

Chapter 12

REPUBLIC OF SOUTH AFRICA

Taxonomic Inventory

Taxa and life stages consumed

Coleoptera

Buprestidae (metallic woodborers)*Sternocera orissa* Buquet, adult**Cerambycidae (long-horned beetles)***Plocoederus frenatus* (author?), larva*Stenodontes (Mallodon) downesi* (= *downesii*) Hope, larva**Curculionidae (snout beetles, weevils)***Polycleis equestris* Boheman, adult*Polycleis plumbeus* Guerin, adult*Rhynchophorus phoenicis* (Fabr.), larva*Rhynchophorus* (= *Calandra*) sp., larva**Scarabaeidae (scarab beetles)***Oryctes boas* Fabr., larva, occasionally the adult*Oryctes monoceros* Ol., larva, occasionally the adult*Oryctes owariensis* Beauv., larva, occasionally the adult

Hemiptera

Pentatomidae (stink bugs)*Euchosternum delegorguei* (= *delagorguei*) (Spinola), adult

Homoptera

Psyllidae (psyllids)*Psylla* sp., sweet secretion

Hymenoptera

Apidae (honey bees)

Apid spp., larvae

Formicidae (ants)*Carebara vidua* Sm., winged adult

Isoptera

Hydotermitidae*Hodotermes* sp., “nymphs”*Microhodotermes viator* Latr., “flyer nymphs”**Termitidae***Macrotermes swaziae* Fuller, winged adult*Odontotermes* (= *Termes*) *badius* (Haviland), winged adult*Termes capensis* DeGeer, winged adult

Lepidoptera

Lasiocampidae (eggar moths, lappets)*Bombycomorpha pallida* Distant, larva*Gonometa postica* Walker, pupa**Saturniidae (giant silkworm moths)***Bunaea alcinoe* (= *caffra*, *caffraria*) Stoll, larva*Cirina forda* (Westwood), larva*Gonimbrasia (Conimbrasia, Nudaurelia) belina* Westwood, larva

Gonimbrasia zambesina Walker, larva
Gynanisa maia (Klug), larva
Imbrasia epimethea Drury, larva
Melanocera menippe (author?), larva
Microgona cana (author?), larva
Urota sinope Westwood (= *Cirina similis*), larva

Sphingidae (sphinx or hawk moths)

Agrius (= *Herse*) *convolvuli* (Linn.), larva

Orthoptera

Acrididae (short-horned grasshoppers)

Cyrtacanthacris (= *Nomadacris*) *septemfasciata* (Serville) (= *Gryllus devastator*), nymph, adult
Locusta sp., adult
Locustana paradalina (Walker), adult
Schistocerca sp., adult

Gryllidae (crickets)

Gryllus (= *Grillus*) sp.

Pyrgomorphidae

Zonocerus elegans (Thunberg), nymph, adult

Quin (1959) reported the use of 13 species in five orders in his excellent study of the food habits of the Pedi, one of the Sotho tribes which in turn is one of several Bantu tribes. The food insect dishes of the Pedi are invariably served as a relish with their cereal meal porridges. In preparing the relishes, the insects are used fresh and whole except for the caterpillar, *Gonimbrasia belina*, and grasshoppers, some of which are cured when supplies are plentiful. The only ingredients added during preparation are salt and water. The insects are stewed dry, then roasted crisp (except for *Bombycomorpha pallida* and *Cirina forda* which are not roasted). Grasshopper legs are prepared differently from the other dishes. The protein content and calories in these relish servings are shown in South Africa Table 1 (see Quin's pages 230 to 235); according to Quin, all of the relishes are very popular with many of them preferred to meat (South Africa Table 2). Quin can be considered a severe critic relative to flavor; although he studied the Pedi for years and knew that they thoroughly enjoyed these insects, when he first began sampling them for himself he repeatedly found it necessary to go outside and retch!

Quin discussed ecological and acculturation factors whereby the coming of "civilization" wreaked havoc among the Pedi and concluded that, "*the recognition and encouragement of their traditional foods and feeding habits could be the means of alleviating, and perhaps even solving, the great problem of malnutrition and disease among these people.*" Relative to insects as a traditional food, Quin states that because of the general deterioration of vegetation and the loss of locust invasions (the result of modern control programs to the north), insects have been reduced to a relatively minor role in the Pedi dietary. He summarized four general reasons why the Pedi, by 1959, hovered between bare existence and starvation (see pages 274-275):

- A) Restricted domicile: The Pedi had formerly inhabited a vast unrestricted area. When the land became unproductive or grazing became poor they could move, allowing the land to reestablish productivity. Furthermore, the country teemed with game. The Pedi are now restricted, the game is virtually exterminated, and the vegetation and top-soil are virtually destroyed.
- B) Indiscriminant disposal of food supplies: Before the advent of the European trader the Pedi had no outlet for their beans and surplus grain, largely kaffir-corn and maize, and it was stored against times of shortage. The tendency today is to dispose of the bulk of the food crop "often even at the expense of current requirements, and what is more, to spend the proceeds on non-essentials like smart clothing or useless nick-nacks for which the Pedi has developed a great liking." Thus, food supplies, disposed of with such prodigality, must be bought back at a premium.
- C) Change in food habits: The "mealie" replaced the traditional Kaffir-corn as the staple. Induction of much of the male population into industry and away from their traditional dietary caused many "to acquire new, but not necessarily better, feeding habits." Thus, "Simultaneously with civilization the Pedi have developed the unfortunate tendency of ignoring some of their valuable traditional foods, adopting cheap inferior European foods -- the only ones they can afford to buy."

- D) Changes in socio-economic structure: These changes have been drastic. Efforts of the individual were formerly focused on the production and acquisition of food, but are now offered in exchange for money. Their earning capacity is low and not sufficient to buy food *and* the numerous other items that, through civilization, have now become essentials.

Sparman (1787, I: 201) mentioned grasshoppers, white ants (*Termes*), caterpillars, and other insect larvae among the foods of the Hottentots. Despite a variety of wild foods, however, the Bushman is "frequently in want, and famished to such a degree, as to waste almost to a shadow."

