SUBFOSSIL INSECTS - A KEY TO PAST DIVERSITY

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It is well known that insects like to hide - during daylight carabids hide under logs or go into hidden recesses in the ground. Weevils lie hidden in trees. But 15m below theground surface, under half a metre of sediment topped by a fetid pool? Cow, sheep and opossum remains slowly decaying in putrid water guard what must have been the deepest, darkest, foulest beetle haven ever found!

This "haven" is actually a 10cm thick layer of sediment in a cave at Waitomo. The well preserved remains of at least 15 species of ground beetle and a dozen species of weevil have been discovered in this unlikely location. They were found amongst hundreds of bones belonging to 18 species of birds. This deposit is unique among those so far encountered in New Zealand, not because of the avian remains but because it is the first time significant numbers of sub-fossil insect remains have been found in caves.

The conditions which permitted the preservation of insect remains resulted in the occurrence of sub-fossil plant remains, mainly seeds, providing data on the adjacent vegetation at the time. Thus a picture of a small forest tarn surrounded by matai, miro, rimu and hinau with an understory of horopito and tree ferns is reconstructed.

Ducks swam on the tarn - takahe, kakapo, weka, kiwi and giant rail roamed the forest floor, along with several moa species. Kaka, kokako and pigeon frequented the trees. Tuataras, several species of native lizards and native frog also wandered about. Now for the first time we know something about the insect life that occurred prior to human contact.

The species represented are all ground beetles or weevils, no doubt because the heavily sclerotosed exoskeletons of these animals facilitate their preservation. The family Carabidae (6 species) dominated, with the remains of 11 individuals being represented. Seven other families of ground beetle were represented by parts of at least 13 individuals. In addition, the weevils were represented by 12 species.

The deposit is either pit fall or stream wash origin and most of the species represented are ground frequenting or flightless species. Most are common in the remnant forests of the area today, eg. *Mecodema crenaticolle* and *Plocamostethus planiuscalus*. *Zeanecrophilus prolongatus* a carrion feeder is often found in cave entrances today.

At least four new species await discription, all of which are probably extinct. One of these is a ground beetle - a new Zopherid, while the other three are weevils. Two of the latter and the Zopherid are large species at least 20mm long. Large carabids have a defence mechanism (they can produce a pungent odour) and those found in this assemblage are still present today. But

other "giant" insects such as two of the extinct species of weevils - one allied to *Anagotus* the flax weevil - would have been prone to predation and are now presumed extinct.

Outlying islands (the last stronghold of many of our "giant" insect species) have in many cases had rats introduced only recently and often their nests contain large numbers of insect fragments. It is pertinent to note that although many vertebrate remains belonging to either birds, lizards, bats or frogs were found associated with the subfossil insects, no remains of kiore occurred. It did occur in the surface layer; thus it seems probable that these insects were deposited some time prior to human contact in New Zealand.

A palynological analysis of the sediment and a study of the remains of seeds also preserved suggests that while these avian and insect remains were accumulating, a podocarp forest with a canopy dominated by rimu was present. Matai, miro, and hinau were also present. The sub-canopy was similar in species composition to that seen in similar forests today. This evidence suggests that this deposit was laid down between 1000 and 10,000 years BP.

Maoripamborus fairburni, the second most common beetle species represented is now restricted to a small area in the Waipoua forest and an area near Russell in Northland.

Sub-fossil deposits in caves have long contributed evidence to show that the vertebrate fauna (birds, reptiles and amphibians) has been greatly affected in both species composition and distribution. These changes are attributable to alterations made to the environment by either man or the predators he brought with him. However this is the first time sub-fossil deposits have contributed evidence to show that changes in our insect fauna parallel those in our vertebrate fauna.

ACKNOWLEDGEMENTS

It is my pleasure to acknowledge the following for their professional assistance:

Dr G Kuschel and Dr J C Watt for identification and information on the beetles.

Dr D Pocknall for the palynological study on the cave sediments and comment on the probable forest type.

Mrs M J A Bulfin for the identification of seeds and Dr T Crosby for commenting on the script.

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OBSERVATIONS OF *Gonorhopterus spinicollis* (Broun, 1904)

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A Note

On 5 May 1982, I collected an adult *Gonorhopterus spinicollis* at Bennetts Siding, Taihape, after having beaten it from a leaf of *Pseudowintera colorata*.

