*Principes*, 37(1), 1993, pp. 42–47

# Hypothesizing About Palm Weevil and Palm Rhinoceros Beetle Larvae as Traditional Cuisine, Tropical Waste Recycling, and Pest and Disease Control on Coconut and Other Palms—Can They Be Integrated?

GENE R. DEFOLIART

Dept. of Entomology, 237 Russell Laboratories, 1630 Linden Drive, Madison, WI 53706

In their book on Cameroon cuisine, Grimaldi and Bikia (1985) describe their recipe for "coconut larvae" as a "favorite dish offered only to good friends" (see recipe, page 44). The flavor of "palmworms" (fat, legless larvae of the weevil genus *Rhynchophorus*) has been appreciated throughout the tropical world for centuries. There are a number of species, but the major ones from the standpoint of wide distribution and use as food are *Rhynchophorus palmarum* in the Western Hemisphere, *R. phoenicis* in Africa, and *R. ferrugineus* in Asia.

Newcomers to the Caribbean region were particularly effusive about palmworms. Bancroft (1769:239), in his "Natural History of Guiana," wrote that the larvae are "esteemed a delicate morsel, not only by the aboriginal Natives, but by many of the White Inhabitants, particularly the *French*, who roast them before the fire, and mix them with crumbs of bread, salt, and pepper." Smeathman (1781:167–69), who was working in West Africa at the time and had taken a particular fancy to the taste of the termite, *Macrotermes bellicosus*, said of the termites, "they are something sweeter, but not so fat and cloying as the [palmworm] which is served up at all the luxurious tables of West Indian epicures, particularly of the French, as the greatest dainty of the Western world." And Stedman (1796:22–23) in Suriname, remarked that, "However disgusting to appearance, these worms are a delicious treat to many people, and they are regularly sold at Paramaribo." Stedman later related (p. 115) that: "We here found concealed near the trunk of an old tree a case-bottle filled with excellent butter, which the rangers told me they made by melting and clarifying the fat of the palm-tree worms: this fully answers all the purposes of European butter, and I found it in fact even more delicious to my taste."

Indigenous populations throughout the tropics have prized palmworms no less than have Europeans, and in the case of *R. palmarum*, Chagnon (1968:30–32) in Venezuela/Brazil, Clastres (1972:160–61) in Paraguay, and Beckerman (1977) and Dufour (1987) in Colombia have reported primitive cultivation systems for the larvae. Chagnon reports: "The Yanomamo come very close to practising 'animal domestication' in their techniques of exploiting this food. They deliberately cut the palm tree down in order to provide fodder for the insect. When they cut the tree, they also eat the heart of the palm, a very delicious, crunchy vegetable that slightly resembles the taste of celery hearts. One palm we cut yielded an edible heart of about 50 pounds. After the pith has been allowed to decay for several months, it contains numerous large, fat, white grubs. The pith is dug out of the tree with sticks, broken open by hand, and the grubs extracted. . . . A fair-sized palm tree will

yield three or four pounds of grubs, some of them as large as a mouse. The grubs are wrapped in small packages of leaves and placed in the hot coals to roast." Chagnon was told by a missionary that the grubs taste very much like bacon.

The Guayaki of Paraguay, according to Clastres, consider the palm larvae as "more than a food gathered by chance in the forest; rather, it is the product of a sort of cultivation. The Indians knock down the palm tree, leaving a stump about 3 feet high. They then generally cut the fallen trunk into sections 10 or 12 feet long, preparing the wood for the insects. . . . Each man is the owner of his larvae bed. . . . This private property is almost always respected and no one touches the larvae of another. Later, the harvest is divided and eaten collectively. Thus the Guayaki distribute a relatively abundant supply of food. . . . It is of great interest to see that the Guayaki, despite their being nomads, establish a fixed source of food to be gathered much later. In doing so, they are obliged to return to the cultivation area after many months of travelling. . . . This cultivation of *guchu* therefore exerts a profound influence upon the wandering habits of the Guayaki in that it gives an order to their travels."