Junod (1962 [original edition 1913?], I: 65; II: 80-83, 334-337) discusses numerous edible insects utilized by the Thonga tribe (see under appropriate groups below). Junod states that, "Although the caterpillars, coleoptera, larvae, and locusts are universally appreciated, there are other 'meats' which appeal to certain individuals of clans, but are disdainfully eschewed by others." A number of examples are given: ". . .the boa is eaten with great gusto by the Rongas and disliked by the Nkunas. The same is true of the big varon lizard. The tortoise is generally eaten, but the Mpfumu boys, who esteem themselves more civilized, reject it. . . .Owing to disgust, some people refuse to eat *pork*. . . .Zulus reject every kind of fish (*nhlampfi*) from the same feeling of disgust. . . .Snails are despised by all the Thongas. . . ." Some other animals are refused because they are taboo, one of them being a tenebrionid beetle.

Schapera's (1930) observations on the food habits of the Bushmen and Hottentots are discussed under Botswana and Namibia, respectively.

According to **Faure (1944)**, locusts, flying termites, and large saturniid larvae are used as food by the Mapulana, in addition to a pentatomid (see below under Hemiptera for the latter).

Bryant (1949: 290) cites several earlier publications for the following information on insect foods of the Zulu:

"The children, for instance were rather partial to roasted caterpillar, selecting a huge fat and hairless specimen, which they called *iCimbi*, and which is the larva of several kinds of moth, according as it is found on the *umuNga*, the *umGanu*, or other trees. White-ants or termites, in season, that is, when emerging from the ground in the flying stage during their breeding season, are greedily gathered up by the Zulu children and, stripped of their wings, fried, as a great delicacy, on a pot-lid, they being called *iNtlwabusi* and *iHlwabusi*. In former times, in periods of famine, roasted locust (*iziNkumbi*) was a godsend to all, and said by Europeans, who ventured to taste them, to possess the flavour of shrimps. . . ."

Bodenheimer (1951: 143-144) recorded several species used as food in South Africa, as communicated to him by Dr. J.C. Faure (discussed below under their respective families).

According to its authors, **Cunningham and Pieser (1991)**, the *Primary Health Care Booklet* was written for primary health care workers and teachers because knowledge about traditional wild foods is being lost as it is rarely taught in modern schools. Meanwhile, malnutrition remains a major problem, one reason being the lack of a mixed balanced diet. The authors advise, "Do not forget about wild foods which are available at no cost." In the booklet, the insects are included in the meat group: *amacimbi*, or emperor moth larvae (Saturniidae), mostly *Microgona cana*, *Brunea alcinoe*, and *Cirina forda*; and *izinhlwalbusi*, winged adults of the ant, *Carebara vidua*. The *amacimbi* are noted as a good source of protein and thiamin and an excellent source of riboflavin and calcium. As meat, *amacimbi* can be prepared by either sundrying or roasting, and salt may be added. For adding to soups, *amacimbi* should be cleaned, boiled for approximately 2 1/2 hours, steamed dry and fried.

Cunningham (1992) states:

"The traditional conservation practice of not felling edible wild fruit producing trees when clearing fields is widespread in Africa, and is a major reason for maintenance of woody plant cover outside of conservation areas. Some of these trees (e.g., *Sclerocarya birrea* [Anacardiaceae]) are also important sources of edible insect larvae (e.g., *Cirina forda* [Saturniidae]) feeding on *Sclerocarya* leaves, and cerambycid larvae from dead *Sclerocarya* trees. What is also increasingly widespread is the social stigma against gathering of wild food resources, which is locally viewed as 'primitive' compared to buying food from the local store. The result is removal of the incentive to conserve wild fruit bearing trees, and neglect of a nutritionally important food resource in marginal agricultural areas by often poor communities."

In a 1993 Reuters press dispatch published in various newspapers (e.g., the *Papua New Guinea Post-Courier*, July 30), Anton **Ferreira** provided coverage of a cocktail party for delegates attending a meeting

of the South African Entomological Society. The snacks were four kinds of insects, termites, stinkbugs ("a delicacy in Natal"), locusts and mopanie worms (the latter "widely eaten by Africa's peasant communities, usually after being dried"). The locusts were prepared by lightly frying in olive oil with just a hint of crushed garlic. Another favorite way of cooking them is with garlic butter and peri peri sauce. Ferreira said the mopanie worms took on the addictive properties of peanuts, especially after being dipped in sour cream. Marcus Byrne, who masterminded the event, said the serious message was to educate people that insects are themselves an important food source. Jan Crafford, who is researching the role of insects in the diet and folk lore of the Venda tribe in northern South Africa, was quoted saying, "Some black communities obtain 80 per cent of their protein from insects."

McCallum (1993) makes several references to edible insect use among the Venda people. First (p. 86): "When the Venda husband comes for his meal . . . The senior wife will bring the porridge and a special bowl, much smaller, with the relish of the day -- caterpillars (very nutritious) or chicken or spinach with onions (moroka), always with salt in it." Again (p. 147): "The flying ants come out at the rains, and they hatch in thousands. In Sibasa (Venda) . . . I remember seeing dozens of young Venda girls running in after the ants, kneeling down and grabbing them in handfuls, stuffing them into their mouths, not even waiting for them to die -- wings and all. They also used to roast these insects."

Coleoptera

The Pedi, according to **Quin (1959)**, refer to all beetles as *dikhunkhwane*. Only the adults are used as food, and before cooking them the elytra are removed. Quin noted that, in addition to the use of specific beetles as food, "the Pedi housewife displays no concern in preparing food from weevil-infested grain or meal and unceremoniously includes them in her dishes." Quin also noted that although dung beetles are commonly used in the Far East, "the Pedi abhor the idea of eating the local *Scarabaeus sacar* (*kgoba-boloko*)."

Buprestidae (metallic woodborers)

Sternocera orissa Buquet, adult

The buprestid, *Sternocera orissa* (*lebitsi-kgoma*), about 3.5-4.0 cm in length and weighing about 2.6g, is especially sought after by the Pedi although not commonly found in the vicinity of the villages. It is collected by hand in the early morning while the beetles are still lethargic. The host plants are pendoring (*Gymnosporia senegalensis*) and widdoring (*Acacia campylacantha*). There is one generation per year, in the spring (**Quin 1959**). **Bodenheimer** had earlier reported (1951: 143-144) *S. orissa* Buq. as being regularly collected in the Transvaal.

Among the Thonga, *Sternocera orissa*, known as *shitambela*, is roasted by the shepherds and eaten after first removing the elytra (**Junod 1913**).