On 31 October, 1982, I was watching this weevil walking around its cage. It was moving around freely at a fast pace and venturing, quite frequently, onto pieces of *P. colorata* which had been in the cage for almost a day. It then went up to the top of one of the twigs where it proceeded to lift each leg, one by one, as if bracing itself. Each leg was lifted off the leaf twice. After staying absolutely motionless for about 30 seconds in this position it suddenly shook the leaf by moving its legs up and down, its body staying still. Immediately afterwards, it spread its elytra and flew onto the glass front of the cage, proceeding as before, to move quickly around. This leaf shaking and flying was repeated twice, later in the day.

On 8 November, 1982 at 6.30 am, *G spinicollis* was on a lichen covered dead branch standing very still. This branch had a diameterof about 2 mm. Its legs went only part way around the branch. I decided to spray some water into the cage and having done this, observed the weevil.

Just after I sprayed the cage, the weevil started making jerky movements from side to side for about 10 seconds pausing between the sixth and ninth seconds - I stopped spraying between the sixth and 8th seconds and as some of the water probably landed on the weevil, it is possible that the spraying triggered these movements.

At 4.50 pm that day, the weevil was off the branch and near the front of the cage on a leaf, once again quite still.

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SILKMOTHS AT AUCKLAND - AN UPDATE

Ruud Kleinpaste

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During the weekend 23-25 April 1983, six adults of the previously unidentified hairy silkmoth caterpillars emerged from their pupae at the PHDS laboratory, Mt Albert. Another specimen emerged on 28 April. The species has now been identified as *Dictyoploca simla* (Lepidoptera:Saturniidae), A native of North India and Pakistan.

The large green caterpillars were found on 9 December 1982 on a *Betula sp* tree in Howick and pupated a few days later. The 'open mesh' cocoon through which the pupa can easily be seen, is spun among the leaves and twigs of the food plant. The adult of *D simla* resembles the gum emperor moth (*Antheraea eucalypti*) somewhat, but can be distinguished by the distinct pinkish colour of the discal region of the hindwing and the light coloured V-shaped area on the forewing which contrasts with the dark brown outer half of the forewing. The wingspan varies from 120-150 mm

D. simla adults fly in autumn and the eggs are laid in rows on the twigs of the host plant where they overwinter. The caterpillars hatch in spring and feed on a wide variety of Dicotyledonous trees - *Aesculus, Juglans, Pyrus, Malus, Prunus, Salix, Betula and Lagerstroemia* have been recorded as hosts. Reference to *D. simla* in the literature are scarce and the species has never been recorded as a serious pest. As could be expected, this silkmoth is rather popular among amateur moth rearers and features in overseas livestock catalogues.

No further sightings of the other new silkmoth species in Auckland have been recorded since our last summary.

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SILK MOTHS IN NZ

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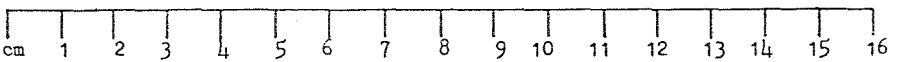
a. Hyalophora cecropia: cecropia silk moth. North America. Wingspan 14-16 cm.
Hostplants: Over 50 species, including apple, ash, cherry, elm, hawthorn, lime, maple, plum, poplar, silver birch, willow.
First found in N.Z. as a caterpillar feeding on apple leaves in a Panmure garden, autumn 1982. Adults have subsequently been recorded from Pakuranga, Panmure, Howick, Bucklands Beach, Ellerslie, Grey Lynn and Maraetai (male). MAF Field Officers have surveyed all areas where cecropia moths had been found during the summer. On one property in Mt. Wellington, two last instar larvae, some infertile eggs and a fresh cocoon were found. In Panmure one old cocoon was found.

b. Samia cynthia: Ailanthus silk moth. North America. Wingspan 9-14 cm.
Hostplants: primary host is Ailanthus altissima (Chinese tree of heaven). Minor hosts include ash, cherry, lilac, liquidambar, pear, plum, privet, sycamore, tulip tree, walnut.
Adults were first found at Albert Park (Auckland central city) at the beginning of November 1982. A search of the lower branches of the 15 m high Ailanthus trees in Bowen Avenue turned up 21 cocoons, some of which produced moths straight away. Adults were also found at Pakuranga and Howick. Eggs and young larvae were found on Ailanthus trees at Pakuranga College on 7 December 1982 and reared to the pupal stage on 5 January 1983.

