



[Index for A Place to Browse - The Food Insects Newsletter](#)

[Home](#)

THE FOOD INSECTS NEWSLETTER

JULY 1995

VOLUME VIII, NO. 2

**Food insects will hold a prominent place in the upcoming
International Symposium on Biodiversity to be held in China. See page 3.**

Ed.: This is the third in a series of invited articles on potential hazards that could be posed by indiscriminate or careless consumption or handling of insects. We are grateful to the authors for generously agreeing to prepare the article under severe time constraints.

Allergies Related to Food Insect Production and Consumption

Joel Phillips
Wendell Burkholder
USDA-ARS
Stored-Product Insects Research Laboratory
Department of Entomology
University of Wisconsin-Madison
Madison, Wisconsin 53706

The cultural practice of entomophagy is old and well-established especially in non-industrialized regions of the world. Thanks to this newsletter, along with occasional anecdotes in the electronic and print media, human consumption of insects is a growing novelty in the U.S. and other nations not usually associated with the custom. Latter-day food insect devotees may simply want to sample species considered delicacies in other cultures, or they may be interested in the reputed nutritional or medicinal qualities of certain food insects. Regardless of motivation, initiates must first overcome the wide-spread cultural taboo against the practice, that is, the idea that consuming insects is generally unhealthy. Proper methods of selection and preparation can largely nullify the health concerns associated with eating food insects. However, one matter will continue to nag the practice, and that is the possibility of allergies to insect-derived foods. Virtually any food item can be allergenic. Yet, other arthropods such as shellfish (i.e., shrimp, lobster, crayfish) are particularly well-known for their ability to induce mild to severe allergic reactions in susceptible individuals. Thus, the risk can not be taken lightly. The following is a brief review of the potential health risks associated with the production and consumption of food insects.

The popular image of insect allergies is that associated with the bites and stings of venomous species like bees, ants, and

from eczema and dermatitis, to rhinitis, congestion and bronchia] asthma. In severe cases, sensitivity to insect material is heightened to the extent that the victim can experience anaphylactic shock, a potentially life-threatening condition often involving rapid swelling, acute respiratory distress, and collapse of circulation. If possible, it is incumbent upon the sufferer to recognize and avoid insect allergens long before the onset of extreme sensitivity.

Since most insect allergies are of the contactant and inhalant type, it would be reasonable to assume that the greatest health risk associated with food insects would be to workers involved in their production. Owing to the small and obscure nature of the food insects industry, especially in the U.S., virtually nothing is known of such problems. However, there are many records of insect-induced allergies among workers in other enterprises. Workers shelling and cleaning walnuts in Bulgaria developed eczema, dermatitis and intense itching of the skin associated with exposure to the larvae and excreta of the Indian meal moth. Although they are not insects, mites that infest cheese, bran, dried fruits, jams and sugars are known to cause transient dermatitis among workers when body fluids are re-leased upon crushing. Records of inhalant allergies in the workplace make up the majority of case histories. In a NIOSH survey of USDA labs that rear insects, nine orders of insects plus mites and spiders

SEE INSECT ALLERGIES,

P.2

IMPORTANT SUBSCRIPTION NOTICE!

The November issue of *The Food Insects Newsletter* will be

wasps (injectant allergens). Over one-hundred deaths per year in the U.S. are attributed to fatal reactions to arthropod venoms. These accounts make hot news, although the vast majority of victims suffer little more than short-term itching, burning and swelling. More common allergic reactions attributable to insects include those caused by contacting body parts or waste products (contactant allergens) or inhaling microscopic dust particles composed of pulverized carcasses, cast skins and excreta (inhalant allergens). Allergies caused by contacting or inhaling insect material can have significant health consequences in the home or work environment with symptoms ranging

under new management. Between now and then, Associate Editor Florence Dunkel assumes the editorship and begins the process of moving the *Newsletter's* base of operations from Madison, Wisconsin to Bozeman, Montana. Effective September 1, all correspondence pertaining to the Newsletter should be addressed to the new editor.

Dr. Florence V. Dunkel
 Department of Entomology
 324 Leon Johnson Hall
 Montana State University
 Bozeman MT 59717-0302
 Tel: (406) 994-5065
 Fax: (406) 994-6029
 E-Mail: UEYFD@MSU.OSCS.MONTANA.EDU
 Please see page 12 for more subscription information

The Food Insects Newsletter

Page 2

Downed US. flyer in Bosnia survives on insects

The story broke on June 8th. Following six harrowing days of avoiding capture after being shot down in Bosnian Serb- held territory, Air Force Captain Scott Francis O'Grady was dramatically rescued by helicopter. President Clinton was "ecstatic." How did O'Grady survive? - by eating grass and insects and drinking rain water, he said. Not surprising, the insects (ants were the ones mainly consumed, apparently)

attracted the immediate attention of the news media. The next day, for example, Capt. O'Grady was quoted by ABC Evening News as saying the ants were hard to eat because they were hard to catch. It wasn't surprising, either, that our telephone started ringing with calls from reporters wanting to know more about the nutritional value of insects and what they taste like. It was nice having edible insects so closely

associated with a new national hero. We heard from more than 15 newspapers, magazines and radio stations over the next 10 days, and some interviewers pursued the subject in depth. Two interviews closed with the question, "How long could a person survive eating only insects?" The answer was easy: "Probably for a lot longer than by eating only in U.S. fast food joints."

Insect Allergies (from page one)

were named as sources of the inhalant allergens. In his 1980 survey of insectary workers, Wirtz found that 67% of his respondents linked their allergy symptoms to direct or airborne exposure to lepidopteran (moth and butterfly) scales with emphasis on respiratory problems. Two labs had 53% and 75% of their personnel develop allergies to scales despite the use of exhaust hoods and protective masks and clothing. Case histories of asthma among Lepidoptera workers are numerous.

Reactions to Orthoptera (grasshoppers, crickets, locusts, cockroaches, etc.) are also common. In 1969 LeClercq reported that workers rearing locusts suffered rhinitis, itching skin, bronchitis and ultimately asthma in general sequence. Wirtz recounted one study of migratory locusts where all of the workers became allergic to the insect. The authors know of a researcher who suffered dyspnea (labored breathing) during a prolonged session of grinding crickets into meal to supplement chicken feed. Ominously, the three cases of anaphylactic shock reported by Wirtz involved

can name at least one food that turns their stomach, it is not clear what role, if any, psychological factors may have played in these illnesses. We can, however, gain some insight from controlled experiments on human subjects done with preparations of common food-infesting insects. A classic study by Bernton and Brown in 1967 utilized dialyzed extracts of seven of these insects in skin sensitivity tests of subjects with and without known allergies. Test extracts included those of the rice weevil (*Sitophilus oryzae*), fruit fly (*Drosophila melanogaster*), Indian meal moth (*Plodia interpunctella*), sawtoothed grain beetle (*Oryzaephilus surinamensis*), red flour beetle larvae and adults (*Tribolium castaneum*), confused flour beetle (*Tribolium confusum*), and lesser grain borer (*Rhyzopertha dominica*). Of the 230 allergic patients, 68 (29.6%) reacted positively to one or more of the dialyzed insect extracts. Surprisingly, of the 194 non-allergic subjects, 50 (25.8%) showed sensitivity to at least one extract. A total of 333 positive reactions were observed. The degree of overall sensitivity was practically the same for both groups, with the Indian meal moth extract eliciting the most positive reactions followed by the extracts of red flour beetle larvae, red flour beetle adults, rice

orthopterans.