Cerambycidae (long-horned beetles)

Plocoederus frenatus (author?), larva

Stenodontes (= *Mallodon*) *downesi* (= *downesii*) Hope, larva

Among the Thonga, when the cooks split the trunks of old half-decayed *nkanye* trees for kindling wood, they are careful to lay aside the large white larvae of the cerambycid beetles, *Mallodon downesii*, *Plocoederus frenatus*, and others (**Junod 1913**): "These enormous white worms (*shipungu*) will be fried in their own fat, and served up as a tit-bit for the ladies on their return to the village." The large white larvae, the *shipungwana*, of another cerambycid which dig channels in the stems of *nkanye*, *nkuhlu*, *mphesa*, etc., are also readily eaten.

The larva of *Mallodon downesi* is esteemed by the kafir (**Berensberg 1907**). Concerning this species, **Distant (1904; vide Duffy 1957, p. 54)** notes that "natives eat the young larvae after roasting them on twigs." See also Cunningham (1992) in the Introduction.

Curculionidae (snout beetles, weevils)

Polycleis equestris Boheman, adult

Polycleis plumbeus Guerin, adult

Rhynchophorus phoenicis (Fabr.), larva

Rhynchophorus (= *Calandra*) sp., larva

Polycleis equestris and *P. plumbeus*, 1.25-1.85 cm in length, are eaten by the Pedi (**Quin 1959**). The host plant is widdoring, and the weevils are collected by hand. There is one generation per summer, according to the Pedi.

The Thonga readily eat the larvae of a large *Calandra* sp. which swarm in the stems of the palm trees of the marsh (**Junod 1913**).

During a study of palm wine yields (**Cunningham 1990**), palm stems were occasionally infested by larvae of *Rhynchophorus phoenicis* and an unidentified scarabaeid beetle. This results in cessation of sap flow but was insignificant to total yield, affecting only 0.3% of stems tapped.

Scarabaeidae (scarab beetles)

Oryctes boas Fabr., larva, occasionally the adult

Oryctes monoceros Ol., larva, occasionally the adult

Oryctes owariensis Beauv., larva, occasionally the adult

Bodenheimer (1951: 186), without attributing a source, states that the larvae and, occasionally adults, of *Oryctes boas* F., *O. owariensis* Beauv., and *O. monoceros* Ol. are eaten in South Africa.

Tenebrionidae (darkling beetles)

The tenebrionid beetle, *Psammodes bertoloni*, known as *shifufuni sha paripari*, is taboo among the Thonga although other coleopterans are eaten (**Junod 1913**).

Hemiptera

Pentatomidae (stink bugs)

Euchosternum delegorguei (= *delagorguei*) (Spinola), adult

Faure (1944) discussed the use of the hemipteran, *Euchosternum delagorguei*, known as *thosono* (plural *dithsonono*), by the Mapulana in the Pilgrimsrest district of the eastern Transvaal. This insect is highly esteemed even though it emits a fluid that, unless avoided, severely burns the eyes. It is a large bug, 24-27 mm long and 13-15 mm wide. They appear only in the winter season, from April to July, and there is only one generation per year. Nothing is known about the nymphal stages. The adults occur in aggregations that swarm during the day, settling again as evening approaches on a variety of trees and brushy plants including among others the "kafferwag-nbietjie" thorn (*Acacia ataxacantha* var. *australis*). They are collected at sundown or early in the morning, or on misty, cloudy days. Faure describes how the "poison" of the stink-gland is eliminated (sometimes perfunctorily apparently) and how the bugs are prepared for eating. They are sometimes eaten raw, but usually they are cooked and eaten either with porridge or alone.

Homoptera

Psyllidae (psyllids)

Psylla sp., sweet secretion

David Livingstone (1857: 164) reported a species of *Psylla* on the leaves of the *mopané*-tree (Genus *Bauhinia*) in Bushmen country near Maila. The people collect the sweet gummy secretion of this scale insect in great quantities and use it as food.

Hymenoptera

Apidae (honey bees)

The Thonga appreciate the bees, or *nyoshi*, for their honey, and eat the larva or *shipungwa* with as much pleasure as the honey itself (**Junod 1913**).

Formicidae (ants)

Carebara vidua Sm., winged adult

The Pedi refer to both ants and termites as *ditshoswane* (**Quin 1959**). The large female flying sexuals of the ant, *Carebara vidua*, nearly 2 cm long, are called *dintlhwa makhura*, while the males, equally long but less heavy, are called *dintlhwa bogwale*. There are three or four generations per year and they are collected by hand as they emerge from the ground after heavy rains. According to Quin, they play an important role in the Pedi

dietary and it is unfortunate that they are procurable only five or six times per year. **Bodenheimer (1951: 143-144)** had earlier mentioned that the females and possibly males of *C. vidua* Sm. are regularly collected in the Transvaal.

See also Cunningham and Peiser (1991) in the Introduction.

Isoptera

Hodotermitidae

Hodotermes sp., "nymphs"

Microhodotermes viator Latr., "flyer nymphs"

Fuller (1918; vide Phelps et al 1975) reported that human fatalities resulted from eating nearly mature nymphs of *Hodotermes*.

In Namaqualand, "flyer-nymphs" are dug from the nests of *Microhodotermes viator* Latr.; they resemble rice-grains when cooked, and this is presumed to be the origin of the Afrikaan name for termite, *rysmier*, or rice-ant (**Bodenheimer 1951: 143-144**).

Termitidae

Macrotermes swaziae Fuller, winged adult

Odontotermes (= *Termes*) *badius* (Haviland), winged adult

Termes capensis DeGeer, winged adult

According to **Quin (1959)**, the flying sexuals of *Termes badius*, which are approximately 1.25 cm long, are referred to as *lekeke*. There are several generations per year. They appear after heavy rains in the summer and are collected as they emerge from the ground.

Sparrman (1787: 307) noted that the food of elderly fugitive Bushmen consists in great measure of termites. Among the termites eaten is *Termes capensis* De Geer (pp. 361-364) and they are either boiled in the same manner as grasshoppers or eaten raw. Sparrman comments on the vast numbers of these soft, milk-white, large-winged insects. He was informed that when these termites were available, the Bushmen and other Hottentots soon grew fat and in good condition from eating them.

Regarding termites, **Simmonds (1885: 370-371)** quotes a Capt. Carmichael as follows:

One evening, it was I think about the middle of May, as we sat enjoying ourselves at dinner, we observed a number of flies of an uncommon aspect, flitting past the tent. We started up and endeavoured to catch one of them, but without effect. Some Hottentot children, who were standing on an opposite bank, remarking our anxiety, came and offered us whole handfuls of them, and directing us to the spot where they had caught them; our astonishment is not to be expressed when we beheld millions of winged insects issuing into daylight from fissures in the earth, and through the pores as it were of the ground where no opening was perceptible. Near these outlets the children had posted themselves, and collecting the insects as they emerged, greedily devoured them. Such of them as escaped the Hottentots were snapped up as they flew along by the small birds and by the *Libellulae* [dragonflies] and other predatory flies. The body of these tiny insects is so small and the wings are so large and unwieldy, that they could hardly support themselves in the air, as they floated along at the humour of the breeze. They were the males of the *Termes capensis*, commonly known as the white ant.

