The "'ofato worm": *Olethrius scabripennis* Thomson, 1865 (Coleoptera, Prioninae); an unusual source of natural protein from the remote island of Niuafo'ou, Kingdom of Tonga.

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As part of a long-term survey of Pacific butterflies, a planned attempt by the first author to reach the remote Tongan island of Niuafo'ou in 2018 fell foul of the vagaries of haphazard ferry and air schedules, both renowned for last minute cancellations. Whilst waiting for a non-existent aeroplane and a ferry that didn't materialise, other islands were visited and many local people were asked about Niuafo'ou. None had been there, but all had stories of the delicacy 'ofato, a succulent 'worm' which occurred only on Niuafo'ou.

In 2023, the first author returned to the Kingdom of Tonga. On Tongatapu, the main island, a series of 'ofato pictures displayed on a mobile telephone taken by a recent visitor to the island were accompanied by a firm declaration that it occurred only on Niuafo'ou. Reminiscent of the witchetty grub in Australia, a collective name given to larvae of certain cossid and hepialid moths or cerambycid beetles, this was clearly the larvae of a large insect. The photographs suggested a large beetle, which seemed unlikely to be restricted to that island. Following many delays,

again due to transport difficulties, the first author reached Niuafo'ou in March 2023.

It was confirmed that the 'ofato was the larva of a large beetle; in order to resolve species identification and geographical distribution the authors endeavoured to make a small collection of the larvae and adult beetle. The third author is very familiar with 'ofato and its habitat; we negotiated the slope of the Niuafo'ou crater rim and found an area of flat, wooded land where we selected a trunk which, although standing, was clearly in the late stages of decay. We found it riddled with tunnels and a number of live 'ofato larvae (Fig. 1) and female adults of a longhorn beetle species (Fig. 2).

Longhorn beetles comprise a huge beetle family with a broad distribution comprising more than 33,000 species in 5,200 genera worldwide. The Cerambycidae alone have more than 1,400 species in 300 genera and many have a significant destructive impact on the timber industry and forest / orchard trees. Pond (1983) noted that "In Fiji, Futuna, Niuafo'ou and Sāmoa large longhorn beetles of *Olethrius* spp. produce wood-boring grubs which are eaten with relish …". Our 'ofato adults were at first tentatively identified as *Olethrius tyrannus* Thomson, 1860 (Cerambycidae, Prioninae), but with advice from the Natural History Museum in London (pictures sent *via* the internet), reassessed as *O. scabripennis* Thomson, 1865, which we now confirm. Vitali (2008: 2-3) outlined the confused history of the nomenclature of this group of beetles which have very recently been revised (Ślipiński *et al*., 2023). The type locality of *O. scabripennis* is Fiji; distribution of the species includes Papua New Guinea, the eastern islands of the Solomon Islands (San Cristobal and the Reef Islands) and northern islands of Vanuatu (Banks group). It is widespread on the Fiji Islands. Records of *O scabripennis* from New Caledonia refer to a different species, possibly undescribed (Ślipiński *et al*., 2023: 163-165).

Olethrius scabripennis is a large beetle which is unlikely to be overlooked, especially as adults are in some seasons attracted to artificial lights on Niuafo'ou. The reason why it is widely believed throughout other Tongan islands to be endemic to the small island of Niuafo'ou is a mystery. It is possible that the fact no form of pesticide is used on Niuafo'ou has allowed a beetle population (and perhaps other invertebrate populations) to thrive to a degree where adults are more conspicuous than they might be

Figure 1: Dead *Rhus taitensis* trunk ravaged by *Olethrius scabripennis*.

Figure 2: *Olethrius scabripennis* adult under bark.

Figure 3: Fully grown 'ofato.

