



THE FOOD INSECTS NEWSLETTER

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Agrecol Corporation Exploring the U.S. Marketability of Insect Food Products

Agrecol is a new company founded on the principle of developing ecological and ecologically sound agricultural products and technology. By the end of 1992, the company hopes to have completed a \$3-4 million, 70,000 square foot research center on 90 acres of land it owns here in Madison, Wisconsin. The center will include greenhouses, laboratories, growth chambers, corporate offices, warehouses and a guest home where visiting scientists can live while conducting their research. All of this will be in a park-like, showplace setting.

The company is the dream of William T. "Bill" Graham. The road was opened for building Agrecol when Graham recently sold the very successful W.T. Rogers Company which he had founded.

New York Bug Banquet switched to The Explorer's Club

Insect dishes won't make it to the Waldorf Astoria after all, not yet anyway. Costs at the Waldorf were soaring out of sight, according to Durland Fish, president of the New York Entomological Society, which is sponsoring the event as part of its 100th Anniversary Celebration. Also, the date has been moved back one day, from May 19th to May 20th.

shortly after returning from World War II. His interest in the nutrient qualities of insects may have stemmed from his days as a prisoner of war in Stalag 17. In a recent newspaper interview, Graham mentioned that when he and his fellow prisoners first arrived at the camp, they were very intent on picking the bugs out of the soup. The camp doctors assured them, however, that the bugs were probably the most nutritious part of the soup.

What makes the new research center unique is how it will operate. The center will have a sizeable staff, but much of the work will be done by scientists from around the world who want to convert their ideas into products for the marketplace. "What were going to do is allow scientists to be their own entrepreneurs," Graham said in another recent newspaper interview. "They'll provide the ideas. We'll provide the research facilities, administration, the production and the marketing. Then we'll split the profits."

According to Patrick LeMahieu, President, some of the current projects include developing a new type of turf grass that requires fewer herbicides and fertilizers and less irrigation water, new snack foods, an enzyme that removes potentially dangerous nitrates from drinking water, and a new plant to be grown in Wisconsin that can

substitute for wood in the papermaking industry. The first new product actually on the market may be, as described by Graham, "a super, super, super-sweet sweet corn." Agrecol recently acquired a forage seed company which sells new forage packets to farmers.

What is of special importance in all of this for *Newsletter* readers is that Agrecol will listen to ideas concerning insects as food. Of particular interest to the company's managers are the environmental implications. Interest on the part of a company like Agrecol speeds up considerably the timetable for possible insect product development, and offers incentive to Western scientists with ideas in this field, where there was little or no incentive before. The company is already making a small investment in the future of insect foods by underwriting some of the day-to-day costs (such as postage and clerical assistance) of the non-profit "Educational Outreach Program on Insects as a Food Resource" here at the University of Wisconsin. This does not include direct support for *The Food Insects Newsletter*, however; by choice, the *Newsletter* will remain primarily a reader-supported endeavor.

Although the company is receptive to realistic development proposals for any edible insect group, the social insects, e.g., honey bee and wasp brood, form one group that is of initial interest. The rationale for the honey bee is that it probably has the best public image of any insect in the United States. It would be difficult or impossible to design an insect more environmentally harmonious than the honey bee. It is an important pollinator, "works hard" in the American tradition, and already produces a highly regarded food-honey, as well as other commercial products such as beeswax, "bee

Cache found!! Several hundred copies of the recipe book, *Entertaining With Insects*. See Page 7.

pollen," etc. With thousands of beekeepers, amateur and professional, around the country a producer network already exists. Whether efficient dual production systems for brood and honey can be developed remains to be seen. Brood management and harvesting techniques have received little research and so far remain labor intensive, but at high prices as a gourmet food, this insect looks economically feasible.

Before submitting a full-blown proposal to Agrecol, a letter of inquiry should be sent to Mr. Patrick J. LeMahieu, President, Agrecol Corporation, 4906 Femrite Drive, Madison, WI 53716-4153 (Telephone (608) 221-9568; Fax (608) 221-2207).

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The Malawi Cookbook

Americans are notoriously among the world's poorest when it comes to a knowledge of geography, so we can probably save some of our readers a trip to the World Atlas by mentioning that Malawi is a small, narrow (north-south axis) country lying between Zambia to its northwest, Tanzania at its northern tip, Lake Nyassa to its northeast and Mozambique embracing its southern half. For many Americans, but none of our readers (we hope), it would be necessary to add that all of these are in southeastern Africa.

The Malawi Cookbook came to us in the form of a

Large termites of the genus *Macrotermes* (Inswa or Mbulika (flying ants)).

