

## Chapter 28

## OCEANIA; AUSTRALIA

## Taxonomic Inventory (see Regional Inventory, Chapter 27)

There are many references to edible "grubs" in the Australian literature. Most of these undoubtedly refer to coleopterous larvae of the families Buprestidae or Cerambycidae or lepidopterous larvae of the family Cossidae. In cases where the family identity of the insect is not clear, the paper is cited here in the Introduction.

**Barrallier (1802: 755-757, 813; vide Flood 1980: 296)** reported that grubs and ants' eggs were eaten along the Nepean River, the former observed in December. **Cunningham (1827, I p. 345)** wrote: "Our wood-grub is a long soft thick worm, much relished by the natives, who have a wonderful tact in knowing what part of the tree to dig into for it, when they quickly pull it out and gobble it up with as much relish as an English epicure would an oyster."

These grubs are mainly woodborers in acacia.

**Meredith (1844: 94)** reported that large grubs, "which are reckoned great luxuries," are eaten at Bathurst.

**Davies (1846, p. 414; vide Bodenheimer 1951, pp. 134-135)** reported that the natives of Tasmania ate a large white grub found in rotten wood and in *Banksia*. Bodenheimer suggests that the grub, about 5 cm in length, was probably the larva of *Zeuzera eucalypti* (McKeown). The Tasmanians also considered ant pupae a delicacy.

**Brough Smyth (1878, I, pp. 206-207, 211-212)** discusses several kinds of insects used as food in Victoria. In addition, they collect honey of excellent flavor produced by a small wild bee called *Wirotheree*. Grubs that are eaten in Victoria include *Zeuzera citurata* and *Endoxyla eucalypti* which are found in the wattle (*Marthtem krang*), an undescribed species of *Endoxyla* found in the white-gum (*Ballook krang*), and an unidentified species of grub from the honeysuckle (*Tharathun krang*). The grubs are named from the trees from which they are collected. The grubs may be eaten raw or cooked for a short time in hot ashes. According to Brough Smyth, Bugong moths (*Agrotus suffusa*) are greedily devoured by the natives. See also Brough Smyth (I) under Formicidae and Psyllidae. **Brough Smyth (1878, II, p. 392)** mentions that grubs and ant pupae are among the foods of the natives of Tasmania.

**Dawson (1881, pp. 20-21)** mentions, in western Victoria, large numbers of pupae (from large green processional caterpillars) which are dug from the ground during the winter at the foot of gum trees and baked in hot ashes. Grubs cut from trees and dead timber, and "about the size of the little finger," are eaten alive "with as much pleasure as a white man eats a living oyster." When roasted on embers, "they are delicate and nutty in flavour." Grubs from the trunks of the common wattle tree (*Acacia*) are considered the finest and sweetest. With the aid of an axe and a small hooked wand, which is carried by every hunter, the grubs are pulled from their holes in the wood. Dawson states that when the women and children hear the sound of chopping, "they hasten to partake of the food, which they enjoy above all others." See also under Psyllidae.

**Lumholtz (1889)** mentions several kinds of insects used as food by the aborigines in Queensland. See below under Cerambycidae, Apidae and Acrididae.

In New South Wales "grubs" of all kinds are eaten as are ants and ant larvae (**Fraser 1892, pp. 52-53**). **Calvert (1894 [or 1898?], pp. 17-29; vide Bodenheimer 1951, pp. 74-75)** discusses the lifestyle of the aborigines of Western Australia, noting that whereas intelligent well-armed white people will die of hunger in the desert, the native will find a sufficiency of food. Four kinds of grubs and two kinds of manna are part of their fare. Grubs which are "extremely palatable" are procured from the grass tree and also from the wattle tree. They are eaten raw or roasted but apparently are improved by cooking. Calvert did not try them, but was told they have a nut-like flavor.

**Stirling (1896; vide Bodenheimer 1951, pp. 72-74)** cites several earlier reports on insect foods of Central Australia and adds additional information. He states: "There are few living animals that come amiss to the Central Australian aborigines. To mention the names of all that are eaten would be largely to recapitulate the zoology of the district." Lerp manna is mentioned as being noted at various localities, particularly in the bed of the Todd River near Alice Springs and at the junction of the Hugh and Finke rivers. The leaves of *Eucalyptus rostrata* and *E. microtheca* bore the small white conical coverings of psyllid larvae. Witchetty grubs and other smaller larvae from the roots of acacias are eaten. The honeypots of the sugar ants are a favourite article of food when obtainable, and there appears to be a special ceremony to promote the supply. *Melophorus inflatus* (the common *yarumpa*) and *M. cowleyi* (the *ittutunie*) were eaten as was *M. midas* probably.

**Roth (1897, p. 93)** reported as follows on the insect foods of the Pitta-Pitta aborigines:

Certain species of ants--a green variety among the Mitakoodi--are eaten raw: the individual stands or stamps upon an ant-bed from which these creatures will run up his legs and thighs, and get scraped or swept off as fast as they come up. Smaller kinds of grubs and caterpillars, especially those found on the grass (*ka-pa-ra*, both of the Boulia and Cloncurry Districts) may be eaten raw and whole: the larger varieties, found in trees, (*ka-lo-rung-or-o* of the Boulia) are usually roasted, the heads not being eaten, or may be dried in the sun, and put away for future occasion. [Sects. 53 and 84 (Fig. 84) of this work should be seen]

There is a honey ant or *yarumpa* totem, *yarumpa* being the Arunta name for the honey ant, *Camponotus inflatus* Lubbock. **Spencer and Gillen (1899, pp. 186-189)** described the *intichiuma* or sacred ceremony of the *yarumpa* totem and the religious significance of the *intichiuma* and totems in general (pp. 167-170, 202-211). They relate the tale of the "Wanderings of the Honey-Ant People" (pp. 438-439), and describe the *intichiuma* of the *udnirringita* or witcheti (misspelled witchetty) grub totem (pp. 170-179).

**Basedow (1904, pp. 16-17)** states that:

When the season is favorable, grubs ('ilguare' and 'iljaleti') and caterpillars ('udnamarre') are extensively collected and devoured. The 'ilguare' lives on the roots of species of *Acacia* and *Cassia*, and it is interesting to watch a native hunting for these. A long rod with a chisel edge at one end, and often referred to as yamstick ('wanna') is forced into the ground at the side of the main stem of the bush and leverage applied. If the root has been attacked by grubs it will readily give way to the strain, and the native consequently sets to work with his "wanna" and hands to unearth the grub. Less difficulty is experienced in finding the 'iljaleti' (larvae of *Cossus* sp.) which lives in the trunks of eucalypts.

Basedow mentions that at the time of their arrival in the ranges, the ground was covered with large green caterpillars that were collected by the natives in large wooden vessels called "mika" carried upon the heads of the women. Grubs and caterpillars are thrown upon hot ashes to roast, but the latter are allowed to remain there for only a very short time, being eaten almost raw.

**Parker (1905, pp. 110, 114; vide Bodenheimer, pp. 126, 130-131)**, in his report on the Enahleyi tribe of northwestern N.S. Wales, states that ant larvae and frogs are considered excellent food. Honey collected from stingless bees is eaten mixed with wax and dead bees. Parker relates an Enahleyi legend that a manna-rich year precedes severe drowth, a tradition that, according to Bodenheimer, is widespread in Australian literature.

**Thomas (1906, pp. 110-112)** states that insects are important articles of food in many parts of Australia. *Agrotis spina* is important in New South Wales where the adult moths are collected by lighting fires under the huge rocks on which they collect. When the moths fall they are collected in bushel-baskets; a fire is built to heat the ground and then the ashes are pushed aside and the moths are winnowed on the hot ground. This removes the wings and "down." They are then eaten or pounded, or if to be kept longer than a week, they are smoked. They resemble a sweet nut in taste, but have a bad effect for the first few days on those who eat them. Despite that, according to Thomas, both the natives and their dogs grow fat on them. Beetles, wasp larvae, March flies and caterpillars are all eaten on occasion. Many kinds of beetle grubs are eaten, and, as described earlier by Dawson (1881), a special instrument is carried for pulling them out of the trees. Ant pupae and larvae are also a favourite food. In Queensland ants and pupae are eaten together, mixed with salt water. Honey is much sought after and Thomas also mentions the sweet secretion of *Psylla* which is sometimes eaten, sometimes infused in water and fermented as a drink.

**Campbell (1926, pp. 407-410; vide Bodenheimer, pp. 75, 103, 114)** commented (p. 410):

Among the Australian aborigines the variety of foodstuffs is considerable, not only from choice, but also owing to the difficulty of obtaining a permanent and regular supply of any one article of diet...In fact almost anything capable of being chewed is regarded as food. During drought and the absence of large game, the maintenance of an adequate food supply is one of the greatest problems for these mere food-gatherers. Thus it is not surprising that larger-bodied or abundant insects are eagerly collected. Most insects appear in a district for a comparatively short time each season, and the appearance of species needed for food was treated by the natives as a matter of great importance.

Other insects mentioned by Campbell (Bodenheimer, pp. 75-76) include the migrating *Bugong*-moth (*Euxoa infusa*) which was of great significance for some tribes in New South Wales, while the larva causes

damage to crops in some years. The 'sugar bags' of *Trigona*-bees, like the green tree-ant (*O. smaragdina*), are largely restricted to the tropical and subtropical areas of the North. The honeypot ants, *Melophorus*, *Camponotus* spp. and others, are eagerly sought for in Central and Northern Australia, while in Central and Southern Australia, the caterpillars of large hepialid and cossid moths, including the witchetty grubs are of great importance. Everywhere, the larvae of beetles such as the longicorn, *Eurynassa australis*, are collected from living or decaying trees, mainly *Eucalyptus* or *Acacia*. In addition to these, many other butterflies, grasshoppers, termites, cockroaches, cicadas, lerp-insects, and numerous others have been used as food by the Australian natives. See also under Formicidae.

**Cleland (1940, p. 14)** notes that while civilized man has made remarkable and, in some cases, lamentable, changes in his environment, there has been no serious depletion of any plant or animal species because of its use as food by the natives. "They did, however, exercise some control by extracting the large white witchetty or bardi grubs of certain beetles and moths found in the stems and roots of a number of native trees and shrubs." These destructive wood-infesting grubs were eaten by the natives.

**Johnston (1943)** summarized aboriginal names and use of the fauna, including insects (pp. 301-307), in the Eyrean region. Many coleopterous larvae, especially cerambycids and buprestids are eaten, but Johnston notes (p. 303), as noted at the beginning of this chapter, that earlier references to larvae usually do not distinguish between Coleoptera and Lepidoptera. He discusses both, therefore, in a section titled Insect Larvae. Distinctions between grubs in the native languages usually refer to the host tree or shrub and habitat within the host. Concerning ants, Johnston cites Mrs. Duncan-Kemp (1933) that natives mixed ant honey with diluted nectar from bauhinias and allowed the mixture to ferment 8-10 days to produce a semi-toxicant. Also cited is an early (1846) report by Schürmann:

. . . large white grubs found sparingly in ant hills about September along with the very numerous small red insects were eaten by the Pangkala after having been sorted out by placing the mass (containing earth and insects) on a large piece of bark (yuta) about 4 feet long and 8 to 10 inches wide. The material was thrown up repeatedly and caught in the yuta, which was held in such a way that the heaviest portion became sorted out towards one end, the lightest towards the other, and the grubs in the middle part. These living grubs were then wrapped in a clean dry grass and chewed and sucked until all nutriment was abstracted.

Duncan-Kemp is also cited by Johnston regarding mantis being roasted on hot stones and eaten.

**Finlayson (1943)** mentions (p. 30) that the roots of the broadleafed mulga or witchetty bush, "harbour a grub beloved by the blacks," and that honey ants (pp. 85-86) are "relished exceedingly." Frequently, a half a day's heavy digging will be done, following the galleries to a depth of four feet in order to obtain 50-100 ants. The sweetness of the thin ant syrup, according to Finlayson, "is relieved by a slight acidity and a flavour of malt." Finlayson was very much impressed by the generosity of the native people (pp. 91-93):

Correlated perhaps with their lack of a property sense, but none the less admirable for that, is the blacks' generosity and impartiality in matters of food distribution. All food obtained becomes the common property of the group, and is brought in and distributed by the older men to all who require it, regardless of any special claims which might be put forward (but never are) by the man who obtained it. Time and time again this generosity has been extended to white men *in extremis*. In the matter of water, the blacks' attitude has been almost quixotically generous, and in a country where water is a vital thing, he has shared freely with the invader and his ravenous stock...

**McKeown (1944a, p. 38; vide Bodenheimer 1951, p. 106)** describes, similarly to previous observers, the procedure used by native women in digging out the *yarumpa* honey ants from great depths, sometimes six feet or more. McKeown (pp. 68, 69 [this may be McKeown 1944b rather than 1944a]; vide Bodenheimer, p. 99) mentions that great hordes of the *Bugong* moths at times migrate to the coastal regions, occasionally invading eastern urban areas. McKeown (p. 177; vide Bodenheimer, p. 133) mentions termites as occasional food. **McKeown (1944b, pp. 182 and following; vide Bodenheimer, p. 103)** discusses honey ants and notes that *Leptomyrmex varians* Em. of Queensland stores its honey in a similar manner. McKeown provides a drawing of *Melophorus inflatus* (p. 183). McKeown (p. 106; vide Bodenheimer, pp. 128-129) discusses lerp-sugar, the common sugar-lerp insect being *Spondylia sp. eucalypti* Dob. (Psyllidae), which is widespread in Australia. The sweet "manna" is much prized by the natives who sometimes also concocted a sweet drink by steeping them in water.

**Mountford (1946)** recorded observations made along the Mann Range, the country of the Pitjendadjara, in central Australia. He states (p. 100):

The menu of my companions was certainly varied; in fact, they ate everything that was edible--grubs, lizards, ants, kangaroos, emus, grasses, and seeds of many kinds. I have eaten many of these foods with relish.

The large white wood grubs, although loathsome in appearance, are particularly palatable, although I must admit it took a lot of determination to eat the first one. They are, indeed, surprisingly similar to roast pork. Lizard tastes like chicken, and kangaroo like delicately flavored beef. Honey ants are as sweet as any honey.

Mountford confesses that he did not try all of the foods, dingo (native dog) and cat, for example. Mountford provides a photograph (p. 98) of a native baby, "fat and saucy," who "thrives on a diet of mother's milk, white grubs, and honey ants." The author drives home the point that the child's home is in the Mann Range "where previous travelers' reports indicated that the country was too bad to support even aborigines."

**Sweeney (1947)** reported on the foods of the Wailbri tribe, which formerly occupied the extensive desert area lying to the northwest of Alice Springs in central Australia. More than 80 percent of their area is desert comprising spinifex and sandhill country with sparse and poor desert timbers. Mulga, an acacia tree edible for stock, growing in the low rainfall areas, belongs to the grass country and does not grow to any extent in the spinifex. The mulga and grass country, which includes the hill and creek areas and is the region of higher and more dependable rainfall, represents about 10 percent of the Wailbri tribal territory. At the time of Sweeney's study, the remnant of the Wailbri numbered about 600 natives, about half of whom had emigrated north seeking easier food supplies. As to tribal vitality, Sweeney notes that about 30 percent of the people are children, including many healthy infants in arms.