In Colombia, Beckerman (1977) reported that the Bari Indians use only *Jessenia* palm as a "grub farm." The trees are cut down and the logs left lying in the forest. "In two or three months the whole trunk is infested with the edible larvae. . . . Several hundred grams of larvae can be extracted from a single trunk. . . ." Dufour (1987) reported that "The Tatuyo felled palms to harvest the fruits, and often returned at a later date to harvest the larvae which subsequently developed in the pith. Palms were also cut specifically with the expectation that they would be invaded by weevils and the larvae ready to harvest in two or three months. Thus, the larvae were both a by-product of the harvesting of palm fruits and 'cultivated.'" Dufour reported a live weight of 3–16 grams for the grubs and a maximum acquisition rate of 2,000 g/hour.

With this gustatory background, let us look at another dimension of palm weevils, restricting ourselves temporarily to the Western Hemisphere. *Rhynchophorus palmarum* is one of the most serious pests of coconut and oil palms in Latin America and the Caribbean, mining the trunks of the trees and transmitting the nematode, *Rhadinaphelenchus cocophilus*, which is the causal agent of red-ring disease (RRD) (Morin et al. 1986, and others). The weevil infests many other species of palms, both wild and cultivated, as well as sugarcane and several root and fruit crops (Hagley 1965, and others). Hill (1983) describes the damage from the weevils as follows: "The larvae burrow in the crown of the palm, feeding on the young tissues, and sometimes destroy the growing point, when the palm will die. The leaves turn chlorotic and die, and the trunk becomes tunnelled and weakened, and may break in a storm."

Schuiling and van Dinther (1981) provide a good entry to the extensive literature on RRD. The coconut palm may die within 3–4 months after the appearance of external symptoms which include yellowing of leaves and premature nutfall. Internally the stem tissue is discolored and necrotic. There is evidence that only the adult weevils are involved in the transmission of the RRD nematode.

Hill (1983) lists recommended insecticides and several cultural control methods that are applied against *R. palmarum*, including elimination of breeding sites by restricting physical injury to palms, control of *Oryctes* beetles, destruction of infested palms, and trapping of adult weevils. Morin et al. (1986) describe procedures that have been successfully used in Para and Bahia, Brazil, since 1975. As adults are attracted for feeding and reproduction to the odor of fermentation emanating from wounds in healthy palms or from the decay of dead or diseased palms, all injured or decaying

### Cameroon cuisine - larves de palmier

(From: *La Cuisine Camerounaise*, by Jean Grimaldi and Alexandrine Bikia, p. 136. Thanks to Dr. Jane Homan, UW International Agricultural Programs, for providing a copy, and to Diane Landry for a translation from the French.)

The larvae of certain coleoptera harvested from the oil palm and from the palm of genus *Raphia* are eaten in Cameroon. These larvae, called "Fos" in Ewondo, are white (oil palm) or yellow (raphia palm). They are sometimes reared. Before any preparation, the larvae are washed in a lot of water and pierced in the abdomen with a sharp piece of bamboo between each washing to let a white, fatty liquid escape. In all regions they are prepared either by stewing, frying in oil with salt and pepper, adding to squash seed paste, or putting on brochettes grilled over coals.

### Coconut larvae recipe

Larvae coming from oil palms or raphia palms, salt, pepper, onion, coconut.

Preparation: Larvae washed and cut in half are mixed with all the condiments cited. The coconuts are chosen at half-hard stage, so that the inside, completely globular, can be taken out of the husk without being broken. The most pointed end of the nut is cut in a way that forms a cap. The nuts are emptied of their milk, then refilled with the larvae and condiments and closed by attaching the caps firmly.

