on planning their project, and have a good idea of the specific resources needed, and they think big!)

Soman Chainani, Key Biscayne, Florida, wrote in part: I am a 14-year old student at Gulliver Preparatory School in Miami, Florida. Your work on the consumption of bugs has triggered my interest as I head toward the selection of a science project to enter in the National Science and Engineering Fair. I plan to test alternative food sources found in the natural environment that may prove as a secondary choice to unhealthy modern meals. If taken one step further, the success of this project may be used to further research on world hunger, where the land may be used as a source to receive the tested alternate foods.

Already planned to be tested are seaweed, algae, soybean, tempeh, Chinese vegetables, Japanese meats, etc. Your research on bugs inspired me for my final and most important sample. What we see and loath everyday may be our savior. I plan to test these alternate food sources through a calorimeter (for energy content) and in conjunction with a food laboratory (for nutritional content).

What I ask of you is some aid in completing my project Is there any way ... ?

From **Andrea Croll**, Aachen, Germany, in part: I am studying graphic design (visual communication) at the Academy of Aachen . . . For my diploma I chose the theme "Edible Insects." In developing an advertising campaign, an information folder, some packaging examples and a concept idea to introduce insect products to the German market, I would like to evoke peoples' interest and curiosity for this kind of food. To be really convincing, I will organize an insect dinner as part of my presentation For this event I am looking for

(Ed.: Who knows? We, and edible insects, may be at the dawn of a new age as the next generation gets ready to take over.)

Brazilian student looking for graduate study opportunity

From **Eraido Medeiros Costa Neto**, in part:

(Ed.: Dr. Dresner also reminded me that, in an earlier letter, he had mentioned his own guava-eating experiences when he was working on the Fruit Fly (Trypetid) Control Program in Hawaii: "When I began my work there, virtually all ripe guavas on the trees (not a cultivated or pest controlled tree) were heavily infested with larvae of the Oriental fruit fly. I, and most of my hiking companions, ate the fruits enthusiastically not discriminating because of larval infestation. My impression is the larvae made the fruit a little less tart." Now, Ed, if you could just convince the public that all these little white larvae, including codling moth, apple maggot, etc., actually improve the flavor of fruit, think of the reduction in cosmetic pesticide use!)

From the student section

(Ed.: The editor always hunkers down a little further in his chair and reads on with both anticipation and apprehension when the opening sentence of a letter says, "I am a student. . . ." The students we hear

First of all I would like to say that I read one of your papers entitled "Insects as food in indigenous populations." I appreciated it very much. Ethnobiology has played an important role in my life. Because of that I decided to study Ethnontomology in my State.

I have been studying Biology at Federal University of Alagoas since 1990. I had been monitor of Entomology for 10 months. Nowadays I am a probationer at the Natural History Museum of the same University where I have been developing research about the role played by insects in some communities of Alagoas, especially as medicine. This research is supposed to end about July, when I will be graduated.

I have professor Jose Geraldo Marques as my guider. He works with Ethnoecology. Once graduated I would like, to continue studying Ethnontomology in my post-graduation (Neto's address: Rua Marques de Tamandare, 67 Peco, Maceio-Alagoas, Brazil).

Ants as Food/Medicine (from page one)

ant, black mountain ant, and spined ant. They are easily recognized as the workers have two spines on the petiole and additional sharp spines on the thorax.

Weaver ants make carton nests on various kinds of trees and in the ground. They are polygynous, the average colony contains 24 queens. However, some colonies may contain more than 100 queens (Chen and Tang 1989a). Most of the nests are located in the sunny grassland during the winter, but they are moved to the shady woods in the hot summer. The nests are made of vegetable litter, dead insects, soil, sands, stones, and silk spun by the ant larvae (Chen and Tang 1990). Queens enter the parent nests or even neighboring nests after mating flights. While mating flights occur every year, budding is the major form of colony founding. The weaver ant is the dominant species in the forests. They forage for honeydew produced by aphids and coccids, and for various kinds of invertebrates, mostly insects. They are good biological control agents for the control of forest insect pests (Chen 1977; Wu and Huang 1986; Chen and Tang 1989b).