c. Antheraea sp. pernyi? Oak silk moth. South China. Wingspan 10-12.5 cm.
Hostplants: hawthorn, oak.
Empty cocoons of this species were found at Pakuranga College on 3 December 1982 and three small caterpillars, found on leaves of oak on 2 December were reared. One caterpillar survived and pupated mid January 1983. The identity of this Antheraea species can only be confirmed when the adult emerges.

d. Dictyoploca simla: N. India, Pakistan. Wingspan 10-15 cm.
Hostplants: cherry, silver birch.
Last instar larvae were found feeding on silver birch at Howick on 9 December 1982. They pupated very soon afterwards and moths began to emerge at Anzac weekend, 1983. This species differs from the others in that it overwinters as eggs instead of pupae.

e. Actias selene: Indian moon moth. India. Wingspan 12-16 cm.
Hostplants: hawthorn, holm oak, plum, rhododendron.
A single adult specimen was found flying in a shopping area in Panmure on 31 March 1980, and handed to K.A.J. Wise at the Auckland Institute and War Memorial Museum.



The cecropia moth is a possible pest species in NZ in the absence of its natural enemies, with the caterpillar eating large quantities of leaves of about 50 species of deciduous trees. Horticulture shelter belts and conservation plantings of willows and poplars are the most threatened, as normal spray routines should control the moth in other horticulture tree crops. Other species may not be a major problem, but the apparently deliberate introductions are causing concern.

After the first cecropia moth was sent to MAF for identification it was given newspaper and television publicity. Leaflets describing the differences between this species and the well established gum emperor moth were distributed to householders in the neighbourhood. Field Officers from the MAF made a thorough search of host plants in the area where the original find was made and subsequent reportings. Public response and further surveys produced 5 new species in Auckland.

Sightings were localised and numbers small so far. Four hectares of land around Pakuranga College and nearby park were sprayed by helicopter with a synthetic pyrethroid (deltamethrin) on 15 December1982, organised by the Forest Service and MAF. Other sites where larvae or eggs had been found were sprayed by hand. Another survey was to take place in July when it should be easier to locate pupae on deciduous hosts.

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A FURTHER RECORD OF THE SOUTH AFRICAN DUNG BEETLE *Epirinus aeneus* (Scarabaeidae)

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Emberson & Matthews (1973) reported the presence of the South African coprine scarab *Epirinus aeneus* Wiedemann on the basis of two specimens collected at Waimari Beach north of Christchurch in 1969 and 1971. In spite of sporadic efforts at collecting the species over the intervening years no further specimens have been found from this locality and the long term establishment of the species remained in doubt. Recently a third specimen collected at Waimakariri Lagoon in October 1982 has been seen. This is a minimum of 6 km north of the previous known locality. The specimen bears the data "on top of sand" which while not very precise, does suggest, combined with the locality of the previous specimens, that the species may be restricted to coastal sand dunes. Its habits in the Cape Province of South Africa do not seem to have been recorded.

The new locality and the spread of dates over thirteen years indicate that *E. aeneus* is permanently established in New Zealand although still apparently restricted to a fairly small area and probably not very numerous. Its establishment seems to parallel that of the artificially introduced *Copris incertus* which was unknown for nearly twenty years following its release near Whangarei in 1956.

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NEW GENERIC NAMES FOR RHYSODIDAE (COLEOPTERA): A NOTE

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A key to New Zealand Rhysodidae was printed in *The Weta* 3 (3): 31-32. This included the following typing errors:

page 31, line 10: monoiliform should read moniliform.
line 46: 1975 should read 1875, 1980 should read 1880.

The names of two endemic New Zealand genera are preoccupied, and should be changed as follows:

Tangarona Bell and Bell, 1982 replaces *Tangaroa* Bell and Bell, 1978, not Lehtinnen, 1967 (Araneae: Uloboridae). The type species and only member of the genus is *Tangarona pensus* (Broun, 1880).

Kupeus Bell and Bell, 1982 replaces *Kupea* Bell and Bell, 1978 not Philpott, 1930 (Lepidoptera: Pyralidae). The type species and only member of the genus is *Kupeus arcuatus* (Chevrolat, 1873).

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THE GERMAN WASP: SUPER PREDATOR!

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In most non-marine ecosystems insects play a series of important roles depending basically upon what they eat. Herbivorous insects feed on living, green plant material - stick insects; decomposers feed on dead botanical matter, such as fallen dead leaves - cockroaches; carnivores obtain the required proteins, fats and carbohydrates by devouring other insects. One of the more frequently seen carnivorous insects is the praying mantis Orthodera ministralis, which is common both here and in Australia.