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

<p>photocopied excerpt of the title page and pages 21-23, via Dr. Steve and Diane Landry to whom it was passed by a friend. Some readers probably suspect that most <i>Newsletter</i> material arrives by similarly surreptitious-sounding routes, but that is not entirely true. Pages 21-23 deal with insects. The authors of the book are Annabel Shaxson, Pat Dickson, and June Walker, all of Malawi. The book was printed by Blantyre Printing and Publishing Company Ltd for the Government Printer, Zomba, Malawi, in 1974 with a revised edition in 1979 and a metric edition in 1985.</p>	<p>added. Black flying ants (<i>Carebara vidua</i>)(Mafulufute). Fry with a little salt, but no fat. Serve hot or cold as a relish.</p>
<p>The section on insects begins by saying: "It is not generally known in the Western world that insects are a very good and cheap source of protein. Taxonomically, these insects are not far removed from shrimps which are considered a great delicacy in the West." Touche! Methods of preparation and cooking are described for nine species and four generic groups. In each case, a bit of information is given about the insects' general habitat and seasonal occurrence. Unlike most insect cookbooks, <i>The Malawi Cookbook</i> gives the scientific names of the insects. Insects and groups treated are the following.</p>	<p>Sand cricket (<i>Brachytrupes membranaceus</i>)(Nkhululu). After digging crickets from their burrows, remove wings (if any), the stomach and intestines (very important) and wash them. Heat a frying pan and fry the crickets with a little salt, and a little fat if desired. If fat is used, chopped onions may also be added. Allow crickets to dry and serve as a relish.</p>
<p>Wild bee larvae (known as Ana a Njuchi).</p>	<p>Shield bug (<i>Sphaerocoris</i> sp.)(Nsensanya). Wash them, and fry with a little salt until brown. Serve as a relish.</p>
<p>Remove larvae from the comb and dry them. Fry with a little salt, dry again if desired and serve as a relish or appetizer.</p>	<p>Lake fly (<i>Chaoborus edulis</i>)(<i>Chaoborus edulis</i>)(Nkhungu). (We quote the entire entry for this interesting insect). These occur only on the Lake and swarm once a month at the time of the new moon. They form huge clouds over the lake which are visible from many miles away. Lake fly are extremely nutritious, being high in protein and calcium and containing six times as much iron as ox liver.</p>
<p>Large green bush crickets (<i>Homorocoryphus vicinus</i>)(Bwamnoni). Remove wings and horned part of legs. Boil in water for five minutes, then dry in sun. Winnow off any remaining wings. Fry with a little salt and a little fat if desired. Serve as a relish. [Similar insects in the United States are called "katydid."]</p>	<p>1 cake dried lake fly Break the cake of lake fly into 1 tomato chopped pieces and boil in a little salted 1 onion chopped water until soft. Add the tomato salt onion, oil and ground- 1 cup groundnuts, nuts. Cook gently for a few fried and pounded minutes and serve with nsima a little oil or rice.</p>
<p>Grasshoppers (<i>Acantahacris ruficornis</i> & <i>Cyrtacanthacris aeriginosa</i>)(Dziwala) Remove wings and horned part of legs. Boil in water for 5 minutes, then dry in sun. Winnow off any remaining wings, and fry in a pan with a little salt. May also be fried with a little fat. Serve as a relish. If frying with fat, a little chopped onion, chopped tomato and/or groundnut flour may be added to the pan.</p>	<p>Green caterpillars (Mofa, Mphalabungu, Kawichi, Mbwabwa, Katondo). These caterpillars [scientific name(s) not given] appear about March and feed on grass. They are common in the Central Region. Remove the stomach and intestines, then wash the caterpillars. Boil for 5 minutes in water, then dry in sun. Heat a frying pan, fry the caterpillars with a little oil and salt. Serve as a relish. Variation: add 1 chopped tomato, 1 chopped onion and a little groundnut flour to the pan. The authors note that after sun drying the caterpillars may be stored for up to three months.</p>
<p>Red Locust (<i>Nomadacris septemfasciata</i>)(Dzombe), and Large green shield bug (Hemiptera: <i>Nezara robusta</i>)(Nkunguni). Both are prepared as for Dziwala.</p>	<p>Cicadas (Genera <i>Platyleura</i>, <i>Pyona</i>, <i>Orapa</i>, <i>Loba</i>, <i>Monomotapa</i>)(Nyenje) These are large cicadas and most conspicuous during the early rainy season. Remove the wings and fry with a little oil and salt. Serve as a relish.</p>

Book Review

Los insectos comestibles en el Mexico antiguo. [Edible Insects in Old Mexico.] Julieta Ramos-Elorduy and Jose M. Pino Moreno. 1989, 108 pp. A.G.T. Editor, S.A., Progreso 202-Planta Alta, C.P. 11800 - Mexico, D.F. (In Spanish, paperback)

From their own extensive field work and from historical documents, the authors describe how insects contributed to the diet of Mexicans in the past, before the Spanish Conquest. Of the 247 species known by the authors to be consumed in Mexico, 70 species are treated in this book. Some of Sahagun's accounts from the early 16th Century are quoted and some of his drawings are duplicated in order to establish the antiquity of use of many species. Some insects such as escamole ants and ahuahutle, the eggs of aquatic bugs (Hemiptera), were held in such high esteem that they were used to pay taxes to the Emperor Montezuma.

The book is divided into Prolog, Preface, Introduction, Chapters 1-4, Appendices and Bibliography. In Chapter 1 (pp. 9-45), the early use of the various species is documented. Species discussed include 1 from the Order Odonata (dragonflies), 7 species from Order Orthoptera (grasshoppers), 1 from Anoplura (lice), 13 from Hemiptera (true bugs), 17 from Coleoptera (beetles), 9 from Lepidoptera

discuss consumption of edible insects by the different groups. Which insects are consumed by which ethnic groups appears to be determined largely by which insects are abundant in a given ethnic territory. Some widely distributed insects are consumed by all ethnic groups. The early manuscripts consulted by the authors give little clue to differences in insect foods of different groups. The authors suggest that, although "mestizos" (Pima-Nahua ethnic group) are found all over Mexico and have probably had the highest consumption of edible insects, it may be less common now because of acculturation than in groups which have had less exposure to "roads, radio, television and tourism, and the distribution of processed foods by the multinational companies." These poorer groups have tended to "preserve their culture and vivid memories of their ancestors' lifestyle." The authors suggest that because of the large territory they occupy in south and central Mexico, the Zapotecos, Mixtecos, Otomies and Nahuas are the ethnic groups with the highest consumption of edible insects.