Workers exposed to the obligate beetle and weevil (Coleoptera) pests of stored grains and milled products have also been affected. Reports of skin itching, hives, rhinitis, dyspnea, and bronchial asthma are numerous and well-documented. Flies and midges (Diptera) as well as mayflies (Ephemeroptera) and caddis flies (Trichoptera) have likewise been implicated as allergenic hazards in the workplace. The above reports as well as others too numerous to mention in this article highlight the fact that insects and related arthropods pose a very real occupational health threat to workers repeatedly exposed to them. Coping with this problem can be an annoying inconvenience that has both economic and health consequences for the worker and employer. Although good ventilation, protective clothing, gloves and masks are common sense preventive measures (as well as being mandated by OSHA), reassignment of the sensitized victim to a non-threatening work environment is often the only viable remedy to the problem.

This brings us to the topic of ingestant allergens, that is, eating or unintentionally swallowing allergenic insect material. Since we are not a nation accustomed to dining on "bugs", direct evidence for allergies to food insects is practically nonexistent. Nonetheless, entomologists are sometimes treated to nebulous accounts of people getting sick after deliberately eating insects. Since most everyone

weevils, fruit flies, confused flour beetles, sawtoothed grain beetles, and lesser grain borers.

The question arises as to where upwards of 25% of the general population might have acquired sensitivity to these insects. At one time or another, most people have had to clean out their cupboards as a result of an infestation by one or more stored-food pests. If the problem is bad enough (and recurrent), sensitivity could be related to inhalant or contactant allergens of insect origin. More likely, however, these allergies are the result of ingesting small quantities of insect material in food over a lifetime. Despite proficient methods of production and storage, trace amounts of insect material are going to find their way into our food. The Indian meal moth and its relatives, for example, can be persistent and notorious pests wherever candy is manufactured or stored. Stored-product moths will also attack flour, pasta and dried fruit. Grain beetles and weevils are a constant threat to stored whole grain, and who hasn't opened a box of cake mix or commel only to discover flour beetles infesting the contents. We are not inclined to eat food showing obvious signs of insect contamination, but we are more than likely getting occasional small doses of insect material in food we consider wholesome. For most people this level of exposure is medically inconsequential. For people with known allergies, especially those of the food and insect

SEE INSECT ALLERGIES, P.4

International Symposium on Biodiversity in Agriculture Beijing, China, 19-21 September 1995

Symposium themes: Agricultural sustainability, biodiversity management, and microlivestock. Day 2 of the symposium, 20 September, is entirely dedicated to insects and other microlivestock as a human food resource. The program for Day 2 is shown below.

G.R. DeFoliart, University of Wisconsin, Madison, WI, USA
An overview of edible insects and their role in preserving biodiversity.

W. Beets, International consultant, BruxeLles, Belgium
Protein of micro-livestock and non-conventional animal proteins versus plant proteins in integrated smallholder farming systems

F. Malaisse, Faculte des Sciences Agronomiques, Gembloux, Belgium
The place of insects in traditional food in Zaire: biodiversity and sustainable management

B. Prasad, Manipur University, India
Future sources of non-conventional animal proteins in India

. Mitsuhashi, Tokyo University of Agriculture and Technology, Japan
Insects as traditional food in Japan

V.B. Meyer-Rochow, Oulu University, Finland, and S. Changkija G.B. Pant Institute of Himalayan Environment and Development, India
Uses of insects as human food in Papua New Guinea, Australia and North-east India

Luo Zhiyi, Shanghai Institute of Entomology .Chinese Academy of Sciences
Insects as food resource in eastern subtropical China

C. W. L. Mercer. The Papua New Guinea University of Technology
Sustainable production of insects for food and income b

Jintana Yyoung-Aree and Prapasari Puwastien, Institute of Nutrition, Mahidol University, Thailand
Edible insects in Thailand: an unconventional protein source.

J. Okedi, National Agricultural Research Organisation, Uganda
The use of insects as human food in Uganda

New Guinea villagers

Julieta Ramos-Elorduy, Instituto de Biología, Universidad Nacional Autónoma de México
Could insect biodiversity be a feasible new sustainable alternative?

Formal poster presentations (16:00-18:00)
Evening: Visit to Beijing Opera

Contact:

Sandra Bukkens
Organizing Secretariat
Istituto Nazionale della Nutrizione
Via Ardeatina, 546
00178 Rome, Italy
Fax: 39-6-50 31 592
Phone: 39-6-50 32 421
e-mail: Giampietro@IN8800.INGRM.it

Symposium Organizing Committee

Maurizio Paoletti
University of Padova
Italy

Jacques Baudry
INRA SAO
Rennes, France

Mario Giampietro
INN
Rome, Italy

Han Chunru
Beijing Agricultural University
China

The Food Insects Newsletter

Page 4

While the editor slept, the periodical cicada prepared to emerge.

A few days after taking the March Newsletter over to the printer, I received a small package in the mail. It was from my mother-in-law, Mary Ball, who lives in Warsaw, New York, and who was at the time within a couple of months of celebrating her 90th birthday, a celebration, attended by a lot of family, that came off on schedule in April. The package contained a copy of the 1995 *Farmer's Almanac*, to the front of which was affixed a message, "see page 46." Turning to page 46, I suddenly felt a slight foreboding upon seeing the title of the article there, "Every 17 Years, Like Clockwork." Dismay began to set in as I read the subheading: "Sometime in the spring of 1995, residents of Pennsylvania, Maryland, Virginia, West Virginia, and North Carolina will begin hearing an incredible and constant racket the likes

Newsletter readers. The fun would be all but over by July when our next issue was due out. The article is by Deborah Papier. It gives a good summary of periodical cicada biology. It notes that there are approximately 15 broods of *Magicicada*, each with a 17- or 13- year cycle, and that each year, somewhere, a brood is making its rare appearance. "In 1995 it's show time for Brood I, a 17-year cicada that has staked out a portion of the mid-Atlantic region." Only the males make music, and the author points out that - melody or cacophony - one thing is indisputable: "The cicada is LOUD. A single cicada can make itself heard a quarter of a mile away. A chorus of the insects can produce a din that will register at 100 decibels - the equivalent of a jackhammer. Like a heavy-metal musician, the cicada runs the risk of destroying its own hearing. But unlike

built-in protective mechanism: While it is singing, it collapses its eardrum, blocking out most of the noise it is making." It is obvious that, when it comes to dealing with noise, cicadas have outdone humans in their evolution. As a taste treat, the author notes that cicadas are easily prepared: "Just dip in batter and fry in butter until golden brown. Serve with cocktail sauce."