The biology of the mantis is not well known, though Sharell (1982) has recorded his observations, and Forster and Forster (1976) diagramatically illustrated the predator status of the praying mantis in manuka (Leptospermum scoparium Forst) community. Hutchin (1972) states that the mantis need not be hungry to kill and devour other insects, but that feeding reactions are triggered by the mere presence of food.
A mantis is capable of overpowering insects of its own size or larger as evidenced by the capture of a Katydid, Caedicia simplex observed at Titirangi, Auckland, in March 1983(G.W. Ramsay, pers. comm.). In this case only the head was devoured.

The mantis does have its own natural enemies, for it is preyed upon by various solitary wasps. Sharell found that a small wasp, probably of the genus Podagrion parasitises the eggs of the mantis by laying its own eggs within the viscid mass of the mantis' egg capsule before it hardens. Hutchin found that in America the adult mantis is the prey of a solitary wasp, Tachytes, which when it locates its prey "...hovers about it, darting at it now and then. In time the mantis tires or perhaps becomes careless. In any case, the wasp eventually darts down

and grabs the mantid's neck-like prothorax with her legs. Then with lightening-like speed, she plunges her sting into the body of the mantis, which at once becomes unconscious. The wasp's next act is that of dragging the body of the mantis into her burrow where it will serve as food for her young."

It is not known whether the adult mantis is predated by solitary wasps in New Zealand. However, it is prey of the German wasp, Vespula germanica.

The German wasp is cosmopolitan in its choice of food, being omnivorous; it shows no preference between either botanical or invertebrate food and will often be seen eating honey dew. Observations by both Gibbs (1980) and Kleinpaste (1980) have added to the list of invertebrate prey taken by this wasp.

In this latest incident, which occurred midday on 20 March 1983, the attack sequence was not observed and whether the wasp initiated the attack on the praying mantis or vice versa is not known. The observation started with the mantis lying prostrate, ventral side up, on the ground. The wasp was standing over the mantis in a head-to-head position, biting through each of the mantis' formidable grasping forelegs in turn at the coxa-femur joint. The dismembered legs were not eaten and at no time did the wasp attempt to sting the mantis. With the legs removed the wasp then severed the head from the thorax at the joint and proceeded to devour it. At this point the wasp was disturbed and took flight carrying with it the remains of the head.

The headless body of the mantis when placed on its legs continued to move and sway in the manner so characteristic of this insect. Such movement was observed for some 15 to 20 minutes prior to the mantis being placed in alcohol for preservation.

The slayer of the formidable mantis must indeed be a 'super' predator.

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A REVIEW OF RECORDS OF SPIDER BITES ON HUMANS IN NEW ZEALAND INCLUDING SOME PREVIOUSLY UNPUBLISHED RECORDS

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The serious effects of the bite of the Katipo spider (Latrodectus katipo Powell)are well known. Hornabrook(1951) gives a detailed historical review and the Department of Health publishes periodic statistical information in their publications(see references). In the period 1967-76 there were 23 cases of hospitalisation following katipo bites. During the same period there were a further 14 cases of hospital admissions following bites by other spiders (usually unidentified). The potential importance of the red-back spider (L. hasselti Thorell) as a danger to humans if it becomes established in New Zealand is well documented.(Sutherland and Trinca, 1978.)

Most spiders possess poison glands and are capable of biting humans provided their chelicerae are sufficiently powerful to penetrate human skin but because of behavioural patterns, some spiders will not bite anything other than insects caught in their webs. There are however, a few recorded instances in New Zealand of spiders, other than katipo, biting humans with significant effect. (Myers, 1927, Chamberlain, 1947 in Watt,1971) These were:

Dipoena blattea Urquhart (Theridiidae)
Hexathele hochstetteri Ausserer
Porrhothele antipodiana Walckenaer(Dipluridae)
Ixeuticus subfasciatus (syn. I.martius) Simon(Desiidae)
Cambridgea foliata Koch (Stiphidiidae)

In addition, Watt describes the effects of bites on himself by a Miturga sp. (Clubionidae) and Dysdera crocata Koch (Dysderidae). Forster and Forster (1973) add Araneus pustulosus Walckenaer and A. transmarina syn. A. brouni (Araneidae). More recently Sunde (1980) describes four cases from the Auckland region of bites from Lampona cylindrata Koch (Gnaphosidae).