As to foods, honey from the native stingless bees is collected during the winter months. The nests are built in the hollows of trees, and the areas favored are those where eucalyptus grows, a type of terrain to which the Wailbri have only limited access. Honey ants, called "Yurambi" by the Wailbri, are found in mulga grass country and they feed mainly in the mulga trees. The repletes are dug out of the ground by the women. Because of their restricted distribution, to gum creeks and flats and the mulga areas, honey from both bees and ants is found only in small quantities. A number of trees produce growths around gall insects, which are used as food, the most useful in Wailbri country being the "bloodwood Apple" which grows to three inches in diameter. The gall insect itself is eaten, as is the kernel or inside layers of growth around the insect. After the insect completes its life cycle and leaves, the "apple" loses its food value.

Sweeney describes an edible fly as follows:

*In-djila-barinba* is the Wailbri term for a fly, whose body is about ½ inch long; when the wings are closed the length is ¾ inch. They frequent the desert bloodwood trees, and make a singing noise with their wings. When they die they fall to the ground and into the spinifex, and are collected by the natives and eaten without any preparation or cooking. The flies are also eaten by the desert goanas. The flies make a sweet substance which is attached to the bloodwoods and which is also used as food.

Of edible grubs, Sweeney says:

There are a number of grubs used as food by the desert native. Edible grubs are found in the eucalyptus genus of trees, but the most common is the witchetty grub found in the roots of the witchetty bush (an acacia); they grow up to 4 inches long and are eaten raw or cooked. The witchetty is a common bush growing in the mulga and grass country; it also grows in the spinifex country edging the mulga. Edible grubs are a common food among the desert natives.

**Bodenheimer (1951)**, in addition to his review of previous literature on the use of insects in Australia, devotes a section to insect totems, their *intichiuma* ceremonies and legends. Quite a number of totem animals are insects and the interested reader should consult Bodenheimer (pp. 76-82). Bodenheimer also devotes a section to the "honey-bags" or honeybees of Australia, all of the native species belonging to the stingless genus *Trigona* (Meliponidae) (pp. 115-128).

**Bourne (1953, pp. 62-63)** mentions several insects used as food but provides little information that has not been encountered in the previous literature. Insects mentioned include ant pupae as a staple food, and white ants [termites] mixed with ground seeds and baked. Some types of moths are very popular and when roasted taste like unpeeled almonds; natives in some parts of the country periodically feast on moths that are attracted to the fires at night and are thrown into the ashes before being consumed. Many caterpillars

are popular, particularly the green ones; they are flung into the hot ashes until the body straightens and the hairs are singed away. Most popular among the many forms of larvae eaten are those of the big *Cossus* moth known as the Witchety grub. There are two species, one developing in the roots of acacia, the other in the butt of eucalyptus trees. The flavor is said to resemble slightly sweetened scrambled eggs. The honey of wild bees is eaten with relish. Other insects discussed include the honey ant, *Melophorus inflatus*, and lerp manna found on leaves of the red gum (*Eucalyptus rostrata*) and secreted by *Psylla* larvae. Bourne (p. 65) mentions several food taboos; one is that expectant mothers in some tribes are not allowed to eat grubs, among other things.

Bourne (p. 59) provides a valuable discussion on the effect that the coming of the white man has had on the nutrition (adverse) of the aborigines.

**Bluett (1954:** 5, 27-28; vide Flood 1980: 296-297) mentions, from indirect observation, the use of witchetty grubs and Bogong moths in the Canberra district.

**Reim (1962)** published an extensive paper on the use of insects as food in Australia [this long paper in German is on hand, but not yet translated]. Much of the information is apparently gleaned from the literature. Species mentioned include: Coleoptera: *Agrianome spinicollis* (Cerambycidae), *Apsectrogastra flavipilis*, *Bardistus cibarius* Newman, *Eurynassa odewahni* Pascoe, *Mnemopulis edulis* (Cerambycidae), *Xyleutes boisduvali* Herrich-Schaeffer, *X. eucalypti* Scott, *X. sp.*, *Passalus* (?), Gyridae (?); Homoptera: *Cicadina*, *Psyllina*, *Spondyliaspis eucalypti* Dobson; Hymenoptera: *Camponotus* spp., *Formica consobrina*, *Melophorus*, *Myrmecia pyriformis*, *M. sanguinea*, *Oecophylla virescens* Fabr., *Trigona* honey; Isoptera: termites; Lepidoptera: *Abantiades marcidus*, *Coenotes eremophilae* (Sphingidae), *Endoxyla eucalypti*, *E. sp.*, *Trictena argentata* Herrich-Schaeffer, *Zeuzera citurata*.

**Meggett (1962)** describes the physical environment occupied by the Walbiri in the central-western part of the Northern Territory, and mentions (p. 4) that, "In good seasons, when food is plentiful, the smaller and less palatable creatures may be ignored; but in times of scarcity even the humblest insects are eaten." Insects eaten include (pp. 14-15): witchetty-grub, (Walbiri name, mijamija) (Cerambycidae larvae?), prized food; witchetty-grub (nalgari) (Cossidae larvae?), prized food; white ant (jarinju) (*Eutermes* sp.?), occasionally eaten; flying ant (bandjidi) (*Eutermes* sp.?), occasionally eaten; honey ant (jirambi) (*Melophorus inflatus*?), prized food; honey ant (jagula) (*Melophorus* sp.?), prized food; manna (jiljalbu) (psyllid lerp), frequently eaten; wild bee (munagi) (*Trigona* sp.), honey prized food and wax used for adhesive; grasshoppers (djindilga), occasionally eaten; caterpillars and grubs (ladjul), some eaten; cicadas and crickets (lirinba), occasionally eaten; and weevils (lodu), occasionally eaten. Meggett additionally lists 13 types of insects that are not eaten, including among others, *Camponotus* and *Myrmecia* ants, *Gryllotalpa* (mole crickets), March flies, mantids, hornets (known as murururururu), and phasmids. Totems include insects (p. 59), and Meggett notes (p. 64) that a honey ant dreaming-site is located within 15-20 miles of the Yuendumu settlement.

In an excellent summary of first-hand experiences, **Tindale (1966)** emphasized the importance of insect foods in the life of the Australian aborigines:

The earliest pursuit of children, under the guidance of their mothers, is a hunt for various kinds of insect larvae, witchety grubs, and beetles. It is probable that the healthy growth of children in large measure is related to this source of food. Early nourishment of babies prior to weaning is assisted and the children are kept quiet by the cossid and hepialid grubs constantly dangling from their mouths. In our society a dummy [pacifier] replaces this early natural food for children.

Tindale notes that in drought years, a reduced supply of grubs, lerp scales, honey ants, etc., along with the disappearance of greens may cause outbreaks of scurvy, playing havoc with the health of adults as well as children. A serious outbreak among the Kukatja (Loritja) people in 1930 was relieved dramatically when the University of Adelaide Anthropological Expedition provided orange juice for the crippled children and their parents, but Tindale notes: "On that occasion Kukatja women complained bitterly of the disappearance of the grubs from the roots of the *Acacia kempeana* shrubs because of the drought, and of the impossibility of digging for the Honey Ant, which had taken their diminished stores of honey far below the ground."

Even the hunters remain alert for insect foods. Tindale writes:

I have seen a man, who supposedly was engrossed in the stalking of a kangaroo, glance aside at a likely gum tree and turn away from the hunt to test a hole with his spear-point. This led him to make a hooked stick with which he pulled out a grub [*Xyleutes*]. He ate it, and only then did his attention return to the more serious business of the hunt.

**Hiatt (1967-68)** listed a caterpillar, grubs and ant eggs (pupae?) (pp. 112, 119) among food resources used by Tasmanian Aborigines.

**Cleland (1966: 114)** makes the following observation:

The rapidity with which, under conditions of an ample food supply, the aborigines seemed to 'fill out' after a period of stringency -- a phenomenon noticed on several of the expeditions from the University of Adelaide -- would, if a fact, suggest that the Australian native can perhaps assimilate and store up food, when the opportunities offer, more quickly than white persons. This may have an important bearing and enable aborigines in the interior to survive when they might otherwise perish.

Cleland inventories the wild food resources of the "Fertile Coastal Regions and Murray System" versus the "Dry Interior." Insects eaten in the former region included (p. 132): "bardie or witchetty grubs such as *Trictena argentata* (Herrich-Schaetter) [sic] and *Abantiades marcidus* Tindale, from the roots of gum trees and from other sources. Termites may have been eaten."

Insects eaten in the Dry Interior include (pp. 143-144):

Witchetty grubs obtained from the roots of the witchetty-bush, *Acacia kempeana* F.v.M. (larvae of buprestid beetles); of the Native Poplar *Codonocarpus cotinifolius* (Desf.) F.v.M. (larvae of a cossid moth); of the Roly-Poley *Salso kali* L. (larvae of a large cossid moth), and of the Red Gum Eucalyptus, *E. camaldulensis* Dehnh. and others (larvae of the Hepealid [sic] moth *Trictena argenata* (Herrich-Schaeffer). Mulga apples (galls) on *Acacia brachystachya* Benth. caused by probably *Trachilogastir* sp. (Hymenoptera-Perilampidae). Edible wax scale *Austrotachardia acaciae* (Frogg.) on Sandhill Mulga, Ooldea. Bloodwoods *Eucalyptus dichromophloia* F.v.M. and allies, in Central Australia have a large Brachyselid gall the size of a small apple; its smooth-lined cavity contains a large female coccid, probably *Apiomorpha pomiformis* Froggalt [sic], which is eaten raw. Termites in the flying stage. Specialized members of the Honey Ant *Melophorus inflatus* Lubb. have honey stored in the crop to such an extent that the hinder portion of the insect becomes enormously distended; by deep digging with yam sticks the women unearth these much-relished sweets from the nests of the ants in mulga thickets.

These mulga honeypot ants are quite numerous in suitable country such as near Haast's Bluff, but the source from which the honey is obtained is not at first sight readily detected. On some of the trees, the scale of the Lerp *Austrotachardia acaciae* (Frogg.) Maskell, may furnish an obvious source for some of the mulga sugar but these infestations are not sufficient. The principal supply seems to come from an exudate from the gland at the base of each phyllode of the Mulga. Under certain conditions, in the early morning, glistening beads of honey dew can be seen at this situation.

The native stingless bees of the genus *Trigona* furnish a welcome source of slightly acid honey. When a bee's nest is suspected in a hollow tree, a stick is poked down the hole until the comb, if present, is reached, when some adheres to the stick. Comb, honey, bees and larvae are all consumed together. In searching for a bee's nest at Macdonald Downs in Central Australia, the natives, instead of looking up the trees for issuing bees, went down on their knees in a likely locality and searched for small dark particles carried away from their nests by the bees and dropped. These having been found, it meant that somewhere close at hand, there was a nest. Likely trees were tapped and any hollow ones climbed and the stick poked down until the one containing the honey was found.

The Ngatatjara distinguish between *mirka* (vegetable and non-fleshy foods) and *kuka* (meat and fleshy foods), and *kuka* is always preferred over *mirka* (**Gould 1969: 260**). Insects are included under *mirka* and are important at times, "particularly honey ants, white ants, and at least two varieties of grub (neither of which was plentiful during 1966-1967, but which we were told had been abundant in other seasons, perhaps even to the extent of constituting a staple food).

**Waterhouse (1971, p. 146)** states:

In the relatively harsh Australian environment where woody fruits prevail, the nomadic hunting habits of the aborigines and the fact that they had no thought or means of storing food

exposed them to irregular and sometimes prolonged periods of food shortage. Possibly because insects were at times almost the only available foodstuffs, but partly because some were regarded as special delicacies, the use of insects as food was widespread if not universal....A number are represented on totems, and sacred Increase Ceremonies were performed to promote their abundance. Among the most prized were several species of honeypot ants, the honey stores and brood combs of stingless bees, a number of species of witchety grub, the bogong moth, the bardee (longicorn beetle larvae) and the sweet manna of various lerp insects. Even the green tree ant...was eaten or used to make a refreshing drink.

Waterhouse relates that the large larvae (up to 8 or more cm in length) and pupae of the witjuti or witchety are eaten raw or roasted, the flavor of the roasted grubs reportedly being delicate and nutty, similar to scrambled eggs, roast pork, or bone marrow. He notes, regarding the aborigines and the bogong moth, *Agrotis infusa* (Boisduval) that, "It is a tribute to their perseverance in the pursuit of food that it took them several days of practice each year before they could hold down such a fat-rich meal." The honeypots are specialized workers of several species of *Melophorus*. These ants are steadily fed honey by food-gathering workers; the honey is stored in the crop, the abdomen eventually becoming distended to the size of a marble.

**Strehlow (1971)** mentions, among the totemic songs and ceremonies of the Aranda, a termite totem (p. 217), the Trjimeta Song of Lukara (witchetty grub) (pp. 282, 295-296), and the Northern Aranda Honey-Ant Song of Ljaba (pp. 685-690), the latter 30 verses in length.

**Tindale (1972: 233, 238, 245, 248-249, 251-253)** discusses insects as part of the food of the Pitjandjara, a simple hunting and food-gathering people who live in the northwestern corner of the state of South Australia. Their territory extends also westward barely into West Australia and northward into the Northern Territory. Wattle tree roots yield *mako ilkoara*, larvae of a species of *Xyleutes* moth (p. 233). Another gathered food is the *anumara* hawk moth caterpillars which feed on *Boerhavia* vines (p. 249). After the first rains cause rapid growth of these (and other) plants, they are soon covered with the small black *anumara* larvae (p. 238): "These grow in about a month to be two-inch long caterpillars. Hundreds of these are gathered into wooden dishes, covered with bark or confined until they have passed all of the *Boerhavia* leafy matter through their bodies and ejected it as frass. The women then separate the larvae from their dung by rocking them in their wooden dishes and cook the grubs by shaking them along with hot ashes, and so good food is available once more." Collecting small animals and insects is womens' work (pp. 245, 248).

Tindale states (p. 251):

The plants of the family Zygophyllaceae, besides their uses as coverings in the steaming of greens, provide two genera, *Nitraria* and *Zygophyllum*, which have Cossid moth larvae boring in their stems. These grubs provide important foods. Thus, *Zygophyllum aurantiacum*, sometimes called native hop, is known to the Pitjandjara as *pijarpiti*. It is a low shrub with slender, rigid stems and yellow flowers with four petals...The grubs boring in the stems are called *mako biarpiti* at Ooldea and are the larvae of a yellow and black spotted moth (*Xyleutes biarpiti*), the female of which has only partly developed wings and so cannot fly. The larvae are abundant where they occur and children spend many happy hours hunting for them...

