
GUEST EDITORIAL

Why Not Eat Insects?

R. I. Vane-Wright

Biodiversity Programme, Department of Entomology,
The Natural History Museum, Cromwell Rd, London SW7 5BD, UK

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.

In 1960 Brian Hocking, reflecting an early concern for the inevitable food shortages facing our burgeoning world population, said 'We have about 50 more years of eating steaks and then perhaps we'll have to explore other sources of animal protein . . .'. During the last three years Gene DeFoliart's *Food Insects Newsletter* has been started, Holt's classic has been reprinted, and Bruno Comby's *Délicieux Insectes* has just been published. Is it possible that insects will become a valued source of alternative protein?

Do insects have food value for *Homo sapiens*?

Ronald Taylor (1975), in a book subtitled *Insects in Human Nutrition*, collated data on food values for a range of insects, comparing their protein, fat, carbohydrate, mineral, vitamin and calorific values with those for beef, lamb, pork, chicken, fish, milk and eggs. Insects contain a lot of protein, some being 'leaner' than trimmed beef, while others offer abundant fat calories. The amino-acid composition, although not ideal (tending to be low in methionine, cysteine and tryptophan), is easily balanced by the addition of suitable plant protein, such as corn gluten. Insects contain calcium, iron, other minerals and some vitamins (notably riboflavin). Other analyses demonstrate that, while part of the protein in insect carcasses is unavailable, being bound in the indigestible cuticle, what remains is nutritious and readily utilized.

If they are so good, why don't we eat them?

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. As food psychologist Gerald Bennett (1988) has put it, we like what we know, we have an irrational fear of the new and, once established, food preferences are highly resistant to change.

In fact, only people belonging to western European cultures, and nations derived from them, do not use insects as food. In Africa, for example, various Orthoptera (grasshoppers, locusts and tettigoniids), termites (Isoptera), and large moth caterpillars (especially certain Saturniidae, such as the so-called Mopani Worm, *Gonimbrasia belina*) are widely eaten. 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.

Correspondence is encouraged and should be addressed to the Editors.

In south-east Asia a great variety of insects is consumed, notably in Thailand. A particular delicacy is the giant water bug, *Lethocerus indicus*. The males are preferred: they have a unique flavour which apparently derives from their sex pheromone glands. Some New Guinea tribes favour cicadas so much that they have special names for each of the more highly prized species. The use made by Australian aborigines of 'witchetty grubs' and 'baked bogong moths' is perhaps more familiar. Koreans eat grasshoppers, and *Bombyx* pupae left over from silkmaking. Similar tastes can be found in Japan. Following a surgical operation, Emperor Hirohito ate little in his declining days other than his favourite insect dish: rice with cooked wasps. Fried wasps (a mixture of larvae, pupae and adults of *Vespula lewisi*) are simply mixed with boiled rice, sugar and soy sauce. The taste is sweet and nutty.

In the Americas the use of insects is also widespread. Marston Bates describes how leaf cutter ants (*Atta*) are toasted and sold in movie theatres in Colombia, serving as popcorn. In North America the Indians made great use of insects — before the mass arrival of Europeans stopped all that. Of the 500 or so insect species now known to be used for human food, about 40% are utilized by Mexicans. The list includes Hemiptera, Coleoptera, Hymenoptera, Orthoptera and Lepidoptera. Specialities include 'madrono worms' (larvae of the social pierid butterfly, *Eucheira socialis*), 'escamoles' (immatures of the ant *Liometopum apiculatum*), and 'ahuauhtle' (insect caviar: eggs of aquatic Hemiptera).

What are the practical problems of entomophagy?

Insects are small, which can make them difficult to collect *en masse* and difficult to process. The wings and legs of grasshoppers are not acceptable to many palates, and need to be removed. To eat mopani worms it is first necessary to force out the bitter guts. Many larvae, however, require no preparation other than a quick rinse: 'dry-roasted mealworms' are readily made from bran-fed *Tenebrio molitor* 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).

The collecting problem can be overcome by trapping. Giant water bugs to make 'Nam prik num maeng daa' are now collected in Thailand with the help of blacklights. Some insects naturally offer themselves in superabundance — the most obvious being locusts. Archaeologist David Madsen, studying the ecology of former Great Salt Lake hunter-gatherers, looked at migratory grasshoppers (*Melanoplus sanguinipes*) and Mormon 'crickets' (*Anabrus simplex*: Tettigoniidae), often cast up in tons along the lake shore. Madsen concluded that harvesting them made good economic sense. Based on calorific values, and in a comparison intended to make the point dramatically, he calculated that a person collecting about 8 kilos of Orthoptera per hour 'accomplishes as much as one collecting 87 chilli dogs, 49 slices of pizza, or 43 Big Macs'.