Recent submissions to the Plant Health Diagnostic Stations at Auckland, Levin and Lincoln have confirmed the aggressiveness of some of the above species and have provided a few additional records as follows:

(1) Chiracanthium stratioticum Koch (Clubionidae)
On 26 January 1979 a 2½ year old by was admitted to the Christchurch hospital overnight following a bite on the hand. The boy was said to be playing with spider webbing when the spider rushed out and bit him. The bite was initially painful and part of the hand swelled up. A number of species of this genus are known overseas to inflict painful bites with severe effects. (R R Forster, pers.com). Another Clubionid, a Miturga sp. has been recorded twice in New Zealand, inflicting bites. In contrast the native Uliodon sp (Clubionidae) was recorded as biting a man at Wanganui on 12 September 1982 with no apparent effect.

(2) Unidentified Salticidae
In Auckland on 27 March 1979 a person(age and sex unknown) was bitten, resulting in swelling and pustules around site of bite.

(3) Trite sp(Salticidae)
At Dannevirke on 12 April 1983 a woman was bitten on the leg resulting in swelling and pain. Ebeling (1975) records one case of a bite by a Salticid in the United States.

(4) Steatoda sp. (Theridiidae)
Since 1981 there have been three records from the Auckland area of minor but painful bites.

In addition further records are available from species already known to bite:

(1) Araneus pustulosus (Araneidae)
Five records have been received including two when a significant effect was caused. Overseas cases of bites are recorded from the USA from an Araneus sp. (Ebeling,1975) and from Australia from A. transmarinus (Southcott 1973).

(2) Dysdera crocata (Dysderidae.)
There are four records of bites including one from Auckland where a man was bitten resulting in swelling and severe pain. Cook (1965) states that "Dysdera is one of the few spiders that will attack rather than retreat from molestation. This aggressiveness combined with the imposing size of the Chelicerae, has given Dysdera an undeserved reputation". Mascord (1970) states that several severe bites have been recorded from this species in Australia.

(3) Lampona cylindrata (Gnaphosidae)
A further record occurred in Auckland on 10 May 1983 when 2 members of a family were bitten. Symptoms were said to be diarrhoea, severe itching, reddening and swelling of the body. This spider has also been responsible for severe bites in Australia (Mascord,1970).

Another case of a bite from a Miturga sp. was obtained from an article in Treeline (1981) which describes a female school teacher being bitten when she was on Mt Fyffe near Kaikoura. The symptoms were described as dizziness and nausea and she was hospitalised for four hours.

The dangers from spider bites in New Zealand can be put in perspective by comparison with Australia. Two deaths from katipo bites were reported in New Zealand in the eighteenth century. Both records are second hand and the deaths occurred many years prior to the dates of the reports. (Hornabrook , 1951). As far as can be ascertained (Department of Health , Occasional paper 19, 1982) no other deaths from spider bites have been recorded in NZ. By contrast, in Australia, Atrax robustus Cambridge (Sydney funnel web spider) has been responsible of 10 deaths up to 1970. No specific antivenenes are available against this spider (Mascord, 1970).. The redback spider (L.hasselti) was responsible for 13 deaths up to 1959 in Australia. An antivenom to this spider has now been produced and has prevented further deaths. Mascord also records severe bites from Australian spiders not established in NZ, including A. formidabilis Rainbow (tree funnel web spider),

Selenocosmia crassipes (Bird eating spider). The violin spider (Loxosceles reclusa) Gertsch, which has recently become established in Australia has been responsible for many unpleasant bites in the USA (Ebeling, 1975).

It is interesting to note that Ixeuticus robustus Koch which is established in parts of the North Island has not been associated with biting records in NZ although it has been responsible for severe bites in Australia. (Mascord, 1970)

ACKNOWLEDGEMENTS

Permission from Mr P S Dale, Officer in Charge, Auckland Plant Health Diagnostic Station; and Mr D C M Manson, Entomologist, Levin PHDS, to publish records from their specimen files is much appreciated.

