

# WHAT MADE THESE TRACKS?



A guide to assist in  
interpreting the tracks  
of small mammals,  
lizards and insects

*by Warren Agnew*

# ACKNOWLEDGEMENTS

- Department of Conservation,  
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## WHY MONITOR?

With the Black Trakka monitoring system we can now gain an accurate picture of the animals living within an area. From the city section to the small block and the large land area monitoring is playing an increasingly important role in enabling a better understanding of the environment. There is the use of the system to determine baseline data before restoration projects begin. There is the discovery aspect of new species and the use of the system in allowing accurate estimates of toxins needed in control operations.

With better understanding of mammal tracks we can now identify male from female through the footprints and individual animals through the size of their feet.

Control the rats, plant to encourage birds and you may well rediscover the dawn chorus we all so enjoy.

At our home in Mahurangi Heads the richness of the birdlife is quite extraordinary. Tui, fantail, warblers, whiteyes, moreporks, pigeons all breeding successfully in an area where predators have been dramatically reduced.

This Mahurangi scenario could be reproduced in towns and cities across the whole country.

We now have the techniques and the tools to do the job.

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# PLACING A TRACKING TUNNEL

If you have a bush area, a few trees or an area of long grass, place your tunnel or tunnels on any obvious pathways. Animals move along fencelines and around streams and pond edges making these sites good places for tunnels. If you are placing a tunnel under a tree, consider covering the tunnel with sticks and or grass so that it has the appearance of a hole.

Try hanging a piece of tinfoil above the tunnel so that it will act as a visual stimuli. Stoats can be attracted from a distance to a tunnel they would otherwise not detect.

Another technique is to place a section of mirror on the outside of the tunnel. A piece 5cm by 5cm is sufficient. A glazier will cut you a piece which you then stick to the tunnel using a double sided tape. Stoats become annoyed by the image of what they consider to be another animal and will run around looking for it and track through the tunnel.

A cheap lure for mustelids is a section of chicken neck. These are readily available in the supermarket. Place the lure on a leaf on the inked section.

We had a female stoat living under our fowl house and it came out to eat at 10.30 am, 1.30 pm and 4.30pm daily.

For rats, mice and hedgehogs, peanut butter is a great lure. If you don't want a mass of tracks just place a fingernail sized blob on the inked section of the card. Smooth, crunchy, salted, unsalted all seem to be appreciated.

Lizards like banana, pear, and sometimes a blend of banana and honey. Place your lure in a milk bottle top and position this on the ink. You may like to experiment with more than one lure in the tunnel.

You might discover a better lure.

You may obtain insect tracks and they can be very small so use a magnifier to study your card.

If you catch an insect try placing it on the inked section of a card. You can begin compiling a data base of insect tracks. If possible measure and photograph your specimen.

*Warren and Lois Agnew*

# MICE TRACKS

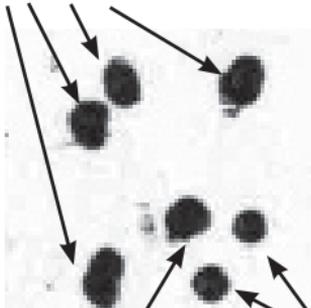


Mice tracks have the same pattern as rat tracks but are smaller. If we magnify the track images x10 there are measurable differences in the feet size of different animals. This can become important in eradication programmes when densities have been lowered and

individuals are targeted. They have 4 toes on the front feet and a central pad.

The back feet have 5 toes and the central pad is split. There are 2 raised bumps behind the central pad.

