Chapter 11

SOUTHERN AFRICA: OVERVIEW

The Southern Africa region as treated here includes Botswana, Mozambique, Namibia, South Africa, Zimbabwe and the islands of Madagascar and Mauritius. A wide variety of insects are eaten including at least 83 species belonging to at least 72 genera, 35 families and 9 orders (see Regional Taxonomic Inventory). The specific identity is known for only 62 of the species, while the generic identity is known for another 17, the family identity for another 7 and only the order for one species. The total, however, is undoubtedly much higher, as almost nothing is known about the specific identity of insects consumed in Botswana, Mozambique and Namibia, while the totals of 35, 36 and 21 recorded (at least to genus) from South Africa, Zimbabwe and Madagascar, respectively, are obviously far from complete. In Zimbabwe, for example, Gelfand (1971) and Chavunduka (1975) record the specific identity of three species of caterpillars (and a fourth species to genus), but identify at least six additional species on the basis of vernacular names and host plants utilized.

Regional Taxonomic Inventory (as of about 1996)

Taxa and stages consumed	Countries
COLEOPTERA (beetles)	
Beetles, beetle grubs	Pan-regional
Buprestidae (metallic woodborers)	
Sternocera funebris (author?), adult	Zimbabwe
Sternocera orissa Buquet, adult	S. Africa, Zimbabwe
Carabidae (ground beetles)	
Scarites sp., larva	Madagascar
Tricholespis sp., larva	Madagascar
Cerambycidae (long-horned beetles)	
Cerambycid sp., larva	Mauritius, S. Africa
Stenodontes downesi Hope, larva	Mozambique, S. Africa
Plocoederus frenatus (author?), larva	S. Africa
Cicindelidae (tiger beetles)	
Proagsternus sp., larva	Madagascar
Curculionidae (snout beetles, weevils)	
Eugnoristus monachus Ol., larva	Madagascar
Polycleis equestris Boheman, adult	S. Africa
Polycleis plumbeus Guerin, adult	S. Africa
Rhina sp., larva	Madagascar
Rhynchophorus phoenicis (Fabr.), larva	S. Africa
Rhynchophorus sp.	Madagascar, Mozambique, S. Africa
Dytiscidae (predaceous diving beetles)	
Cybister hova Fairm., adult	Madagascar
Elateridae (click beetles)	
Click beetles	Botswana
Lucanidae (stag beetles)	
Cladognathus serricornis (author?), larva	Madagascar
Passalidae (bess beetles)	
Palmicolous passalid larvae	Madagascar

Scarabaeidae (scarab beetles)

Lepidiota anatina (author?), adult	Zimbabwe
Lepidiota masnona (author?), adult	Zimbabwe
Lepidiota nitidicollis (author?), adult	Zimbabwe
Oryctes boas Fabr., larva, occasionally adult	S. Africa
Oryctes monoceros Ol., larva, occasionally adult	S. Africa
Oryctes owariensis Beauv., larva, occasionally adult	S. Africa

DIPTERA (true flies)

Swarms of flies	Botswana

Culicidae (mosquitoes)

Mosquitoes	Botswana

HEMIPTERA (true bugs)

Nepidae (waterscorpions)

Nepa sp., adult	Madagascar

Pentatomidae (stink bugs)

Euchosternum delegorguei (Spinola), adult	S. Africa, Zimbabwe
Pentascelis remipes (author?), adult	Zimbabwe
Pentascelis wahlbergi (author?), adult	Zimbabwe

HOMOPTERA (cicadas, etc.)

Cicadidae (cicadas)

Lobo leopardina (author?)	Zimbabwe
Phremnia rubra Signoret, "sugar"	Madagascar

Fulgoridae (planthoppers)

Pyrops madagascariensis Fabr.	Madagascar

Psyllidae (psyllids)

Psylla sp., sweet secretion	S. Africa

HYMENOPTERA (bees, ants wasps)

Apidae (bees)

Trigona spp., larvae	Zimbabwe
Bee larvae/pupae	Botswana, S. Africa, Zimbabwe

Eumenidae (mason and potter wasps)

Mason wasp	Botswana

Formicidae (ants)

Carebara vidua Sm., winged adult	S. Africa, Zimbabwe
Ants	Botswana, Namibia

Vespidae (wasps, hornets)

Wasp larvae	Botswana, Madagascar

ISOPTERA (termites)

Termites, "white ants", "flying ants"	Botswana, Namibia S. Africa, Zimbabwe
Termite soldier	S. Africa, Zimbabwe