The nuts are stood straight up by some banana leaves in a pot containing water. The amount of water should be such that, during the course of cooking, it cannot penetrate the nuts. The cooking is rather long. After cooking, the nuts are cut into slices.

This favorite dish is only offered to good friends and is served with manioc sticks.

### Bamoun preparation

Among the Bamoun, the larvae are strung up and left to dry hanging under the trellis that is found above the foyer. After they are well-smoked, they can be incorporated, after being washed, into the squash seed paste.

trees are removed and traps are constructed along the edge of a plantation from cut pieces of thinning, wild palms or uninfested parts of damaged or diseased trees. Whole trunks of oil-palms, which are very thick, can be cut into cubes and left in small heaps; but only the tender apical 1–2 meters of the thinner but tougher trunks of wild and coconut palms are used. They are split into longitudinal sections and intercrossed into piles with the bud on top. Trap heaps should be renewed weekly, either by replacement with other palm pieces and burning of the old infested ones, or by spraying with palm sap to maintain attractiveness and also with 0.15% methomyl to prevent the piles from becoming a source of infestation.

At the Paricatuba oilpalm estate in Para, Brazil, according to Schuiling and van Dinther (1981), palm losses from RRD were held to 1.14% of palms in the susceptible age group through the program of phytosanitation, i.e., preventing wounds and early elimination of palms showing distinct growth disorders by felling and transporting the trunks to the oil factory where they were sawed into blocks and steam sterilized at 130°C for 1 hour, which kills the nematodes. This program was considered much more effective than insecticides, the efficacy of which, according to the authors, is open to question.

In Africa and Asia, *Rhynchophorus phoenicis* and *R. ferrugineus*, respectively, damage palms as does *R. palmarum* in Latin America and the Caribbean. RRD, however, is apparently not found outside the Western Hemisphere.

The hypothetical scenario that can be created from the foregoing has long intrigued this writer. Palmworms would certainly seem worthy of wider publicizing as traditional cuisine of gourmet quality, the kind of delicacy that could be promoted as tourist and urban fare by the best restaurants throughout the tropics and subtropics, and eventually, maybe, even as an

item for export. Could such wider promotion and use create more opportunities for employment and entrepreneurship in the rural countryside? Could, in fact, expanded markets provide a basis for attempting to combine increased palmworm production with more efficient recycling of dead and diseased palms, and as part of reduced-pesticide integrated pest management (IPM) programs and disease control on coconut and other palm species?

Taking a cue from how indigenous populations have done it for centuries, could the trap logs recommended for pest and disease control, through a simple modification in procedure, be used simultaneously for palmworm production? The desired harvest stage is the late-instar larva. Studies in Trinidad (Hagley 1965), Brazil (Morin et al. 1986) and Mexico (Gonzalez and Camino 1974) have shown that the egg and larval stages of *R. palmarum* last 2–4 days and 40–61 days, respectively, at essentially ambient temperatures. Instead of burning trap logs at the end of a week or spraying them with methomyl to kill the larvae, as suggested by Morin et al., if left in place for approximately 45–50 days, the larvae would be ready for harvest. All would be large-sized, few would have pupated and no adults would have yet emerged. Possibly, logs could be reused if desired by spraying with palm sap to renew attractiveness. If not, they could at that point be burned or otherwise disposed of.

Greater efficiency might be achieved by additionally seeding new trap logs with eggs from adult weevils caught in traps baited with coconut tissue. This should exert additional control pressure within the plantation, while producing a higher density of developing larvae in the logs, thus producing more larvae per unit of substrate, more efficient recycling of the logs and a reduced mass of material left for burning. Maharaj (1973), in Trinidad, described a simple aluminum trap that catches more than twice as many weevils as the conventional split-log trap and uses only about one-fifth as much coconut tissue as bait. To incorporate food production as part of weevil IPM as hypothesized, trap logs would have to remain in place about 7 weeks instead of one, and thus would occupy 7 times as much ground surface, but that should not be a huge problem in palm plantations.