The thing that is frustrating about this is that, after the big Illinois emergence in 1990 (see the November 1990 *Newsletter*), we started and half completed a followup article that would summarize cicada broods and biology and describe how to tell when and where the next big emergence will be. Four years later, the manuscript sits here, still half-completed.

of which they will not have heard since its human counterpart, the cicada has a 1978 " It was too late to alert our

Insect Allergies (from page two)

varieties, the matter becomes problematic. In the case of food insects, does the sensitized person exercise strict avoidance of this novel cuisine or take his or her chances?

Perhaps there are processes that largely diminish the potential threat of food allergies. One school of thought suggests that insect allergens in food are deactivated by cooking, yet, when five of the aforementioned insect extracts were heated at 100°C for one hour, positive skin reactions were again observed, although they were deemed less vigorous than those of the unheated treatments. In a 1964 study, Bernton and Brown heat-treated the extracts of cock-roaches at 100°C for one hour and found that these allergens likewise resisted deactivation. The idea that insect allergens are deactivated in the highly acidic environment of the stomach is also appealing until one considers the number of normally eaten foods that have been identified as potentially allergenic and whose allergens obviously survive digestion and cooking.

For most people, working with or eating food insects would pose little if any health risk, especially if they have no history of allergy to insects or other arthropods. Nonetheless, since sensitivity can be acquired with repeated exposure to an allergen, a measure of vigilance is in order. The person with known insect or arthropod allergies would be wise to exercise some caution. Cross-reactivity among related as well as taxonomically dispersed groups of insects has been established. There is also evidence for cross-reactivity

among distantly related members of the Arthropoda suggesting the existence of common allergens within the phylum. So, if you are allergic to shellfish, you might want to reconsider the urge to "down" a plate of fried mealworms. As with anything, a little knowledge and common sense should keep you out of trouble.

Further Reading

Bauer, M. and R. Patnode. 1983. NIOSH, HETA, Report No.82. 002-1312. 36p.

Bellas, T.E. 1990. Occupational inhalant allergy to arthropods. *Clinical Reviews in Allergy*. 8:15-29.

Brenner, R.J., K.C. Barnes, .M. Helm, and L.W. Williams. 1991. Modernized society and allergies to arthropods. *American Entomologist*. 37(3): 143-155.

Bernton, H.S., and H. Brown. 1967. Insects as potential sources of ingestant allergens. *Annals of Allergy*. 25:381-387.

Gorham, R.J. 1976. Insects as food. *Bulletin of the Society of Vector Ecology*.3:11-16.

LeClercq, M. 1969. *Entomological Parasitology*. Pergamon Press, New York. 158 pp.

Phillips, J .K. and W .E. Burkholder. 1984. Health hazards of insects and mites in food, pp. 279-292, in F.J. Baur (ed.), *Insect Management for Food Storage and Processing*. American Association of Cereal Chemists, St. Paul, MN.

Wirtz,R.A. 1980. Occupational allergies to arthropods - documentation and prevention. *Bulletin of the Entomological Society of America*. 26(3):356-360.

The Food Insects Newsletter

Page 5

Recent Technical Papers and Reviews

Adamolekun, B. 1993. *Anaphe venata* entomophagy and seasonal ataxic syndrome in southwest Nigeria [letter to the editor]. *Lancet* 341 :629. Department of Medicine, College of Health Sciences, Obafemi Awolowo University, Ile-Ife, Nigeria.

Adamolekun notes that, because of the high cost of conventional protein foods, protein energy malnutrition is widespread in rural Nigeria. He further notes that consumption of the larvae of *Anaphe venata* is particularly

adds, "It's all the more baffling because the larvae had been used as food for ages and yet, the ataxia being reported is a more recent development."

Mercer, C.W.L. 1993. Insects as food in Papua New Guinea. In *Invertebrates (Minilivestock) Farming* (I. Hardouin and C. Stievenart, eds.), pp. 157-162. Philippines: EEC-DGXII/CTA/IFS DMMMSU/ITM. Department of Forestry, PNG University o Technology, Private Mail Bag, Lae, Papua New Guinea.

This paper was part of a symposium co-organized and

common in southwestern Nigeria, that the nutritional value of the larvae has been shown similar to that of chicken egg, and that mass-rearing of the larvae as an alternative protein source has been advocated. The writer then suggests: "However, *A. venata* entomophagy may be implicated in the actiopathogenesis in southwest Nigeria of an ataxic syndrome that occurs annually in the rainy season (July-September). The syndrome is characterized by sudden onset of severe intention tremors and truncal and gait ataxia after a (usually evening) meal. Up to now the cause remained unknown. The preceding meal consumption led to the suspicion that a food toxin may be responsible, but no food item was common to all patients presenting with the disease.

Dietary recall data are given on patients seen at the Ife State Hospital with the ataxic syndrome. All patients had consumed the roasted larvae of *A. venata* in their last meals before onset, and market surveys indicated that the period of wide availability of larvae coincided with the occurrence of the seasonal ataxia.

Adamolekun concludes: "This seasonal ataxia may occur in poorly nourished subjects who are marginally thiamine-deficient because of a monotonous diet of carbohydrates containing thiamine-binding cyanogenetic glycosides, and who have a seasonal exacerbation of their thiamine deficiency from thiaminases in seasonal foods. The dietary recall in my patients supports this view. Thiaminases are present in many insects, and the invariable finding of *A. venata* entomophagy in all patients with the seasonal coincidence of the ataxic syndrome and the wide availability of the larvae in the markets implicates the larvae. It is ironic that poorly nourished people who desperately need protein supplementation appear to be at greatest risk for developing this ataxic syndrome."

Adamolekun, B. 1993. Epidemiological studies of the etiology of a seasonal ataxia in Nigerians. [Abstract.] *Neurobiology* 43:1419.

Adamolekun presented The Bruce S. Schoenberg International Lecture in Neuroepidemiology on April 29, 1993, at the American Academy of Neurology 45th Annual Meeting. This abstract gives more medical detail and less entomological detail on the ataxic syndrome than is found in the letter to *The Lancet* (above).