Hodotermitidae

Hodotermes sp., nymph	S. Africa
Microhodotermes viator (Latr.)	S. Africa

Termitidae

Macrotermes falciger Gerstacker, winged adult, soldier, queen	Zimbabwe
Macrotermes natalensis (Haviland)	Zimbabwe
Macrotermes swaziae Fuller, winged adult	S. Africa
Odontotermes badius (Haviland), winged adult	S. Africa
Termes capensis DeGeer, winged adult	S. Africa

LEPIDOPTERA (butterflies, moths)

Caterpillars	Pan-regional

Lasiocampidae (eggar moths, lappets)

Bombycomorpha pallida Distant, larva	S. Africa
Borocera madagascariensis Boisduval, pupa	Madagascar
Borocera sp., larva	Madagascar
Gonometa postica Walker, pupa	S. Africa
Libethra cajani Vinson, pupa	Madagascar
Rombyx radama Coquillet, pupa	Madagascar
Lasiocampid larva	Zimbabwe

Limacodidae (slug caterpillars)

Limacodid larva	Zimbabwe

Notodontidae (prominents)

Anaphe panda (Boisdv), larva	Zimbabwe

Psychidae (bagworm moths)

Debarrea malagassa Heylaerts, pupa	Madagascar

Saturniidae (giant silkworm moths)

Antherina suraka (author?), larva	Madagascar
Bunaea alcinoe (Stoll), larva	S. Africa, Zimbabwe
Bunaea sp., larva	Zimbabwe
Cirina forda (Westwood), larva	S. Africa, Zimbabwe
Gonimbrasia belina Westwood, larva	Botswana, S. Africa, Zimbabwe
Gonimbrasia zambesina Walker, larva	S. Africa
Goodia kuntzei Dewitz, larva	Zimbabwe
Gynanisa maia (Klug), larva	S. Africa
Gynanisa sp., larva	Zimbabwe
Imbrasia epimethea Drury, larva	S. Africa, Zimbabwe
Imbrasia ertli Rebel, larva	Zimbabwe
Lobobunaea sp., larva	Zimbabwe
Melanocera menippe (author?), larva	S. Africa
Microgone cana (author?), larva	S. Africa
Microgone sp., larva	Zimbabwe
Pseudobunaea sp., larva	Zimbabwe
Tagoropsis sp., pupa	Madagascar
Urota sinope Westwood, larva	S. Africa

Sphingidae (sphinx or hawk moths)

Agrius convolvuli (Linn.), larva	S. Africa, Zimbabwe
Sphinx moth pupa, adult	Madagascar

Family uncertain

Coenostegia diegoi (Mab.), pupa	Madagascar

ODONATA (dragonflies)

Libellulidae (common skimmers)

Libellulid nymphs	Madagascar

ORTHOPTERA (grasshoppers, locusts, etc.)

Acrididae (short-horned grasshoppers)

Acanthacris ruficornis (Fabr.)	Zimbabwe
Acrida bicolor (Thunberg)	Zimbabwe
Cyathosternum spp.	Zimbabwe
Cyrtacanthacris septemfasciata (Serville), nymph, adult	S. Africa, Zimbabwe
Cyrtacanthacris sp.	Madagascar
Locusta migratoides (author?), adult	Zimbabwe
Locusta migratoria (Linn.), adult	Zimbabwe
Locusta migratoria capito Saussure	Madagascar
Locusta sp., adult	Madagascar, S. Africa
Locusta tartarica	Botswana
Locustana pardalina (Walker), adult	S. Africa
Ornithacris cyanea (Stoll), adult	Zimbabwe
Schistocerca sp., adult	S. Africa
Truxaloides constrictus (Schaum)	Zimbabwe
Locusts, grasshoppers	Pan-regional

Gryllidae (crickets)

Acheta sp.	Zimbabwe
Brachytrupes membranaceus (Drury), adult	Madagascar, Zimbabwe
Gryllus sp.	S. Africa
Crickets	Botswana

Gryllotalpidae (mole crickets)

Gryllotalpa africana (author?)	Zimbabwe

Pyrgomorphidae

Zonocerus elegans (Thunberg), nymph, adult	S. Africa

Tettigoniidae (long-horned grasshoppers, katydids)

Ruspolia differens (= nitidulus) (authors?)	Zimbabwe

Quin (1959) reported the protein and calorie content of 11 insect species used as relishes by the Pedi in South Africa, and concluded that the loss of their traditional foods, including insects, was largely responsible for the problems of malnutrition among these people. Throughout southern Africa the insects are prepared in a variety of ways but most often as relishes for use with the basic cereal porridge. The insects add flavor and valuable nutrients. Quin reported that the insect relishes used by the Pedi ranged from popular to extremely popular and that many were preferred to meat (Chapter 12, Table 2). He described the flavor of different species as being salty-nutty, fruity-meat, meaty vegetable, fatty like marrow, etc. This enthusiasm for insect cuisine is not limited to the Pedi. For example, Chavunduka (1975) in Zimbabwe states of the sand cricket, *Brachytrupes membranaceus*, "When well-prepared it is considered a delicacy, for it turns an ordinary meal into a dinner." Some African insects are quite acceptable to the modern Western palate. R.J. Phelps, in Zimbabwe, noted (pers. communication to the author, 1987) that "many people of European background eat termites here, although not in the quantities that the local people do."