Ants as a health food in ancient China Insect medicines play an important role in the history of China. In *Shennong Ben Cao Jing* (Shennong Pharmacopoeia), written about 100-200 A.D., 21 species of insects were recorded as having medicinal value. The list was extended to 73 species in Li Shih-zhen's *Ben Cao Kang Mu* (Compendium Materia Medica) published in 1578, and 11 additional species were added in the *Supplement to Compendium Materia Medica* by Chao Xue-ming in 1756 (see also Chen 1990).

In ancient China ants were used as food for the nobles as well as for the common people. In the *Book of Etiquette* it is mentioned that ant eggs (pupae) were prepared as a special paste to serve the nobles. It was mentioned in *Ling Biao Lu Yi* (Wonders from South China), a book written by Lu Shun of the Tang Dynasty (869-887 A.D.), that in the southern provinces nests of large ants were hollowed out and large quantities of eggs were collected to make a caviar-like dressing. This delicacy was served at dinner to welcome honored guests. It was believed that eating ants would rejuvenate old people. Li Shihzhen, the author of *Con Wendium Materia Medica*, cited a medicinal function of the armored lizard in reducing swelling, easing pain, and in preventing inflammations. He attributed these functions to its ant eating habits. It was also recorded in Chao Xue-ming's *Supplement Compendium Materia Medica* that eating 6-10 g of ants per day could make one healthy and increase milk production in women.

Analysis of the nutritional contents of ants. Many nutrients needed by the human body are found in ants. The weaver ant contains 42-67% protein and is rich in amino acids, minerals, and vitamins (Chen 1983; Wang *et al*, 1987, see tables 1 & 2). The high concentration of zinc in these ants is beneficial for the growth and development of children. Eating ants also bolsters the human immune system although it is unclear how eating ants serves to perform this function (Wang *et al* 1987).

Ant medicines currently sold without prescription in China include an ant wine, a syrup, a paste, and a powder. These products are

formulated for personal preference. To make the mixture more palatable the ants are sometimes mixed with wine, with tea, or with selected medicinal herbs.

Medical function. The main thrust or characteristic of Chinese medicine is that it combines food and medicine. The essence of this medicine is based upon the Yingyang Theory, which is also called the white and dark equilibrium theory. When the size of the dark fish equals that of the white fish, the patient is in good health. On the other hand, when the dark fish becomes larger or smaller than the white fish, the patient will be sick. Chinese medicine is designed to maintain an equilibrium so that the fish remain about the same size. Ants, combined with other medicinal herbs, are used to increase blood circulation and metabolism. Eating ants also helps in activating or bolstering the human immune system. Ants are an ideal medicine for patients suffering from rheumatoid arthritis (Wu 1986; Guo 1987; Liu 1991). They promote the function of the thymus gland and the spleen (Wang *et al*, 1987; Zhang *et al*, 1991). The titers of Mn, Se, and Zn in the spleen, the thymus gland, and in the blood was increased, while that of Cu and Fe was decreased, after 0.5 ml of a 25% ant liquid was injected into the abdomen of white mice (Wang *et al*, 1987). It is well known that Mn plays an important role in activating some enzymes and in increasing the production of macrophages and antibodies. Se is necessary for the formation of thymus gland cells. Zn slows down aging of adults as well as preventing some kinds of malnutrition caused by a lack of zinc in children. Low Cu and Fe is good as these minerals inhibit the function of white blood cells when concentrations are high.