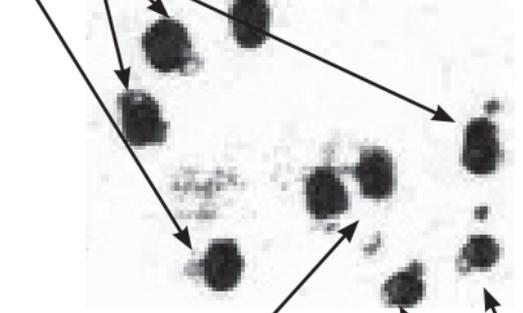
FRONT FOOT  
TOES



CENTRAL  
PAD

Small  
raised  
bumps

HIND FOOT  
TOES

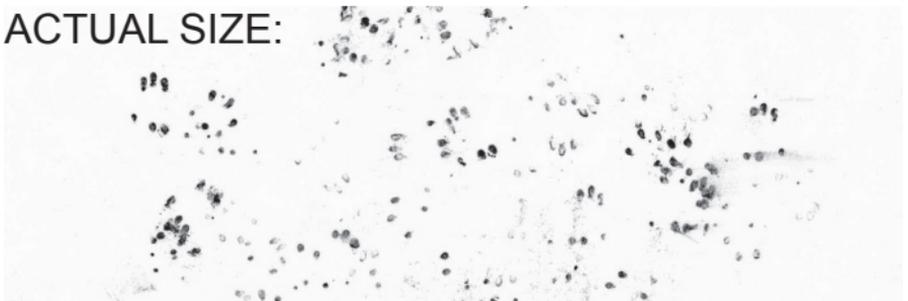


SPLIT  
CENTRAL PAD

Small  
raised  
bumps

These tracks are from the right feet. Note how the hind foot has been placed outside of the front foot. Female mammals have a wider pelvis than their front shoulders. These tracks have been made by a female mouse.

ACTUAL SIZE:

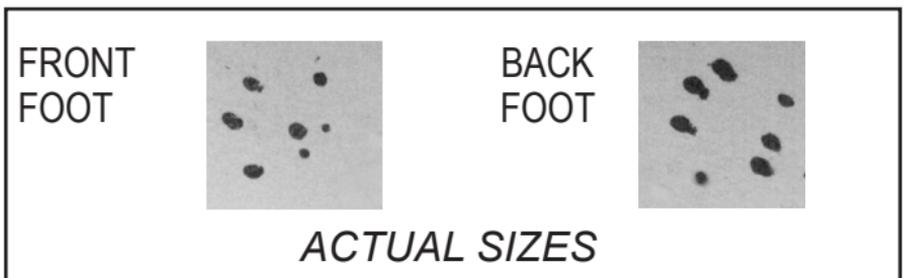
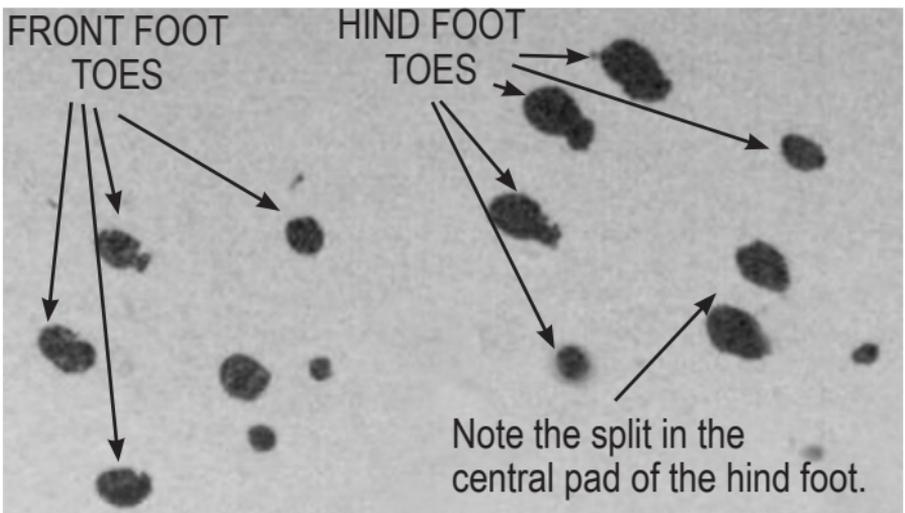


# RATTUS RATTUS TRACKS



Here we have below a front foot and to its right a back foot. Both feet are on the right of the animal. As the back foot is placed to the right of the front foot this animal is a female.

## ENLARGED VIEW



Rats have 4 toes on the front foot and five on the back foot. All 4 feet are the same width. Females have a wider pelvis than their front shoulders hence the back feet on females are placed outside of the front.

Feet sizes range from 8mm - 22mm. Measure at the widest part toes 1-4 or 1-5

# STOAT TRACKS



One night my wife and I were woken by a series of unusual and very loud calls which we thought were similar to the cry of a species of nocturnal petrel which fly across the North Auckland peninsular from their burrows on Little Barrier Island to feed in the Kaipara Harbour.