Bodenheimer (1951: 143-144) mentioned that winged sexuals of *Macrotermes swaziae* Fuller are regularly collected in the Transvaal.

Miscellaneous Isoptera

Backhouse (1844: 584; vide Bodenheimer 1951: 155), referring to the Hottentots, remarked on the resemblance of flying white ants and their "pupae" to rice grains, and described them as quite palatable. A large nest sometimes yields a bushel of "pupae." The Hottentots utilize them after their corn supply is consumed. Backhouse noted that when Hottentots were able to find termites in abundance, they soon became fat, even when previously reduced by hunger.

Stowe (1905: 58-59) states, regarding the Bushmen: "The most abundant supplies of insect food were derived from the innumerable ant-hills found in the country, and in the early days the almost periodical visits of

vast swarms of locusts." Stowe continues:

The Bushman-rice, as it was termed by the Dutch, or chrysalides of white ants obtained from the ants' nests, was merely gathered in such quantities as sufficed for daily use. This Bushman rice was called '*Kasu*' by the Bushmen themselves. To obtain a supply, the nest was opened with a digging stick, called '*Kibi*.' The 'eggs' were then taken out and placed upon a small grass mat, made expressly for the purpose, and which was used as a sieve. The 'eggs' were then properly sorted, and placed in a small grass basket or skin bag, and the process was continued until a sufficient quantity was obtained. They were then taken to the cave or camp, when they were placed on the fire, on a flat stone with a little fat, and roasted until they were brown, when they were considered fit for use.

According to **Bodenheimer (1951: 142)**, Moffat reported that termites cooked in butter, and caterpillars, grilled and roasted, are consumed. According to **Berensberg (1907)**, the Hottentots eat termites both boiled and raw, while the Indians in Natal eat the flying termites after removing the wings.

According to **Junod (1913)**, one of the favorite insect dishes of the Thonga is provided by the winged white ants or termites which emerge around Christmas by the thousands. The soldiers are collected by inserting grasses, smeared with glue, into the holes. The heads are eaten and the bodies thrown into a calabash to season the evening meal. To collect the winged forms, a hole is dug in the termite mound and an old pot is placed in the bottom of the hole. The expected exit hole is covered with green branches which prevent the termites from flying when they emerge. Those which happen to emerge under the covering of branches fall into the pot which becomes full within a few hours. Many of those which do not emerge under the branches fall prey to birds and toads.

See also Sparrman (1787), Faure (1944), Bryant (1949) and McCallum (1993) in the Introduction.

Lepidoptera

Lasiocampidae (eggar moths, lappets)

Bombycomorpha pallida Distant, larva

Gonometa postica Walker, pupa

Caterpillars are referred to collectively as *diboko* by the Pedi (**Quin 1959**). The larva of *Bombycomorpha pallida* (*ngwana mamahlwehlwana*) is about 3.0 cm in length and has one generation per year, according to Quin. This species occurs in the winter, whereas all other lepidopterous larvae become available during the summers.

The edible pupae of *Gonometa postica* (*mmakonokono*) are 3.75 cm in length and enclosed in a tough parchment-like cocoon. Host plants of the larva, which is not eaten by the Pedi, are witoring, huilbos (*Peltophorum africanum*), and pendoring. The cocoons occur on twigs of the host plants. There is apparently one generation per year, normally during January and February, according to Quin (1959).

Zumpt (1971) reported an outbreak of rumen impaction among cattle that resulted from ingestion of cocoons of *Gonometa postica* (Walker). Several hundred animals were reported to have died. Zumpt described symptoms and autopsy findings. Affected animals were in poor to extremely poor condition, stunted in growth and pot-bellied. In three cases studied in which rumenotomies were performed, the rumen contained a single mass of impacted ingesta, the mass weighing 45, 71 and 82 lbs, respectively. The average weight in 41 cases in which the impactions were removed operatively was 34 lbs. In each case the impaction was a solid interwoven mass of ingesta particles adhering to fine silken threads. The age of affected animals ranged from seven months to four years, the majority being 1-2 years old. Attempts to dissolve the masses with surface-reducing and other agents were unsuccessful; removal of the impactions was the only remedy.

Zumpt concluded from the case histories that the cocoons are ingested during the weaning stage. Calves are normally kraaled-off under thorn trees. The caterpillars of *G. postica*, which appear shortly after the first summer rains, live on thorn trees, especially black thorn and camel thorn. Their cocoons are about 5 x 2 cm in size and are covered with tiny, short, black spicules. Counts done in calf-kraals indicated that more than 60% of the pupae in the cocoons had been parasitized. Peak parasitization of cocoons was also noted in the 1934 outbreak involving *G. rufobrunnea* (Edwards 1935). Zumpt suggests that parasitized cocoons probably dry out quickly and thus break off easily during spring winds. Calves, which pick up and lick many foreign objects during the weaning period, thus come into contact with large numbers of cocoons. Collection of all cocoons in weaning kraals prior to occupation appears to be the only practical prophylactic measure. Zumpt states that destruction of the caterpillars, cocoons or moths would be an enormous task and probably impractical.

Edwards (1935) reported losses of cattle from rumen impaction in the Northern Transvaal caused by the

ingestion of cocoons of *Gonometa rufobrunnea* Auriv. The outbreak lasted two seasons and occurred when parasitization of cocoons was at its peak.

Saturniidae (giant silkworm moths)

Bunaea alcinoe (= *caffra*, *caffraria*) Stoll, larva

Cirina forda (Westwood), larva

Gonimbrasia (= *Conimbrasia*, *Nudaurelia*) *belina* Westwood, larva

Gonimbrasia zambesina Walker, larva

Gynanisa maia (Klug), larva

Imbrasia epimethea Drury, larva

Melanocera menippe (author?), larva

Microgona cana (author?), larva

Urota sinope Westwood (= *Cirina similis*), larva

The large, pretty caterpillars of the saturniid, *Gonimbrasia belina* (*notoleetsana*) are 8-10 cm in length and are known as *masonja* or "mopanie worms" by the Pedi (Quin 1959). In Pedi territory where the mopane (*Copaifera mopane*) is exotic, host plants are confined to *Sclerocarya caffra* and *Burkea africana*. There are one to three generations per year. The larvae are ready for harvesting approximately three weeks after emergence and are available for three to four weeks before they pupate in the soil around the base of the host plant. The caterpillars grip the host plant tightly and cannot be shaken off; they must be picked by hand. According to Quin, a good picker in an average infestation can collect 18 kg (40 lb) of larvae per hour.