Tindale continues (p. 252):

*Nitraria schoberi*, the niter bush, which lives on saline soils, also provides *Xyleutes* larvae, which bore in the stems and are an important source of food. The shrubs occur near some of the larger dry lake beds which margin the southern border of Pitjandjara territory. On certain nights in summer thousands of the moths, white-winged with black spots, fly into fires, but as they generally come at a time when better food is available, they are not always eaten. On the other hand, the grubs and pupae boring in the base of the stem of the shrub earlier in the season are eagerly sought-after items of food.

Tindale states (p. 252):

Lerp scales occur on several species of *Acacia* and *Eucalyptus* and provide a source of sugar as food upon which all may need to feed. The *wama wanari*, or lac scale of the mulga (*Acacia aneura*), is found infesting large areas of mulga and then may be absent over equally wide areas. Western Pitjandjara may live for days on this substance, breaking off the twigs covered with scale and drawing them through the lips sore and bleeding from the rough sticks drawn across them. The lerp scale of the *ngarukalja* (*Hakea francisiana*) yields a similar *wama*,

which is of sufficient importance that it is the subject of an increase ceremony (*inma tjukur*).

Tindale mentions the *purara*, or honey ant (*Melophorus inflatus*) as an example of an insect clan totem. According to Tindale (pp. 252-253):

The term *wamapiti* is often used as a term for any form of lerp sugar as well as honey. Honey ants occur only in mulga scrub. After big rains they harvest the flow of honey from flowers and the sweet sap from glands on the growing tips of mulga twigs. It is stored well below ground level in the inflated abdomens of certain worker ants. These living stores of honey, each the size of a pea, tide the ants over lean years during which lack of rain prevents the flowering of the mulga. Thus honey ants are one of the buffer food supplies for natives in dry years. Usually women dig for honey ants using a digging stick and wooden scoop. Sometimes when other food is in short supply men join in the search. Holes as deep as 3 or 4 feet may develop, often several yards in diameter, as they search for storage holes and their living sacs of sweetness.

Finally, Tindale notes (p. 253):

When all else fails the hairy colonial larvae of the bag shelter moth (*Panacela*), which occur in frass-filled silken webs on *Eucalyptus*, are gathered and eaten. Their irritating hairs are singed off by heating them with hot ashes. The hairs of the caterpillars cause intense irritation to the lips and throat and also cause a skin rash. The Pitjandjara concept of abject misery is to be under the necessity of eating such larvae.

**Roheim (1974)** discusses myths, songs and totems involving honey ants (pp. 48, 133-137) and witchetty grubs (pp. 132-133) and says of the latter (pp. 47-48):

One small representative of the animal world belonged to the sphere of activity of women and children. This was the witchetty grub, the larva of the big Cossus moth. It was regarded as a great delicacy by the natives and eaten by most Europeans who had lived in the bush for some time. The taste resembles that of scrambled eggs, but is considerably richer. Children often spend the better part of the day digging for these grubs. When Mrs. Roheim offered little Aldinga some strawberry jam, he exclaimed, 'Maku' (witchetty), partly because the shape of the preserved strawberry reminded him of the grub, but mainly because of his delight.

Roheim continues:

The children ate the grubs raw, or slightly roasted. Tjintjewara described the manner of obtaining and preparing *maku*. When the children saw a particular kind of bush, they examined its base to see if there were any of the shells which the moth discards when it leaves the chrysalis. If these shells were present, the children knew there were grubs in the bush. They dug into the ground until they found the root of the bush, where they saw the excrements of the *maku*. They then broke the thick root with their yam sticks and inside it found the much coveted delicacy.

Relative to the nomenclature of indigenous peoples, **Meyer-Rochow (1975a)** suggests that "a species is likely to get an individual name to contrast it with the more general term or to distinguish it from the term of a related 'type-specimen', if it is harmful, edible, or in any other way outstanding." The author records terms used for various terrestrial arthropods by three ethnic groups in Papua New Guinea and by the Pintupi and Walbiri tribes of central Australia. Terms used by the Walbiri for edible species are as follows: Coleoptera: *Euryscaphus* sp. (scarab beetle) (*ni(e)di*); larval Cerambycidae (*mijamija*); larval Cuculionidae (*lodu*), occasionally eaten; Homoptera: cicadas (*lirinba*), occasionally eaten; scale insect (Coccoidea) (*manda*), some forms eaten; manna (psyllid lerp) (*jiljalbu*); plant galls of a variety of families (*pilburi*), some occasionally eaten; Hymenoptera: *Camponotus inflatus* (honeypot ant) (*ing(u)rani*); *Melophorus* spp. (honey ants) (*jirambi*, *jagula*); *Trigona* sp. (native honey bee) (*djolala*); Lepidoptera: caterpillars (*waiburi*, *wai(o)upi*, *ladjul*), some eaten; witchetty grub (larval Cossidae) (*ngalgari*); Orthoptera: grasshoppers and locusts (Acridoidea) (*tindilga*, *djindilga*), occasionally eaten; *Teleogryllus commodus* (cricket) (*djabalari*), rarely eaten. Some of the above Walbiri terms were reported by Meggitt (1962).

Pintupi terms for edible insects are given by Meyer-Rochow as follows: Coleoptera: *nidi nidi* or

*nirrinirri*, general term for beetles, some adults and grubs of which are eaten; Hemiptera: leaf bugs of various families (*patana*), some of which are eaten; Homoptera: leaf hopper (Cicadelloidea)(*jugri jugri*), some eaten; Hymenoptera: *Camponotus inflatus* (honeypot ant)(*ngari*); Isoptera: termites (*longurlma*, *lungkunpa*); Orthoptera; grasshoppers and locusts (*djindilga*, *tjintilyka*), occasionally eaten. Some of the above Pintupi terms were reported by Hansen (1974).

**Meyer-Rochow (1975b)** proposes that edible insects can help ease the food shortage in certain underdeveloped countries. He suggests that many of the proposed strategies for increasing food production are impractical for developing countries:

Severe problems are attached to strategies such as using more efficient insecticides, clearing virgin bush and intensifying irrigation to obtain more arable land. There are also problems dealing with the introduction of hitherto little-used or unknown foods like fish meal pastries, algal bread, soy bean milk, and so forth. The exploitation of so far untapped resources in the sea has a major drawback, in that the catching and processing of midwater fish and squid (both of which, admittedly, populate the oceans in billions of individuals) is a technically difficult and very expensive venture which, to date, is uneconomical even for the richest nations. Similar limitations are found in suggestions which deal with the synthesis of artificial proteins from coal and oil. While this is possible in principle, and is already done in a few industrialized countries, the process requires sophisticated technical know-how and financial backing which most underdeveloped nations cannot hope to achieve in the next two critical decades.

Today artificial proteins are not much cheaper than the real thing, and if poor nations are meant to buy these products from rich producer countries, the consequent imbalance of payments would lead to an ever-increasing economical and financial dependence of the poor on the rich nations -- even though the consumer countries might provide the raw materials necessary to make the artificial foodstuffs.

Meyer-Rochow mentions a number of well-known edible insects from around the world. He emphasizes that it is not his intention to convert European people to insect foods, but he is convinced that "entomophagy, direct or indirect, could ease the hazards of malnutrition in countries where the consumption of insects by humans has only recently been given up." He states:

There is no need to be ashamed of eating insects. Indeed I can see no sound reason why, in our society, oysters, crabs, or a Scottish haggis are called delicacies, while beetles, pickled caterpillars or dried grasshoppers are viewed with revulsion. For too long, European habits have been regarded as a criterion for the degree of 'civilization' acquired by the indigenous people of many countries. Instead of preserving their own identity, many so-called 'primitive people' have been led to believe that aping the European way of life was the fastest way to be accepted by European society. While this might have been true in colonial times, it no longer holds today.

Meyer-Rochow continues:

Once entomophagy has been revived in some countries (which would perhaps be easier than the introduction of new and unknown food products, local enterprises could develop around an existing market for edible insects. It should be emphasized that insects need not be consumed directly, but could be given to poultry or other domestic animals. Certain fast growing insect species could be bred commercially, and particularly palatable forms could be hand-collected or baited in the field. Very often adults of seasonally abundant crop pests are strongly attracted to light and can easily be caught with traps at night. These and other measures would help in ridding plantations of pest insects while at the same time enabling valuable protein to be collected. Such activities could even boost local food industries, as insects may be sold preserved (for example, cooked and canned, dried or pickled), fresh or in the form of 'insect meal.'

Meyer-Rochow concludes:

Environmental scientists, of course, would have to keep a watchful eye on any large scale exploitation of insects outside of cultivation in insect farms. But what will happen once insects

are bred commercially under scientific control and subjected to the attentions of food research specialists? Probably quite a lot: in the past 80 years the daily milk production of a single cow has risen tenfold, chickens now lay an egg almost daily instead of one per week, and pigs have been bred with additional ribs to provide more grilling chops. For insects, however, there is as yet no such success story, because until recently food scientists with a European background have not even dreamed of insects as human food. In their minds, insects existed only as food destroyers and pests. Proper research in insect farming, backed financially by international organizations like FAO and the World Health Organization, might result in similar advances to those in European animal husbandry mentioned above.

**Meyer-Rochow (1976)** reiterates many of the points made in his 1975b paper regarding the potential of entomophagy in helping to meet world food needs. He notes that the Australian aborigines formerly ate a wide variety of insects and that central Australian tribes such as the Walbri and Pintupi still do. "Here insects represent a genuine food category -- their consumption is by no means a mere emergency measure." He notes that the average weight of the larval witchety grub is 1.2 g wet weight and 0.777 g dry weight and provides the following data on proximate analysis (percentage with dry weight listed first, then wet weight): protein 38%, 16.5%; carbohydrate 5.7%, 2.5%; fat 39.8%, 17.2%; fiber 16.2%, 7.1%; water (wet wt. only) 56.7%.

**Macfarlane (1978)** briefly describes the pattern of European intrusion into central Australia over the past century. There is little in the early records to indicate that aborigines were subject to malnutrition in the early days of white settlement. Aborigines ate essentially anything that was digestible by an omnivore. Macfarlane mentions that social organization, the sharing with other members of the group anything that was caught, also tended to reduce malnutrition. He cites earlier studies on types of foods used, noting that caterpillars, ants and beetle larvae were background staple and that sugar from honey ants and *Hakea* flowers were among the favorite foods. Macfarlane makes brief reference to the use of insects by the Ngatjatjara at Kudjuntari, a group with minimal European contact, on the southern fringes of the Rawlinson Ranges during November and December, 1963. It was during a period of long drought (several years). European contact was limited to every three months when a truck from Woomera came through to keep contact and distribute some flour, tea, sugar and condensed sweetened milk for children (which was often consumed by adults). As good supplies of kangaroos were being obtained, there was not much pressure to dig for frogs or hunt for grubs. Macfarlane states:

But cossid larvae from the mulga were gathered by the women. The moth larvae of *Xyleutes biarpiti* (mako witjuti) from *Acacia kempeana* were collected more as snacks than as major dietary component. Similarly the honey ant, *Melophorus inflatus*, was dug up twice in a week. Young women dug briskly for these 1 cm diameter honey storage ants, which were enjoyed by those who did the work, but there were not enough ants caught to provide one for each member of the hoard [sic]....Several hands-full of caterpillars were caught, cooked and eaten, but only by one family.

From this and other study sites, Macfarlane concluded: "The overall picture of these hunter/gatherer hordes, as they made contact with European foods and culture, was that of well fed infants and adults. Traditional foods involved less hunting and gathering as acculturation increased..."

**Cutter (1978)** provides a breakdown of the current Aboriginal population as follows: 1) Urban (relatively assimilated), 2500 approximate population; 2) Urban (living in fringe areas), 1000; 3) Settlements and missions, 5500; 4) Rural (cattle stations), 3000; 5) Rural (outstations), 2000. Cutter states (p. 63):

Most Aboriginal people are now quite non-nomadic, living in conditions similar to those of traditional times, e.g. humpies, wood fires, family groups. They generally live on the outskirts of a white society and are very dependent upon it. With the changes that have already occurred in Aboriginal society, most people are now dependent upon a cash economy for food clothing and transport.

The reasons why people moved from a traditional, self-sufficient hunter/gatherer economy to a squatter society in the first place are not clear. It certainly was not in search of better health, material possessions or social order. The major reasons were probably related to accessibility of food and water and the pressures of authorities to live in settlements. Since government and mission authorities have accepted the outstation movement and at least given it tacit support, people are moving back to traditional areas and thus reinforcing traditional culture. The greater income now available and good seasons have also encouraged this. However, despite

this decentralisation trend, most people even in these areas accept and want to maintain a cash economy and 'white' services.

Cutter mentions witchetty grubs as a minor food, saying: "The men would be out hunting kangaroos and hopefully bush turkeys or emu, and the women would be digging for rabbits and witchetty grubs. Other bush foods such as wild tomatoes, yams, goannas and honey ants would also be sought and eaten." Cutter concludes: "Aboriginal people have already demonstrated that they do not want to be assimilated into white culture but they do want to integrate some of the features of white culture into their own."

**Meyer-Rochow (1978/1979)** reviews different uses to which insects are put by traditional societies and proposes a classification of the uses. The coverage of edible species largely repeats information in the author's previous publications.

**Bardon (1979)** gives a concise discussion of the "Dreamtime" (mentions ants and grasshoppers among others) (p. 9) and discusses and reproduces paintings produced by Aboriginal artists of the Papunya settlement in the Northern Territory. Several tribal groups live there although Papunya is not the traditional region for any of them. Bardon states (p. 7): "These tribal artists have inherited an ancient knowledge which may not survive their own lifetimes. They pass it on to young men who wish to learn from them, and happily there is a revival of interest, among the younger people, in this traditional life..." Honey ants (p. 40) and witchetty grubs (p. 64) are among the subjects included in the paintings. T-shirts and postcards depicting honey ant dreaming (each animal and plant has a "dreaming" - the story of its creation and importance, where it is found and the correct time for the collection (Roff 1983)) are for sale in many tourist areas.

**Gould (1980: 2; vide Oliver 1989: 160)** reported that a Pitjantjara group in the Western Desert distinguished 47 varieties of small game and other fleshy food, including grubs. The women provided the plant food, which made up about 80% (by weight) of the food supply throughout most of the year, and another 10% by collecting small animals and animal products. The men provided the meat, which was valued highly but made up no more than 10% of the annual food supply.

**James (1983)** provides a partial nutrient analysis on 63 species of indigenous foods, including four insects (see under Formicidae and Cossidae below). The study was conducted primarily to determine the value of bush foods in the survival of Defence forces, as well as to obtain information of use to nutritionists concerned with Aboriginal health and feeding habits and to those investigating new commercial food sources.