The authors cite some of their recent papers in describing "rustic cultivation" of several species. In exploiting nests of the escamoles ants (genus *Liometopum*), for example, people are careful to leave dried nopal or maguey leaves or dry grass to aid the ants in reconstructing the nest. To help preserve humidity, fresh herbs are added, and the entrance is sealed with a large rock covered with fresh leaves. In this way, the nest can be exploited every year or even two or three times during a year. Wasps are cultivated by bringing the small foundation

<p>(caterpillars), 2 from Diptera (true flies), and 20 from Hymenoptera (bees, ants, wasps). Many common names are identified, for example a total of 11 for the leafcutter ants, <i>Atta cephalotes</i> and <i>A. mexicana</i>.</p> <p>In Chapter 2 (pp. 47-56), nutritional value of insects is discussed. Most, if not all of the data (5 tables) are drawn from previously published work by these authors. It should be noted that work published prior to the late 1980s by the senior author was under her then-married name, de Conconi. The insects highest in protein content are the grasshoppers, with the five species analyzed ranging from 70.9% to 77.6% on a dry weight basis, and the wasps, six of seven species analyzed ranging from 61.4 to 72.0%. Protein digestibility in nine species examined ranged from 77.9% to 98.9%. From amino acid data on 18 species, the insects generally surpassed 1973 FAO (Food & Agriculture Organization) values except most were low in tryptophan. Insects comprising the ahuahutle and axayacatl (aquatic Hemiptera) were low in methionine/cysteine, but rich in tryptophan.</p> <p>In Chapter 3 (pp. 57-65), the authors present a figure (representative for south-central Mexico) showing the seasonal distribution of edible insect consumption by month for 63 species. Elevational (climate) and vegetational differences variously modify these distribution patterns in other parts of the country. Of the species discussed, 58.6% are most abundant during the summer and fall (rainy season), while 29.2% are more abundant in the spring (dry season). About 12% are found also during the winter (dry).</p> <p>In Chapter 4 (pp. 67-75), the authors present a map showing distribution of 23 ethnic groups in central and southern Mexico and</p>	<p>combs from the forest and hanging them from the houses until they are large enough for exploitation.</p> <p>The "worm of madrono," <i>Eucheira socialis</i> (Lepidoptera: Pieridae), is also "cultivated." The larvae construct large silk pockets in which they remain during the day, going out to feed at night on the leaves of the madrono (<i>Arbutus</i>). Each pocket has about 150 caterpillars, all of the same sex. Cultivation consists of leaving three or four pockets to insure continued reproduction. The authors state that this species practically disappeared in Nduayaco Apoala, State of Oaxaca, because of overexploitation (no effort was made to leave pockets of larvae uncollected). The edible insects associated with the maguey are also cultivated by many ethnic groups.</p> <p>Much information on collecting, preparation and marketing of the edible species is provided in the Appendix (pp. 79-93), which consists of 40 black and white photographs and accompanying legends.</p> <p>This book is a valuable work on the use of insects as food in Mexico, another in a long series by these investigators. As they point out (p. 75), insects should not be considered "unconventional food"; they have been eaten extensively in the past, and they continue to be consumed today. The authors conclude by saying that edible insects "could become the 'good Samaritans' in our fight for survival."</p> <p>(Ed.: We thank Ms. Heloisa Scholl, San Antonio, Texas, for translating the book. Our review was prepared from her translation.</p>
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Recently from the Technical Journals

Vane-Wright, R.I. 1991. Why not eat insects? *Bull. Entomol. Res.* 81:1-4. Biodiversity Programme, Department of Entomology, The Natural History Museum, Cromwell Rd, London SW7 5BD, UK.

The author borrows the title for this guest editorial from the title of Vincent Holt's 1885 book which was recently reprinted by the Natural History Museum [statutory name: British Museum (Natural History)] (see *Newsletter Vol. 1, No. 2, p. 3, 1988*, for a review of Holt's book]. Vane-Wright comes on as forthrightly as Holt did 100 years ago, by opening with this salvo: "To many people the idea of eating insects evokes only feelings of disgust. For them, the answer to Vincent Holt's (1885) famous question seems obvious. But what does biology tell us? A wide range of vertebrates are insect eaters. The common ancestor of primates is thought to have been an insectivore. Most monkeys and apes eat insects -- including the chimpanzee, our closest living relative. In contrast, many humans restrict their choice of meat to a few vertebrates, molluscs and crustaceans." He then cites Brian Hocking's 1960 [University of Alberta] statement, "We have about 50 more years of eating steaks and then perhaps we'll have to explore other sources of animal protein..."

Noting that western European cultures, and nations derived from them, are the only ones which do not use insects as food, the author says, "Food habits are not conditioned by nutritional tables, calorie counts or balanced diets. What we eat is conditioned by religion, by tradition, by fashion -- in a word, by culture." Once established, food preferences are highly resistant to change. Mentioning a number of insects consumed in Africa, Asia and the Western Hemisphere, including the famous mopani worm, *Gonimbrasia belina*, *mbrasia belina*, in Africa, Vane-Wright asks: "Could such insects become acceptable to western palates? Perhaps. My three-year old daughter finds fried mopani worms irresistible; her food preferences have yet to become fixed."