We thank Dr. A.E. Akingbohunge, Department of Plant Science at Obafemi Awolowo University, for alerting us to these studies. Professor Akingbohunge remarked that there is no clue as yet why feeding on the roasted larvae could induce thiamine deficiency, and

published by the Tropical Animal Production Unit of the Institute of Tropical Medicine in Antwerp, Belgium. In brief introductory remarks on the history of insect consumption, the author suggests that the European *Cossus* was most likely the stag beetle, *Lucanus cervus* (Lucanidae) or possibly the longicorn, *Prionus corioranus* (Cerambycidae), but by the 19th century the consumption of insects in Europe had all but ceased. As a young boy in Nyasaland (now Malawi), the author sampled grasshoppers and locusts which the markets always sold and winged termites which emerge in the millions from their termitaries. He attests that "roasted termites are delicious, with a flavour like salty bacon." He encountered two insects commonly eaten in Sarawak, Malaysia, the sago grub, *Rhynchophorus ferrugineus* (Curculionidae) and the larvae of *Hoplocerambyx spinicomis* (Cerambycidae).

In Papua New Guinea, many species are eaten in one locality or another. Whole clans go out to collect cockchafer beetles (Scarabaeidae: Cetoniinae). Adult weevils (Curculionidae), longicorn grubs (Cerambycidae), cicadas, termites, Mayfly adults, wasp larvae, scorched adults of a hawk moth (Sphingidae), locusts and grasshoppers, and spiders are all eaten. The author, with a group of university students, was offered longicorn grubs (appeared to be a species of *Batocera*) cooked in coconut milk as the centerpiece of a celebratory feast at Ahora, about 30 km from Gona. He observed, in the Gabensis logging area near Lae, villagers collecting in large numbers grubs of the longicorn *Hoplocerambyx severus* from under the bark of felled *Anisoptera polyandra* trees. The insect breeds in such numbers that if logs are left in the forest for any length of time they become riddled with holes and piles of frass (sawdust) surround them. The author extracted nearly a hundred grubs from a single log in little more than 15 minutes. The high regard for these grubs is indicated by the fact that villagers must climb 1000 meters to reach the logging area and collect them. Relative to locusts, during a serious outbreak of *Locusta migratoria* in the Markham valley near Lae in 1988, villagers partially made up for their crop losses by consuming large quantities of the locusts.

The insect discussed in greatest detail is the sago grub, *Rhynchophorus ferrugineus papuanus*. Consumption of these grubs is wide-spread in PNG and it is the only insect sold regularly in local food markets. "It is everywhere considered a delicacy." The grubs can cause injury to the stems and crowns of living palms, and eating the grub is a common biological control method. In some areas, palms are cut down in the knowledge that the grubs will breed in the rotting

SEE RECENT TECHNICAL PAPERS, P. 8

Letters

Little boys are made of rats and snails and puppy dog tails, little girls are made of sugar and spice and everything nice, *kungu* is made of

In the March '95 *Newsletter* (page 9), we asked if anyone could clarify the taxonomic composition of *kungu*, used as food in parts of East Africa. Dr. Penny Gullan, The National University of Australia, responded. Her letter, in part:

My colleague Dr. Peter S. Cranston, of the CSIRO Division of Entomology in Canberra, has examined several cakes of *kungu* which were in the Natural History Museum in London (Peter used to be Curator of Diptera at the NHM). He says that the *kungu* that he examined was mostly composed of *Chaoborus (Sayomyia) edulis* Edwards with smaller quantities of chironomid midges. Please refer to the enclosed pages from a recent book on the Chironomidae. In addition, you may not have seen the paper by Bergeron et al. (1988) who have analysed the flour from dried insects from Lake Victoria. The full reference is: Bergeron, D., Bushway, R.J., Roberts, F.L. *et al.* (1988) The nutrient composition of an insect flour sample from Lake Victoria. Uganda. *Journal of Food Composition and Analysis* 1 :371- 7. I'm sorry that I can't send you a photocopy of this article- Peter cannot find his copy of it.

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

Editor: The book referred to by Dr. Gullan is: Annitage, P.D.; Cranston, P.S.; Pinder, L.C.V. (eds.). 1995. *The Chironomidae: Biology and ecology of non-biting midges*. London: Chapman & Hall. The relevant pages are 371- 72 in Chapter 14, Medical Significance, by Cranston (pp. 365-384) and pages 430-431 in Chapter 17, Chironomidae as Food, by Arrnitage (pp. 423-435) (although the second paragraph quoted below [from Ch. 17] was largely written by Cranston, who has studied *kungu*).

"We know from other entomologically and anthropologically skilled observers that the cake is also termed '*kungu*' and is prepared from aquatic insects emerging en masse from other Ugandan lakes (Chapter 17). Examination of an example of the cake preserved in the Natural History Museum showed that a major component is actually a species of fly belonging to the family Chaoboridae, *Chaoborus (Sayomyia) edulis* Edwards (Cranston, unpubl.). This species undergoes lunar periodic emergence (section 10.2.2) from Lake Victoria, and moves in large numbers towards lakeside lights. As the specific name implies, F. W. Edwards knew of the edibility of the species when he described it. It is uncertain whether the allergic disorders of white residents of Entebbe were due to the chaoborid or the small tanytarsine midges also

chaoborids as being the main source (Beadle, 1974). The flies are attracted to lights and fall to the ground. They are collected, boiled and made into small cakes (*Kungu* cake) which are said to taste similar to caviar or salted locusts. Large numbers of chironomids emerge at the same time as chaoborids (MacDonald, 1956) and they also constitute a proportion of the midges collected for food. Bergeron et al. (1988) have analysed the flour made by grinding the dried insects and report high proportions of protein (67 g/1 DOg) with a high *in vitro* digestibility of 91 %."

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

MacDonald, W. W. 1956. Observations on the biology of chaoborids and chironomids in Lake Victoria and on the feeding habits of the 'elephant-snout fish' (*Mornyrus kannume* Forsk.). *Jour. Animal Ecology* 25:36-53.

Early alert for upcoming BBC productions

The BBC Natural History Unit has given attention to food insects topics for several years now. The following is excerpted from a letter from Rupert Barrington (Producer), dated April 4th:

I thought I would just let you know that, inspired by your *Newsletter*, we have covered two lots of "Insects as food" for our BBC series on Insects. These were a short piece on the Mopane worm in Botswana (unfortunately I could not get out there -we commissioned a South African crew to do this for us) and various insects being collected, sold and cooked in Thailand (Bamboo worms, crickets of two kinds, hornet grubs and giant water bugs).

The series (called Alien Empire) is being transmitted here in November this year. It is co-funded by WNET in USA and will, I imagine be transmitted in USA around the same time. The sequences are in the sixth (final) programme.

I am hoping, on the strength of this, that I may be able to get an entire programme commissioned on Insect eating. I keep fingers crossed for this. The gratifying thing is that most people react with fascination rather than disgust when they see this footage. We are very much pushing the angle that this is no different to eating crustaceans, so western attitudes to eating insects are groundless.

(Ed. In a later letter, Mr. Barrington changed the time of probable showing in the U.S.: "The series is due to be shown by WNET early next year (probably February)."