A few days later my wife Lois came to tell me that

there were a pair of brown eyes looking out from under our fowl house. She thought they were those of a mustelid.

And so began an interesting few weeks. We set up tracking tunnels a metre or so from the fowl house and placed Black Trakka monitoring cards in each tunnel along with some chicken meat as a lure.

On one tunnel I fixed a "Dick Smith" camera which we linked to our TV set.

We didn't have long to wait before our stoat came into view. We could tell it was a stoat because of the distinguishing black tip on its tail. The animal had a finely shaped head and jaw which indicated it was a female.

She ate voraciously and after a while had three eating times: 10.30 am, 1.30 pm, and 4.30 pm. We obtained a large number of sets of tracks on our recording cards. The feet of the animal were interesting. The front feet were 10 mm in width and did not splay when it was carrying food under the fowl house. We couldn't see under the fowl house as it is too close to the ground.

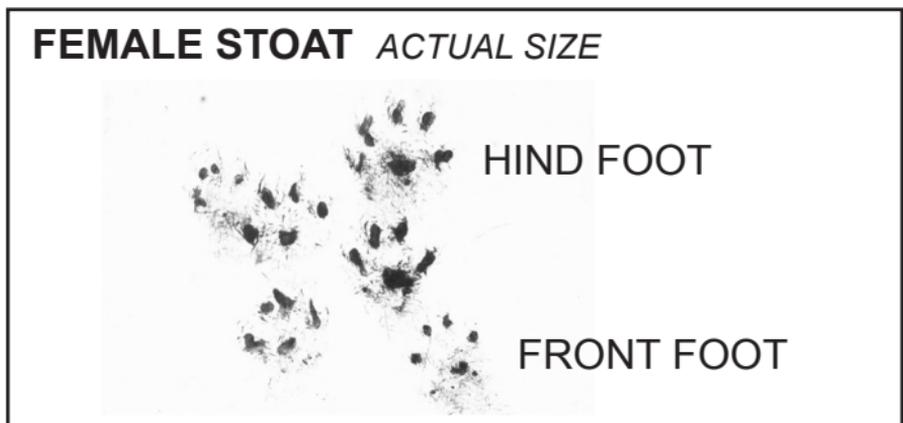
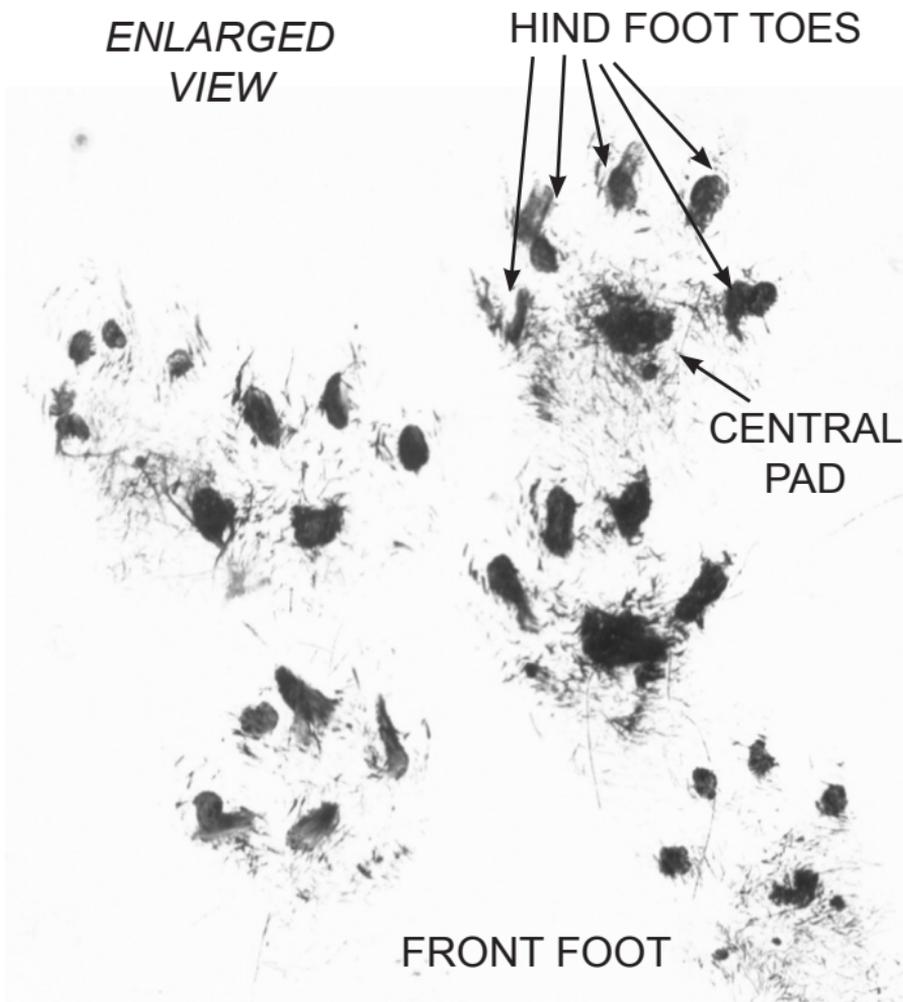
The back feet were 15mm in width. We obtained hundreds of tracks and there was virtually no variance in the size of the feet.