Unpredictability of supply is a major problem with wild insects for feeding urban societies, even though many insects are locally or periodically abundant. Advanced culture techniques will be needed if city dwellers are to be reliably fed on a large scale. The author notes that, "the very fact that

dry (to stop growth of toxic molds) because dead insects deteriorate rapidly. Cooking is always desirable because some insects carry parasites.

Vane-Wright asks whether, despite insects being a wholesome source of protein, fats and other nutrients, there is any compelling economic reason for using them as food. His answer: "Well, there may be. Raising conventional protein animals, such as cattle, is having a major effect on the surface of the planet -- large areas of forest burned to make way for ranching, with all the problems that this short-term economic solution brings -- including greenhouse gases released by cattle effluent." Also, stimulating the idea that insects are desirable food could promote additional concern for the conservation of biodiversity, as well as reducing pesticide pollution and returning grazing land to forest.

The author concludes: "Insects have an undeservedly bad reputation. A handful of noxious species has meant that, too often, they are all seen as enemies. In their most infinite variety, insects could yet be our salvation. Is it not time for economic entomologists to develop a more positive view of their value? Why not eat insects indeed!" With only three pages in this review, Vane-Wright does about as well as can be done in covering the relevant ground.

El Boushy, A.R. 1991. House-fly pupae as poultry manure converters for animal feed: a review. *Bioresource Technol.* 38:45-49. Department of Animal Nutrition, Agricultural University, 6708 PM Wageningen, The Netherlands.

Author's Abstract: Poultry wastes can be converted into a high protein feedstuff for farm animals by upgrading with housefly pupae. This process solves the problems of accumulation of poultry wastes which may not be attractive as soil fertilizer and cause pollution. If this upgrading of manure takes place, a reasonable animal protein feedstuff will be created and partially solve the problems of human malnutrition by increasing the animal protein supply in the form of meat, milk, butter and eggs.

From the few published relevant data the following may be concluded. The housefly-pupa meal is produced from caged layer manure. This feedstuff is characterized by a high content of crude protein of 61.4% and further contains fat (9.3%), ash (11.9%) and metabolizable energy (10.38 MJ/kg). The pupa meal is a good source of essential amino