Insights and a research request from Namibia

Eugene Marais would like to be contacted by readers who have information, either unpublished or through better access to the literature than he, on any of the three questions below. His address:

present." (p. 372).

"Swarming dipterans are also used as food by humans living around some large African lakes. Most records are anecdotal and refer to

The Food Insects Newsletter

Page 7

the National Museum of Namibia, Entomology Centre, P.O. Box 1203, Windhoek 9000, Namibia. His letter, in part:

During the 1970s a Swedish researcher, Dr. C.A. Silow, investigated the ethnozoology of midwestern Zambia. Dr. Silow investigated a part of Zambia which is fairly close to Namibia, and situated in the more humid savanna of central Africa. The pattern of ethnoentomological folk classification described by Dr. Silow is fairly closely linked to that of Namibian tribes, and I would like to access his information on especially the beetles, wasps, Hemiptera, and orthopteroid orders.

I have two publications of Dr. Silow: 1. Silow, C.A. 1976. Edible and other insects of Mid-Western Zambia. Studies in Ethno-Entomology II. Institutionen for allman och jamforande etnografi vid Uppsala Universitet. *Occasional Papers V*. Almqvist & Wiksell, Uppsala. 223 pp. (Lepidoptera only) 2. Silow, C.A. 1983. Notes on Ngangela and Nkoya ethnozoology. Ants and termites. *Etnologiska Studier* 36: 1-177. (Published by Goteborgs Etnografiska Museum (ants (Formicidae) and termites (Isoptera) only).

In his 1976 introduction it is clear that Dr. Silow had substantial information on other insect orders too, e.g. on beetles (Coleoptera), Hemiptera, orthopteroid insects, bees and wasps (Hymenoptera), and other lesser orders. However, I have been unable to trace any further references in which he has published additional information, and was also unsuccessful in obtaining his present address from Swedish correspondents. Does anyone have references to other publications in which Silow provided this information, or does anybody have a present address for Dr. Silow, or even the address of an institution at which his notes or even manuscripts might be deposited?

The other queries are more general.

From the ethnoentomological literature it is clear that insect food resources are restricted in both time and space, and that different tribes and ethnic groups in the same environment do not necessarily make use of the same resources. The reasons for tribal differences are based on a complex combination of ethnic history and traditions, tribal migration, subsistence practices, etc. The temporal and spatial resource constraints, however, are based on the geographical distribution and abundance pattern of insects, which determine which insect resources can be utilized.

with a marginal subsistence economy. I came across an obscure reference about the now extinct Xam Bushmen of western South Africa, who used astronomical observations to determine the season to harvest immature termite alates. In the conference proceedings of the first Ethnobiology Symposium (Posey & Overal. 1990. *Ethnobiology: Implications and applications*. Museo Paraense Emilio Goeldi Vol. 1), Fortune mentioned that the first turtle month of the Carribean Karaja is also named for the flowering of a tree. In scattered references, periods named after seasonal environmental attributes are also mentioned, but none of these are clearly linked to gathering a specific resource. I would like to find more references to the use of environmental clues by ethnic groups which had/have to migrate to harvest food, especially to harvest insects in arid or semi-arid areas.

Bees (Apidae) are one of the few insect groups where the stored products are the primary resource, rather than the insect itself. Though the brood, and occasionally adults, might be eaten, ethnic groups all over the world would rather harvest the honey, pollen and wax of several bee and wasp species. In Asia swift nests are harvested as food, while the well-known consumption of honey ant repletes in Australia could also perhaps be regarded as harvesting the product rather than the animal. Another well known insect product utilized widely is the honey dew secretions of various Homoptera (Hemiptera) species. In Namibia though, several tribes gather the seed collected by harvester ants. The useful seed is winnowed for subsequent use, e.g., by pounding into flour to make porridge, while husks, gravel, ants and inedible seed are discarded. Silow (1983. Notes on Ngangela and Nkoya ethnozoology. Ants and termites. *Etnologiska Studier* 36:50) mentioned that the Nkangala in Angola used to do the same. I will be most grateful for information on any other tribal groups which harvest the product or labour of insects as a principal food resource or delicacy, rather than the insect itself.

(Ed.: I'm pleased to mention that Mr. Marais plans, in the near future, to send an article for the *Newsletter* on entomophagy in Namibia, with examples from various communities and interesting historical notes.)

University students and entomophagy in Papua New Guinea

Dr. Christopher W .L. Mercer, Senior Lecturer in Entomology, Forestry Department, PNG University of Technology, Lae, PNG, writes in part:

Distribution and abundance are even more critical in semi-arid and arid environments, as in Namibia, where the economy of subsistence practices becomes critical. In nomadic communities of arid areas, especially those primarily dependent on hunting and gathering, it is important to be able to predict which resources will be available at different times. As such pastoral communities did not have watches or almanacs, they had to depend on environmental clues to determine seasons and the passage of time. Some clues are fairly obvious, such as general changes in the weather pattern (summer/winter, onset of the rainy season, etc.). However, such seasonal changes are still too crude for tribes

I would like to firstly thank you for continuing to send me *The Food Insects Newsletter*. I find it most interesting, and I also make use of it during my entomology courses. The majority of my students are keen consumers of a whole range of insects when they return to their villages during vacation time. I have come to the conclusion that it is the West which is out of step in its aversion to insects as food!

SEE LETTERS,

P.11

The Food Insects Newsletter Page 8

Recent Technical Papers (from page five)

pith, and they are then harvested a month or two later. Ordinarily, however, the sago palm is harvested when the starch level is highest, usually between 12 and 15 years of age, just before flowering after which the palm dies. Mercer states that, in the Sepik and Fly river areas the palm is cut down primarily for sago production (each palm produces 250 kg of sago starch, enough to feed a man for a year), and the grubs are a by-product. The trunk is left covered with sago leaves to prevent oviposition by the adult weevils while the palm tops and butts are left exposed to oviposition.

At the market in Lae, the grubs, along with other collected wild food products, are sold mainly by women from villages along the sea-coast. They are sold live in aerated plastic bags for one kina (about US \$1.05) per bag containing about 40 grubs weighing 250 grams. The author mentions that they are bought both by Papua New Guineans and foreigners, and usually sell out very quickly. Usually, the grubs are either boiled or roasted, and, according to the author, they "are tender and sweet with a slightly nutty flavour."

Mercer concludes: "Insects are an important, but largely unrecognised part of the diet of Papua New Guineans. Nutritional programmes in future should recognise this fact." In a broader context, he concludes that the predicted world protein shortage could be ameliorated by using insect protein, but that an educational program would be necessary "to overcome the taboos currently held in the West."

Mercer, C. W. L. 1994. Sago grub production in Labu swamp near Lae -Papua New Guinea. *Klinkii (Jour. Forestry Papua New Guinea)* 5(2):30-34.