Unpredictability is, however, a major problem with wild insects for feeding urban societies. It would be necessary to develop advanced culture techniques if insects were to feed city dwellers reliably on a large scale. Indeed, the very fact that 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.

Are insects safe to eat?

Of the millions of insect species known to exist, only a few hundred are eaten by humans. This probably says more about small size and lack of super-abundance than edibility. However, there are some basic safety rules to be followed.

The insects must be caught alive and healthy, and processed immediately (dead insects deteriorate rapidly). If insects are to be stored dry, they must be protected from damp (to stop growth of toxic moulds). Synanthropic scavengers, such as houseflies and cockroaches, often carry bacteria and are best avoided (although many prisoners of war have survived only by eating roaches). All insects are likely to carry parasites (protozoa, nematodes, etc.), so proper cooking is always desirable. Hairy or spiny insects may irritate, while brightly coloured species are likely to be poisonous. Green or brown plant-feeders, or pale, unicolorous larvae are generally thought to be the most suitable.

Why eat insects?

Insects offer a wholesome source of protein, fats and other nutrients, which only needs to be balanced with widely available plant protein, vitamins, minerals and carbohydrates. Insect protein could substitute for almost all vertebrate protein on which many of us now depend. Insects *are* edible, and they can be very appetizing — as shown by the gourmet ethnic restaurants of Mexico City and roadside food stalls of Bangkok.

That is all very well, but is the idea just a local curiosity, best left to hunter-gatherers or ethnic minorities — there is surely no compelling *economic* reason to utilize insects for food? 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.

Doubts have often been raised about the conversion efficiency of cattle, especially in tropical climates. I have not seen figures comparing the conversion efficiency of edible insects with cows. However, in 1975 David Pimentel published figures demonstrating that, in the USA, the biomass of arthropods per hectare was about 1000 kilos, whereas for traditional livestock the comparable figure was less than 100 kilos.

Are insects really food for the future?

In 1974 Julieta de Conconi questioned 12,000 people in Mexico City about attitudes to insect food. An overwhelming 93% thought that insect foods were 'in the future' and that commercial insect food products should be developed. Be that as it may, wild insect foods are already of significance in the rural economies of many tropical and subtropical countries. South Africa's Bureau of Standards has estimated the 1600 tonnes of mopani worms are sold within the republic annually (presumably this represents only a fraction of what is actually consumed). For Zaire, Gomez and co-workers estimated in 1961 that insects accounted for 10% of 48,000 tonnes of animal protein produced (compared with 30% for game and 47% farm fishing, and only an equivalent 10% from grazing animals).

The Food Insects Research & Development Project, University of Wisconsin at Madison, is looking at the potential value of insects as poultry and fish feedstocks. Successful trials have been conducted, for example, using *Musca domestica* larvae to recycle poultry manure as a chicken feed. In India it has been estimated that 20,000 tonnes of de-oiled *Bombyx mori* pupae are produced annually, as a by-product of the silk industry — much of this material is fed to hens. So, even if we cannot stomach the idea of insect eating first hand, insects could make an excellent source of protein for our farm animals.

Could a variety of insects be the spice of life?

A trip round the average supermarket will soon convince you that westerners survive on an incredibly limited diet. Meat from two or three dozen mammals, birds, fish, decapod crustacea and molluscs is combined with a barely less limited range of fruit, grains, pulses and vegetables. There are 22,000 insect species in Britain alone, all waiting to be tried — what choice, what variety! More importantly, stimulating the idea that insects represent potentially desirable food could promote concern for the conservation of biodiversity. Mass-harvesting methods for turning insects that threaten crops into good protein might do much to reduce pesticide pollution, and perhaps permit the return of grazing land to forest. As Gene DeFoliart (1989) has emphasized, if we can only push prejudice and ignorance aside, the beneficial effects of utilizing insects for human food on a large scale could be immense.

Insects have an undeservedly bad reputation. A handful of noxious species has meant that, too often, they are all seen as enemies. In their almost 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!

References

Bennett, G. (1988) *Eating matters: why we eat what we eat*. 224 pp. London, Heinemann Kingswood.

DeFoliart, G.R. (1989) The human use of insects as food. *Bulletin of the Entomological Society of America* **35**, 22–35.

Holt, A.V. (1885) *Why not eat insects?* Facsimile reprint, with new introduction by Laurence Mound, 1988. 99 pp. London, British Museum (Natural History) & E. W. Classey Ltd.

Taylor, R. L. (1975). *Butterflies in my stomach*. 224 pp. Santa Barbara, Woodbridge Press.

© Dept. of Entomology
The Natural History Museum 1991