<p>eating insects belongs to the hunter-gatherer stage of human evolution may be a major factor in their rejection by western people; we may unconsciously reject entomophagy as primitive." Although some insects are difficult to process, others are easy: "dry-roasted mealworms are readily made from bran-fed <i>Tenebrio molitor</i> [beetle] larvae simply by freezing, washing, and then roasting the grubs at 95°C for two to three hours. They taste a bit like potato crisps (but are far more nutritious)."</p> <p>Relative to safety, "Green or brown plantfeeders, or pale unicolorous larvae are generally thought to be the most suitable." Hairy or spiny insects may irritate, and brightly colored species may be poisonous. Insects should be processed immediately and stored</p>	<p><i>acids, mainly arginine (3.7%), lysine (3.8%) and methionine (1.6%). It is a relatively well-balanced protein source for poultry.</i></p> <p><i>With an additional building to layer houses, it is possible to produce, continuously, upgraded manure composed of pupa mixed with manure residue, this stuff will be treated by heat up to 180°C to be sterilized, dried and may be used as a feedstuff in animal nutrition.</i></p> <p>SEE TECHNICAL PAPERS, p. 8.</p>
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<p>Letters</p> <p>How to collect paper wasp larvae and pupae -- cautiously</p> <p>From Dr. James Ryan of Ryan and Hilchie Biological Consultants, Ltd., Edmonton, Alberta, Canada.</p> <p>You invited practical suggestions on wasp brood harvesting techniques in the last newsletter. I have harvested c.a. 300 active colonies of paper wasps, and served wasp brood as party food. I can offer some advice. First, social wasps sting, and inexperienced collectors may find themselves suddenly in trouble, so I suggest avoiding these. If not, realize that many paper wasps dwell in underground or inaccessible cavities, and are best left alone. Those in free-standing nests which can be approached undisturbed are the most realistic option. Wear protective clothing such as a complete bee suit, and expect numerous escapes. Work at night, when wasps see poorly although they will still be hot and active.</p> <p>Aerial nests have a single entry hole at the bottom, which can be plugged with tissue wrapped around a pencil. Slip a plastic bag over the nest, and pull, so it tears off of the branch, eave, or wall and falls into the bag. Tie the bag and freeze at least 8 hours. Remove the paper envelope, brush away frozen wasps (and defreeze, with all debris, as thawed wasps may sting and even fly despite being technically dead) so you have only combs. Frozen larvae and pupae can be removed with forceps and prepared according to taste. Blue jays and magpies like them raw, but cook all meats (no sushi for this cowboy!). You may notice frozen droplets on larval mouthparts, which are regurgitated stomach contents intended as food for adult wasps. Larvae exhibit trophylactic feeding behavior immediately following disturbance, like a peace offering. Expect 100-200 g of larvae from a normal (soccerball-size) nest.</p> <p>More on wasp harvesting</p> <p>Dr. Roger Akre of Washington State University wrote, under date of 24 January 1992:</p> <p>"No one in their right mind eats yellowjacket larvae as the meconia taste terrible. However, the prepupae and pupae are sweet and are a delightful treat. We vacuum the workers, quick freeze the comb, then use forceps to extract the pupae just prior to their immersion in the hot peanut oil in the deep fat fryer. Last year we ate common yellowjacket larvae (<i>Paravespula vulgaris</i>). This is also an excellent use for Africanized bee pupae, and we ate some at our "bug fry" last year."</p> <p>In response to some questions by the Editor, Dr. Akre wrote again under date of 18 February:</p> <p>"The reference to eating yellowjacket larvae would have been correct if my letter had stated that the prepupae and pupae were</p>	<p>eaten. Indeed, we only selected those individuals that had voided the meconium. The prepupae exist for several days before becoming pupae. The yellowjacket workers are vacuumed, - ., then the nests are taken with little risk. Of course, the prepupae and pupae must be extracted individually with forceps."</p> <p>Ed.: The "meconium" is the mass of undigested food particles which have been stored in the blind-ending midgut throughout the entire life of the hymenopterous larva (bees, ants, wasps). After a thin cocoon has been spun inside the cell by the full-grown larva, this mass breaks through the membrane separating the midgut from the hindgut, and is voided through the anus. At this point, the larval stage comes to an end, and the insect, in a quiescent state, is known as a pharate or pre-pupa. These are the 'larvae' that wasp veterans harvest along with the pupae; the voided meconium is plainly visible in the closed end of the cell.</p> <p>Collecting termites in the Pacific Northwest</p> <p>Donald Luttrell of San Jose, California, writes:</p> <p>"I was one of the instructors in an "Escape and Evasion" course at Fort Lewis, Washington. Part of the course involved living off the country. In addition to the mandatory reptile cuisine, I demonstrated how to find and consume termites (raw, in this case). In the rain forest there, every dead tree was loaded with them. The workers of that particular species are about 1/2 inch long; the soldiers are half again as long, the extra length being a large head and formidable mandibles. I recommended to my class that they not try to eat soldiers without removing the heads since, like Reavis's agave worms, they would most likely bite back. Since this was an evasion course, cooking, or any fires, were strongly discouraged. Since it was the army, they all ate the termites, but a few remarked that they "didn't taste bad."</p> <p>The editor wrote to Dr. Akre about the possible identity of the termites mentioned above. His response:</p> <p>"The large termites are <i>Zootermopsis angusticollis</i>, dampwood termites. They are quite common in western Washington and are probably quite good eating. Since there are few on this side of the state, I have never had an opportunity to eat them. Army (and Air Force) survival schools in Washington also advocate the use of <i>Formica obscuripes</i> and <i>F. exsectoides</i> as sources of formic acid as 'salad dressing' for any greens such as pig weed, dandelion, or lambs quarter that can be collected and eaten. The formic acid gives the greens a better flavor, not quite so flat."</p>
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<p>Catching Up on the Newspapers</p>	<p>Penny Mentock-Barkan. Only the last day of class would involve the voluntary downing of bugs, including sauteed</p>
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<p>In the last issue of the <i>Newsletter</i>, November 1991, we summarized a few of the many magazine articles that have appeared in the past couple of years. Below, we do the same with newspaper articles, in a slightly different format.</p>	<p>crickets, chocolate-covered grasshoppers and mealworm quiche, but students aren't exactly lining up for the creepy-crawly course.</p> <p>Only one student signed up by Tuesday. Ten are needed for the two-week course, Patrick said. Some parents called the college to say they were trying to discourage their children from taking the class. One woman said she was worried she might someday find her son peeling bugs from trees and devouring them."</p>
<p>Making Music in Zaire</p>	<p>Earthworms fare no better in Canada</p>
<p>(From a long article by Neil Henry in the <i>Washington Post</i> of May 10, 1991.)</p>	<p>(From the <i>Ottawa Citizen</i>, April 2, 1990, an article titled "School board on hook over class worm feast," by Bob Harvey. Thanks to Professor Yves Prevost of Lakehead University, Thunder Bay, Ontario, for sending it.)</p>
<p>Kinshaza, Zaire: The hot band known as Masanka looked like some kind of single-celled organism as it jammed at an outdoor pub here the other night, expanding in size whenever anybody from the crowd felt the spirit to join in.</p>	<p>"School board officials will take action today on parents' complaints that kindergarten children ate baked worms as part of a school experiment. If the story's true, it's a very unfortunate event," said Yvon Ferrand, public sector chairman of Ottawa-Carleton's French Language School Board. "The investigation's already started."</p>
<p>"At first, Masanka, which means "many happinesses," was just a guy hitting a cola bottle with a fork, another fingering a thumb piano, a third pounding a goatskin drum, a dude in dark glasses playing keyboards and a fifth on saxophone.</p>	<p>Nancy Tetreault, one of the parents who complained about the experiment at Ecole Seraphin-Morin in Gloucester, said she has taken her daughter Cindy out of the school over the incident, and will be talking to lawyers today to see if any legal action can be taken against the board. Tetreault said that when she complained to principal Jerome Tremblay on Friday, he admitted that he personally wouldn't eat worms, but said he got complaints from the parents of only two of the 29 children involved.</p>
<p>"Then, so many other folks joyously joined the band at Chez Ngolela - singing, clapping, banging beer bottles with spoons - that you could hardly tell where Masarika ended and the listeners began....</p>	<p>"I was furious about it. I can't believe they let five-year-old children eat worms," said Tetreault. She said she learned of the experiment only when Cindy brought home a certificate signed by teacher Norman Roy and congratulating her on eating baked worms. Tetreault said the experiment was in a book from the Ontario Science Center; the class first boiled the worms in lemon water and then baked them. "If I want my daughter to eat worms, I'll feed them to her myself. What are they going to do next week. feed them rats?"</p>
<p>"This infectiously buoyant Zairian beat can be savored in the cite section of Kinshaza on any night of the week - often starting as late as 2 a.m. - in clubs that range in style from the bright-colored lights and well dressed crowds in the O.K. Jazz Club to down-home outdoor pubs featuring neighborhood youths honing their skills on guitars, trumpets and bottle drums.</p>	<p>"Paul Guilbeault, a public health inspector with the Ottawa-Carleton Health Unit, said there is no health problem with eating the worms."</p>
<p>"Beer, fried goat innards and insect delicacies such as termites, caterpillars and palm grubs sauteed in spicy garlic sauce are the most popular items on the menu [emphasis added]."</p>	<p>"I'll have the Witjuti Grubs, Please"</p>
<p>Ed.: The music goes on, but we've included enough to show that when down-to-earth people gather to have fun, edible insects are often part of the scene.</p>	<p>(This article, from <i>The Christian Science Monitor</i>, August 8, 1991, was subtitled, "Bush Tucker Catches on," and further subtitled, "Australians and their visitors are ordering up more native foodstuffs and Outback cuisine." By Ron Scherer. Dateline Hornsby, Australia. Thanks to Nancy Fox, UW International Agricultural Programs, for sending it over.)</p>
<p>But pockets of resistance still exist</p>	<p>SEE NEWSPAPERS, p. 7.</p>
<p>(This article titled "Insect-cuisine course bugging some parents," was datelined Powell, Wyoming, June 7, 1991 (AP). Thanks to John Kulli, MD, of Pittsford, New York, for sending it in.)</p>	<p>"The class for third- and fourth-graders is titled 'Incredible Edibles' and would focus on the nutritional value of insects, said instructor</p>
<p>"Sauteed crickets, chocolate-covered grasshoppers and mealworm quiche have some parents hesitant about a summer class offering for their grade-school children. "I'm not sure about it, but I think the mealworm quiche might be the problem," said Wendy Patrick, coordinator of a summer youth enrichment program at Northwest College. "Mothers just can't seem to bear the thought of it."</p>	<p>"Then the grubs arrived.</p> <p>"Only two at first. The other two had mysteriously exploded during cooking, I was told, and would soon be replaced. The grubs looked like huge, segmented french fries. They were to be eaten whole, I was instructed, but beyond that I received conflicting advice about the proper method for consuming them. Jenny Dowling, the restaurant's co-owner, instructed me to hold them by the head so they won't break off in your hand. But Jim, a fellow diner with an absolute passion for grubs (he ordered eight), suggested I eat them head-first so the claws wouldn't scratch my throat on the way down.</p> <p>"I was swayed by Jim's compelling argument. Head-first they would go, claws, heads and all. After a few moments' deliberation, I finally grabbed a grub by its tail and plunged the head into my mouth. I bit. I chewed. Not good. Not too bad, either, but not good. The shell tasted like overdone chicken skin; the inside was dark, dry and a little nutty. The spicy</p>