SEE ANTS AS FOOD/MEDICINE, P. 9

Table 1: Amino acid composition of dried weaver ants

Amino Acid	Free	Hydrolyzed
Almline	4.024	4.880
b-Alanine	1.026	-
Arginine	3.345	2.122
Aspara&e	0.266	-
Aspartic Acid	0.568	4.357
Cystine	0.328	0.308
Glycine	0.581	6.831
Glutamic Acid	3.836	6.287
Histidine	0.375	1.366
EME Histidine	4.441	-
Isoleucne	0.761	3.250
Leucine	1.000	3.905
Lysine	0.687	2.405
Hydrolyisine	0.159	-
Methionine	-	0.677
Phenyiaianine	1.824	2.309
Proline	6.471	3.558
r-Aminobutyric Acid	0.104	-
Sarcosine	0.223	-
Serine	2.157	2.718
Phosphonic Serine	2.458	-
Threonine	1.189	2.271
Tyrosine	1.031	3.816
Valine	1.793	3.868

Ants as Food/Medicine (from page eight)

Ant medicine also plays a very important role in reducing inflammations, in reducing pain, in controlling convulsions, in treating asthma, and in calming people. It lets one sleep more soundly. It is also used in treating tumors, insomnia and backbone rigidity.

Ant medicine inhibited inflammation in the ears of white mice caused by xylene treatments. The mice were given 12g/kg ant paste per day for 5 days. It also inhibited arthritis in the feet of white rats caused by treating them with formalin. The rats were fed 4g/kg ant paste per day for 5 days. It also eased asthma in guinea pigs when the animals were fed 1.6 g/kg ant paste (Zhao *et al*, 1983). Ant powder relieved pain in white mice caused by treatment with acetic acid, and it reduced the number of body twists when fed to the mice at the rate of 11.25g/kg ant powder per day for 2 days. It also relieved pain caused by electrical shock after the mice were fed 11.25g/kg ant powder per day for 4 days (Zhang *et al*, 1991).

Ant medicine plays an important role in liver protection, and it is used to treat patients suffering from chronic hepatitis. Guanosine triphosphate (high levels of GIP indicate a hepatitis infection) content decreased in white rats after feeding with 2.4g/kg ant paste per day for 5 days (Zhao *et al*, 1983). Ant medicine increased sexual performance in both male and female humans. It is also used to make the menstrual period normal and to increase the secretion of milk.

Ant medicine increased appetite of patients suffering from cancer, relieved their pain, improved their digestion and increased the number of the white blood cells to fight the cancer (Wang *et al*, 1987).

The ant medicine slows aging, at least in other insects, but possibly also in humans. It increased the longevity of adults of the vinegarfly, *Drosophila melanogaster*, by 8 days when they were fed on an artificial diet containing 0.3% of ant powder, or by 1-12 days when they were fed a diet containing 0.6% of ant powder. Ant powder also increased the wing beat frequency per minute of adult *Drosophila* (De *et al*, 1991).

Table 2: Mineral composition of entire dried weaver ants and weaver ant paste (ground dried ants to which are added medicinal herbs)

Minerals	Ant paste(%)	Ant(%)	Minerals	Ant paste(%)	Ant(%)
As	0.68000	0.80000	SC	0.00002	-0.00002
Ba	0.00062	0.00164	Se	0.00230	
Be	0.00001	0.0000	0.00130		
Co	0.68000	0.68000	Sr	0.00128	
Cr	0.00039	0.00012	0.00046		
Cu	0.00133	0.00262	Ti	0.00007	
Eu	0.00023	0.00009	0.00430		
La	0.00020		V	0.00020	
0.00012			0.00011		
Li	0.30000	0.82000	Y	0.00004	
Mn	0.09989	0.02669	0.00003		
Mo	0.00700	0.00000	Yb	0.00044	
Nb	0.00021	0.00004	0.00019		
Ni	0.00123	0.00054	Zn	0.03232	
P	0.12600	0.03996	0.01161		
			Zr	0.00004	
			0.00007		
			A1203	0.11000	0.14000
			CaO	0.59000	
			0.17000		
			Fe2O3	0.10000	0.06000
			MgO	0.49000	0.11000
			SiO1	0.00000	
			0.34000		

Evidence of slowing aging by ingesting ant medicine is presumably demonstrated by a 98-year-old man called Zhongshan Yan. He lives in red star farm in Heilongjiang province. He has excellent sight, good hearing, and is full of energy. Furthermore, he can still ride a bicycle. He said he eats ants every day, when asked by journalists about the secret of his longevity and robust health.