These caterpillars have been fairly extensively commercialized. In areas where they occur in profusion and are bulk-dried, they are first eviscerated (methods are described by Quin), the rate of evisceration being about 7.3kg (16 lb) of caterpillars per person per hour. They are then roasted for 15 minutes, then spread out to dry, which requires about 43 hr for the product to become sufficiently dry for storage. According to Quin, all three methods of evisceration are wasteful as a large proportion of fat is discarded along with the waste. The gut is removed mainly to eliminate the resin-flavored mopanie leaves that have been ingested. [Author's note: The waste associated with eviscerating could possibly be eliminated by starving the collected caterpillars for a few hours and then curing them whole, as is done with caterpillars in some other parts of Africa.] Quin recorded a weight loss of 84% during the processing and drying of larvae.

Quin mentions that a trader informed him that he alone handled more than 1000 32 kg (70 lb) bags of these caterpillars per year. Also, according to Quin, when given a choice the Pedi prefers 1/4 lb (114 g) of these caterpillars to 1 lb (454 g) of fresh beef. Further, a local trading business provided the information that these caterpillars, when available, seriously affect the sale of beef. Quin states that probably the only feasible way of meeting the demand for insect foods is to expand the *masonja* industry, not only in the Northern Transvaal but in adjoining Bechuanaland (now Botswana) and Zimbabwe.

The caterpillars of *Gynanisa maia* (legakgale) are 8-10 cm long when fully grown (Quin 1959). Host plants include widdoring, huilbos, and pendoring. The larvae are collected by hand early in the morning, as they tend to move to the top of the tree during the heat of the day. There is one generation per year. The caterpillars of *Cirina forda* (*noto*) are about 6.0-7.5 cm long; the host plant is wild sering (*Burkea africana*) and there is one generation per year.

Dreyer (1968) determined protein digestibilities of 135 foodstuffs in trials with young albino rats. The digestibility of mopani-worm meal (*Gonimbrasia belina*), which is eaten as a delicacy in considerable quantities by most rural Bantu tribes, was only 78.3%. Previous work by A.S. Wehmeyer (unpublished data) had found the amino acid composition of dried mopani worms to be relatively complete with high proportions of lysine and tryptophan (which are limiting in maize protein) and of methionine (limiting in legume seed proteins). Absorption of some nitrogenous components may be reduced by the presence of chitin in insect tissues. Other foods with protein digestibilities generally below 80% include dried beans, kaffircorn, and two other traditional Bantu foods (*marogo* and Bantu beer).

According to Dreyer and Wehmeyer (1982), the South African Bureau of Standards estimates annual sales of mopanie caterpillars, *G. belina*, through agricultural cooperative markets at about 40,000 bags, each containing 40 kg of traditionally prepared, dried caterpillars. This amounts to 1600 metric tons entering reported channels of commerce, but one would presume that this is only a fraction of the volume actually consumed. There is now a mopanie worm cannery at Pietersburg in the northern Transvaal.

Dreyer and Wehmeyer analyzed two kinds of mopanie material: 1) Traditionally prepared, in which the intestinal contents are squeezed out by hand, with the remainder being dried by exposure to sunlight (the drying process is sometimes accelerated by placing the material on a metal plate over an open fire), and 2) Canned material, prepared from dried caterpillars which had been soaked in water overnight but to which no condiments had been added. The soaking water was discarded, and the material then steamed, canned, freeze-dried and ground. Results of analyses of these two types of samples are shown in South Africa Table 3. Differences in nutrient content of the two samples pertained mainly to water-soluble components such as magnesium, sodium, potassium, and the B-complex vitamins, which were found in smaller quantities in the canned than in the uncanned product, probably due to losses in the soaking water which was discarded. The investigators consider the heat treatment applied during canning as another probable cause of nutrient loss, noting that the concentration of thiamine (a heat-labile vitamin) in the canned sample was only 16% of that in the uncanned sample. Despite such losses, the authors conclude that most of the nutrients listed are "present in concentrations sufficiently high to make substantial contributions to the traditional, predominantly cereal diet of the people using the mopanie caterpillar as a food." Unpublished data by Wehmeyer are cited which show that the traditional maize porridge made from unsifted meal yields only the following per 100 g solids: protein 9 g, fat 4.33 g, calcium 3.67 mg, iron 3.13 mg, phosphorus 224 mg, copper 0.3 mg, and zinc 2.0 mg.

Dreyer and Wehmeyer determined dry matter digestibility using both intact and caecectomized rats, the latter being anatomically closer to humans. The indigestible dry matter (IDM) content of the moisture-free caterpillars was comparatively high, 20.1% and 31.3% in the intact and caecectomized rats, respectively. This was due in part to a relatively low protein digestibility value, but also, apparently, to a high cellulose content, indicating that the digestive tracts of the caterpillars were not completely cleaned out during preparation of the samples studied. Digestibility of mopanie protein was found to be relatively low compared to protein from other products of animal origin (South Africa Table 4).

As discussed by Dreyer and Wehmeyer, however, this weakness

"was compensated for to a considerable degree by an assimilability index which compares favourably with those of the high-class products such as casein and beef. The net effect of the digestibility and assimilability, as given by the NPU [Net Protein Utilization] values, is such that, quality-wise, the mopanie product protein occupies a position well above the midpoint between the bottom end (gluten, 27%) and the uppermost point on the scale of natural proteins as exemplified by whole hen's egg protein (85%)."

The authors suggest that the low values for mopanie protein digestibility result from the fact that some of the nitrogenous components in insects are present in the form of chitin, which is not hydrolyzed in the intestinal tracts of mammals because of the absence of chitinase. Assuming the assimilable protein requirement for nitrogen equilibrium in a 70 kg man to be about 30 g per day, it can be estimated from the NPV's (Net Protein Value) in Table 4 that 67.4 g of moisture-free caterpillars would meet this requirement. Assuming a moisture content of 83.1% in whole, fresh caterpillars, as determined by Quin, 399 g of fresh material or about 69 fresh caterpillars would furnish the requirement.