Newspapers (from page 6)

"Emu, kangaroo, bunya-bunya nuts, wattle seeds, warrigal greens, and, of course, witjuti (or witchetty) grubs, are all bush foods that are integral parts of Down Under cooking. Australian cuisine has to embrace indigenous foods and then combine wild food with homegrown, European, and some American or Asian ingredients," says Vic Cherikoff, a bush food consultant and owner of the Bush Tucker Supply Proprietary Limited.

"The concept of native foods is increasingly appealing to hotels and restaurants frequented by tourists. A recent ad for the Yulara resort in the Outback featured the food instead of nearby Ayers Rock. Among the dishes: buffalo carpaccio, emu fillets stuffed with crocodile, and baked witchetty grubs.

"One Australian chain, the Country Comfort Inn, has decided to make 'bush tucker,' or native foods, a signature of its

<p>restaurants, which are part of its 19 motels. Bush food has also taken to the air on Australian Airlines, and the Australian Broadcasting Corporation has been educating the public about bush foods with its series, 'The Bush Tucker Man.' Book stores are well-stocked with books on bush tucker.</p> <p>"But the real excitement surrounds bush foods cooked European-style. At Rountrees, for example, Chef Bruneteau recently hosted 30 members of the Pittwater Food & Wine Society. The menu: Witchetty Grub Soup, Skate on Warrigals, Emu with Orange Sauce, and Rosella and Quandong Tart.</p> <p>Bruneteau buys the witchetty grubs frozen. They are roughly the size of a man's index finger. They are pureed and mixed with a broth to make a meaty-tasting soup. Aborigines eat the grubs whole and uncooked. "They have a nice, nutty flavor when roasted," says Bruneteau, who adds they are much better than the snails favored by his French ancestors. He estimates he uses about 12,000 grubs per year including a considerable number in the soup which he cans and sells."</p> <p>Another opinion on Witchetty grubs</p> <p>(From the article, "Down-Under Grub," by Scott Kearin in the <i>Washington Post</i>, May 26, 1991. Thanks to Luther Dietrich of Annandale, Virginia for sending it.)</p> <p>Scott Kearin thought he had tried virtually every ethnic and national cuisine imaginable. Then he tried Australian -- specifically, witchetty grubs. This was at Rowntrees - we mentioned Chef Jean Paul Bruneteau above. With <i>The Ballad of the Man from Snowy River</i> as background music, Kearin ordered a traditional Australian "damper" -- camp bread cooked over coals -- to be followed by a hearty helping of four witchetty grubs. But we should let Kearin tell this in his own words:</p> <p>"I consumed my damper with considerable relish. It was delicious. I was enjoying myself.</p>	<p>peanut sauce made the next grub more palatable, and suddenly I had done it. I had eaten two dry-roasted grubs.</p> <p>"But then two more arrived, this time stuffed with an egg and garlic concoction, the legacy of the chef's European training. These grubs tasted better, but their moist, viscous interior made them seem a little too much like, well, like bugs. It was all I could do to get them down.</p> <p>"I also tried some grilled crocodile that night -- something like fishy pork, fork-tender after marinating for three days in orange and mango juice -- and it was exquisite. So was the traditional Australian fare, such as beef, seafood and lamb -- food I could eat anywhere.</p> <p>"But until you've eaten a witchetty grub, you haven't really been to Australia.</p> <p>Book available: Entertaining With Insects.</p> <p>Out of the blue came a letter from Dr. Roger Akre of Washington State University in which he mentioned that, within the past year, he had purchased from BioQuip Products a copy of the insect recipe book, <i>Entertaining With Insects; or The Original Guide to Insect Cookery</i>, by Ronald Taylor and Barbara Carter (Woodbridge Press, 1976,160 pages). Upon checking with BioQuip, we found that they have several hundred copies on hand, part of a stock purchased from a small (and apparently rather inactive) distributor. The book has long been thought to be out of print. If you are looking for an insect recipe book published in the United States, now is your chance. The price from BioQuip is \$7.95 plus \$1.50 for postage and handling. Call or send your order to BioQuip Products, 17803 LaSalle Avenue, Gardena, CA 90248-3602. Telephone: (213) 324-0620.</p> <p>This all-around delightful little booklet was reviewed in the March 1989 <i>Newsletter</i>. It contains 85 recipes (plus a few more on earthworms), based mainly on mealworms, crickets and honey bee adults and brood.</p>
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The Food Insects Newsletter