The writer has not seen reports of "cultivation" for either *R. phoenicis* or *R. ferrugineus*, but the latter is attracted to dying or damaged parts of palms, cut or split palm trunks, and even decaying sugarcane (Kalshoven and van der Laan 1981). The larval period, normally 2 months or longer, has been reported as only 24 days when feeding on the nutritious palm "cabbage." So, enriching the larval diet might have a place in increasing production as food.

A fourth species, *Rhynchophorus bilineatus*, the famous sago grub which is the subject of feast and ritual among certain Melanesians in Papua New Guinea, is also "semi-cultivated" (Townsend 1970). In the opinion of at least one European, however, "the taste of the grub is fatty and oily and is no delicacy for the palate of a European" (Meyer-Rochow 1973).

*Rhynchophorus* larvae rank with winged termites as among the richest sources of animal fat, a frequently scarce and needed commodity among tropical rural populations. And insect fatty acids, in general, are highly unsaturated. The high fat content of *R. phoenicis* is reflected in its high energy value of 561 kcal/100 g of insect (Oliveira et al. 1976). It is also high in thiamine, riboflavin, and zinc and fairly high in iron.

For U.S. gourmets, it should be known that one species of *Rhynchophorus*, *R. cruentatus*, extends into the southeastern states where its larval-feeding damage to the terminal bud is a lethal problem in transplanting mature cabbage palmettos (*Sabal palmetto*) and Canary Island date palms (*Phoenix canariensis*) (Giblin-Davis

and Howard 1989). At a length of 24–33 mm, it is the largest known weevil in the United States.

In even a brief discussion of major pests of palms, the giant palm rhinoceros beetles, primarily of the genus *Oryctes* (Scarabaeidae: Dynastinae), must be mentioned. The larvae of these beetles have also been widely used as food in Africa and Asia. In this case, it is the adult beetles that do the serious damage, while the larvae are found in all sorts of refuse (Bedford 1980). Of the three species reported as food in Africa, *Oryctes monoceros* breeds in dead standing coconut and oil palms in western Africa and in decaying coconut logs in eastern Africa, *O. boas* breeds in rotting vegetation and manure heaps (but not in rotting wood), and *O. owariensis* in dead standing oil palm, coconut and *Raphia* trunks. *Oryctes rhinoceros*, in Asia and the western Pacific, breeds in a wide variety of dead but not yet decomposed plant material, including the tops of dead standing coconut palms, coconut stumps and logs on the ground, and other types of decaying wood, as well as compost, dung heaps, rotting straw, rotting coconut husks, coffee and cacao pulp waste, and refuse from sugar cane factories, ricemills, sawmills, and various other types of agricultural products processing. Larvae attain a length of 6–8 cm (Hill 1983) and Kalshoven and van der Laan (1981:463–68), citing Leefmans in 1920, note that up to 50 grubs/$m^3$ may be found in refuse dumps adjacent to towns and larger villages. Although insecticides and a promising baculovirus, *Rhabdionvirus oryctes*, are available, control of rhinoceros beetles is based on sanitation and cultural practices similar to those recommended for *Rhynchophorus* weevils. Thus, it seems hypothetically possible that *Oryctes* could also be incorporated into palm IPM programs, recycling an endless variety of tropical wastes into animal protein and fat.

Having a recipe from Cameroon was a rather flimsy excuse for writing this article, and I have done so with some trepidation. The main problem is that I haven't been in a palm plantation since becoming interested in insects as food, and have never seen a palm grub or rhinoceros beetle larva *in situ*. Many of our readers, however, are surrounded by palms, and some are no doubt knowledgeable about palm culture. Maybe we can hear from some of you as to the current situation and future possibilities with palm weevils and rhinoceros beetles.

## LITERATURE CITED


BANCROFT, E. 1769. *An Essay on the Natural History of Guiana, in South America.* London: Becket and De Hondt, p. 239.