At one point the cards recorded a larger number of tracks and when I studied these I realized they were the tracks of another animal. The difference in size between the front feet and that back feet was much smaller. I now know these are tracks of a male stoat.

On one occasion I placed a tracking tunnel forty metres from the fowl house and placed a child's colourful spinning windmill close beside. The stoat went through the tunnel. Following a heavy downpour the stoat disappeared.

A few months later while working with stoats on a research project at Landcare Research, I was amazed when a

stoat began to call. It was the same call that had woken Lois and I. It was a huge booming call that on a still night would travel for hundreds of metres and is obviously an effective communication system for stoats. When I expressed my amazement to the Landcare Technicians, as I had never read of stoats making a loud call, they were able to inform me that the calls weren't unusual. I went back down to Landcare with Ass. Professor Dianne Brunton and while we recorded a series of stoat calls we unfortunately did not hear the loud call.



# TARGETING INDIVIDUAL ANIMALS

## Stoat tracks recorded in monitoring tunnels at Karekare

Scientist Peter King has had several lines of Gotcha Traps monitoring tunnels set out for 9 years as part of a rat control programme in a wider study of the effect of rat numbers on other species.

The tunnels are spaced at 50m intervals within the lines. Lines 2 and 3 are 100m apart, lines one and three are 600m apart, lines 4 and 5 are 100m apart ten and six about 200m apart.

He did not use lines 7, 8, and 9 in this particular project.

Peter discovered a kereru egg lying on the ground. The egg appeared to have come from a tree which was within his study area. By the damage to the shell it was clear the egg had been predated. Peter took advice and concluded the egg had been removed from a nest by a stoat.

He placed Black Trakka monitoring cards in his tunnels along with the Connovation stoat lure Erayz to monitor for stoat tracks.

Stoat tracks were immediately recorded in 6 of the tunnels in lines 1, 2 and 3.

Study of the tracking cards showed that the tracks recorded in the 6 tunnels had all been made by the same animal, as the measurements of the feet were identical. Further, the tracks recorded were those of a male as the variation in the comparative widths of the front and back feet were in the range of 10-12%.

Peter then renewed the tracking cards, each lured with Connovation Erayz, in the 6 tunnels that had been tracked by the stoat.

He also placed a Groucher trap at the end of each relured tunnel. The Black Trakka tunnels and the Groucher traps are of similar dimensions allowing an animal to move freely from one to the other.

On the first night the traps were set, Peter caught a male stoat. No further stoats were caught.

The pigeons laid a further egg for a chick was later hatched and successfully fledged.

With increasing ability to identify individual mustelids by the use of the Black Trakka monitoring cards and the success of the Connovation lure consideration should be given to the targeting of individual animals as demonstrated so successfully by Peter King.

# WEASEL TRACKS



To further examine the tracks of mustelids I have had a number of weasels and stoats caught live to run the animals through Black Trakka Tunnels and across monitoring cards. My friends the conservationists Willy and Robyn Ducre recorded the valuable observations contained in this booklet.

We were able to sex and weigh the animals.

As with the stoat that lived under my fowl house for a summer, the female weasels have back feet that are some 50% wider than their front feet.

With male weasels and stoats there is a much smaller difference between the size of the feet. The back feet are about 10% wider than the front feet.