<p>Technical Papers (from page 4)</p> <p>The author points out that a chicken ranch with 25,000 caged layers produces 2500 kg of wet manure per day or 912.5 tons per year, thus creating a major problem of waste disposal. Dry poultry manure is not, of itself, recyclable as a good feedstuff for poultry because of its low energy and high content of uric acid and non-protein nitrogen, neither of which can be utilized by monogastric animals. Research during the late 1960s and the decade of the 1970s, however, showed that house fly (<i>Musca domestica</i>) a pupal meal produced by larval biodegradation of poultry manure is of high protein quality. In addition, digestion of the manure by larvae converts it into an odorless, loose, crumbly product that can be easily dried and used as a feedstuff. Unfortunately, no practical large-scale method of separating the pupae from the digested manure residue has been found. El Boushy suggests then that the most practical procedure is to produce a mixture of pupae and manure residue, thus upgrading the latter to reasonable feedstuff quality. He describes how this could probably be economically accomplished with equipment that is already in practical use on many large poultry farms.</p> <p>Katya Kitsa. 1989. Contribution des insectes comestibles a l'amélioration de la ration alimentaire au Kasai-Occidental. [The importance of edible insects in Western Kasai Region, Zaire.] <i>Zaire-Afrique</i> 239:511-519. Reviewed by Dan Turk, Department of Forestry, North Carolina State University, Raleigh, N.C</p> <p>Katya Kitsa conducted a survey of household expenditures on edible insects over the course of 9 months (September 1986 through May 1987) in Kananga, a city of over 200,000 people in Western Kasai Region, Zaire. Based on the prices of insects in city markets, he calculated the quantities of insects</p>	<p>periods. More types of insects were available from December to April than the rest of the year.</p> <p>The author calculated the dietary importance of insects in Kananga based on protein content and quality compared with FAO/OMS dietary recommendations. According to his calculations, insects satisfied all of the daily animal protein requirements of the people who ate insects. Similarly, using regional animal production statistics, he calculated that cattle, sheep, goats, pigs, poultry and fish (apparently the only animals for which data were available) satisfied only 37.5% of dietary animal protein requirements in the region as a whole. Because of their potential to satisfy protein needs, he concluded that insects "merit the attention of all people responsible for promoting the improvement of our people's health: health workers, merchants, and researchers." His recommendations for increasing insect consumption in Kananga included nutritional education to extirpate sociological and psychological constraints to insect consumption, and examination of possibilities for the development of an insect flour for feeding to children.</p> <p>This study represents a rare attempt to quantify the dietary importance of insects. A previous article (Gomez <i>et al</i> 1961) estimated that insects contributed 33% of all animal protein produced in what is now Western Kasai Region. Although the accuracy of Katya Kitsa's survey data is open to question, it is clear that insects continue to contribute substantially to protein nutrition in this part of Africa. Local publication of this article is evidence that Zairians consider edible insects a resource worth developing.</p> <p>Reference</p> <p>Gomez, P.A.; Halut, R.; Collin, A. 1961. Production de proteines animales au Congo. <i>Bulletin Agricole du Congo</i> 52(4):689-815.</p> <p>Necrology</p>
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purchased. In the 237 households surveyed, 564 of the 2006 people represented purchased an average of 1331 kg of insects per month. This amounts to 2360 g of insects per person per month for the people who ate insects, or 663 g insects per person per month for all people surveyed. If accurate and representative, this represents at least 12,000 tons of insects consumed in Kananga per year. The relative quantities (weight basis) of various insects consumed were termites 35%, caterpillars 30%, larvae 23%, and grasshoppers 12%. The author noted that people in outlying areas purchased more insects than those living nearer the city center. On a weight basis, the price of smoked caterpillars was only 26% of the price of beef.