**Hercus (1989)**, citing earlier studies, states that distinctions made between grubs in Aboriginal languages usually refer to the habitat (Johnson 1943):

Thus in the Wangkangurru language of the Simpson Desert the green caterpillars that appear in large numbers after rain and feed on the fresh grass are called *wadnhamarra* (Lower Southern Aranda *anhemare*). Root grubs (larvae of buprestid beetles and cossid moths) are called *pardi*, and this word is also used as a general term for all caterpillars. The grubs from box-trees have the special name *pitha-kapurru* (larvae of hepialid moths, Cleland 1966: 144). The very large green caterpillars that live in foliage are called *yatinjangu*. In the mythology too these different types of grubs all have their separate stories. There is a major myth and song cycle about a big 'Grub-war.' Different groups of ancestral grub men coming from the south, converge and have a battle on the grassy plains near New Crown in the extreme south of the Northern Territory.

Hercus continues:

Everyone was happy to eat the grubs from the roots and trees, but it seems that the grass grubs were dried and stored. This was not only a matter of food storage: these grubs were not considered edible except in powder form. The preparation of the grubs was an elaborate process which was still carried out by Wangkangurru and Yarluyandi people living according to a semi-traditional life-style in the 1930s at Pandie Pandie and at Andrewilla south of Birdsville.

Hercus provides a translation from Wangkangurru on the preparation of grass witchetty grubs. It was done entirely by old women. Typically there is magic associated with hunting, but not usually with food-gathering, but preparation of the grass witchetty grubs was an exception to the general rule. There was magic and secrecy connected with it.

**Irvine (1989)** reports efforts to market insects as food in Australia, focusing on Vic Cherikoff, generally recognized as Australia's foremost authority, and his company, Bush Tucker Supplies, in Sydney. Cherikoff considers that the insects with the best commercial potential could be witchetty grubs (*Xyleutes*

*leuchomochla*), bardi (*Bardistus cibarius*) and similar grubs, honey ants (*Melophorus bagoti*) and sugarbag (*Trigona* bees). While Cherikoff feels that more research is needed before insect foods can be commercialized on a large scale, he has developed a network of suppliers all over the country who send him their local delicacies, like the farmer near Lismore in NSW who digs longicorn beetles, tasting like scrambled eggs, from rotting trees. Cherikoff conducts insect food tastings and dinners, tours and courses, and claims an 80% to 90% acceptance rate for the bush foods offered. He notes that there is already a huge demand, including for export, and that he has had to decline orders of thousands of kilograms from Japan solely due to lack of supplies. Irvine mentions Rountrees on Sydney's North Shore and seven other restaurants among a growing list in Australia that offer insect foods.

Irvine mentions nutritional studies conducted by Cherikoff and university nutritionists. Bogong moths (*Agrotis infusa*) contain 20% protein, 50% fat (dry weight basis), energy content of nearly 2000 kilojoules, and are particularly high in zinc. Bardi grubs are a very good protein source. When fed to fish, 1.8 kg of bardi convert to 1.0 kg of fish.

**Low (1989)** discusses bush foods, including several insects (pp. 189, 201-203):

Insects were very important foods to Aborigines. (White Australians often infer from this that the Aboriginal diet was meagre and that Aborigines lived poorly. In fact, insects are very tasty and nutritious, and it is more to be wondered that European cultures make so little use of them. I have eaten a variety of moths, grasshoppers, grubs, ants and the like, and find them excellent foods.)

Low's discussion of several species is included, in part, under the proper taxonomic categories below.

**Cherry (1991)** discusses insects as part of Aborigine cultural beliefs and their use as food and medicine. Various papers are cited for information on the Bogong moth (*Agrotis infusa*), the true witchetty grub (*Xyleutes leuchomochla*), honeypot ants (*Melophorus bagoti* and *Camponotus* spp.) and honeybag (*Trigona* spp.). Cherry notes that the Aborigine population, estimated at more than 300,000 before 1770, is now down to about 160,000 and that about two-thirds of them now live in cities and have adopted suburban lifestyles.

**Ron Scherer** (*The Christian Science Monitor*, August 8, 1991) comments as follows:

The concept of native foods [including witchetty grubs] is increasingly appealing to hotels and restaurants frequented by tourists. . . . One Australian chain, the Country Comfort Inn, has decided to make 'bush tucker,' or native foods, a signature of its restaurants, which are part of its 19 motels. Bush food has also taken to the air on Australian Airlines, and the Australian Broadcasting Corporation has been educating the public about bush foods with its series, 'The Bush Tucker Man.' Book stores are well-stocked with books on bush tucker.

Scherer mentions Rountrees, its Chef Bruneteau and his witchetty grub soup:

Bruneteau buys the witchetty grubs frozen. They are roughly the size of a man's index finger. They are pureed and mixed with a broth to make a meaty-tasting soup. Aborigines eat the grubs whole and uncooked. 'They have a nice, nutty flavor when roasted,' says Bruneteau, who adds they are much better than the snails favored by his French ancestors. He estimates he uses about 12,000 grubs per year including a considerable number in the soup which he cans and sells.

**Pfeiff and Hutchison** (*The Globe and Mail [Canada]*, November 10, 1993) state that there is an explosion of interest in bush tucker, and Australia's book stores now offer a wide selection of cookbooks with recipes for such dishes as Bogong moth in cream sauce, and black nightshade flan. "Tucker trips" are some of the most popular expeditions for both domestic and overseas tourists throughout the tropical north and in the Outback around Alice Springs where such bush foods as witchetty grubs can be sampled. The authors note that Vic Cherikoff supplies more than 40 restaurants across Australia with their bush tucker.

## Coleoptera

### Buprestidae (metallic woodborers)

See Tindale 1953 under Lepidoptera: Cossidae.

**Cerambycidae (long-horned beetles)***Agrianome spinicollis* (author?)*Appectrogastra flavipilis* (author?)*Bardistus cibarius* (Newman), larva*Endoxyla eucalypti* (author?)*Endoxyla* sp., larva*Eurynassa odewahni* Pascoe (= *australis*), larva*Mnemopulis edulis* (author?)

One of the earliest reports of the famous *Bardistus* grub appears to be that of **Cowan (1865, pp. 70-71)**:

The trunk of the grass tree . . . (*Xanthorea arborea*), when beginning to decay, furnishes large quantities of marrow-like grubs [*Bardistus cibarius*], which are considered a delicacy by the aborigines of Western Australia. They have a fragrant, aromatic flavor, and form a favorite food among the natives, either raw or roasted. They call them *Bardi*. They are also found in the wattle-tree, or mimosa. The presence of these grubs in the *Xanthorea* is thus ascertained: if the top of one of these trees is observed to be dead, and it contains any *bardi*, a few sharp kicks given to it with the foot will cause it to crack and shake, when it is pushed over and the grubs taken out, by breaking the tree to pieces with a hammer. The *bardi* of the *Xanthorea* are small, and found together in great numbers; those of the wattle are cream-colored, as long and thick as a man's finger, and are found singly.

**Lumholtz (1889)** mentions several kinds of beetle grubs which occur in decaying tree trunks in Queensland, one of which, *Eurynassa australis* (Cerambycidae), is shown in a figure (pp. 153-155). The best of these, according to Lumholtz, occurs in acacia trees, is glittering white and the thickness of a finger. Lumholtz states that the aborigine does not ordinarily eat raw animal food and that these beetle larvae were the only exception known to him. While some were eaten alive during the collecting, most were carried in baskets back to the camp. Preparation consisted of placing them on red-hot ashes where they immediately became brown and crisp and ready to be eaten. Lumholtz wrote: "Strange to say, these larvae were the best food the natives were able to offer me, and the only kind which I really enjoyed...In taste it resembles an egg, but it seemed to me that the best kind, namely the acacia larva, which has the flavour of nuts, tasted even better than a European omelette." The natives also ate with relish the adult beetles which they roasted after first removing the wings. Adults of several others of the larger wood-borer beetles were also fondly eaten.

Of the "bardee," *Bardistus cibarius* Newm., which ranges from Western Australia to New South Wales, **Tillyard (1926)** states (pp. 233-234) that, "its larvae are found in the stems of grass-trees and 'black-boys' (*Xanthorrhoea*) and are eaten both by aborigines and white people."

See also in the Introduction: Brough Smyth (1878, I), Campbell (1926), Cleland (1940), Irvine (1989), Johnston (1943), Meggett (1962), Meyer-Rochow (1975a), Reim (1962) and Waterhouse (1971). Some other mentions of "grubs" may also pertain to this family.

**Curculionidae (snout beetles, weevils)**

See Meyer-Rochow (1975a) in the Introduction.

**Scarabaeidae (scarab beetles)***Anophlognathus viridiaenneus* (Hope), larva*Euryscaphus* sp., adult

**Hope (1842, p. 132)** provides evidence that the white grubs of *Anophlognathus viridiaenneus*, the adults of which are golden-colored, are the larvae eaten by the New Hollanders and in some other parts of Australia. Hope states there can be little doubt that the white grubs of other species are often mistaken for them and also eaten. He opines:

Should this opinion be further substantiated, and the food prove palatable and wholesome, the settler, from policy, should patronize as food these dainties which are so highly prized by the wild Australian, and thereby secure the crops of future years by feeding on the insects capable of destroying them; and certainly no reason can be adduced why the grubs of New Holland may not rival in delicacy the palm-worm of the Eastern World, or the cossus of Europe, which

the Roman epicure, in the days of Pliny, so highly esteemed.

See also Meyer-Rochow (1975a) in the Introduction.

## Diptera

### Bibionidae (March flies)

See Thomas (1906) and Sweeney (1947) in the Introduction.

## Homoptera

### Cicadellidae (leaf hoppers)

See Meyer-Rochow (1975a) in the Introduction.

### Cicadidae (cicadas)

*Cicadina*

See Calvert (1894), Meggett (1962) and Reim (1962) in the Introduction, and Brough Smyth (1878, I) and Dawson (1881) under Psyllidae.

### Coccoidea (scale insects)

*Apiomorpha pomiformis* Froggatt, gall

*Austrochardia acaciae* (Frogg.), lerp sugar

In desert areas, a shiny red lerp (*Austrochardia acaciae*) found on mulga trees was important to inland tribes (**Low 1989**: 189). See also Cleland (1966) and Meyer-Rochow (1975a) in the Introduction.

### Psyllidae (psyllids)

*Eucalyptolyma* sp., lerp sugar

*Spondylaspis* (= *Psylla*) *eucalypti* Dobson

*Psylla*

*Psyllina*

One of the earliest reports of *lerp* manna appears to be that of **Dobson (1851, p. 235**; vide Bodenheimer, pp. 72-73, 129-130); the insect was identified as *Psylla eucalypti* which was sometimes observed in great numbers on the leaves of *Eucalyptus rostrata* and *E. microtheca*. The white conical scales, about 2 mm high by 4 mm in diameter, are secreted by the larvae and were much prized by the natives for their sweetness. When abundant, they were collected in great quantities, entire trees being cut down to obtain them.

**Fluckinger and Watts (1875**; vide Bodenheimer, p. 73) analyzed the *lerp* manna of *Eucalyptus dumosa* and found it to contain a starch-like substance, the *lerp*-amylum, and a sugar.

**Brough Smyth (1878, I)** discusses three sources of sweets that were available prior to the arrival of the Europeans, one of which was manna, and he distinguishes two kinds of manna. He states: "Little is generally known of the manna of Australia. It was, however, at one time an important article of food; and in the western part of Victoria the natives gather it in pretty large quantities still." In the months of December to March, the Aborigines of the Mallee country gather and eat *Larap*, *Larp*, or *Lerp*, a kind of manna of which Brough Smyth says, "It is a nutritious food, and is eaten with various kinds of animal food." This *lerp*, according to Brough Smyth, is the sugar from *Psylla eucalypti* reported earlier by Dobson, but is very different from the manna gathered from the large *Eucalyptus viminalis* and which is produced by a species of cicada. The latter is amorphous while the former is of a crystalline and shell-like structure.

**Dawson (1881)** mentions two kinds of *buumbuul* (manna) used in western Victoria. One, which resembles small pieces of loaf sugar "with a fine delicate flavour" drops from the leaves and twigs of certain kinds of gum trees. It is gathered and eaten by the children, or mixed with acacia gum dissolved in hot water as a drink. The other type of *buumbuul* is deposited in large quantities by a large dark-colored cicada on the stems of white gum trees. It is a liquid resembling honey and occurs in waxen cells which are collected by ascending the trees and scraping the cells from the bark. It is mixed with gum dissolved in cold water and used as a drink. Dawson relates that the natives complained that because of the increase in opossums

resulting from destruction of the wild dogs, "they never get any *buumbuul* now, as the opossums eat it all."

**Basedow (1925, p. 147)** mentions lerp manna, secreted by larvae of *Psylla*, on leaves of red gums (*Eucalyptus rostrata*) growing along river-beds in central Australia. The manna is referred to as *prelja* by the Arundnta, and large quantities are collected and eaten.

**Low (1989)** mentions, in promoting bush foods, that one variety of lerp, *Eucalyptolyma* sp., can be found on eucalypt trees especially in the cities, where the trees are stressed. These lerps are white and waxy and have a sweet crumbly taste.

See also in the Introduction: Bourne (1953), Calvert (1894), McKeown (1944b), Meyer-Rochow (1975a), Parker (1905), Reim (1962), Stirling (1896), Thomas (1906), Tindale (1972), and Waterhouse (1971).

## Hymenoptera

### Apidae (honey bees)

*Trigona* spp., larvae, pupae

**Braim (1846, II, p. 248)** remarks on the flavor of the honey of a small stingless bee in New South Wales and indicates that the bee brood is also eaten: "The honey is of delicious flavour, after it has been carefully separated from the comb, the cells of which are generally filled with small flies. The natives, however, devour it just as they find it, and are very fond even of the refuse comb, with which they make their favourite beverage called Bull, and of this they drink till they become quite intoxicated." The hives are "generally found at the summit of remarkably high trees," and it is the women who are sent up to collect them while the men stand below. Braim describes how "she reaches the dizzy height to which she is directed from below, exhibiting throughout the most astonishing stretch and pliancy of limb, and the most wonderful absence of all fear of danger."

Honey is highly prized and eaten in large quantities by the natives of Queensland, but **Lumholtz (1889)** states (p. 142) that "they refuse the larvae, however hungry they may be."

**Spencer (1928, II)** states (pp. 547-548) that in the Powell Creek region one of the choicest foods here as everywhere is the "honey-bag" of the native bee which nests in the hollow limbs of gums, lance-woods and other trees. Ingenious methods of finding and collecting the nests, as well as collecting opossums are described. The bee nests are found by one of three methods, the simplest of which is to happen across a tree where the bees can be seen flying in and out of the nest. Another is to catch a bee, fasten a bit of white fluff to it so that it can be better seen and followed to the nest. The third is to place the ear next to a likely-looking gum tree, and if a nest is present, the hum of the bees can be heard. Once located, the "honey-bag" is chopped out. Spencer describes it as follows:

The comb is quite irregular in shape, varying, of course, in different hives. The cells are like little round balls much like, only smaller than, those of the English bumblebee, the largest about a quarter of an inch in diameter, some of them containing honey and some pollen and nectar, not yet made into honey. A third kind is much smaller and contains the eggs, larvae and pupae. The whole mass is scooped into a piece of bark. Hundreds of bees get mixed up with the pollen and honey, but the natives do not mind this and eat the whole of it with relish. So far as the honey itself is concerned it is excellent.