Ant eating is also practiced in other Asian countries. The weaverant, *Oecophylla snwragdina*, is made into a paste and eaten as a condiment in India, Burma, Malaysia, and Thailand. The venom of the tropical American ant genus *Pseudomyrmex* appears to have potential in the treatment of rheumatoid arthritis, especially for its ability to curb synovial inflammation (Gotwald 1986).

Are ants toxic to humans? Definitely not as shown by tests of varying time spans conducted on animals (Zhao *et al*, 1983, Zhang *et al*, 1991).

Public reports on ant medicines. Ants used as medicines have been reported by more than 200 newspapers and magazines. TV stations such as China Central TV Station (CCTV), Zhejiang TV Station, and Nanjing TV Station continuously report on ants used as medicines. Various radio stations also report on ants used as medicine.

The Chinese people are very enthusiastic about ants used as medicine. Chen received letters and calls almost every day from enthusiastic people asking about the medicinal function, ant-rearing methods, and recipe contents while he was an assistant professor of entomology in China.

Perspectives and potential problems. The enthusiasm of people for ant medicine is increasing each year. The amount of ants consumed is huge. It is estimated by Dr. Zhicheng Wu in Jingling Ant Therapy Center in Nanjing that at least 5000 pounds of clean ants are consumed each year. However, this consumption is viewed with some concern by scientists as the weaver ant plays an important role in the forest ecosystem. They are now being overharvested for medicine, and fast becoming endangered to the point of becoming extinct.

Methods of waring the weaverant were investigated, and the first ant breeding farm was established in Yuyao, Zhejiang province in September 1991. The farm is small and insufficient to provide the ever increasing demand for weaver ants, but it is regarded as a good beginning in the effort to wisely use the ants without depleting them.

USDA chemists are currently examining ant powder to determine if they contain prostaglandin inhibitors, a class of chemicals that essentially mimics aspirin. If so, the use of ants in treating arthritis and some of the other ailments may have some scientific foundation.

Acknowledgement

We thank Dr. Zhicheng Wu from the Jingling Ant Therapy Center in Nanjing for providing information.

SEE LITERATURE CITED, P. 10

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Newspapers (from page five)

With the explosion of interest in bush tucker, Australia bookstores now offer a wide selection of cookbooks with recipes for such dishes as Bogong moth in cream sauce, and black nightshade flan. There is even a television series called *The Bush Tucker Man* hosted by Les Hiddens, an army major who is a leading expert on edible plants.

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Zhao, Y., J. Wang, A. U, P. Xie, and S. Pan. 1983. Studies on medicinal function of the weaver ant. *Guangxi Chinese Medicine* 6(6):39-43.

"Tucker trips" are some of the most popular expeditions for both domestic and overseas tourists throughout the tropical north and in the Outback around Alice Springs. People actually pay good money to hunt and sample the notorious witchetty grub *au naturel*: eating one is a kind of down under initiation rite and tops the list for party-stopping anecdotes. [The author states that she has spent a lot of time in the Outback and sampled a lot of bush food, including raw witchetty grubs: "pleasant nutty, scrambled egg sort of flavour," but "gruesome mushy texture."]

The author describes dining at Riberries, an "Australian restaurant" in the heart of Sydney. Riberries opened in December, 1991, and now offers the country's premier Outback cuisine:

There was no way I was going to see witchetty grubs on the menu here, I told myself standing outside the door of this old 19th-century house, the tables laid with pink linen and crystal, a French chef in the kitchen. Twice.

"If we want an Australian cuisine, we need the indigenous flavours of this country. That is what makes French cuisine taste French and Thai cuisine taste Thai," says Jean-Paul Brunetcau, the French-born owner and chef as he delivers our appetizers: a half-dozen brown witchetty grubs which Brunetcau has gently barbecued. They are neatly nestled in a small coolamon, a carved wooden dish similar to those used by aboriginal women for food gathering. The ugly creatures were miraculously transformed on the grill, and gave off a hazelnut aroma, light and crispy like a small eggroll, they were delightful.