From their studies, Dreyer and Wehmeyer concluded that,

"the consumption of mopanie caterpillars can to a substantial degree supplement the predominantly cereal diet with many of the protective nutrients. The main advantage of this foodstuff is its high protein value, in spite of the fact that the digestibility of this protein is lower than that of most proteins of animal origin. The traditional method of degutting does not yield a product completely free from gut contents, a considerable amount of cellulosic material still being detectable in the samples investigated."

The large "lopané" caterpillars which were collected in great quantities for use as food, referred to by **Livingstone (1857: 164)**, may have been *G. belina* as Livingstone mentions they feed on the leaves of the mopané-tree.

Berensberg (1907) mentioned that the fat caterpillars of the saturniids, *Gynanisa maia*, *Nudaurelia belina* and *Bunaea caffra* are emptied, stuck on small sticks, and roasted by the natives of Natal.

According to **Junod (1913)**, edible saturniid caterpillars eaten by the Thonga tribe are collectively known as *tomane*. These include *Cirina similis* (Dist.) [Quin 1959: 114, calls this species *Urota sinope*], which are found in groups on the *nkanye* tree in October, and are known as *matomane*. In Junod's words: "By the exercise of a gentle pressure on the hideous creatures, the inside is squeezed out, and the rest is thrown into a saucepan and boiled, resulting in an indescribable broth of a blackish colour. To see it is quite sufficient . . . and they enjoy it!" Other species include *Bunaea caffraria* the *matomane* of nyamari; *Melanocera menippe*; *Gonimbrasia zambesina*, on the *nhlangu* shrub, and others.

Bodenheimer (1951: 143-144) mentions *Gonimbrasia belina* and other large saturniid caterpillars among the insect foods in South Africa, as communicated to him by J.C. Faure. **Velcich (1963;** vide Malaisse & Parent 1980) states that to the north of Transvaal, the *Gonimbrasia belina* harvest takes place from December to February and from April to May. [Note: Doubtful that Velcich should be included under S. Africa. Need to see the original.]

In a 1994 Reuters press release (e.g., *San Francisco Chronicle*, September 4), Anton **Ferreira** interviewed insect expert Chris Styles and reported that the mopane worm (*Imbrasia belina*) is such an irresistible snack that the people of southern Africa could be eating it into extinction. "People utilize them tremendously, both as food and as a way to make money," Styles said. "In a lean year when they are hard to come by, a kilogram (2.2 pounds) will fetch \$30 in Johannesburg or Pretoria." Styles said an increasing number of young women were harvesting mopane worms as alternative employment dried up in southern Africa's rural areas. He said nature conservation in South Africa had focused on the mammals like rhino and elephants at the expense of creatures like the mopane worm which were less spectacular but more relevant for rural communities. "Conservation means nothing to these communities if they don't benefit from it." Styles hopes to find a way to farm the caterpillars.

In a Reuter dispatch (*Financial Gazette* [Zimbabwe], August 10, 1995), Deputy Environmental Affairs Minister Bantu Holomisa told researchers attending a seminar at the University of Pretoria that mopane-worm farming is a potential gold mine for sustainable rural development in S. Africa. Rural communities' reliance on the caterpillar, with its high protein content, shows an important use for wildlife resources. He said his department would help researchers to promote the cash benefits of the worm and to start pilot programs to farm them. Some farmers are using pesticides against the worms, but that will change "once they know there is a gold mine in them," Holomisa said. "In the long term, farming of mopane worms is going to be feasible -- there's no doubt about that. South Africans, especially in the northern areas, love these worms." He added that experimental breeding programs could also help reverse a trend towards environmental neglect. "Under the twin onslaught of poverty and excess, South Africa's natural resource base is crumbling and its biological diversity is dwindling. In the long term, environmental neglect leads to a bankrupt nation with little hope of ecological and economic recovery. The solution lies in recognising that conservation and development are both necessary and interdependent."

Among other points made at the seminar, studies by the Council for Scientific and Industrial Research (CSIR) have shown that the mopane worm averages 10% protein, and taking 15 worms per day satisfies the adult requirements for calcium, iron and riboflavin. At least 2,000 women in the Northern Province are involved in collecting the worms, both as food and a source of income. The worms are usually sun-dried after harvesting which gives them a long shelf-life. They are added to stews or eaten alone like peanuts. In Johannesburg, they cost up to 105 rand per kilogram.

See also Faure (1944), Cunningham (1992) and Cunningham and Peiser (1991) in the Introduction.

Sphingidae (sphinx or hawk moths)

Agrius (= *Herse*) *convolvuli* (Linn.), larva

The caterpillar of *Herse convolvuli* (*naatla*), the sweet potato sphinx, feeds on *Convolvuli* sp., is 6.0-7.5 cm in length, and has one generation per year (**Quin 1959**).

Miscellaneous Lepidoptera

Livingstone (1858: 48) mentioned that, in Boer country: "In traveling we sometimes suffered considerably from scarcity of meat, though not from absolute want of food. This was felt more especially by my children; and the natives, to show their sympathy, often gave them a large kind of caterpillar, which they seemed

to relish; these insects could not be unwholesome, for the natives devoured them in large quantities themselves."

Cloudsley-Thompson (1953) reported the following:

"Some South African friends with whom I was staying in November, 1942, took me to an estate of theirs not far from Johannesburg, some days after a heavy hailstorm had caused considerable damage in the Transvaal. Branches and leaves smashed from the trees lay scattered on the ground and a large number of three-inch caterpillars of a cryptic bluish-green colour, bruised and dead, were mingled with the debris. While we were looking at them, a Zulu came up and asked permission to gather the insects which, he said, were very good to eat."

See also Sparrman (1787), Bryant (1949) and McCallum (1993) in the Introduction.

Orthoptera

Acrididae (short-horned grasshoppers)

Cyrtacanthacris (= *Nomadacris*) *septemfasciata* (Serville) (= *Gryllus* *devastator*), nymph, adult

Locusta sp., adult

Locustana pardalina (Walker), adult

Schistocerca sp., adult

Prior to 1937, heavy invasions of both the brown locust (*Locustana pardalina*) and the red locust (*Nomadacris septemfasciata*), occurred periodically in the northern Transvaal (**Quin 1959**). Great quantities were collected and it was not uncommon to see wagons "loaded high" with bags of locusts. Because of the vegetational deterioration, locusts as well as most other insects are seldom collected now in sufficient quantities to allow preservation and storage. Quin discusses two species of importance to the Pedi. The brown locust, *L. pardalina* (*segongwane*), is about 6-7 cm long. It is practically confined to the inland plateau, preferring drier areas with short vegetation and karoo-bush. There are ordinarily two generations per year, but dependent on rainfall, temperature, food supply and natural enemies, there may be three in some years. They are mainly grass eaters but readily attack crops. They are collected by hand at night or in early morning while still lethargic.