Author's Abstract. Insects form an important source of protein in the tropics of Africa, South America, and South East Asia. The most widely eaten insect in New Guinea is the grub of the Sago Palm Weevil,

inferior sago starch and has lower yields than *M. sago*, and, by the Labu people, is used almost exclusively for raising sago grubs.

In Labu swamp, *M. rumphii* is felled at between 12 and 15 years, just before flowering and when the starch level is highest. Mercer describes the process as follows: "The palm is felled using an axe so that the trunk falls across other vegetation and is thus above water level. A stump of about 1 metre in height is left, and this is also used for raising sago grubs. All along the upper surface of the trunk at intervals of about a metre, small squares of the very hard outer covering or cortex are removed by axe, exposing the soft fibrous interior. This is to facilitate oviposition by the sago weevil. Striations are also cut in the 'cabbage' to make it more attractive to female weevils. Prepared trunks measured between 8 to 10 metres in length."

The female weevils are attracted by the odor given off from damaged parts. The majority arrive at night and upwards of 100 weevils were observed on freshly felled trunks in the early morning. Females continue to visit a trunk for several weeks after it is felled. Each female lays 200-500 eggs; the eggs hatch in 3 days. The larvae, up to 6 cm long at maturity, make tunnels up to 1 meter in length. The larval period lasts 2-4 months, but may be as short as 24 days when they feed on the more nutritious II cabbage." The pupal stage lasts 14- 28 days, and the young adult stays in the cocoon for 8-14 days before emerging.

As female weevils continue to visit the felled (and prepared) palm trunk for a number of weeks, and the speed of larval development varies with richness of the food supply, grubs at all stages of development are found in anyone trunk. Trunks were visited about 10 times beginning about one month after the tree was felled, with 50-60 grubs collected each visit and between 500 and 600 grubs collected per tree. Later on, when pupae and young adults were found, they were eaten raw by collectors or taken home for cooking, but they were not sold in the market at Lae.

Rhynchophorus ferrugineus papuanus (Family: Curculionidae). This insect attacks both the smooth-trunked sago palm *Metroxylum sagu* and the thorny-trunked sago palm *M. rumphii* (Family: Palmae). The production of sago grubs was studied at Labu swamp about ten kilo- meters from Lae in Papua New Guinea (PNG). Between 500 and 600 grubs were harvested from each specially prepared palm trunk. The grubs were sold in Lae market either alive or grilled on a bamboo skewer. Live grubs were one kina (approx. US \$1) for 40, while grilled were approximately 15 for fifty toea (US \$0.50). This represents a significant source of rural income.

This paper includes some information contained in the 1993 paper (see preceding review), but expands greatly on the life cycle and harvest of *R.ferrugineus papuanus* and how sago palm is prepared for grub production. In the Sepik floodplain where the smooth- trunked *Metroxylum sagu* is exploited, the trunk is used for sago production while the starch-rich "cabbage" (leaf bases and actively growing top) and stump are left for raising sago grubs as a by- product. The grubs are harvested about two months after the tree is felled. *Metroxylum rumphii*, the thorned-trunk sago palm, produces

Mercer cites other studies for results of nutritional analyses of the grubs: 760.2 kilojoules/1 DO grams, protein 6.1 %, fat 13.1 %, carbohydrate 9%, iron 4.3 mg/100 g, thiamine 0.08 mg/1 DO g, riboflavin 0.43 mg/1 DO g, niacin 2.4 mg/1 DO g, and calcium 461 mg/1DO g. The calcium is four times as high as that for any other meat tested. The grubs are also an important source of zinc. Mercer concludes that in the areas of PNG where sago is the staple food, the eating of sago grubs may help to alleviate protein deficiency.

DeFoliart, G.R. 1995. Edible insects as rminilivestock. *Biodiversity and Conservation* 4:306-321. Department of Entomology, University of Wisconsin, Madison, WI 53706 USA.

A dictionary defines "livestock" as "domestic animals kept for use on a farm or raised for sale and profit." Although insects harvested from the wild are widely sold for profit in tropical countries, few insects meet the criterion of being domesticated. The most truly domesticated edible insect is the silkworm or mulberry silk moth,

SEE RECENT TECHNICAL PAPERS, P.

10

The Food Insects Newsletter

Page 9

How about doing something different, like dining out in Mexico? Si? May we have the menu please?

Restaurante - Bar LA CAVA DEL LEON

Carretera Mexico-Texcoco Km 36.5
a.m. a 7 p.m.
Tel.: 499-49

Servicio de: 8

ESPECIALIADES DE LA CASA

Pesos

Nuevos

Cazuela de Escamoles al Epazote \$40,000 \$40.00
Pot of ant larvae fried and cooked with
\$15.00

Chenopodium ambrosioides L.
6,000 6.00

(Chenopodiaceae).

7,000 7.00

Cazuela de Escamoles a la bilbaina 40,000 40.00
7,000 7.00

Pot of ant larvae fried in olive oil

Pesos

Nuevos

SOPAS (soups)
Sopa de medula \$15,000

Consome de pollo

Sopade Cebolla

Sopa deajo

Sopa azteca

8,000 8.00			
and dry red chile		Arroz	
5,000 5.00			
Cazuela de escamoles a la cazuela	40,000 40.00	Espaguetti	
20,000 17.00			
Pot of ant larvae cooked with herbs		Crema de champinones	
8,000 8.00			
Cazuela de Escamoles a la mantequilla	40,000 40.00	Consome de camero	
5,000 5.00			
Pot of ant larvae fried on butter		Sopa de tortilla	
7,000 7.00			
Orden de Chinicuiles a la cazuela	40,000 40.00		
Salsa en molcajete de Chinicuil verde	40,000 40.00	CARNES (meats)	
o roja		Carn asada con papas o enchiladas	
20,000 17.00			
Hot sauce with beetle larva ? made on		Milanesa con papas	20,000
17.00			
molcajete (grinding stone) with either		Filete a la tampiquena	
22,000 22.00			
tomatillos (green) or tomatoes (red)		Filete en salsa de champinones	28,000
28.00			
Gusano blanco a la bilbaina	40,000 40.00	Filete a caballo	
28,000 28.00			
Agave or prickly pear worms cooked and			
fried in olive oil and dry red chile		AVES (poultry)	
Gusano blanco a la mantequilla	40,000 40.00	Pollo frito con papas	17,000
17.00			
Same kind of worm fried on butter		Pechuga en salsa de queso	20,000
20.00			
Gusano blanco a la cazuela	40,000 40.00	Pechuga empanizada con papas	17,000
17.00			
Worms cooked with herbs		Pollo parrilla	
17,000 17.00			
Molcajete de gusano blanco en salsa	40,000 40.00	Codomiz en mixiote verde o chipotle	18.000
18.00			
verde o roja			
Hot sauce with worms prepared on the		LUNES CALDO DE HUESO EN SALSAS VERDES!	
grinding stone (molcajete) with chiles and		GRACIAS	
tomatillo (green) or tomatoes (red)		BUEN PROVECHO!	