The author describes a bush tucker trip to Bathurst Island and a mangrove forest, guided by two Tiwi Islanders: To the Tiwi Islanders, mangroves are an outdoor supermarket stocked with shells, crabs, fishes and their favourite, mangrove worms. Soft-spoken and shy, elderly Mary-Margaret wields an axe with the muscle of a lumberjack, shattering fallen tree trunks in a single blow. She's barely done before everyone scrambles for a chunk of wood, drawing out and gobbling up the slippery whitish mangrove worms that have tunneled inside The mangrove worms - once I got past their appearance - tasted like fresh salty oysters on the half shell though a bit gritty with mud

"Wattle it be?" jokes Vic Cherikoff, owner of the small Wattle Seed Deli near Sydney's Chinatown. On my last day in Sydney I dropped in to see Cherikoff who supplies more than 40 restaurants across Australia with their bush tucker ... To stock his Bush Tucker Supply Company, Cherikoff pays dozens of aboriginal families across the country to gather native ingredients and encourages them to start up

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small-scale growing operations so that they can benefit from the knowledge they have shared; he himself gains about \$10,000 worth of bush tucker from "ornamental" trees and bushes throughout downtown Sydney. "We've really just begun experimenting with food from our own backyard," says Cherikoff. "There are hundreds of new flavours out there waiting to be discovered."

If you go, the authors suggest, for information and brochures contact the Australian Tourist Commission for their guide to aboriginal tours, arts and crafts. Unfortunately, no address is given. They do give the address for Cherikoff, however. Vic Cherikoff, Bush Tucker Tours, P.O. Box B 303, Boronia Park, New South Wales 211 1, Australia. Phone (02) 816-3381.

(Ed.: The mangrove worm sounds like it might be a cerambycid beetle grub. Any Australian readers with more information? Also, the authors mention something called Morton Bay bugs from Queensland. Is this an insect? Maybe North Americans are about ready for some kind of North American bush tucker. After all, Native Americans included more than 60 kinds of insects in their dietary. See November 1991 *Newsletter*.)

Casper Star-Tribune (Wyoming) (AP) Sent in by Liz and Jon Erickson (who, incidentally, are in-laws of the editor), Jackson, Wyoming.

Professor Jim Wangberg and his students will launch the first annual Wyoming Insect Cook-Off in the University of Wyoming Union Ballroom. "Every year I do a seminar on insects as food and it's always been popular," Wangberg said. "This year I thought it would be fun to involve students." Seven students in the class will prepare and present sauteed grasshoppers or mealworms "with not much to disguise the flavor other than some cooking oil, maybe some butter, and a little bit of seasoning," chocolate chipies, or crickets, mealworm munchies, cricket creole pilaf, stir-fry hoppers and surprise pie. Wangberg will also give a history of insects as food and their nutritional value.

A report published in *The Chronicle of Higher Education* (Dec. 1) after the event (sent in by Dr. Murray Blum, Athens, Georgia) quoted Wangberg that after his lecture, "there was an actual feeding frenzy."

Arkansas Times, December 30, 1993. Sent in by Jessa Dean Scott, Rogers, Arkansas (sticking with relatives, Ms. Scott is the editor's sister).

In a year-end summary of the best and worst in 1993, the worst party food: Minced mosquito meat pie, mosquito-chip cookies, mosquito supreme pizza and mosquito gumbo were served up at the, annual World Championship Mosquito Calling Contest at Crowley's Ridge State Park in Greene County. Each dish included one-fourth cup mosquitoes.

(Ed.: They've gone about as far as they can go in Arkansas.)

Abbott, Thomas Slone and Ronald Sommer. Also in *The Honolulu Advertiser*, sent in by Dr. John Medler, and in *The Benton County Daily Record*, sent in by Lola Seamster of Bentonville, Arkansas (this is like old home week, Ms. Seamster is the editor's 86-year old aunt).