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TABLE TOP PETS

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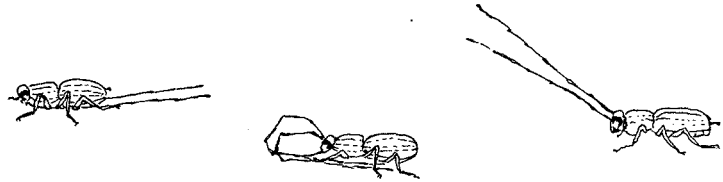
Entomology Division DSIR
Private bag Auckland

In mid-November 1982, when the little grass stem anthribids, *Euciodes suturalis*, were flying, we found many of them included in sweepings of pasture which we were checking for the spotted alfalfa aphid. I became fascinated by the extraordinarily long antennae of the males (Penman, 1978) and wondered how on earth they cope with such out-of-proportion appendages. They were suffering from excess heat and humidity on arrival at our lab. and not really coping very well even with their legs. I took one of the little males home to watch it move around and while having dinner, let it out of its container onto an envelope. He amused us for the duration of the meal by walking to the edge of the paper, then turning around and walking back to another edge. Never once setting foot onto the tablecloth (perhaps the colour didn't please him!). Most of the time he held his antennae erect and slightly forward waving from side to side (was he picking up vibes or maintaining his balance?) Every so often he appeared to trip ove them as they got too low, and did not stop to re-adjust antennal height but kept walking, each pair of feet eventually stepping over them until they were dragging along underneath his body and trailing out behind.



After several minutes of travelling in this manner, he would stop and physically pull his antennae "out front" again with his front legs and carry on. The longer I watched the more convinced I was that he simply put them"out back" when he didn't need them or was tired of holding them erect, and that they really are an awkward nuisance!

Another table top pet we watched last summer was the strange rectangular colydiid beetle , *Rhitidinotus squamulosus* which walked around the edge of a square ceramic and cork tile. He insisted on walking along the vertical face which made cornering rather difficult. I have often admired the way drivers of articulated vehicles manoeuvre around a tight corner but watching this rigid beetle makes a truck driver's life look pretty simple.

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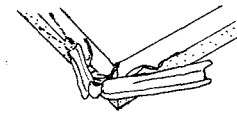

EATERS OF LONGHORN LARVAE

Wendy Pond

47 Makora Waiheke Island

In Fiji, Futuna, Niuafo'ou and Sāmoa large longhorn beetles of Olethrius spp. produce wood-boring grubs which are eaten with relish, as is the huhu grub of Prionoplus reticularis in New Zealand. In Niuafo'ou, these grubs are called afato or 'ofato, and are prized as a delicacy when the larva is fully grown and has stopped eating, preparatory to becoming a pupa. In NZ, the cognate word awhato is given to 'vegetable caterpillars', the larvae of Porina spp. invaded by Cordyceps fungus.

This pop song was composed by Kitione Mamata, a Tongan Wireless operator, during a term of service in Niuafo'ou. It was sung at kava parties by the Malua-o-Vailahi group.

'OFATO

'Ofato ko e mafi 'ofato totolo
Ka foto 'o ka soso
'Eke 'e ha sola ko si'ene fie'ilo
Fanongo he hake pea mo e hifo
'I si'ono 'eke'i holo pe ko e hā hono ifo
Tama 'oua e pehe'i si'oto kakala manako.

'Ofato afenga 'o si'ete faka'aho
Tu' he la'a tu'u he hako
Ke toli mo fili hao manako 'ene anganofo he taulalo
Viki e lelei fakama'unga ki ai 'ete manako
Taha'i kuonga ne lato he foaki 'a e taumama'o
Pohopoho lava, ko ia koa ho fakamalo?

'Ofato hingoa 'o si'ete sia ngako
'Efinga si'ete 'ilo
Pitenga si'oto ifo, pununga'anga 'o e manako
'Ofa loto 'i si'oto mahu he 'ikai ngalo
Fiu hono kumi holo, ta na'a te tuku 'i loto
Ki si'ete kopate malu ko e 'akau popo he vao

Kitione Mamata, 1967

And the English translation by Wendy Pond -

'Ofato, the champion creeping grub
Appearing amongst crowds
The inquisitive visitor wants to know,
Having heard in the comings and goings
Having asked around, what does it taste like?
Fellow, don't mention my favourite grub.

'Ofato, my diversion at luncheon
Be it fine, be it windy
Take your pick from its compliant lowly haunt
Praise its excellence, the mainstay of my craving
Each generation was satisfied with God's creation
Goodness gracious, was that His gift?

'Ofato, my jar of dripping
My hamper of food
Metropolis of my taste, nest of desire
From love of plenitude, never forgotten
Fed up with searching? Look! I left it here inside
My coolsafe, the bush-felled rotten wood.