BECKERMAN, S. 1977. The use of palms by the Bari Indians of the Maracaibo Basin. *Principes* 21:143–54.

BEDFORD, G. O. 1980. Biology, ecology and control of palm rhinoceros beetles. *Annu. Rev. Entomol.* 25:309–39.

CHAGNON, N. A. 1968. *Yanomamo: The Fierce People.* New York: Holt, Rhinehart and Winston, pp. 30–32.

CLASTRES, P. 1972. The Guayaki: *In: Hunters and Gatherers Today* (M.G. Bicchieri, ed.), pp. 138–74. New York: Holt, Rhinehart and Winston.

DUFOUR, D. L. 1987. Insects as food: a case study from the northwest Amazon. *Am. Anthropologist* 89:383–97.

GIBLIN-DAVIS, R. M. AND F. W. HOWARD. 1989. Vulnerability of stressed palms to attack by *Rhynchophorus cruentatus* (Coleoptera: Curculionidae) and insecticidal control of the pest. *J. Econ. Entomol.* 82:1185–90.

GONZALEZ, N. A. AND L. M. CAMINO. 1974. Biologia y habitos del mayate prieto de la palma de coco, *Rhynchophorus palmarum* (L.) en la Chontalpa, Tab. *Folio Entomol. Mex.* 1974 (No. 28):13–19.

GRIMALDI, J. AND A. BIKIA. 1985. *Le Grand Livre de La Cuisine Camerounaise*, p. 136.

HAGLEY, E. A. C. 1965. On the life history and habits of the palm weevil, *Rhynchophorus palmarum. Ann. Entomol. Soc. Am.* 58:22–28.

HILL, D. S. 1983. *Agricultural Insect Pests of the Tropics and Their Control.* London: Cambridge Univ. Press, 516 pp.

KALSHOVEN, L. G. E. AND P. A. VAN DER LAAN. 1981. *Pests of Crops in Indonesia.* Jakarta: P.T. Ichtiar–Van Hoeve, pp. 463–68.

MAHARAJ, S. 1973. A new design of trap for collecting the palm weevil, *Rhynchophorus pal-*

*marum* (L.). *Ceylon Coconut Planters' Rev.* 7(1):5–7.

MEYER-ROCHOW, V. B. 1973. Edible insects in three different ethnic groups of Papua and New Guinea. *Am. J. Clin. Nutr.* 26:673–77.

MORIN, J. P. F. LUCCHINI, J. C. A. DE ARAUJO, J. M. S. FERREIRA, AND L. S. FRASA. 1986. *Rhynchophorus palmarum* control using traps made from oil palm cubes. *Oleagineux* 41(2): 57–62.

OLIVERIA, J. F. S., S. J. PASSOS DE CARVALKO, R. F. X. BRUNO DE SOUSA, AND M. MAGDALENA SINAO. 1976. The nutritional value of four species of insects consumed in Angola. *Ecol. Food Nutr.* 5:91–97.

SCHUILING, M. AND J. B. M. VAN DINTHER. 1981. 'Red ring disease' in the Paricatuba oilpalm estate, Para, Brazil. A case study. *Zeut. Angew Entomol.* 91:154–69.

SMEATHMAN, H. 1781. Some account of the termites, which are found in Africa and other hot climates. *Philosoph. Trans. Roy. Soc. London* 71:139–92.

STEDMAN, J. G. 1796. *Narrative of a Five Year's Expedition Against the Revolted Negroes of Surinam, in Guiana, on the Wild Coast of South America; From the Year 1772, to 1777* . . . (2 vols. London, Vol. II, pp. 22–23.

TOWNSEND, P. K. W. 1970. Subsistence and Social Organizations in a New Guinea Society. Ph.D. diss., Univ. Michigan.

Reprinted from: *The Food Insects Newsletter.* 1990. III(2): 2–6.