Of the many restaurants in Mexico that offer insects on their menus, Don Chon's in Mexico City has undoubtedly received the most publicity in the United States (see July 1989 and July 1993 Newsletters). But, Dr. Carlos Blanco of Ciudad Obregon, Sonora, via the menu printed above, recently introduced us to the La Cava del Leon. As the Editor used most of his Spanish vocabulary in the title above, we asked Dr. Blanco if he would translate the House Specialties (insects) section at the top of the menu, which he kindly did. Although the original menu is well spaced and attractive, with a neat red lion in the upper left corner, in adding translations, etc., we had to crowd everything up in order to keep it fitting on one page. Dr. Blanco also explained that the "peso nuevos" column represents the value of the peso after its recent devaluation by the government, leaving the exchange rate at the time of our correspondence, February 11, 1995, at about 1 US dollar per 6 "new pesos. and, further, the portions at the restaurant were a bit on the small side.

The escamoles (ants) on the menu are *Liometopum apiculatum* or *L. occidentale*; the gusano blanco are white maguey "worms" or white agave worms, the larva of the skipper butterfly, *Aegiale hesperiaris*.

Interestingly, the insects are by far the most expensive items on the menu. Even so, the prices are quite reasonable at the La Cava del Leon compared to the US \$20-30 we've seen for the same dishes at Don Chon's and some other restaurants in Mexico. So, while the city folks pay rather dearly for their insect favorites, the hard-working campesinos have the option of eating like kings when it comes to insect fare. To quote Juan Gonzalez, a 24-year-old day laborer who collects leafcutter ants for the market in Colombia (see Kevin Krajick's article in the July 1994 *Newsletter*), "You make good money. and the ants are tasty."

The Food Insects Newsletter
Page 10

Recent Technical Papers (from page eight)

Bombyx mori (Family Bombycidae). the pupae of which are used as food and animal feed in much of Asia. The silkworm has been cultivated for so long, beginning 5000 years ago in China, that it is doubtful that it could any longer survive in the wild state. The edible pupae are the by-product of commercial silk production, and obviously, any insect that can produce two or more useful products simultaneously increases its economic and environmental efficiency.

In addition to the mulberry silk moth, there are more than a dozen species of "wild" silk producers (Lepidoptera) of commercial interest, the pupae of which are also used as food or animal feed. Three important species, all Saturniidae (giant silk moths), are found in Asia. *Antheraea pernyi* feeds on oak leaves and produces tussah silk. Thousands of acres of oak are under cultivation in China today for tussah production, and the pupae are considered a delicacy. *Antheraea assamensis* produces muga silk, and the government of India is actively promoting the development of mugaculture with research aimed at producing varieties that are better suited for indoor rearing and yielding larger cocoons. Experimental investigation has shown the pupae to be suitable as a high-protein substitute for fish meal in chick diets.

Things are somewhat reversed in the case of the eri silk moth, *Samia ricini*, which has been domesticated for centuries in India, China and Japan. For the tribal peoples in northeastern India, the eri pupa is considered a delicacy, while the cocoon is more or less a by-product. Based on research in Nepal, the author states of this species which feeds on castor: "It offers a nearly ideal example of sustainable agriculture: the castor plant grows on poor soils, helping to prevent soil erosion; castor bean oil is sold for medicinal and industrial uses; excess leaves are fed to the caterpillars which produce silk and a pupa that is a high-protein food or animal feedstuff, and the caterpillar frass and other rearing residue can be used for fish pond culture.'

Wild silk producers in Africa include two species of Lasiocampidae, *Gonometa postica*, the pupae of which are a food of the Pedi in South Africa, and *Borocera cajani*, the pupae being a food in Madagascar. *Borocera* sericulture is at low ebb today while *G. postica* is being studied for its sericulture potential in Africa and India. The other wild silk producers of commercial interest in Africa belong to the family Notodontidae. At least four species of the genus *Anaphe*, which spin large communal silk nests, are used as food, but in this case the larvae are harvested before they pupate within the large silk bag nests. Another domesticated insect that is also a multiple-product insect is the honey bee, *Apis mellifera* (Apidae). In industrialized nations apiculture

thought of as the invertebrate equivalent of dairy cows, which are valued not only for their milk but also as meat. II The author suggests that, because of its commercial products, including food, and its enormous importance in the pollination of crops and non-cultivated plants, the honey bee possibly represents "the most environmentally harmonious food production system in the realms of agriculture. II In tropical regions, in addition to *Apis mellifera*, numerous species of stingless bees (subfamily Meliponinae) are cultivated or to some extent manipulated for both honey and brood production.

The most widely "farmed" non-domesticated insects are probably the larvae of *Rhynchophorus* weevils, in Asia, Africa and Latin America (for one example, see the preceding review of the paper on sago grubs). In some regions, certain edible insect sources are considered private property, and in other instances conservation is practiced in connection with edible insect harvest. Examples are given. The paper cites 65 references.

Weissling, T .J.; Giblin-Davis, R.M. 1995. Oligidic diets for culture of *Rhynchophorus cruentatus* (Coleoptera: Curculionidae). *Florida Entomologist* 78(2): 1-10. University of Florida, Institute of Food and Agricultural Sciences, Fort Lauderdale Research and Education Center, 3205 College A venue, Fort Lauderdale FL 33314. Present address of senior author: USDNARS, 3706 W. Nob Hill Blvd., Yakima WA 98902.

Authors' Abstract. Several artificial diets were evaluated as alternatives to decomposing pineapple (*Ananas comosus* (L.) Merrill) for culture of *Rhynchophorus cruentatus* (F.) larvae. The most suitable diet tested for larval growth and survival was a combination of canned pineapple, oats, sucrose, molasses, brewers yeast, Wesson's salts, vitamins, and preservatives. Diets that were not supplemented with brewers yeast provided poor larval growth and survival. Larvae cultured from artificial diets were placed in sugarcane (*Saccharum officinarum* L.) for pupation.

A limiting factor found by the authors was that larvae would construct a cocoon only when placed in sugarcane stem. Sugarcane appeared to contribute very little to continued growth of maturing larvae and is suspected of being nothing more than a source of fiber from which the cocoon is constructed. Other more readily available fiber sources were tried but found to be unacceptable by the larvae.

This paper is of special interest for two reasons. As pointed out a number of times in *The Food Insects Newsletter* (see particularly the July 1990 issue and reviews of above articles by Mercer), *Rhynchophorus* (palm weevil) larvae are widely

is practiced mainly for honey production with other commercial products being beeswax, pollen, propolis, royal jelly and venom (used for treating people with severe sting allergies), but throughout the tropical world, in addition to honey, the "brood" (larvae/pupae) of numerous species is almost universally admired as a food delicacy. The author states, "In fact, honey bees might be

considered to be food of gourmet quality. *R. cruentatus* is the only species of the genus which occurs in the United States, thus providing a local representative in Florida and nearby southeastern States.