Over the same nine month period, a survey of insects sold in the six major rural markets that supply Kananga with edible insects yielded information on the types and seasonality of insects available in Kananga. The people selling insects provided information covering the summer months. Sixteen types of insects, identified by local names, are described briefly: 9 caterpillars, 4 termites, 2 beetle larvae, and a grasshopper. Three of these, soldier termites, beetle larvae from oil palms, and beetle larvae from raffia palms, were sold live throughout the year. All others were seasonal though preservation permitted some to remain in the markets for extended

The distinguished career of Dr. Douglas Keith McEwan Kevin ended suddenly as the result of a recurrent heart problem. He was born in 1920. Dr. Kevin twice contributed short items published in *The Food Insects Newsletter*. He was an internationally renowned authority on the systematics and biology of orthopteroid insects, and in later years developed an interest in ethnoentomology or "cultural entomology." Among other things, he served as President of the Entomological Society of Canada, as chair of the Department of Entomology, and, later, as Director of the Lyman Entomological Museum and Research Laboratory in McGill University in Quebec. A full obituary can be found in *American Entomologist* 37(4), pp. 253-254, 1991.

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Directory Finally Issued

The long-promised Directory was mailed just prior to mailing this March issue of the *Newsletter*. A copy was sent free to those listed (about 400 people who returned an Address Form on which they had checked "yes" for Directory listing) and to all who have made a contribution at one time or another in support of the *Newsletter*. Others may obtain a copy, postpaid, for \$4.00. The Directory lists names, addresses, relevant interests, telephone, TELEX and FAX numbers, alphabetically by country, or, for the United States, alphabetically by state.

Directory Corrections:

One name was inadvertently omitted. Please add.

Edward M. Binic
114 Winchester Road
Fairlawn OH 44333

Two names were misspelled. The correct spellings are:

Mollie Mondoux Edward J. Van Istendal
(Oregon) (Pennsylvania)

Two addresses have changed. The new addresses are:
Warren A. Hatch Alan M. Horowitz
Apt # 944 RFD
123 S. Figueroa Street Moyock NC 27958
Los Angeles CA 90012 (formerly Amchitka
Island AK).

And yes, we know it should be Alabama, not Albama

Agrecol (from page one)

Over lunch a couple of months ago, Bill Graham described to your editor his business philosophy in this new venture, 1) Develop some things that are worthwhile, 2) Make a little money in the process, if possible, and 3) Have fun doing it. Your editor assured him that it would be hard to have more fun than you can have trying to sell insects as food in the good ole USA. He laughed. Doing something worthwhile and having fun doing it may outweigh "making a little money in the process," for this unusual 67 year-old entrepreneur.

(Ed. Some of the above was drawn from articles by Mike Flaherty and Joe Schoenmann in the *Wisconsin State Journal* of October 20, 1991, and *The Capital Times* of January 28, 1992, respectively.)

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Having a Party?

Consider offering your guests an unusual and healthful party delicacy: raw yellowjacket larvae. "The yellowjacket larva is the best insect I've ever eaten," said ESA [Entomological Society of America] member Douglas Whitman, from the Department of Biological Sciences, Illinois State University. "It's like eating a grape. When you first bite in, it's very tough, but suddenly, it explodes in your mouth with a sweet, nutty flavor." (Reprinted from *Sphecos* 21, April, p. 67, which had reprinted it from the ESA Newsletter 14(4):1, 1991).

Edible insects are in your future and maybe sooner than you think

At least that's what Malcolm Abrams and Harriet Bernstein decided in compiling their new book, *More Future Stuff -- Over 250 Inventions That Will Change Your Life by 2001*, Penguin Books, 336 pp. This volume is a sequel to *Future Stuff*, published in 1989. Insects are in fast company here with such innovations as a 100% recycleable Volkswagen, refrigeration by sound (instead of environmentally unsafe

Edible insects are covered on pages 281-282 where it starts off: "It's time Westerners got wise. Most of the rest of the world knows how delicious and nutritious insects can be. In Africa, Asia, Latin America, and the Western Pacific insects are valuable and traditional food sources. So what gives with Europeans and North Americans?" The authors then note that insects are high in protein, unsaturated fatty acids, vitamins such as riboflavin and thiamine and minerals such as iron and zinc (the latter important for vegetarians). They note that the flavors of insects are varied and good. Food conversion efficiency of many insects is high, and therefore, their environmental compatibility, and insect harvest bolsters rural economies. Furthermore, the edible insects are clean feeders, contrary to the feeding habits of shrimps, crabs and lobsters. The main obstacle to commercialization is the need for methods of mass production. Obviously impressed by the overwhelming logic of the above (most of which was supplied by your Newsletter editor), Abrams and Bernstein say that edible insect products can be expected to arrive in stores or become otherwise available nationwide as early as 1995, and they set the odds at 50:50 that this will happen by 2001. Only time will tell whether they are too optimistic.

Chicken? NO! Steak? NO! Caterpillars? YES!

chemical coolants), car parts made from recycled soda bottles, computerized shrinks, synthetic vocal tracts, blue roses (to signify sadness), self-watering plants, jetlag pills, personal hovervehicles, strawberry-flavored bananas, shower-cap bandages and roll-up grills.

Dr. John Medler of the Bishop Museum, Honolulu, sent an article from the *Economist*, October 19, 1991 (p. 47). The article is titled, "Zaire: The descent to darkness." In describing the recent turmoil in that beleaguered country, it states: "Much of the country was cut out of basic commerce: visitors to one town recently found only fried caterpillars on the hotel menu."