Many of the early records showing the enthusiasm of native populations for their insect foods pertain to locusts and are quite dramatic, probably because locust swarms are always on such a grand scale that even Western observors could hardly fail to notice what was happening. Kunckel d'Hercules tells of how, in 1892, King Kuma of Togoland had to forbid the locust hunt as it caused the natives to neglect their fields. Le Vaillant's statement (1782) is typical of many early accounts from S. Africa: "Joy showed itself suddenly on all faces when a cloud of advancing locusts was sighted, composed of millions of these insects." Le Vaillant mentions that his men "boasted so much about the excellence of this manna," that he decided to try them for himself. In

Madagascar, a battle between two tribes was interrupted by the sudden appearance of a locust swarm. Fighting ceased immediately as both sides became occupied with collecting the locusts. Appreciation of insect foods was not limited to the general populace, but extended to royalty. Camboué tells us (1886) that in Madagascar insects were found even at the royal table in Tananariva. "The late queen Ranavalona II kept, in addition to her hunters and fishermen, some women who merely scoured the fields to collect locusts."

Native populations not only liked their locusts, the insects were good for them nutritionally. In S. Africa, Sparrman (1787), Moffat (1865) and Stowe (1905) all mentioned that when locusts abound the natives become fatter and in better condition than before. Sparrman, and also Backhouse (1844), make a similar observation regarding the condition of the natives when termites are available. Fleming (1853), in S. Africa, reported that the Korannas and Bushmen live for months on locusts which they grind into a meal, mix with fat and grease and bake in cakes.

Western assessments of the flavor of African locusts are mixed, though generally favorable, as shown by the following from S. Africa. Bryant (1949) reported that roasted locusts were "said by Europeans, who ventured to taste them, to possess the flavor of shrimps." Moffat (1865) states that locusts are "on the whole, not bad food. . . When full-fed they are almost as good as shrimps." Livingstone (1858) said of locusts, "Boiled, they are disagreeable; but when they are roasted I should much prefer locusts to shrimps, though I would avoid both if possible." Locusts were said by Stowe (1905) to be "far from unpalatable," by Junod (1913) to be "simply nauseating," and by Le Vaillant (1931) to be not disagreeable, tasting like the yellow of a boiled egg. Dornan (1925), in Botswana, said that locusts "are not at all bad eating." Relative to another insect, we do not know the reaction of the guests, but we owe to DeCarey (1937 in Madagascar) the information that in 1894 a dish of *Borocera* pupae (a silk-spinning moth) prepared in a bechamel sauce (white sauce with cream), was served in an official meal in the French Residence in Tananarive.

Only two species have received detailed nutritional evaluation in the region, the termite, *Macrotermes falciger*, in Zimbabwe (Phelps et al 1975), and the caterpillar, *Gonimbrasia belina* (known as the "mopanie worm"), in S. Africa (Dreyer 1968, Dreyer and Wehmeyer 1982). The termite was found to be very high in energy, 761 kcal/100 g on an ash-free basis, but of only medium protein value (a PER of 1.7 for lightly fried termites compared to 3.5 for fish and 1.1 for maize). The frying, however, may have resulted in some loss of lysine, as Moyo had earlier reported *M. falciger* to be a rich source of this amino acid and thus a good supplement to the traditional maize in the diet. The amino acid composition of dried mopanie worms was reported by Dreyer to be relatively complete with high proportions of lysine and tryptophan (which is also limiting in maize protein) and of methionine which is limiting in legume seed proteins. Dreyer and Wehmeyer concluded that, despite protein digestibility lower than that of most proteins of animal origin, "the consumption of mopanie caterpillars can to a substantial degree supplement the predominantly cereal diet with many of the protective nutrients."