Figure 4: Plate of 'ofato.

on other islands. Although it utilises many different tree species, it only develops in dead wood so, unlike the widespread Rhinocerus beetle, *Orcytes rhinocerus* Linnaeus, 1758 (Scarabaeidae, Dynastinae), a significant pest on young coconut trees and oil palms in Fiji and elsewhere

in the Pacific, it is not considered an agricultural pest. Although *O. scabripennis* prefers mango trees on Niuafo'ou, it also utilises a variety of other tree species, including coconut, the giant hibiscus (softwood) and the Casuarina or Ironwood (hardwood). The condition of the wood (dry, and free from fungal infection) seems more important to the beetle than the species. With a small human population, Niuafo'ou still has plenty of natural forest in comparison to other Tongan islands, where a need for firewood quickly removes naturally dead wood possibly resulting in fewer breeding opportunities for the beetle. The distinctive Rhinocerus beetle, found on other Tongan islands (*e.g*. Niuatoputapu, Vava'u, Tongatapu) appears, according to local people, to be absent from Niuafo'ou.

Figure 5: Schoolboy eating raw 'ofato.

Figure 6: Pupae (ta'upo'ou).

The wood-boring 'ofato larvae, known as mulipuni, grow to several centimetres in length and excrete tightly packed 'faeces' of chewed wood as they tunnel below the outer surface of the wood. When they are fully grown and have stopped eating, larvae are prized as a delicacy, eaten either uncooked (Figs. 3, 4, 5), or lightly fried. The pupal stage, known locally as ta'upo'ou (Fig. 6), is said to be 'creamy' inside, with a crusty 'biscuit-like' outer skin – to some aficionados (including the second author), this is the tastiest of the forms eaten. Even when there are numbers of larvae and

adults present, the substantial tunnels the larvae make as they chew their way through rotten wood never meet. Some local people claim that ‘ofato that have fed on the wood of a dead coconut tree are tastier than those that have fed on other trees. The adult beetle is known locally as ‘kivikivi’.

In addition to larvae in all stages of growth we found adult beetles under the bark and with the intention of photographing them out in the open placed them on a variety of vertical twigs and trunks … with limited success, since as soon as an individual was released, it immediately scrambled nimbly upwards and attempted to fly off the highest point. The plate full of larvae we collected (Fig. 4) in a short space of time from this one tree: *Rhus taitensis* (Anacardiaceae), known as Rhus, Sumac (Australia) or Tavahi (Tonga) were gladly given to a pregnant lady who was said to be experiencing a craving for ‘ofato! Three adult female *O. scabripennis* were deposited in the collections of the Natural History Museum, London.

The ’ofato is so great a delicacy and so revered locally that a song was composed in its honour by Kitione Mamata, a Tongan Wireless operator, during a term of service in Niuafo’ou in 1967 (Pond, 1983). It is still performed in the lakalaka, a group action song performed whilst standing (usually when the King is visiting the island). The song remains especially important in Tongan culture and is incorporated in the UNESCO World Heritage programme.

‘OFATO

‘Ofato ko e mafi ‘ofato totolo

Ka foto ‘o sōsō

‘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'u he la'ā 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 koā ho fakamālō?
'Ofato hingoa 'o si'ete sia ngako
'Efinga si'ete 'ilo
Pitenga si'oto ifo, pununga'anga 'o e manako
'Ofa loto 'i s'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

A translation of the song was provided in 1983 in *The Wētā* journal by Wendy Pond, to whom we believe we should acknowledge the translation; it is reproduced here,

'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.

Eating large insect larvae is not unusual in the Pacific Region: in New Zealand Māori prize the "huhu grub", the larva of the endemic *Prionoplus reticularis* White, 1843, another longhorn cerambycid, and the heaviest beetle in New Zealand. In addition to a substantial protein content they are a rich and valuable source of fat in remote areas where food is scarce. Huhu flavour has been likened to both 'buttery chicken' and peanut butter, akin to the stated peanut butter flavour of the Australian witchetty grub (which the first author confirms). In these days of global food shortages, perhaps we're missing a trick somewhere?

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