**Irvine (1957, p. 125)** states, without citation, that bee brood is commonly eaten in the comb by the aborigines of Australia, and **Low (1989)** mentions "bee bread" (meaning bee brood?). According to Low, honey of the stingless *Trigona* bees was the "supreme delicacy" for many tribes.

See also in the Introduction: Bodenheimer (1951), Bourne (1953), Brough Smyth (1878, I), Campbell (1926), Cherry (1991), Cleland (1966), Irvine (1989), Meggett (1962), Meyer-Rochow (1975a), Parker (1905), Reim (1962), Sweeney (1947), Thomas (1906) and Waterhouse (1971).

### Formicidae (ants)

*Camponotus* (= *Formica*) *consobrinus* (author?), pupa

*Camponotus* (= *Melophorus*) *inflatus* (Lubb.), honey-pot

*Colobopsis* *gasseri* (author?), pupa (a synonym of *Camponotus gasseri*?)

*Melophorus* *bagoti* Lubb., honey-pot

*Melophorus* *cowleyi* Frogg., honey-pot

*Melophorus* *midas* (author?), honey-pot

*Melophorus* spp., honey-pots

*Myrmecia pyriformis* (author?), pupa  
*Myrmecia sanguinea* (author?), pupa  
*Oecophylla smaragdina* (Fabr.)  
*Oecophylla virescens* (author?)

**Lhotsky (1835:** 106; vide Flood 1980: 296) reported ants are eaten at Monaro.

The natives of Victoria are very fond of a mixture of ant pupae and powdered dry bark of the "stringybark" tree, "the taste being something like that of a mixture of butter and sugar." Regarding harvest of the ant pupae, **Brough Smyth (1878, I)** says:

Mr. Wilhelmi mentions the trough of bark used by the blacks of South Australia for holding the pupae of the ants. The trough is called *Yuta*; it is about four feet in length and eight inches in breadth. The natives open the ant-hills and the pupae are placed in this trough, which is shaken and so manipulated as to retain the pupae and to throw off the dirt and refuse. The season of the ants is in September and October, and during these months the *yuta* is always seen in the hands of the natives.

Pupae consumed include those of the common ant, *Formica consobrina*, which are about the size of rice grains, and those of the black and red bull-dog ants, *Myrmecia pyriformis* and *M. sanguinea*, about three-quarters of an inch in length.

**Froggatt (1896)** describes two new species of honey ants, *Camponotus cowlei* and *C. midas*. He also quotes correspondence from Professor Spencer as follows:

The black honey ant (*Camponotus inflatus*, Lub.) is called "Yarumpa" by the natives, by whom it is esteemed a great luxury; it is, *par excellence*, the honey ant of the central country, and ranges across to the Murchison in Western Australia. We found them plentiful in certain districts on the hard sandy plains, and also often very abundant in patches among the Mulga scrub. The ground all round Ayers Rock, to the south of Lake Amadeus, was strewn with heaps of sand where the natives had been digging them out. They construct no mound over their nests; the entrance, which is an inch in length by a quarter of an inch in width, leads down into a vertical shaft or burrow from five to six feet in depth. About a foot below the surface horizontal passages about a foot in length lead off from the main shaft, at the end of which were three or four of the honey ants, while the bottom of the main shaft, which is excavated into a larger cavity, contained a considerable number. The 'honey ants' are quite incapable of movement and must be fed by the workers. Unlike all the other ants noticed in this country, these did not appear to collect twigs, leaves or grass to carry into their burrows.

The red honey ant, *C. cowlei*, is called "Ittootoonee" by the natives and is apparently a much rarer species as Spencer observed only one small colony.

**Saville-Kent (1897, p. 253;** vide Bodenheimer, p. 114) reported the following of the green tree-ant, *Oecophylla*: "Mashed up in water, after the manner of lemon squash, these green tree-ants form a pleasant acid drink which is held in high favour by the natives of N. Queensland and is even appreciated by many European palates." A liquid made from the ants and their larvae is also commonly used as a remedy for a variety of ills, such as stomach troubles, headaches, coughs, etc.

In central Australia, honey ants are found in parts of the scrub and are "a very favourite food" (**Spencer and Gillen 1899, pp. 26-27**). In some areas, acre after acre of the hard sandy soil has been dug out in the search for these insects.

**Basedow (1904)** discusses honey ants as follows:

A 'native sweet' which is eagerly sought both by young and old is the honey-ant (*Melophorus inflatus*) or 'winudtharra' of the blacks. These curious creatures, nocturnal in habit, live associatedly in colonies below the surface of the ground, usually in thickets of mulga and at the base of one of these trees. The native, on finding the exit from the ants' nest, traces the narrow channel downwards by working with his hand and stick to a depth of often many feet, at which the colony resides. The 'honey-ant,' which it has been ascertained is one of the workers specially modified, stores honey within itself at the expense of the gatherings of the remaining ants, to an amount disproportionately large when compared with its own size. To permit of this the abdominal portion of the ant swells, according to the intake of honey, until it assumes a globular form having a diameter of a centimetre or more...The natives are

passionately fond of these little luxuries of the bush and spend hours collecting the same...To the palate the first sensation is that of a distinct taste of formic acid, which no doubt is excreted by the ant as a natural protection. This taste is, however, slight and momentary, and upon bursting the membrane a recognition of the taste of rich honey follows.

**Noetling (1910: 290-291)** identified three species of ants used as food in Tasmania, i.e., *Myrmecia pyriformis*, *Colobopsis gasseri* and *Camponotus consobrinus*, and comments: "The number of ants distinguished [by the natives] is remarkably large, but we find that the native words are all combinations of the word `tietta' or `teita' with another word. Considering that the eggs [pupae] of these insects were delicacies, it is hardly surprising that they distinguished such a large number."

In discussing the native foods in northwestern South Australia, **White (1915, pp. 728-729)** states: "Sugar ants (*Melophorus inflatus*), called by these natives 'woma,' are much relished. They dig large pits up to 4 ft. or 5 ft. deep in search of the ants; grasping them by the forepart of the body they bite off the inflated abdomen, which contains the sweet fluid."

In central Australia, throughout the MacDonnell Range, and the country to the north and southwest and in the Musgrave Range district, honey ants (*Melophorus inflatus* (Beecher)) are eagerly sought after by the local tribes (**Basedow 1925, pp. 146-47**). These insects live underground, usually in the red sandy loams carrying forests of mulga. When the entrance to a nest has been discovered, a thin stick is inserted as a guide for the digging. It is tedious, done by women who not infrequently must dig to depths greater than their height. The honey ant is a modified worker of the colony who is so overfed that the abdomen swells to the size of a marble, about three-eighths of an inch in diameter. The abdominal walls are so stretched as to become an extremely fine membrane through which the honey can be clearly seen. The ants are of course unable to move in this condition and serve as living tanks that can be tapped by other ants as required. To eat the honey the ant is grasped by the head, the swollen abdomen placed between the lips which then squeeze the contents into the mouth. The first sensation is of formic acid due probably to a secretion produced by the ant in self-defense, but the honey is pure and delicious. According to Basedow, the honey ant is called *winudtharra* by the Aluridja and Wongapitcha, and *yerumba* by the Arundnta.

**Tillyard (1926, p. 290)** distinguishes the honey-pot ants as *Camponotus inflatus* Lubb. (the black honeyant of "Yarumpa"), *Melophorus cowleyi* Frogg. (the golden-yellow honey-ant or "Ittootoonee") and *M. bagoti* Lubb. (the red honeyant). The replete workers of the first two species measure 17 mm in length and the gaster is enormously distended. The aborigines esteem the ants a great luxury and dig out their nests in search of the honey-pots. Both genera belong to the Formicinae or Camponotinae.

**Campbell (1926, pp. 408-409)** mentions that ants are a common food in Australia, and in the arid areas of Central Australia, the 'sugar-ants' *Melophorus inflatus* and *M. cowleyi* are collected and eaten. In Northern Australia, the adults and larvae of the green tree-ant, *Oecophylla smaragdina*, are eaten. In the Cooktown district, the nests are opened on a smooth surface to allow the adults to scatter, leaving the larvae, which are collected and formed into a ball by rolling them in the palms of the hands before swallowing them. Sometimes several of the balls were rolled into one big ball, which was usually washed in water before being eaten, after which the water was used as a drink. Other species of ants and ant-maggots were eaten by the natives of New South Wales.

**Spencer (1928, I, pp. 172-175, 206)** described the collection of honey ants (*Melophorus inflatus*) between Ayers Rock and Mt. Olga, a country dominated by wiry shrubs of Cassia and belts of Mulga. Spencer states:

The Arunta people call it Yarumpa and are very fond of it. In this miserable part of the country it is one of their chief delicacies. In some places the whole surface of the ground was turned over, just as if a small army of prospectors had been at work. There is nothing on the surface to indicate the existence of a burrow, except a small opening straight down. The natives soon found one or two and immediately set to work to dig them out. It was astonishing to watch the speed with which the elder women worked. First of all, the ground round the opening was loosened with the aid of a digging-stick, held in the right hand, and, alternately loosening the soil with her stick and then throwing it out over her shoulder, the lubra soon dug a hole just big enough to hold her body. The main burrow went down for between five and six feet, with horizontal passages going off all around it. A few of the honey ants were found in each of these, but the greater number were in a swollen chamber at the bottom.

In the nests dug out here, there were only two kinds of ants, the ordinary worker and the honey ants. Spencer notes that when the ants want to eat honey, they tap the sides of the honey-bag with their feet, and in response to this stimulus the honey is passed out in drops from the mouth. *Melophorus cowleyi* (native name,

Itutuni) and a "new species" of honey ant are mentioned briefly, but in neither of these is the abdomen so distended and specialized as in *M. inflatus* which Spencer calls "*par excellence* the honey ant of the arid parts of Australia." In addition to the honey ants, grubs, wild bee honey, flies and pounded ant-hill clay are mentioned among the insect food used (p. 206). **Spencer (1928, II, Fig. 282, opposite p. 458)** illustrates the ceremony of an ant totem belonging to the Kingilli moiety of the Warramunga tribe.

**Croll (1937, p. 16)** briefly discusses honey storage by *Camponotus inflatus*, called yarumpa by the Arunta who gather it whenever they can.

**Terry (1941; vide Conway 1990)** discusses the honey ant, *Camponotus inflatus*, the Aranda name for which is "Yerrampe."

**Badger and Korytnyk (1956)** examined the carbohydrate constituents of the honey-ant, *Melophorus inflatus*, collected about 190 miles northwest of Alice Springs in central Australia. The fructose:glucose ratio was found to be 0.67:1.0. In bee honey, fructose usually predominates, the ratio averaging 1.20:1.0, although, according to the investigators, the range varies widely depending on the source of the honey. The authors note that Mexican honey-ants were found by Wetherill to produce almost pure fructose, but they consider the evidence presented as inconclusive.

**Tindale (1966)** describes an acid-tasting drink made from crushed ants (eggs, larvae and adults of *O. smaragdina*). Of *Melophorus inflatus*, called *jeramba* by the Aranda, Tindale says:

These helpless living storehouses of food assist in tiding the ants over the lean years when there is no flowering of the mulga [*Acacia aneura*]. Aborigines say that after two dry years there is no honey to be gathered by digging out the nests. In normal times a rich supply of food may reward an afternoon's effort by a group of women. They may leave behind them a hole 6 feet across and several feet deep as witness to the gathering of half a pound of honey in its multitude of pea-sized spherical packages.

**Hart (1974, pp. 3-7)** describes a Saturday honey-ant (*tjala*) dig with a group of aborigines as part of a discussion on the inadequacy of present-day education in maintaining the integrity of Aboriginal society. The following extracts provide some insight:

The group of two men, five women and ten children took me several miles to a flat plain on the Fregon road studded with Mulga trees. Here the red sandy loam was easier to dig, and the mulga blossoms provided the honey which the ants stored.

They looked for the black ants on the ground, followed them to their almost invisible holes and then the women dug down with *wana*, the sharp digging sticks, scooping the earth out with the *piti*, the carrying dishes. The children watched every move intently as the women dug deep down, the perspiration streaming from their foreheads.

Presently the digging in one hole stopped, the woman reached for the carrying dish, shook out the dust, and the children leaned dangerously forward over the six-foot deep pit. The mother loosened a couple of clods of earth and pulled out a handful of the strange looking ants, showing their transparent abdomens extended with golden honey to the size of small marbles. She straightened up, passed the carrying dish up to the oldest child and watched as the five-year-old boy put the ball into his mouth, sucked out the honey and threw the ant away. He passed the dish on to the next child and they shared the honey-ants around.

There was no grabbing or struggling amongst the children. They sat contentedly waiting, knowing that the honey-ants would be shared out and that they would get their part of the mother's find. She did not eat many herself, but found satisfaction in watching the children suck the honey from the ants and brush the flies from their sticky mouths. She laughed at my efforts to cope with the ants that the children gave me, instructing me not to bite the ants but to suck out the honey.

Hart says,

A time-motion study of this operation would show it to be most uneconomical; an hour's hard work for a few cents worth of honey....Honey-ants can't be mined or excavated, no one has yet thought out a process of mass-production or mechanical excavation. It just isn't economical. But for those children it was pure enjoyment. It was a picnic with a purpose, an education in

giving and sharing, a mother teaching her children their way of life with its values and customs.

Hart continues:

Try to make this education more efficient by having one trained teacher for every thirty children and the personal touch is destroyed, the enjoyment is lost and the important values are not conveyed to them. One of the greatest dangers in our present system of education is that Aboriginal parents feel redundant; they are given the impression that their way of life, their culture, and their values are superceded and the giant machine of schooling will take care of all the education the children need.

One Aboriginal aide who had spent a number of years working with white teachers informed me quite seriously, 'These children come to school knowing nothing, absolutely nothing'. The language which they had learned at home was grammatically perfect by the time they had reached school-going age, but wasn't used in the school. Their knowledge of the out-door world, the edible plants, berries and animals was quite extensive, but not applicable inside the walls of the classroom. Their knowledge of the people in the community and their characters and abilities was well-developed, but social abilities are not at a premium where the child is required to sit still and keep quiet. The values of the Aboriginal world, of sharing and co-operation, of reliance on people rather than on money, of using and enjoying rather than hoarding and storing, these values were replaced in the classroom by the middle-class values of the acquisitive, technological world of the *walpala*, (the white person). The Aboriginal teacher saw they knew nothing of the *walpala*, learning, values and ambitions, so he discounted all the valuable learning of those early years as being irrelevant to school.

Hart concludes this particular line of thought as follows: "It doesn't take long for this message to be transmitted to parents....When the education machine takes over in the school with mass-production methods, the early learning of the child is not only discounted as valueless, but it is discouraged and destroyed because the parents themselves become convinced that their contribution is unwanted."