In Zimbabwe, according to Gelfand (1971), insects such as the ants, termites and crickets are usually collected by the women and children, and according to Wilson (1990) they are frequently eaten opportunistically, especially by the children. Wilson stresses the importance of the high fat content of many of the species, as people living on a predominantly millet diet take in even less fat than those living predominantly on maize. In the opinion of Chavunduka (1975), insect foods have averted many potential cases of kwashiorkor in the rural areas of Zimbabwe, and he recommended that their use, as the cheapest source of animal protein, should be encouraged.

In S. Africa, some black communities derive 80 per cent of their protein from insects (Ferreira 1991), yet Cunningham and Peiser (1991), authors of the *Primary Health Care Booklet* written primarily for teachers and health care workers, decry the fact that knowledge of traditional foods is being lost because it is rarely taught in the schools. And Cunningham (1992) notes that there is an increasingly widespread social stigma toward gathering of wild food resources, including insects, as opposed to buying food from stores. This stigma also exacts an ecological price, in that it removes the incentive for conserving wild fruit-bearing trees when clearing fields. These trees are the major woody plant cover outside of conservation areas and the source of certain edible insect larvae. Similarly, in Zimbabwe, Wilson mentions that a small but increasing number of people are refusing to eat caterpillars because they are food for 'primitives,' although this is not yet widespread in rural areas and has not yet had an impact on the urban marketing of caterpillars. Quin discussed at length how the coming of 'civilization' wreaked economic and nutritional havoc among the Pedi in S. Africa.

Edible insects are of significant economic importance in the region. Quin stated that the Pedi of S. Africa, when given a choice, prefer the mopanie worm to fresh beef, and when available these caterpillars seriously affect the sale of beef. There are processing plants for mopanie caterpillars in Botswana (Brandon 1987) and S. Africa (Dreyer and Wehmeyer 1982), and The South African Bureau of Standards estimated annual sales of the caterpillars, through agricultural cooperative markets alone, at about 40,000 bags, each containing 40 kg of traditionally prepared, dried caterpillars. According to Schaad (pers. comm. 1987), dried mopanie caterpillars are exported by the tons from Botswana to Zambia. Ferreira notes that the mopanie caterpillar is being used so extensively as a source of food and income that S. Africans may be eating it into extinction. The S. African

government is now interested in supporting research aimed at developing methods of 'farming' the caterpillars, and mopanie conservation is considered an important factor in helping to deter environmental degradation.

The mopanie caterpillar is also a major food item in Zimbabwe, where its price is similar to that of fresh beef (Wilson 1990). Another saturniid caterpillar, *Cirina forda*, is also found widely in rural and urban markets (McGregor 1991), and Chavunduka (1975) noted that some rural families in Zimbabwe make a fairly good living from selling caterpillars. Wilson (1989) notes that there is a long history of regional international trade in caterpillars, and that a number of large industrial concerns now deal in dried and tinned caterpillars. As in S. Africa, however, there is growing concern in Zimbabwe about the diminishing caterpillar numbers as the result of ecological changes. Wilson believes that heavy exploitation by people may be a contributing factor to the decline.

As insects dependent on woodland, such as most caterpillars, decline in dietary importance, insects not dependent on woodland are increasingly important. Of the four species now most widely marketed in Zimbabwe, two belong to the latter category, the cricket *Brachytrupes membranaceus* and the katydid *Ruspolia differens* (McGregor 1991). Also, termites, both alates and soldiers, are still widely marketed, and they can be an important source of income.

Locusts were formerly of great economic importance in the region. Osborn (1924) stated, for example: "All forward looking housewives in Madagascar have a goodly supply of dried locusts on hand. They are to be had in the great public markets, whither they are carried in hundreds of huge shallow baskets." They were particularly important items of commerce following invasions by swarms. In 1935, to take advantage of this, the Madagascar government instituted a special high-speed tariff on locusts shipped by rail; they were taxed at the same rate as fish and game (DeCary 1937). A variety of other insects have been marketed in Madagascar, including weevil larvae (Curculionidae), silkworm pupae (Lasiocampidae) and pupae of bagworm moths (Psychidae).

As already mentioned, the availability of some edible insect species is decreasing in the region because of ecological factors. In Zimbabwe, this results from bush clearance for settlement and agriculture, and the consequent disappearance of many indigenous trees and grasses upon which the insects feed (Chavunduka 1975). Insecticides also have had an adverse effect on the insect populations. Ecological deterioration in the form of vegetation and top-soil destruction in S. Africa, along with the loss of locust invasions from the north (because of international locust control programs), reduced edible insects to a relatively minor role in the Pedi dietary (Quin 1959). The insecticide-based locust control programs have also had an effect in Zimbabwe. Environmental concerns regarding the use of pesticides for locust control have resulted in a recent upsurge of interest in S. Africa in harvesting the insects as food and/or animal feed as an alternative procedure (Ledger 1987).