The red locust, *C. septemfasciata* (*maphata-kalala*), is large, 7.5 cm from front of head to tip of folded wings. It primarily inhabits tropical and subtropical regions. According to Quin, there have been no invasions of the Northern Transvaal since 1937. The red locust feeds on the grass family, but attacks a variety of other plants. There is only one generation per year in South Africa. Both hoppers and fliers are collected, this being done in bulk by hand during the night or early morning while they are still lethargic.

Locusts have a long history as human food in South Africa. **Sparrman (1787, I: 366-367)** states that:

The locusts, likewise sometimes afforded a delicious treat to the more unpolished and remote hordes of the Hottentots; when, as sometimes happens, after an interval of eight, ten, fifteen, or twenty years, they make their appearance in incredible numbers. . . the Hottentots were highly rejoiced at the arrival of these locusts, though they are sure to destroy every bit of verdure on the ground: but the Hottentots make themselves ample amends for this loss, by falling foul on the animals themselves, eating them in such quantities as, in the space of a few days, to get visibly fatter and in better condition than before.

Steedman (1835, I: 137) notes that the Bushmen are particularly partial to locusts; he also observed locusts being fed to fowls which devoured them avidly. Steedman remarks that "the gamebirds we shot in this part of the country had a strong and disagreeable flavour, in consequence, as I supposed of feeding on these insects."

Pringle (1835) vividly describes the abundance of locusts and mentions (p. 164) that they are devoured by "every animal, domestic and wild. . . whilst the half-starved Bushmen, and even some of the Colonial Hottentots consider them a great luxury, consuming great quantities fresh, and drying abundance for future emergencies." Pringle refers to the locust of South Africa as *Gryllus devastator*, and states that, "The flying locusts, though often seen in such numbers as to obscure the sky when they are passing, and to destroy luxuriant fields of corn in a few hours, are less dreaded by the farmers than the larvae, devoid of wings -- vulgarly called by the colonists *voetgangers* (foot-goers)."

Cumming (1850: 69; vide Bodenheimer 1951: 162) reported passing through a swarm of locusts in April

that was so dense that, when resting at night, they covered the vegetation. As summarized in part by Bodenheimer: "Locusts afford fattening and wholesome food to men, birds and all sorts of beasts; cows and horses, lions, jackals, hyenas, antelopes, elephants, etc. devour them. [Cumming] met a party of Batlapis carrying heavy loads of them on their backs. His hungry dogs made a fine feast upon them. The locusts were roasted as food for his men as well as for the dogs."

The Korannas and Bushmen of the Cape greet the approach of locusts with joy, according to **Fleming (1853: 80)**:

Horses, dogs, cats, and poultry, all devour them with avidity, and the Korannas and Bushmen save them in large quantities, and then grind them between two stones into a kind of meal, which they mix with fat and grease, and bake in cakes. Upon these they live for months together, and are seen leaping, clapping their hands together, and chattering with the greatest joy, so soon as the locusts are seen approaching.

Fleming described the locusts as seeming to be "a smaller kind of the *Gryllus Migratorius*, or Migratory Locust," (*Locusta migratoria*).

Moffat (1865: 298-299) gives a vivid description of a destructive locust invasion in 1826: "They had not been seen for more than twenty years before, but have never entirely left the country since. . . . The natives embrace every opportunity of gathering them, which can be done during the night. Whenever the cloud alights at a place not very distant from a town, the inhabitants turn out with sacks, and often with pack-oxen, gather loads, and return the next day with millions." The locusts are prepared for eating by boiling them, then spreading them on mats to dry in the sun. The legs and wings are removed by winnowing, and they are eaten whole with a little salt or may be pounded into a meal to which a little water is added to make a kind of cold stir-about. According to Moffat, when the locusts abound the natives become quite fat. He states of the locusts that, "They are, on the whole, not bad food. . . . When full-fed they are almost as good as shrimps." Moffat, similarly to Pringle earlier, notes that the adult swarms, "fearful as they are, bear no comparison to the devastation they make before they are able to fly. . . ." One species is mentioned, with reddish wings, that is inedible.

Livingstone (1858: 48) mentions that, in the Boer country of the Cashan Mountains, their supplies were so irregular that they were "sometimes fain to accept a dish of locusts." He says:

These are quite a blessing in the country, so much so that the *rain-doctors* sometimes promised to bring them by their incantations. The locusts are strongly vegetable in taste, the flavor varying with the plants on which they feed. There is a physiological reason why locusts and honey should be eaten together. Some are roasted and pounded into meal, which, eaten with a little salt, is palatable. It will keep thus for months. Boiled, they are disagreeable; but when they are roasted I should much prefer locusts to shrimps, though I would avoid both if possible.

Simmonds (1885: 351) credits Alfred Cole with the information that a whole kraal of Caffres once died after having consumed an unusual quantity of locusts. **Kunckel d'Hercules (1893;** vide Bodenheimer 1951: 163-164) reported that in Togoland in 1892 King Kuma had to forbid the locust hunt as it caused the natives to neglect their fields. **Berensberg (1907)** states that one of the greatest pests in South Africa is the locust, which he identifies as *Cyrtacanthacris septemfasciata* (Serv.) (= *Gryllus devastator*): "The natives of South Africa consider the locusts a very welcome food, and eat them roasted or dried; the Hottentots and Bushmen welcome the arrival of a swarm, which gives variety to their menu. . . . They prepare also a fat brown soup of the eggs."

Stowe (1905: 58-59) notes that:

The arrival of [a swarm of locusts] was hailed by the Bushmen as a glorious time of harvest, as they were esteemed excellent and nourishing food. Immense numbers of them were caught, deprived of their legs and wings, dried in the fire, and then either ground with a *maalklip*, that is a flat stone, or one which has been slightly hollowed in the centre, upon which the dried locusts were reduced to powder by means of a smaller round one worked with both hands, or pounded in one of the mortars which have been described as hollowed out of the solid rock and used in the preparation of grass seeds. . . . The locust-powder was stored in a dry place, in skin sacks, and kept for future use, when it was made into a kind of porridge, and also, when mixed with honey, into a sort of cake, which was said by those who have tasted it to have been far from unpalatable. The nutritious properties of this food were proved by the fact that during the locust season the Bushmen increased in flesh, and became rotund and well-conditioned.