**Winfield (1982;** vide Conway 1990, pp. 2, 6-9) described the harvest of honey ants by Aborigines in central Australia. They may be eaten at the digging site by biting off the gaster, or mixed with ground flour to make a sweet dough or damper.

**Roff (1983;** vide Conway 1990, pp. 2, 8, 11) reported the use of honey ants by Aborigines in central Australia, and that, even today, dreamtime stories of honey ants are wide-ranging in the Outback.

**James (1983)** provided analyses of various indigenous Australian foods; data for larvae of the green tree ant, *Oecophylla smaragdina*, are as follows: water 71.6%, protein 15.6%, fat 0.8%, energy 450 kJ/100g, thiamine 238 µg/100g, ascorbic acid Tr/100g.

**Conway (1985)** visited the Alice Springs area to study the honey ants, *Camponotus inflatus* and *Melophorus bagoti*. He was told by the aboriginal family with whom he stayed that aborigines may eat up to 50 repletes at a time, but they only partially dig up the nests in order not to destroy the colonies and to preserve a valuable resource. Conway also sampled the taste of witchetty grubs (found in the roots of *Acacia* sp.), which are eaten either raw or after toasting them lightly in the ashes of the fire. The toasted grub was bland, according to Conway, but with a taste somewhat like corn. Although there may be 30 grubs per plant, they apparently do not harm it. They are available the year round, and are never found in roots deeper than 8 inches.

According to **Low (1989)**, both adult ants and larvae of *O. smaragdina* were eaten in north Queensland, and the honeypot ants (*Melophorus* species) were important foods in central Australia. Around Sydney, ants were eaten with bland fern starch to provide flavor.

**Conway (1990)** observed the use of honey ants and witchetty grubs near Alice Springs in central Australia. The honey ants are reported to get their nectar for storage either from red scale insects on mulga trees or from flowers. In digging for the ants, the first repletes were found at a depth of about 11 inches. Only part of the nest is dug up, in order not to destroy it. Much of the other information given here is a repeat of the author's 1985b paper.

Among Australian species of honey ants, according to **Conway (1994)**, *Camponotus inflatus* develops the largest repletes, with gasters (abdomens) expanded to the size of a marble. Also, according to Conway, only the large repletes of *C. inflatus* are eaten by the Aborigines. Repletes of other honey ants in Australia are smaller, those of *Melophorus bagoti*, for example, being only about half as large as those of *C. inflatus* and they are not normally eaten. Conway summarizes information on the biology and ecology under the following subject headings: honey ant habitat, nest density, population size, reproductives and nuptial activity, guests

and parasites, repletes, nest architecture, circadian and seasonal activity, food sources, intraspecific and interspecific competition, and predators.

As to the significance of honey ants in Aboriginal culture, Conway notes that Aborigines expend much time and effort digging honey ants. In a one-year study of 22 Aborigines, there were 76 excavations involving 80 hours of digging with quantities of honey retrieved per dig ranging from 45 to 250 g. The author also briefly discusses the importance of honey ants in Aboriginal mythology and ancient and modern-day art.

See also in the Introduction: Bardon (1979), Barrallier (1802), Bourne (1953), Brough Smyth (1878, II), Campbell (1926), Cherry (1991), Cleland (1966), Cutter (1978), Davies (1846), Finlayson (1943), Fraser (1892), Gould (1969), Hiatt (1967-1968), Irvine (1989), Johnston (1943), Macfarlane (1978), McKeown (1944a, b), Meggett (1962), Meyer-Rochow (1975a), Moodie and Pederson (1971), Mountford (1946), Parker (1905), Reim (1962), Roheim (1974), Roth (1897), Spencer and Gillen (1899), Stirling (1896), Sweeney (1947), Thomas (1906), Tindale (1972) and Waterhouse (1971).

### **Perilampidae**

*Trachilogastir* sp., mulga apples (galls)

See Cleland (1966) in the Introduction

### **Vespidae (wasps, hornets)**

In north Queensland, wasp larvae were smoked in the nests and eaten (**Low 1989**). See also Thomas (1906) in the Introduction.

## **Isoptera**

Termites, frequently associated with gum trees, are important items of food for Aborigines (**Tindale 1966**). They are collected by women using special digging sticks, spade-like scoops and pointed hammerstones, and winnowed in wooden dishes. Ashes and hot embers are shaken in the dishes with the termites to kill and cook them. Alternatively, the live insects may be pounded and kneaded into a raw oily cake.

See in the Introduction: Bourne (1953), Cleland (1966), Gould (1969), McKeown (1944a), Meggett (1962), Moodie and Pederson (1971) and Reim (1962).

## **Lepidoptera**

### **Cossidae (carpenter moths, leopard moths)**

*Catoxophylla cyanauges* Turner, adult

*Cossus* sp., larva

*Xyleutes amphiplecta* Turner, larva

*Xyleutes biarpiti* Tindale, larva

*Xyleutes boisduvali* Herrich-Schaeffer, larva

*Xyleutes eucalypti* Scott, larva

*Xyleutes leuchomochla* Turner, larva

*Xyleutes* sp.

*Zeuzera citurata* (author?), larva

*Zeuzera eucalypti* McKeown, larva

**Noetling (1910)**: 281, 290-291, 295) states that the white grubs of *Z. eucalypti* were considered a delicacy by the Tasmanian Aborigines.

**White (1915)** states, of foods in northwestern South Australia:

One of their, if not the chief, foods is their 'margu', being the larvae of a big moth found in the roots of the broad-leafed mulga (*Acacia kempeana*). The natives seem to detect the grub at the roots by the foliage of the tree, and at once strike the ground with their pointed stick, 'wanna', to find the position of the root. Having ascertained this, they soon loosen the earth around and thrust the pointed end of the stick under the root and pressed up sufficiently to be grasped by the hands and forced away from the stem, and at the junction of stem and root the large grub is invariably found. It is sometimes eaten raw by biting off the head and squeezing the contents into the mouth, but they are more often placed in the hot ashes for a few minutes,

when the skin is roasted like parchment and the contents attain the consistency and colour of the yolk of an egg, and is of a nutty flavour.

F.P. Dodd, in Oberthur (1916, p. 33), cited by **Bodenheimer** (pp. 85-86), reported on the great Australian cossid, *Xyleutes eucalyptii*. As summarized by Bodenheimer:

Many Australians have eaten these caterpillars and all pronounce them quite palatable. At Townsville, 900 miles farther north, there are still some blacks, but they seem to have become so used to the white man's food that caterpillars, which have to be cut out of tough timber, no longer are attractive for them. But here at Kuranda, I have often been disappointed to find that a larva of *X. boisduvali*, which perhaps I had located months before, had been cut out and eaten by some wandering native. These caterpillars are in green trees, and large coleopterous larvae in rotten trees or logs are much sought for and esteemed by the Blacks here, which is 200 miles north of Townsville, and at Heberton we several times met bands of youthful blacks, provided with tomahawks, searching through the bush for these things, principally the caterpillars, which, as a rule, are roasted a little before being devoured.

**Basedow (1925, pp. 122-125)** states that the most popular and widely distributed insect in the diet is the witcheti (misspelled witchedy) grub. He mentions that there are two varieties, one living in the roots of shrubs such as Cassia and certain species of Acacia, and another that bores into the butt or larger limbs of the eucalyptus. The former is detected by ramming the yam-stick into the ground under the shrub and testing the roots' resistance to leverage; if a grub is present, the root snaps, whereupon it is unearthed by digging. Grubs in eucalyptus are detected by the small holes the young larva bores into the bark. If the holes are high above the ground, the natives will climb the tree. All grub holes are examined on the way up and the occupants extracted. Basedow describes the methods of climbing and the marvelous ease and assurance of the climbers. The grub is extracted by means of a hooked stick cut from a small pronged twig, one arm of which is from 4-6 inches in length, the other cut short and sharpened to form the hook. The hooked end is inserted into the hole until the grub is hooked and then it is withdrawn. As the diameter of the hole is smallest at its entrance, the bark is cut away to a shallow depth to allow the grub to be drawn out. The witchetihook is used throughout central and southern Australia and the Arundta word for it is *ullyinga*.

**Tindale (1953)** conducted the definitive study on the famous *witjuti* or *witchety* (often misspelled as "witchetty") grubs of Australia, which are cossid moth (Cossidae) larvae. In the Arabana native language from which the term is taken, *witjuti* refers to the shrub, not to the grub, and must be prefixed by the word *mako*, meaning grub. Tindale states that, "Aborigines with access to *witjuti* grubs usually are healthy and properly nourished....Women and children spend much time digging for them and a healthy baby seems often to have one dangling from its mouth in much the same way that one of our children would be satisfied with a baby comforter." He mentions that at Ooldea, grubs were abundant enough that half-a-dozen boys required less than an hour to gather an estimated half-pound weight of larvae. Also, over a period of several months spent observing nomadic Pitjandjaras in the Mann and Musgrave Ranges, it was noted that part of nearly every day's diet consisted of these larvae.

Tindale furnishes much valuable information on the life cycles of the cossids and their adaptation to the desert regions of Australia. *Xyleutes leucomochla* Turner is a large species having a female wing expanse of up to 17 cm or greater. It occurs at least in Western Australia and South Australia. The mature larvae are about 8 cm in length by 1.5 cm in diameter, creamy white in color with the head, prothorax, spiracles and appendages light brown. The larvae are naked except for the inconspicuous primitive hairs. A contracted specimen preserved in alcohol weighed 6.5 g according to Tindale. A female pupa measured 7.4 cm in length by 1.6 cm in diameter. The larvae occupy a silken chamber from which they feed on the roots of *Acacia ligulata* shrubs, incorporating the part of the root being eaten into the walls of the chamber. Tindale states that the amount of wood actually eaten is apparently relatively small and the larva relies on the flow of sap for food, using the jaws to keep the wounds fresh. The silken chamber later shelters the pupa, and is connected to the surface of the ground by a long (20-30 cm or longer) silk-lined tunnel sealed with a silk cap at its upper end. At emergence the moth cuts away the cap and leaves the empty pupal shell protruding from the soil within a foot or so of the butt of the *Acacia* shrub. The adults emerge in early autumn. The finding of newly-vacated pupal shells, fully grown and half-grown larvae at the same season suggests two years in the larval state.

The grubs of *X. leucomochla* are called *maka wardaruka* by the Ngalea people, meaning grubs of the *wardaruka* (*Acacia ligulata*) shrubs. Their term for the pupae is *mako miring wardaruka*, or simply *mako miring*, while the adults are *kinta-kinta wardaruka*. The empty pupal shells are said to be *ilungu* or "dead." Tindale notes that the time of year when pupae rise to the surface prior to adult emergence is important to the

people because numbers of them can be gathered without the labor of digging deeply for them. At the end of summer, in anticipation of this event, the Pitjandjara sing a song, "*Wardaruka miring tjarei*," meaning "Acacia trees pupae are carrying." It is a popular song at evening dances in which the women and children take part. The Pintubi people call *X. leucomochla* or similar pupae *wanman-umbiri* or *wanman-mbiring*. A similar species from *Acacia kempeana*, which has not yet been reared or identified, is called *mako ilkoara* by the Pitjandjara.

Another cossid used as food in Western Australia and South Australia is *Xyleutes biarpiti* Tindale. The females are incapable of flight. The larvae are rather similar in general appearance to those of *X. leucomochla*, but much smaller, an apparently full-grown larva measuring only 5.1 cm. Weight of a full-grown female larva is no more than 2.2 g. Tindale gives the length of a female pupa as 4.3 cm, that of a male pupa as 2.3 cm. The larvae are borers in the roots of *Zygophyllum fruticosum*; both larvae and pupae are in chambers within the main root-stock of the shrubs. The escape tunnel extending toward the surface of the sand is sealed with silk. Emergence of adults appears to take place at about dusk. Native children can detect the presence of grubs by differences in the state of growth of infested plants compared to those not infested. Tindale states that children spend much time digging for the grubs at the bases of the shrubs. *Zygophyllum* bushes are called *biarpiti* and the grubs are called *mako biarpiti*, the pupae *miring biarpiti* or simply *miring*. In some areas, according to Tindale, nearly 50 percent of the bushes have one or more grubs.

The females of *Xyleutes amphiplecta* Turner are also brachypterous. The species has a wide distribution in Queensland, New South Wales, Victoria and South Australia. The male is much smaller than the female. The food plant in Queensland is *Bassia*, in South Australia, *Pachycornia trianda* (Samphire). According to Tindale, the larvae are found in or near the crown of the plant and, unlike many members of the family, are relatively free-living and able to migrate from one shrub to another. The life cycle extends over two years. The females emerge in late summer. Tindale cites behavioral evidence for a female-emitted sex attractant. The larvae are used as bait by fishermen on the Murray River and as food by the aborigines who scrape the ground over the nearly vertical holes and detect the high humidity maintained in occupied burrows. The grubs are collected by using a hooked stick.

*Catoxophylla cyanauges* Turner also has females that are brachypterous. The species occurs in Western and South Australia, central Australia and New South Wales. The food plant is apparently *Acacia*. Tindale states that the female moths appear in March and April in the Northern Flanders Ranges. The Wailpi people call the moths *ango* and relish them as food.

Larvae of a fifth species of cossid discussed by Tindale occur in the roots of the tumble weed or rolypoly bush (*Salsola kali*). The adult has not been identified. According to Tindale, this species is eaten by aborigines in the Western Desert. In searching for the larvae, a digging stick is swept across the patches of drying weeds and those that are infested readily break off. Tindale states that the larvae are one of the causes that make the shrub break off and become a tumble weed. Finally, a sixth species of cossid, also unidentified, is mentioned. In addition, Tindale makes reference to a buprestid grub that is edible.

**Tindale (1958: 339; vide Hercus 1989)** briefly summarizes information on witchetty grubs. **Smith (1962)** stated, after frying the abdomen of a female *Xyleutes boisduvali* in a very little fat: "In my opinion, when eaten with toast this was a superior dish to scrambled eggs."

**Tindale (1966)** states that the taste of *Xyleutes*, "when lightly cooked in hot ashes, would delight a gourmet" and further elaborates: "I visited a cattle station at Mandora, in Western Australia, where a daily accompaniment to the whisky drink, before dinner, was a plate of toasted cossid grubs. They have a flavour all their own, like cream cheese with chitin adding the firmness of the crackling on roast pork. The grubs are equally delicious when eaten raw . . ."

Reuther (1981), cited by **Hercus (1989)**, describes how the Diyari Ancestor "Darana," by means of magic incantations collected grass witchetty grubs, called *muluru* in Diyari, and then dried and powdered them.

**Meyer-Rochow (1982)** mentions several examples of insects used as food in various parts of the world, mainly the same examples included in some of his previous papers. In addition, he presents data on vitamin and mineral content of witjuti grubs as follows: vitamin D (400 i.u./g), vitamin A (10 i.u./g), iron (6 ppm), copper (5 ppm) and zinc (19 ppm).