The migratory locusts which have been of such historical importance as a food source in Africa do indeed pose a huge problem. As pointed out by Quin in S. Africa, Chavunduka, Wilson in Zimbabwe and others, international locust control programs have greatly diminished the availability of locusts as food. But, as is well-known, the locusts are equally historic as destructive pests of cultivated crops and other vegetation. Depending on conditions, locust behavior can change from "solitary" (like a grasshopper) to "gregarious," and it is the resulting concentration of locusts into migratory nymphal bands and adult swarms in "outbreak areas" that makes them dangerous, the outbreak areas being the permanent breeding grounds from which plagues originate. The ratio of plague, or invasion, area to outbreak area can be very high. For example, the outbreak areas for *Cyrtacanthacris septemfasciata* total less than 2000 sq. miles in continental Africa, but the ratio of the plague area to outbreak area is about 1500 to 1 (Gunn 1960). For *Locustana pardalina* the ratio is much lower, outbreak areas occurring within 130,000 sq. miles, while the plague area is about 330,000 sq. miles.

The four major locust species in Africa are *Schistocerca gregaria* (the desert locust), *Locusta migratoria migratorioides* (the African migratory locust), *Cyrtacanthacris septemfasciata*, (the red locust) and *Locustana pardalina* (the brown locust). Only the latter three are important in southern Africa. *Schistocerca g. gregaria*, the dreaded scourge of the north, is represented by another subspecies, *S. g. flaviventris* (Burmeister), in western S. Africa, Namibia and southern Angola. Although *flaviventris* swarms periodically, it becomes a pest of only relatively minor importance (Scholtz and Holm 1985).

The African migratory locust is widely reported as food across southern, central and eastern Africa. Scholtz and Holm (1985) state: "Its main outbreak area is the middle Niger flood plain in West Africa. Swarms from this source have led to devastating plagues which sporadically spread across the continent as far as South Africa. During their migration they breed en route and form new generations of swarms. The species is preemanently present in the solitary phase in southern Africa." The scattered solitary forms cause negligible damage, but swarms cause complete defoliation of crops (Hill 1983: 163). The species is polyphagous but shows some preference for Gramineae, both wild and cultivated. For control of either the hoppers or flying swarms, various insecticides are used.

The red locust occurs throughout Africa south of the Sahara, including Madagascar and other off-shore islands (Dirsh 1965). Scholtz and Holm (1985) describe its outbreak areas as temporarily flooded depressions

geographically restricted to Tanzania, Zambia, southern Malawi and southern Mozambique, but state that virtually the whole of southern Africa falls within the invasion area. Food plant preferences are for grasses and graminaceous crops, but a great variety of crops may be attacked (Hill 1983: 164). Swarm damage can be devastating and result in complete crop defoliation. Hoppers can be controlled by wheat bran baits containing one of several residual insecticides, or sprays can be used against both hoppers and flying swarms.

The brown locust, *L. pardalina*, is restricted to southern Africa, occurring, according to Dirsh (1965), in S. Africa, Namibia, Zambia and Angola. Although its outbreak areas are confined to S. Africa, migration swarms invade most of southern Africa (Scholtz and Holm 1985). Ledger has documented the history of brown locust outbreaks in S. Africa, showing that the locust was in major or minor outbreak in more than 100 of the 190 years between 1797 and 1987. Prior to the introduction of chemical pesticides between 1900 and 1910, 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. . . . 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." Both in the historical account and in an interview conducted July 7, 1986 by *Argus*, a Cape Town newspaper, Ledger, an entomologist who is director of the Endangered Wildlife Trust, argues that the brown locust should be harvested as a high-protein food, not poisoned with insecticides. Aside from the ecological benefits of reduced pesticide use, a spin-off of harvest would be jobs for the unemployed. During the preceding year, of the Rand7-million (= US$2.8 million) spent for locust control, R2-million was part of the Government's unemployed relief program. The possible harvest method receiving research attention in S. Africa involved the use of industrial size vacuums, which would be used after the hoppers or fliers had settled and clustered for the night on vegetation.

Locusts weigh approximately 2.0 g apiece and the potential harvest of locust protein is enormous. Gunn (1960) suggests that there were perhaps 10^{11} adult red locusts weighing about 300,000 metric tons at the 1934 to 1935 peak of the 1929-1944 plague. Data suggest 5 to 10 million locusts as the minimum number in an emigrant swarm from an outbreak area. The efficacy and cost of international locust control programs relative to the damage done by the insects has recently come under U.S. Congressional criticism (see Chapter 20).

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