Junod (1913) states that the Thonga avenge themselves on destructive locusts by eating them wholesale:

When a swarm of these destructive creatures has alighted somewhere in the evening, and is benumbed by the cool air of the night, the villagers go and collect them in bags or baskets in great quantities. The heads, wings and legs are torn off and the bodies roasted on the embers, or boiled and used as seasoning. When plentiful, the locusts are dried and crushed in mortars to make a much appreciated flour. To our taste, locusts are simply nauseating.

Le Vaillant (1931; vide Bodenheimer 1951: 163) wrote in January 1782:

Joy showed itself suddenly on all faces when a cloud of advancing locusts was sighted, composed of millions of these insects. They passed not much above our heads on a front of almost 1000 m. continuing for over an hour in such a dense stream that they did fall like hail upon us. Those of my men who were accustomed to wild life, enjoyed them and boasted so much about the excellence of this manna, that I ceded to the temptation to eat them. My prejudices were certainly stronger than any real cause for aversion, as I could not detect any disagreeable flavour, and they actually taste like the yellow of a boiled egg [I: 202, 208]. . . . The Bushmen also dried locusts on mats, removing the wings and legs. As these locust had begun to ferment they had a very bad smell. The Namaquis had as their sole provisions some pieces of dried meat and a sack of dried locusts (II: 100).

Adler (1934) recommended the use of locust meal for balancing the rations of pigs and poultry, stating that particulars were obtainable from the Schools of Agriculture in the different provinces. Fodder containing 10% locust meal was also relished by cattle in tests at the Potchefstrom School of Agriculture. Analysis of red-wing locust nymphs [probably *Cyrtacanthacris septemfasciata*] just prior to the adult stage showed: moisture 10.5%, protein 46.1%, fat 9.6%, ash 5%, fiber 12.5%. This compared favorably with the protein content of the local peanut and coconut oil-cake meal. Adler suggests that locust meal is better utilized as a feed concentrate than as fertilizer because of its high fat content. On one farm where locusts had settled on trees for the night, enough to fill 55 burlap bags were collected in 1 3/4 hours, using a "flame-projecting appliance which works on crude paraffin." On another farm the next night, 85 bags were filled, using the same device.

Bodenheimer (1951: 143-144) quoted correspondence from J.C. Faure that, "wagon-loads of adult migratory locusts are collected, especially if the females are full of eggs. . . . This applies especially to *Locustana pardalina* Walk. and *Nomadacris septemfasciata* Serv., but I have no doubt *Locusta* and *Schistocerca* would also be eaten."

Ledger (1987) gives an historical account of South Africa's efforts to deal with the brown locust, *Locustana pardalina*, over the past two centuries. It appears that the brown locust was in major or minor outbreak in more than 100 of the 190 years between 1797 and 1987. Chemical controls were introduced between 1900 and 1910. Pre-1900 control measures included, "trampling the hoppers with herds of livestock; smoke and noise to chase locusts from crops, while indigenous people used pits filled with grass to catch hoppers for consumption." Ledger states:

The man in the street reads about locusts used for animal feed and for human consumption and wonders whether any potential for locust control could be found in the intensive harvesting of the insects. African tribes have always utilised locusts for food and the famous South African writer and epicure, C. Louis Leipoldt, included a recipe in his Cape Cookery book. . . . The logistics of locust harvesting are formidable, but serious thought is being given to the harvesting of krill in the Antarctic, where the problems and severe weather conditions pose far greater constraints than in the Karoo.

Ledger briefly summarizes recent attempts in S. Africa to harvest the locusts, using industrial vacuum cleaners. See also Sparrman (1787), Faure (1944) and Bryant (1949) in the Introduction.

Gryllidae (crickets)

Gryllus (= *Grillus*) sp.

Junod (1913) mentions that the cricket, *Grillus*, known as *shiyendlwa*, is eaten by some Thonga.

Pyrgomorphidae

Zonocerus elegans (Thunberg), nymph, adult

Zonocerus elegans (kodi), eaten by the Pedi, is a brightly colored insect about 3-5 cm in length. It is a non-swarming locust, but a serious pest of garden plants. There are probably two generations per year (Quin 1959).

Miscellaneous Orthoptera

Steyn (1962) described the case history of a 4-year-old Swazi child who died after eating a single grasshopper of the species, *Phymateus leprosus* Fabr. This species is not eaten by adult Swazis because they know it to be poisonous. Rabbits dosed by stomach-tube with freshly minced grasshoppers exhibited toxic symptoms of the heart and respiratory system. It was not determined whether the toxicity was caused by the insect itself or by toxic plant material that it had ingested. *P. leprosus* often feeds on the leaves of wild cotton or milk-bush (*Asclepias fruticosa*) and on Ceylon rose (*Nerium oleander*), and both plants are active heart poisons.

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Chapter 12 of The Human Use of Insects as a Food Resource: A Bibliographic Account in Progress, by Gene R. DeFoliart, posted on website July, 2002

South Africa Table 2. Palatability of food insects used by the Pedi (Quin 1959).

Order and Species/Flavor/Popularity
Coleoptera
<i>Polycleis equestris</i> / Indistinct, salty-nutty / very popular; vies with meat
<i>Sternocera orissa</i> / Appetizing, fruity-meat / extremely popular; preferred to meat
Hymenoptera
<i>Carebara vidua</i> / Pleasant, meaty, somewhat like soft-shell crab / extremely popular; preferred to meat
Lepidoptera
<i>Bombycomorpha pallida</i> / Meaty-sweet / most popular of all caterpillars
<i>Cerina forda</i> / Indistinct, meaty / extremely popular
<i>Gonimbrasia belina</i> (fresh) / Meaty vegetable / extremely popular; preferred to meat
<i>Gonimbrasia belina</i> (cured) / Indistinct, meaty / extremely popular; preferred to the fresh article
<i>Gonometa postica</i> / Fatty, like marrow / extremely popular; preferred to meat
<i>Gynanisa maia</i> / Wild, meaty / very popular
<i>Herse convolvuli</i> / Appetizing, meaty-vegetable, somewhat like asparagus / very popular
Orthoptera
<i>Locustana pardalina</i> / Palatable, sweet, meaty-vegetable / most popular of all relishes
<i>Locustana pardalina</i> (legs) / Appetizing, meaty / very popular; relish concentrate
<i>Zonocerus elegans</i> / Bitter, meaty / popular
