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SUSCEPTIBILTY OF TERRESTRIAL AMPHIPODS, ESPECIALLY *TARA TARANAKI,* TO POSSUM CONTROL OPERATIONS

(Short Answers in Conservation Science)

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SUSCEPTIBILITY ;OF TERRESTRIAL AMPHIPODS, ESPECIALLY *Tara taranaki,* TO POSSUM CONTROL OPERATIONS

SUMMARY

The role and nature of *Tara taranaki* are described. Its links to other species are considered; and the possible effects of possums on the species is discussed.

It is likely that 1080 poison is highly toxic to amphipods, but no matter how poisonous it is to *Tara taranaki,* its use is likely to be far less damaging in the long term to this species than are the effects of an uncontrolled possum population.

INTRODUCTION

Terrestrial amphipods are land Crustacea unique to those lands that once formed part of Gondwanaland or islands of the Indo-Pacific region.

Zoologically and biogeographically they are very interesting in being one of the few groups to have conquered land. Their solutions to the problems associated with land dwelling are unique and thus make them of considerable importance. Zoologically, they are arguably much more interesting than better known groups, for example the moa, and have the advantage of still being alive.

They not only exist, they thrive in most parts of the country. Many species (eg, *Puhuruhuru aotearoa* and *Parorchestia tenuis*) achieve some of the highest biomass values ever recorded for New Zealand animals. They live in land, in forests of all types, and in damp grassland, both indigenous and adventive. Where-ever it is damp enough and leaf litter is available, there will be amphipods. However, one or two species are thought to be extinct, and others have a very limited distribution.

Terrestrial amphipods eat dead plant matter, especially lignocellulosics. They disrupt the structure of wood by rasping and chewing with their mouthparts. They are extremely efficient grinders, thus they disrupt the structure of wood and expose its constituents to digestion. They can digest cellulose and hemicellulose, but not lignin. Thus, 80% of the plant wastes can be utilised by these organisms. Life plant material is not eaten.

They are active at night and may climb trees to obtain forage; *Tara taranaki* is a tree climber.

The females bear their eggs in a special brood chamber, and the young have direct development.

In the forest they are major routes for the mineralisation of plant wastes, so are very important in the long-termed health of the forest.

Some species are small, ranging up to 3 mm in length. Most average about 12 to 15 mm in length, but one or two species are (or were) much larger: up to 25 to 40 mm in length.

SYSTEMATICS AND DISTRIBUTION

This is being reviewed by me in a volume of the Fauna of New Zealand due out later this year. I have enclosed a key to the species taken from that publication.

There are a number of genera, most of which are sympatric, and species, most of which a allopatric. One species is introduced from Australia. It has spread widely throughout the North Island and the northern South Island in disturbed habitat from which it excludes the native species.

Of the native species, some, such as *Parorchestia tenuis* and *Puhuruhuru aotearoa* are widespread and common, living everywhere on the two main islands except Canterbury and North Otago. Other species have a limited distribution. The genus *Tara* consists of species with a limited distribution. Most live at mid-

altitudes. Only *Parorchestia lesliensis* is known to be limited to higher altitudes, although many common species occur from sea-level to well above bush line.

TARA TARANAKI

This is the largest terrestrial landhopper species known in the world, but it is very poorly known. I found it in only two collections in museums throughout New Zealand, the USA and Europe. All the specimens in these collections had been collected in the vicinity of Dawsons Falls. I have searched extensively in the same vicinity, but the specimens I found, though still large, were much smaller than those in the two earlier collections made 35 and 40 years ago. In the area I explored there was considerable sign of possum damage. Nor did I find any climbing tree trunks as did one of the earlier collectors.

The male of *Tara taranaki,* when turned upside-down, has the most fearsome looking "pincers"; these are normally held under the body and cannot be seen. They are not used for defence or aggression, but for manipulating the female during copulation.

In the area I explored it was reasonably common, though not in the high densities that *Parorchestia tenuis* exhibits further down the mountain. It has a low density or is absent under pepper tree.

Recently, it has been shown that carnivorous snails are specially adapted for capturing amphipods. Ground foraging birds also eat them extensively. And some strange invertebrate predators appear to take them when they are moulting: flatworms and peripatus are examples.

Tara taranaki can be recognised by its colour, brown, and its large size (although it seems not to be as large as formerly). It lives under thick litter in the daytime, and scuffles about on its side when disturbed, but does not jump as do smaller, and more active species. At night, it walks about on the surface in an upright position, which looks most awkward because it is laterally compressed so that it stands "tall and thin" and seems as though it will overbalance at any time. However, they do not, and the lateral compression of the body enables them to slip sideways through the litter at a considerable speed.

LIKELY IMPACTS OF POSSUM ON *Tara taranaki*

The possum competes for vegetable matter with all herbivores and first-stage decomposers. High numbers of possum will result in low numbers of other herbivores. Possums will also cause floristic changes in species composition toward less-palatable species. This will affect the amphipod.

Possums have also been reported as eating "grubs" if they come across them. I have no doubt that larger specimens of *T. taranaki* would be consumed if they were encountered while climbing near a possum.

Thus the two main impacts are a reduction in available food, which would affect density, and predation on larger individuals, which I have already shown in other species causes a reduction in mean size and density in amphipod populations.

EFFECTS OF REDUCTION IN *T. taranaki* POPULATIONS

Any reduction in amphipod numbers (biomass) would affect those animals that feed on them: invertebrate carnivores, such as the carnivorous snails, and ground-feeding birds.

Diversion of lignocellulosics away from amphipods into possums would also result in a poorer nutrient return to plants, and a greatly impoverished soil structure. Crustacea eat at night and live in the litter during the day where they deposit their lignin-rich faeces and mineral-rich urine in the soil, well below the soil surface, and usually in the near vicinity of the feeding roots of plants. Soils where amphipods are common are dark, rich, friable loams. When examined under the microscope such soils appear to be comprised of little dark cylinders, which are amphipod faeces.

Thus, besides the immediate and well known deleterious effects of possums in their direct actions on plants, they have a number of indirect impacts which also affect desirable plants and animal species, such

as the carnivorous snails.

THE EFFECT OF INSECTICIDES ON ARTHROPODS

DDT has been shown to be highly toxic to terrestrial amphipods (Duncan, unpublished). Amphipods seem susceptible to all insecticides tried. The compound 1080 is known to be quite toxic to arthropods from the work of Dr C. Eason and others. It is likely, therefore, to be toxic to amphipods if eaten in sufficient quantities. Amphipods eat stock food, so if the poison is contained in stock food pellets, then there could be significant mortality. However, if applied on broadleaf or using an attractant such as aniseed, then amphipods are much less likely to be affected. Again, if fresh plant extracts are incorporated into a stock food formulation, then amphipods are less likely to be affected. Amphipods like dead plant matter where the plant's natural defences have been destroyed. Thus the incorporation of catechol or diphenols into stock food formulationswill be inhibitory to all normal herbivores other than browsers, such as the possum.

My opinion is that 1080 is a very suitable poison, but further research is needed to ensure that the bait targets the pest species as closely as possible. Work carried out by myself and students at the University of Canterbury showed that the incorporation of phenol-rich, fresh plant extracts into normal stock food formulations was highly attractive to possums, but far less attractive to non-target species. This work is still progressing with an attempt to produce better possum and rabbit baits.

In any case, possum damage is so serious to *Tara taranaki* that the best strategy is probably to vigorously attempt to control the possum by all practical means. Any decrease in *Tara taranaki* numbers will be only temporary (I hope) and the species will recover to occupy its key role in the ecology of the system, to the betterment of all components of the system.

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