**James (1983)** provided analyses for various indigenous Australian foods, including the following data for witchetty grub: water 60.7%, protein 15.1%, fat 19.2%, energy 1167 kJ/100 g, thiamin 1000  $\mu$ g/100 g, and ascorbic acid 5 mg/100 g.

**Kimber (1984: 18)**, relative to food storage as part of resource management by Aborigines in the Simpson Desert and associated arid lands, discussed the moolili grub or muluru caterpillars (grass ?) which were gathered in large numbers, crushed, dried and stored as flour for future use [these might be hepialids?].

**Clarke (1988: 70)** states that witchetty grubs were obtained from the roots of *Xanthorrhoea*. **Low (1989)** states that witchetty grubs are "nutty-tasting; they can be eaten raw but are especially delicious when roasted

over a fire. **Cherry (1991)** notes that witchety larvae are rich in calories, protein and fat and cites the Australian National Commission of UNESCO (1973) that 10 witchety are sufficient to provide the daily needs of an adult. These grubs were the most important insect food of the desert and were a much valued staple in the diet, especially for women and children.

See also in the Introduction: Bardon (1979), Basedow (1904), Bluett (1954), Bourne (1953), Brough Smyth (1878, I), Campbell (1926), Cleland (1940, 1966), Conway (1990), Cutter (1978), Davies (1846), Finlayson (1943), Hercus (1989), Irvine (1989), Macfarlane (1978), Matthew (1910), Meggett (1962), Meyer-Rochow (1975a, 1976), Moodie and Pederson (1971), Mountford (1946), Pfeiff and Hutchison (1993), Reim (1962), Roheim (1974), Scherer (1991), Spencer and Gillen (1899), Stirling (1896), Sweeney (1947), Tindale (1972) and Waterhouse (1971). Some other mentions of "grubs" may pertain to this family.

### **Hepialidae (ghost moths and swifts)**

*Abantiades marcidus* Tindale, larva, pupa, adult

*Oxycanus* spp., larvae, pupae, adults

*Trictena argentata* Herrich-Schaeffer, larva, pupa, adult

*Trictena argyrosticha* Turner, larva, pupa, adult

**Angas (1847, I, p. 57)** reported that while in camp in South Australia, "large ghost-moths [Family Hepialidae] fluttered into the embers, in such quantities that the natives made a capital supper on their scorched and roasted bodies."

**Gray (1930, p. 6; vide Bodenheimer, p. 87)** mentions that the natives of the Wirra Lube at Orroro dug up the grubs and pupae of ghost moths (Hepialidae) around the big gum trees on Pekina Creek and cooked them in ashes. They were known as *barti*. Tindale (1932, pp. 504-505; vide Bodenheimer, p. 87) states that one female of the big Australian ghost moth, *Trictena argentata* H.S., which is widely eaten, deposited 29,000 eggs and still contained 15,000 developing eggs in its abdomen. In the southern districts, the moths emerge in the late afternoon after the first autumn rains have fallen. In the arid northern areas of South Australia they emerge at irregular seasons, shortly after or during heavy rainstorms. The moths are attracted to light and fire.

Writing of another ghost moth, *Abantiades marcidus* Tindale, **Tindale (1932, pp. 516-517)** states:

The Wirrangu natives of Fowler Bay, on the West Coast of South Australia, dig up the larvae and pupae from around the roots of 'gumtrees' and use them as food. The adults fly into the camp fires in great numbers; when this happens they are carefully raked out and eaten. They distinguish four stages: the small larvae, *pindi*; the full-grown larvae, *yalgunda*; the pupae, *ljirgi*; and the adult moths, *kunku*. The pupa of this species is 80 mm in length by 15 mm in greatest diameter. The pupal chamber is a silk-lined, vertical, subterranean shaft, 63-75 cm in depth, extending to within a few millimeters of the surface. Pupation occurs at the base of the tunnel. The pupa is capable of motion and the plug of earth closing the chamber is lifted like a hinged lid when the pupa thrusts itself halfway out of the hole during emergence.

**Tindale (1938, pp. 2, 5))** states from his own observations regarding *Trictena argentata*:

The natives of Warupuyu, where we camped, are exceedingly fond of the grubs. They call them *mako tuuta*, i.e. the grubs (*mako*) of the *tuutu*, or red gumtree). *Tuutu* trees grow on the low sandy banks and on the beds of wide waterless creeks, which only flow after the rare floods caused by summer rains.

The natives discover the places where the larvae of *Trictena argentata* are likely to be living by observing minute cracks on the surface of the ground. In such places the earth has fissured and contracted during dry weather, cracking most readily above one or other of the lateral roots of the tree. They dig down along these cracks and find vertical silk-lined tunnels, commencing at a depth of about six inches. They examine the tunnels closely and smell the silken lining. If the material is damp, but has the correct odour, and if they see signs of freshly spun silk, they continue down several feet, using a native digging stick and their hands in excavating. By persisting in the search, grubs may be discovered, usually at depths of from four to five feet. The sand at this level is quite damp. Usually the grubs are deep down and much labour must be expended to obtain them, therefore they are considered only as an occasional luxury. When the pupae work their way towards the surface just before rain falls in the summer season, they are more readily available as food. On the night when the moths

emerge, there is a great feast for the children, for the moths flutter wildly into the numerous fires which are built to attract them. . . .

On one occasion when a grub was being dug out, it was injured in the process; the native cooked it by laying it in the hot ashes of his camp fire for about half a minute. When the skin became taut with the warmed juices within it, he raked it out, flicked it with his fingers to remove the adhering dust and offered it to me. It tasted like warm cream or the baked skin on roast pork, and was quite delicious.

**Tindale (1966)** adds *T. argyrosticha* to the list of species eaten (in Queensland) and states that many species of the genus *Oxycanus* are eaten. The larvae of hepialids are external feeders on the roots of gum trees and on several species of *Acacia* and when full-grown may be up to six inches in length. Tindale emphasizes their sensitivity to both dessication and excessive moisture and notes that they may be found at depths of six feet.

See also in the Introduction: Campbell (1926), Cleland (1966) and Matthew (1910). Some other mentions of "grubs" may pertain to this family.

### **Noctuidae (noctuids)**

*Agrotis infusa* Boisd. (= *A. spina*, *A. suffusa* and *Euxoa spina*), adult

**Bennett (1834, pp. 265-273)** describes a trip to "Bugong Mountain" to see for himself the multitudes of moths which congregate on the granite walls and are called "Bugong" by the aborigines. "The months of November, December, and January, are quite a season of festivity among the native blacks, who assemble from far and near to collect the Bugong; the bodies of these insects, contain a quantity of oil, and they are sought after as a luscious and fattening food." Bennett's observations indicated that the moths congregate only where there are massive granite outcroppings, one such location being known as "Warrogong" by the natives. Mr. Hamilton Hume is credited for the information that the Bugong is found also in the Snow Mountains by the aborigines living to the southward and forms their principal food during the summer.

To collect the moths from the surfaces and crevices of the granite masses, the natives build smokey fires at the base. They are swept from the walls by the bushels-full. Bennett describes the preparation of the moths as follows:

A circular space is cleared upon the ground, of a size proportioned to the number of insects to be prepared; on it a fire is lighted and kept burning until the ground is considered to be sufficiently heated, when, the fire being removed, and the ashes cleared away, the moths are placed upon the heated ground, and stirred about until the down and wings are removed from them; they are then placed on pieces of bark, and *winnowed* to separate the dust and wings mixed with the bodies: they are then eaten, or placed into a wooden vessel called a 'Walbun, or Culibun,' and pounded by a piece of wood into masses or cakes resembling lumps of fat, and may be compared in colour and consistence to dough made from smutty wheat mixed with fat. The bodies of the moths are large, and filled with a yellowish oil, resembling in taste a sweet nut. These masses (with which the 'Netbuls' or 'Talabats' of the native tribes are loaded, during the season of feasting upon the 'Bugong,') will not keep above a week, and seldom for even that time; but by smoking they are able to preserve them for a much longer period. The first time this diet is used by the native tribes, violent vomiting and other debilitating effects are produced; but after a few days they become accustomed to its use, and then thrive and fatten exceedingly upon it.

Bennett continues, "These insects are held in such estimation among the aborigines, that they assemble from all parts of the country to collect them from these mountains." Bennett notes that the crows are also very fond of the Bugong, so fond, in fact, that they try to steal it even while it is being prepared by the natives."

**Bell (1853: 286)**, referring to the Tumut Valley in 1839, stated:

My own experience of the natives at this time led me to suppose they were a very inoffensive race; for all I had seen had been the Bogong blacks, on the Tumut, who came down in the summer from the ranges, sleek and lazy from the grub or fly of that name which infests that part of the country. I think they were the handsomest natives I have ever seen; at all events

they were the best conditioned.

**Eyre (1859: 55; vide Flood 1980: 70)** provides early evidence of Bogong moth hunting in the Canberra district between 1832 and 1839. While looking over a piece of property in the Molonglo Plains, he learned that: "at the Tinderry Mountains a kind of moth...congregates...in such great numbers that the blacks flock from all quarters to catch and eat them...they taste like a burnt almond. The Blacks never look so fat or shiny as they do during the 'Bougan' season and even their wretched half-starved dogs get into good condition then, in such profusion and so fattening are they.

**Scott (1869: 40-48; vide Flood 1980: 61-62, Table 5)**, provides (according to Flood, p. 61) the only eyewitness account of Bogong moth hunting, as narrated to him by Robert Vyner, who, in 1865, ascended (with a guide) a peak called Numoiadonga by the Aborigines [probably Numbananga Peak approached from Tumut Valley to the west, according to Flood]:

The moths were found in vast assemblages sheltered within the deep fissures, and between the huge masses of rocks, which there form recesses, and might almost be considered as caves. On both sides of the chasms the face of the stone was literally covered with these insects, packed closely side by side, over head and under, presenting a dark surface of a scale-like pattern -- each moth was resting firmly by its feet on the rock, and not on the back of others, as in a swarm of bees. So numerous were these moths that six bushels of them could easily have been gathered by the party at this one peak; so abundant were the remains of the former occupants that a stick was thrust into the debris on the floor to a depth of four feet.

Mr Vyner tells me that on this occasion he ate, properly cooked by Old Wellington [the guide], about a quart of the moths, and found them exceedingly nice and sweet, with a flavour of walnut, so much so that he desired to have 'another feed'...The Bugong moths are collected and prepared for food by the aborigines in this wise: a blanket or sheet of bark is spread on the floor; the moths, on being disturbed with a stick fall down, are gathered up before they have time to crawl or fly away, and thrust into a bag. To cook them a hole is made in a sandy spot and a smart fire lit on it until the sand is thoroughly heated, when all portions left of the glowing coal are carefully picked out, for fear of scorching the insects -- as in such a case a violent storm would inevitably arise, according to their superstitious notions. The moths are now poured out of the bag, stirred about in the hot ashes for a short time, and then placed upon a sheet of bark until cold. The next process is to sift them carefully in a net, by which action the heads fall through, and thus the wings and legs having previously singed off, the bodies are obtained properly prepared. In this state they are generally eaten, but sometimes they are ground into a paste by the use of a smooth stone and hollow piece of bark, and made into cakes.

**Scott (1873; vide Common 1954, p. 224)** reported that in 1867, bogong moths invaded the city of Sydney in such vast numbers that they constituted a public nuisance. Millions of the moths had apparently flown out to sea, for they littered the beaches north and south of Sydney for more than 100 miles.

The Victorian highland tribes exploited the Bogong moth as shown by von Lendenfeld in his 1886 report on the goldfields of Victoria (**Victoria Department of Mines 1884-89: 72; vide Flood 1980: 70**): "The high tablelands which constitute the nucleus of this range are inhabited by a species of moth belonging to the Noctuidae. The caterpillars of it are exceedingly abundant, and formed, half-roasted, at certain seasons, a favourite food of the Australian natives. The natives call these caterpillars 'Bogong', which name was afterwards applied to the habitat of the Bogong."

**Helms (1890: 14-15)** observed millions of "Boogong" moths in March, 1889, on the highest peak of the Ramshead Range (Kosciusko region). He mentions that immense numbers of birds pursue the moths and thousands of crows (? ravens) were always to be found about the rocks where the moths congregate. Helms was told by an informant who had lived in the area for many years that small parties of men would head for the rocks on the summit as early as October, as soon as snow had melted on the lower ranges. "A great gathering usually took place about Christmas on the highest ranges, and for about two months a great feast of roasted moths would be held." Participating tribes were friendly, and some had come from a long distance. Helms's account of how the moths were stupefied by smoke, collected and cooked in hot ashes was expanded in his later (1895) account (see the following).

**Helms (1895, pp. 394-396, 406-407)** describes the harvest of "Bugong" moths (*Agrotis spina* Gn.) by the Omeo tribe, drawing heavily on personal accounts from early settlers. The Omeo, according to Helms, had become extinct at the time of this writing. Helms did not become aware of the earlier description by

Bennett until after he had written the account quoted below:

The food supply was as a rule abundant in the district during favourable seasons. It consisted of all kinds of game, birds and birds' eggs, reptiles, fishes, and insects. Amongst the first the opossum furnished probably the most frequent meal, because it occurred very abundantly; and amongst the insects the "Bugong" supplied numbers of the natives with a fattening diet for months. How this unique and remarkable food supply, found always on the highest mountains, was procured deserves a detailed description: --As early as October, as soon as the snow had melted on the lower ranges, small parties of natives would start during fine weather for some of the frost-riven rocks and procure "Bugongs" for food. A great gathering usually took place about Christmas on the highest ranges, when sometimes from 500 to 700 aborigines belonging to different friendly tribes would assemble almost solely for the purpose of feasting upon roasted moths. Sometimes these natives had to come great distances to enjoy this food, which was not only much appreciated by them but must have been very nutritious, because their condition was generally improved by it, and when they returned from the mountains their skins looked glossy and most of them were quite fat. Their method of catching the insects was both simple and effective. With a burning or smouldering bush in the hand the rents in the rocks were entered as far as possible, when the heat and smoke would stifle the thickly congregated moths, that occupied nearly every crack, and make them tumble to the bottom of the cleft. Here an outstretched kangaroo skin or a fine net made of kurrajong fibre would receive most of the stupified and half-singed insects, which were then roasted on hot ashes. This process required some care and attention in order to prevent the bodies of the moths getting scorched, and therefore the ashes required to be not too hot and had to be free from large glowing embers. The insects were thrown upon the ashes and well mixed with them, and then the whole was stirred with sticks till the wings and legs had broken away and the body was cooked, when it generally shrivelled to the size of a grain of wheat. The mass was freed of the ashes by dropping it by degrees into some vessel or on a skin and allowing the wind to sift it; the food was still further cleansed from adhering particles of dust and other unpalatable substances by gently rubbing it between the hands, and rolling it backwards and forwards from one to the other whilst blowing from the mouth. The taste of the roasted bodies of the "bugongs" is, according to some Europeans who tried them, sweetish and nut-like and rather pleasant eating.