Beijing, China: Chinese scientists have developed nutrition-rich extracts from maggots of the common fly, and are negotiating with food and pharmaceutical firms to mass-produce the products, the official Zinhua News Agency said Saturday. It quoted one scientist as saying the maggot extracts are "surprisingly appealing" but did not describe how they taste.

Scientists have discovered that maggots are rich in nutrients. Five hundred grains of pure protein and 200 grams of low-fat oil and amino acids can be extracted from 1000 grams of maggots [dry weight basis, no doubt]. The amino acids can be used as a nutritional supplement for children's food, and the low-fat oil is effective in preventing heart disease, the report said.

It said the maggots are kept in large bottles and fed distiller's grain, wheat bran and other farm waste. One fly can produce billions of maggots every week, making it suitable for mass production.

(Ed.: A billion maggots per week is a slight exaggeration. Normal production is more like 500 eggs per lifetime for female *Musca domestica*, the nearly cosmopolitan common house fly, and related species. Some term other than "maggot" should probably be coined for muscoid fly larvae when discussed as food and reared in clean media. The natural habitats with which many of these species are normally associated conjures up rather unsavory connotations. If any Chinese readers can furnish abstracts (preferably in English) of the technical papers behind these news releases, it would be much appreciated.)

San Francisco Chronicle, January 28, 1994 (Reuters). Sent in by Ralph Mistler of San Francisco

Beijing. China's official Yinhua news agency, fresh on the heels of telling folks that maggot extinct is a good source of nutrition, urged people yesterday to add ants to their diet.

Wu Zhicheng, "an expert on ant diet" based in the central city of Nanjing, has worked out dozens of recipes for ant-based cakes, teas and wines to promote ant eating, the news agency said. "Ants are a miniature nutritious treasury," Xinhua quoted Wu as saying, adding that ants contain more zinc than either soybeans or pig liver. Mnhua said Chinese have been eating ants for more than 3000 years and "the longevity of many old people who are now over 100 years old has been found to be connected with an ant diet."

The edible ant suggestion follows Yinhua's report Saturday that announced a scientific team had worked out a way to develop maggots as a "huge new source of nourishment for the 1990s."

Black Islanders: A Personal Perspective of Bougainville 1937-1991. By Douglas Oliver, Honolulu: Univ. Hawaii Press, 1991.

Insects of many species are used as food in various parts of Papua New Guinea, but this book contains the only mention that we have seen of their use on the island of Bougainville. Tom Slone of Berkeley sent the pertinent pages, pages 98 and 99, from which the following is quoted:

"The starch obtained from the pith of the trunk [sago palm] was a substitute food staple, fronds were the principal thatching material, the broad bases of branches were used as troughs, and rotting palm stumps crawled with choice edible grubs Collecting edible insects was only an incidental activity. If people saw them they sometimes tried to catch them; there were no special implements involved. In addition to sago grubs, which were regarded as a delicacy, the Siwai liked to eat beetles, white ants--large and small--and certain kinds of spiders."

Tentatively, the "guerba caterpillar" is *Cirina forda*

Remember the letter from Purdue University nutritionist Cynthia Bertelsen (November 1993 *Newsletter*) asking about the guerba caterpillar which seemed to be associated with the sheanut tree in Burkina Faso? The caterpillar is probably *Cirina forda* (Westwood) (Lepidoptera: Saturniidae), which has an extensive range and is widely eaten and widely sold in Africa. Fazoranti and Ajiboye (1993) mention that the larvae of this species, called *Kanni* in Nigeria, are collected from the crowns of the sheabutter tree, *Vittellaria paradoxum*, or from the trunks when the caterpillars are descending to pupate in the soil. UW botany professor Ray Evert did a little checking and came up with the common names shea-butter and butter seed tree. It seems logical to assume, unless contrary information is forthcoming, that all three of these common names are applied to the same tree. Pinhey (1974) lists many species as hostplants of *C. forda*.

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