The authors note that, unlike some other *Rhynchophorus* species, it is not considered a major pest of palms, but it will attack transplanted or otherwise stressed ornamental palms; in Florida it is sympatric

SEE RECENT TECHNICAL PAPERS,

P.11

The Food Insects Newsletter

Page 11

Recent Technical Papers (from page ten)

with the native cabbage palmetto, *Sabal palmetto*, which because of its low cost, natural abundance and high transplanting survivorship, is often used as mature specimens in landscaping.

The motivation for this study on rearing was that research on the biology of *R. cruentatus*, and on its vector potential for the red ring nematode, *Bursaphelenchus cocophilus*, requires the collection of adults in the field, which is an expensive and time-consuming endeavor. When U.S. investigators whose insect research is not motivated by the food value of the insect nevertheless are cognizant of that added potential value of their work, it signifies progress for the food insects field. Weissling and Giblin-Davis conclude their paper by stating: "although we are aware of no human consumption of *R. cruentatus* larvae in the U.S., larvae of *R. palmarum*, *R. phoenicis*, and *R. ferrugineus* ...are considered delicacies by some. The culture of *R. cruentatus* on artificial diets could be a potential advancement in developing a niche for consumption of our indigenous species by palm weevil gourmets or feeding burrowing owls in captivity. ..."The Editor did not have time to check with the authors, but it would seem that the sugarcane fiber/cocoon problem would not be a problem in rearing larvae to market size, but only in maintaining the permanent breeding culture.

Hotlix

adds to its insect snacks product line

One of the new products is called "Cricket Lick-it," a creme de menthe sucker with a cricket in the middle. Cricket-Lick-It is sort of taxonomically related, in candy technology, to an older product, the tequila-flavored sucker containing a mealworm. The other new product is LARVETS--Original Worm Snax, available in Cheddar Cheese, Mexican Spice and BBQ. These are mealworms roasted, seasoned and packaged pocket-size, 36 packages per box. The company is looking into other package styles for bulk sales as they have had requests from wineries and other businesses that would like to use them for tastings.

For information, contact Hotlix, 791 Dolliver, Pismo Beach, CA 93449. Tel: (805) 773-1942; 1-800-Eat-Worm/1-800-328-9676; Fax: (805) 773-3840. O

Leafcutter Ants

"Leafcutters: Gardeners of the Ant World" is the title of an interesting article by Mark W. Moffett in the July National Geographic (Vol. 188 (1), pp. 98-111). There is no mention of the ants as food, but their nest-building and their tending of their fungus gardens is described and pictorially illustrated.

Letters (from page seven)

To heck with modesty! No editor can resist printing letters like these

From **David Strange, M.D.**, Petaluma, California, in part:

Thank you for founding and editing *The Food Insects Newsletter* for all these years. It is one of my favorite publications, about the only thing I get in the mail that I read

How to order at least the essence of Thai giant water bug

From **Renaud Berard**, Lille, France, a student in Chinese medicine and an amateur entomologist, in part:

After reading the article in the March 1993 *Newsletter* about the giant water-bug [*Lethocerus indicus*], I am writing you to report the availability of products I found in an Asian

cover to cover the same day I receive it. Your approach underscores at least two principles for The Good Life: Stay open to new experiences; and Lighten up.

From **Joe Buehler**, St. Peters, Missouri:

Enclosed is my check for. ...This is to "re-up" my subscription, and to pay for one for my brother, who keeps trying to steal my copy ! Thanks.

From the student section -- students think for themselves

Megan Murray, age 12, Woodland, California, writes:

I am writing to you because I just got the *Almanac of the Gross, Disgusting and Totally Repulsive*, and I read the creeping cuisine and I would like the latest copy of your newsletter. I'm 12 years old and my mother says that even thinking about eating bugs is sick, but I want to try them myself. In 4th grade I read a book called *How to Eat Fried Worms* and wanted to try it, but I gave up because I couldn't find a worm!!!

shop: 1) maengdana fish sauce and shrimp paste, which can be ordered from Phiboonchai Maepranom Thai Chili Paste Co, Lm, 113/1-2 Setthakit Village, Bangkok, Thailand; 2) maengdana essence, which can be ordered from Food Specialties Co., Lm, 1048/5-6 New Road, Bangkok 10500, Thailand; and 3) frozen maengdana, available only with difficulty.

The word "maengdana" is probably equivalent to the Lao name of the giant water-bug, *Lethacerus indicus* (Mang daar nah) (W .5. Bristowe.1932. *Trans. Ent. Sac. London* 80, part 2: 387-404). The first two products above have simply the maengdana flavour (pear and cinnamon) coming from maengdana essence (synthetic hexanol esters); the frozen maengdana wasn't very pleasant because of my inability to prepare and cook it properly. The fine savor of the essence can be added to shoya, tamari, or fish sauce to exalt the taste of other insects. ...

The Food Insects Newsletter
Page 12

FDA's Gorham Retires

The last day on the job for Dr. J. Richard Gorham Ph.D. at the Food and Drug Administration, Washington, DC was 31 May, 1995. Dick was a charter recipient of *The Food Insects Newsletter*, and contributed early-on to its pages, co-authoring (with Paris M. Brickey, Jr.) the article, "Preliminary Comments on Federal Regulations Pertaining to Insects as Food," in the March 1989 issue (Vol. 2, no.1). Notice that it was "Insects as Food," not "Insects in Food," in the title. One of his most recent achievements was co-editing the three-volume work, "Foodborne Disease Handbook" published by Marcel Dekker, New York. It looks as though Dick will slide into real retirement only slowly. He is one of the organizers and co-conveners for Section 18, Urban and Stored Products Entomology, which will be part of the XXth International Congress of Entomology in Florence, Italy, 25-31 August 1996.

Newsletter Subscription Information

Effective immediately, all checks and money orders for subscriptions, contributions, back issues, etc.. should be made out to Montana State University (no longer to UW Board of Regents).

Please check your mailing code (to the right of your name on your address label). When the mailing list is transferred to Montana, only names with a mailing code beginning with P (paid subscription) or F (free distribution) will be on it. Libraries and Peace Corps Volunteers automatically qualify for free subscription; others can be placed on the free distribution list

simply by requesting it of the editor. Names with old-fashioned code designations such as CM, D and M (unless the four numbers after the M end in 95) will be deleted.

In evolving from an "all free publication" two years ago, the retiring editor has been, to say the least, slow, haphazard and indecisive in adopting sound, coherent billing and other business policies and procedures. I wouldn't want to live with my system any longer, so it's probable that adjustments and refinements will be necessary after the new editor has had time to see how things are working at the new location.