This unique food supply is restricted to the highest mountains of Australia, but here it can always be found in abundance during the summer months. It is a marvel that the highest and stoniest ridges, on which snow lies for fully five and sometimes six months of the year, with a naturally scant though rapidly growing summer vegetation, should harbour such enormous numbers of an insect (the caterpillar of which is known to be very voracious) which was at one time the means of fattening a congregation of over 500 aborigines every season.

Helms visited Mt. Tate in February 1893 and states:

Unless seen it is scarcely credible what an enormous number of the Bugong moths inhabit the crevices and clefts of the rocks on the highest ridges of the mountains...Thousand of crows may be seen swarming during the whole of the summer about the rocks feeding on nothing else but the moths....Like the dusky coloured men, the birds are fonder of this food than anything else, and will not touch even dead or dying sheep, I am informed, whilst plenty of "Bugongs" are to be found.

Helms notes that the statement by von Lendenfeld (1886) that it is the Bugong caterpillar that is eaten is incorrect.

**Jardine (1901:** 53-54; vide Flood 1980: 67, Table 5, 80-81) described Bogong moth hunting by the Currak-da-bidgee Tribe, N.S.W. at Jindabyne in the Kosciusko region in 1844 and 1845. "The moths used to be so numerous that when they rose in the air they looked like a dark cloud." The feasting began in September and lasted two to three months. The moths were caught with a net in the rock shelters. Sand was heated with large fires, moths placed in oven in burning hot and covered up. They cooked in a few minutes, and were picked out of the hot sand with sharp sticks. Jardine says the moths were "nutritious and palatable," having the "flavour of marrow (I have tasted them myself." The Aborigines went up to the mountains looking very thin and miserable, but returned in from 2 to 3 months looking fat and sleek. He said, "The gins are not

permitted to eat this food, so are sent in the forest to collect roots etc. during the feast." Jardine estimated that the Aborigines must have eaten several tons of moths during their two to three month stay each year.

**Howitt (1904: 693)** describes a meeting between a friend of his and two young men of the Ngarigo tribe, about the year 1840 at the Snowy River near Barnes's Crossing (near Dalgety): "one of them carried two peeled sticks each about two feet long, and with notches cut in them, which they told him reminded them of their message. The sticks were about one half-inch in diameter. Their message was that they were to collect their tribe to meet those of the Tumut River [Walgalu] and Queanbeyan [Ngunawal], at a place in the Bogong Mountains, to eat the Bogong moths."

**Tillyard (1926)** states (p. 442) that *Agrotis infusa* Bd. (= *spina* Gn.) (Agrotinae), the Australian Bugong or Bogong moth, frequently appears in countless numbers in the Southern Alps, and in dry seasons along the eastern coast. It sometimes swarms in Sydney, becoming a nuisance in houses. Tillyard notes that the moth was an important article of food for the aborigines, who made a dough or paste from the bodies.

**Gale (1927: 57-58; vide Flood 1980: 67, 70)** was told by Mrs. John McDonald of Uriarra, A.C.T., on whose property the Aborigines gathered to feast on Bogong moths that: "It was the yearly custom of the blacks to assemble from all the neighbouring districts, with their gins [women] and piccaninnies, to some hundreds in number, for the purpose of feasting on the grubs...These were gathered by the majority of the congregated blacks and gins, while a small detachment remained at home to prepare for the cooking or roasting of the grubs." According to Mrs. McDonald, the moths were cooked on a very large flat rock slab behind the homestead, and derived the name "Uriarra" from "Urayarra" which meant "running to the feast." McDonald's evidence is contrary to several previous reports suggesting that moth hunting was strictly a male activity.

When Robinson visited the Monaro in July 1844, he commented (**Mackanness, ed., 1941: 328; vide Flood 1980: 70**): "The natives of the low country and of the mountains assemble in large numbers in the fine season to collect the Boogong fly, a species of moth found in myriads in the higher altitudes of the mountains. They are extremely nutritious and the natives subsist during the season entirely upon them, they are called Cori by the Omeo, and Boogong by the Yass blacks." According to Flood (1980: 70), Coree is the name of a mountain in the Australian Capital Territory, on which both moth aestivation sites and Aboriginal campsites have been found.

**Payten (1949; vide Flood 1980: 73-75, 81)**, based on the recollections of old settlers of the Jindabyne district, states, regarding the Bogong moth (p. 1): "From Eden, Bega, Braidwood, Tumut, the Upper Murray, and Gippsland the tribes wended their way to the tablelands and thence to the foot of the main range. Here a halt was made to observe certain formalities before commencing the feast of several months' duration, usually November, December and January. For these three months the aborigines feasted on the moth, to them a great delicacy and a food which was both plentiful and easily acquired." Payten continues: "The excursions of these tribes and groups were contrary to the usual fixed tribal boundaries and knowing the ways of the Aboriginal we would expect that such a migration would be carried out under proper rules and procedures." Payten (pp. 2-4) describes in detail the "formalities," rules and procedures governing the moth hunting. Pitched battles between the New South Wales and Victorian tribes are mentioned, but "old hands" were firm in insisting that these were intertribal battles and not mere local brawls.

Payten (p. 2) states: "That the Bugong moth was important to their mode of life is self-evident from the long distances travelled and the arduous journeys entailed. The Upper Murray groups in order to participate in the festival made the gruelling ascent up along the ridge near Leather Barrell Creek to the tops at Kosciusko. The ascent is as steep and rough as it is long, for the track leads up what is probably the biggest single drop in Australia."

**Common (1954)** conducted studies on the biology, ecology and behavior of the bogong moth, *Agrotis infusa* (Boisd.) (= *Euxoa infusa* and *A. spina* Guenee), shedding much light on the mystery of the origin of the vast number of these moths that congregate on granite outcroppings in the mountains. Moths of the spring generation migrate to the mountains where they aestivate gregariously from early November until early April, the months when the "moth camps" are occupied by the aborigines. In the late summer and autumn, the moths migrate back to their breeding grounds at lower elevations in New South Wales and southern Queensland. The fat-body of aestivating moths during summer and autumn was well-developed, the average fat content of the abdomens of males exceeding 61% and of females 51% of their dry weight.

Bogong moths were apparently preservable enough to be carried down from the mountains as **Wilkinson (1970: 7-9; vide Flood 1980: 67)** says: "The Bogong moths caught in the mountains named after them were a great relish with the blacks. After being properly cured for eating they were more like prunes than anything else. They were carried about in Coolamons (the hollowed out bend of a tree)."

**Hughes (1974: 121-127)** discusses the ecological and physiological basis for the seasonal migrations of the Bogong moth.

**Flood (1976: 42-44)** quotes, regarding details of the organization of moth-hunting, from an early

description by a European settler:

The excursions of these tribes and groups were contrary to the usual fixed tribal boundaries...The pilgrimage halted on these corroboree grounds at foot of the main range for two reasons. Firstly, the exchange of greetings and ensuing social ceremonies. Secondly because they were not permitted by tribal laws to proceed to the tops until a certain rite had been performed.

This rite was performed near two large granite rocks on the Big Bugong, by an advance party. Bull roarers were used and the ceremonial was accompanied by much noise and shouting. On completion of the rite a smoke signal was put up and only then, never before, the tribes assembled on the corroboree grounds broke up into their separate groups and proceeded independently to the tops. Eventually reaching the tops some groups camped there, others built their mia mias [shelters] lower down in more sheltered positions making a daily excursion to gather the moths. There is some evidence to show that the groups did not wander over the tops indiscriminately, but that each group may have had its own pitch. A chief known as Dicky Cooper brought his group to the same place year after year. This locality came to be known as Dicky Cooper's Bugong.

Flood comments that the concept of each group having its own pitch would be a practical way of dividing long mountain chains amongst a series of groups coming from both sides of the range.

**Josephine Flood (1980)** conducted an exhaustive study on the use of the bogong moth (*Agrotis infusa*) by the tribes of southeastern Australia, and concludes that they were a major food source. From reviewing the previous literature (12 references) (pp. 61-82) she notes (p. 82):

Of these sources, seven describe the effect of the moth diet as rendering the Aborigines fat, sleek, and in excellent condition. A considerable amount of moth feasting is implied to achieve this transformation. Those authorities (five) who mention the duration of the moth hunting all write in terms of two months or longer each summer. The moths are described as being available in 'great numbers', 'multitudes', 'millions', 'myriads', etc. by eight of our eleven sources, and three describe them as a favourite delicacy of the Aborigines.

Flood continues:

There is thus a high degree of consensus (and no contra-indications) among the ethnohistorical sources that Bogong moths were available in large quantities for a considerable period and were a highly-prized food on which at least the male Aborigines grew fat during the summer months. Although moth hunting was primarily a male activity, there are indications that moths were ground into a paste and carried down in coolamons to the valleys to the rest of the tribe.

Flood continues:

. . . the large quantities of moths and their ease of gathering make them the most reliable summer food source in the Australian highlands, as I found from personal experience when experimenting in 'living off the land' in the Brindabella Range of the A.C.T. one summer. As a favourite food of the upland Aborigines, moths would be given high priority in the annual scheduling of food, being preferred to other foods that were available at the same time. Thus Bogong moths were both part of the annual seasonal subsistence round, and also the means to support large seasonal congregations of people for such essentials to tribal society as shared ceremonial life, marriage and trade.

Flood (pp. 109, 112) considers the moths to have been prized food for all of those tribes whose territories included major moth-aestivation sites, i.e., the Walgalu of the upper Tumut, the Ngarigo of Monaro, the Djilamatang of the upper Murray, the Jaimathang of Omeo, and the Minjambuta of Mt. Buffalo, as well as several other tribes. Flood describes in detail many of the campsites and also tools used, such as "moth pestles." Flood emphasizes (p. 76 and elsewhere) the prime importance of the social aspects of moth hunting, indicated by the fact that, although the highland tribes could have feasted independently on moths within their own tribal territories, they gathered together for moth feasts.

**Oliver (1989: 174-175)** notes relative to collecting the *bogong* moth, *Agrotis infusa*, that although

most of the people were from the lower elevations of the highlands, some may have come from as far away as the coasts to the east and south, from distances up to 100 miles. Although fights occasionally broke out among the communities, the normal mood was friendly. In fact, the assemblies came to be the occasion for large intercommunity ceremonies, including initiation rites. Oliver states that:

The annual assemblies of moth-eaters were also occasions for trading regional specialties such as boomerangs, spears, baskets, opossum-fur garments, and, possibly, ochre, songs, and elements of the rituals they performed. While the seasonal presence of the moths may have been the main reason for people assembling, the desire to hold intercommunity rituals, and to trade, may have figured, inasmuch as some assemblies included communities from other areas where moth aestivation also took place.

See also in the Introduction: Bluett (1954), Brough Smyth (1878, I), Campbell (1926), Cherry (1991), Irvine (1989), McKeown (1944a), Thomas (1906) and Waterhouse (1971).

### **Psychidae (bagworm moths)**

*Panacela* sp., larva

See Tindale (1972) in the Introduction.

### **Sphingidae (hawk-moths)**

*Coenotes eremophilae* (Lucas)

*Hyles lineata livornicoides* (author?), larva

Aborigines starved the caterpillars of *H. lineata livornicoides* for a day or two before roasting them. According to **Low (1989)**, the cooked larvae have a pleasant savoury taste and can be stored for a long time.

See Reim (1962) and Tindale (1972) in the Introduction.

### **Family unknown**

*Strigops grandis* (author?), larva

*Panacela* sp., larva

**Simmonds (1885, p. 355)** wrote that the large fat caterpillars of *Strigops grandis* are eaten by the aborigines of Australia.

**Matthew (1910, p. 90; vide Bodenheimer, p. 100)** reports that natives of Queensland detect the presence of large lepidopterous wood-borers by the wood-dust they dislodge, which can be seen at the entrance of their holes or on the ground. The grubs are removed by means of a pointed stick and are eaten raw or roasted, the head being rejected. Matthew reports on the basis of personal experience that the larvae are a delicate food, having the flavor and consistency of a soft rice pudding enriched with eggs.

**Basedow (1925)** states (p. 122) that the Wongapitcha and other desert tribes consume quantities of green caterpillars, but usually only at the beginning of the season when the caterpillars have fed on fresh herbs and acquired a sweetish flavor.

See also in the Introduction: Basedow (1904), Bourne (1953), Gould (1969), Hercus (1989), Hiatt (1967-1968), Johnston (1943), Meggett (1962), Meyer-Rochow (1975a) Roth (1897), Thomas (1906) and Tindale (1972).

## **Mantodea**

See Johnston (1943) in the Introduction.

## **Orthoptera**

### **Acrididae (short-horned grasshoppers)**

*Chorticetes terminifera* (author?)

**Lumholtz (1889, pp. 186-187)** mentions swarms of grasshoppers in Queensland and that the women gathered large quantities of them. Their wings and legs were removed by throwing them into the fire, after which they were individually roasted. They tasted like nuts.

The Kaiadilt people of Bentinck Island use a large species of plague locust as food (**Tindale 1966**). The locusts are strung side by side on sharpened sticks and toasted lightly over the cooking-fire.

**Brand et al (1983)** conducted proximate and mineral analyses on the plague locust, *C. terminifera*, and reported the following values: water 67.2%, protein 25.0%, fat 2.0%, carbohydrate, trace, fiber 10.4%, ash 2.0%; minerals (mg/100 g edible portion): Na 101, K 239, Mg 37, Fe 4.0, Zn 9.2, Cu 2.2. Energy was calculated as 499 kJ/100 g edible portion.

See Meggett (1962) and Meyer-Rochow (1975a) in the Introduction.

### **Gryllidae (crickets)**

*Teleogryllus commodus* (Walk.)

See Meggett (1962) in the Introduction.

### **Gryllotalpidae**

See Meyer-Rochow (1975a) in the Introduction.

## **Miscellaneous**

**Froggatt (1923, pp. 9, 10)** discusses forest damage caused by insects in several of the edible groups, but does not discuss their use as human food. Relative to cattle, he mentions that the phytophagous larvae of one species of *Pterogopherus* (Tenthridinidae) sawfly appears sometimes in countless millions, stripping the leaves from the ironbark gums; they congregate at the base of the tree when full-fed and numbers of cattle sometimes die from eating them.

Edible insect galls. See Cleland (1966), Meyer-Rochow (1975a) and Sweeney (1947) in the Introduction. As gall-producing insects occur in five different orders, it is not possible to assign these to families.

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### Items Needing Attention

Pp. 1, 44. Calvert (1894 or 1898?).

Pp. 2, 49. Roth (1897). Need to see Sections 53 and 84 (Fig. 84) of this work.

P. 5. McKeown (1944a, b). Some confusion as to which of these should be attributed for one of the statements made.

Pp. 7, 49. This is a make-shift summary by the author; a firm translation is needed.

Pp. 25, 50. Terry (1941), pages?

P. 45. Dobson (1851), title of paper?

P. 32. Kimber (1984), cossids or hepialids?

P. 46. Fluckinger and Watts (1875), initials?

P. 48. Lumholtz, 1890 or 1900?

P. 50. Winfield (1982), page 80?