The size of the feet vary between individual animals. Thus it is quite possible to identify and determine how many different individuals you have in an area.

It appears that weasels place more pressure on the heel of their foot than do stoats.

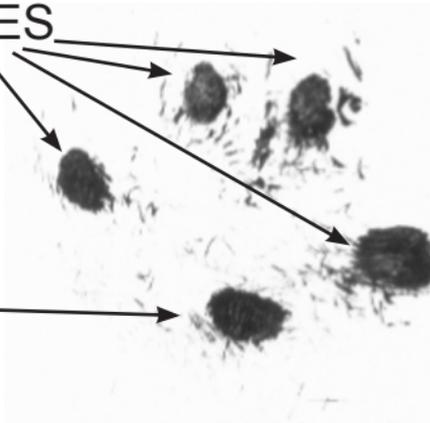
Central pads are usually well defined. As with the stoat, the underside of the weasel feet are covered in fine hair.

When caged, weasels move so fast they are difficult for the human eye to follow.

# FEMALE WEASEL TRACKS

HIND FOOT TOES

CENTRAL PAD



*ENLARGED  
VIEW*



FRONT  
FOOT

**APPETITE:** In 36 hours, 2 nights and one day, a male weasel (96gms body weight) ate 138gms of raw possum leg. These animals are voracious eaters and blindingly fast.

HIND FEET

*ACTUAL  
SIZE*

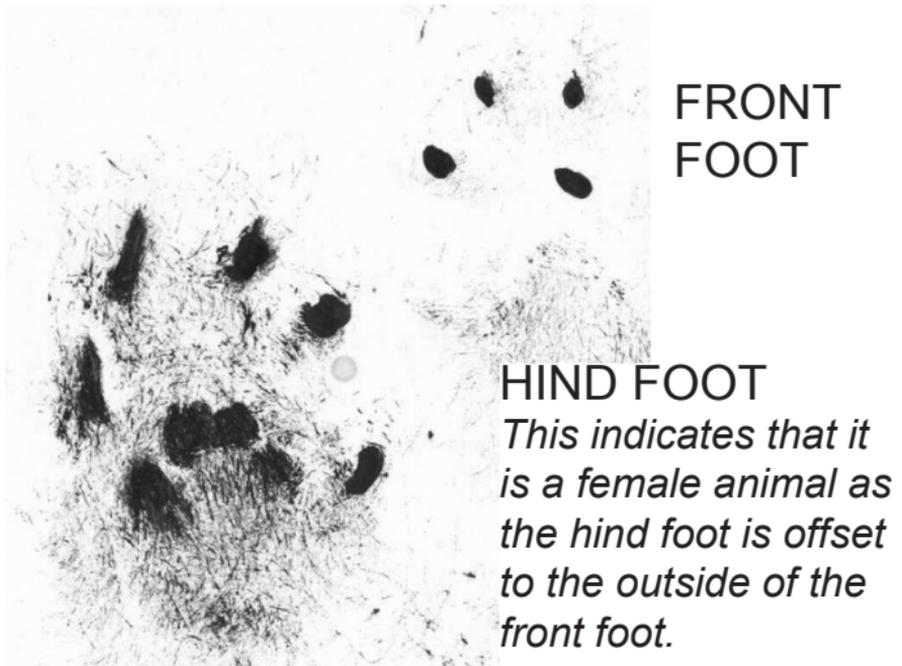
Weasels appear to only track 4 toes on the hind feet

# FERRET TRACKS



As with weasel and stoats, ferrets have very fine hairs covering the underside of their feet. They track 4 toes on the front feet and five on the back. The female has hind feet 50% wider than the front feet.

There is a marked difference in the central pads of the hind feet of ferrets as the central pad is tracked as four distinct sections.



# POSSUM TRACKS



The front feet are smaller than the back. the claws are 1-1.5cm out in front of the central pads which comprise 4 main sections. The feet are circular in shape.



*ACTUAL SIZE*

# MALE HEDGEHOG TRACKS



These tracks have been made by a male hedgehog. Note how the hind feet are placed in line with the front feet. If it was a female the hind feet would place outside of the front.

As a young student I lived in Auckland and had laying fowls. I bought replacement pullets (young hens) and one night I heard one of the pullets crying out. It had been dragged by the neck some 30 metres from our section where I found it held by a hedgehog. I released it unharmed.

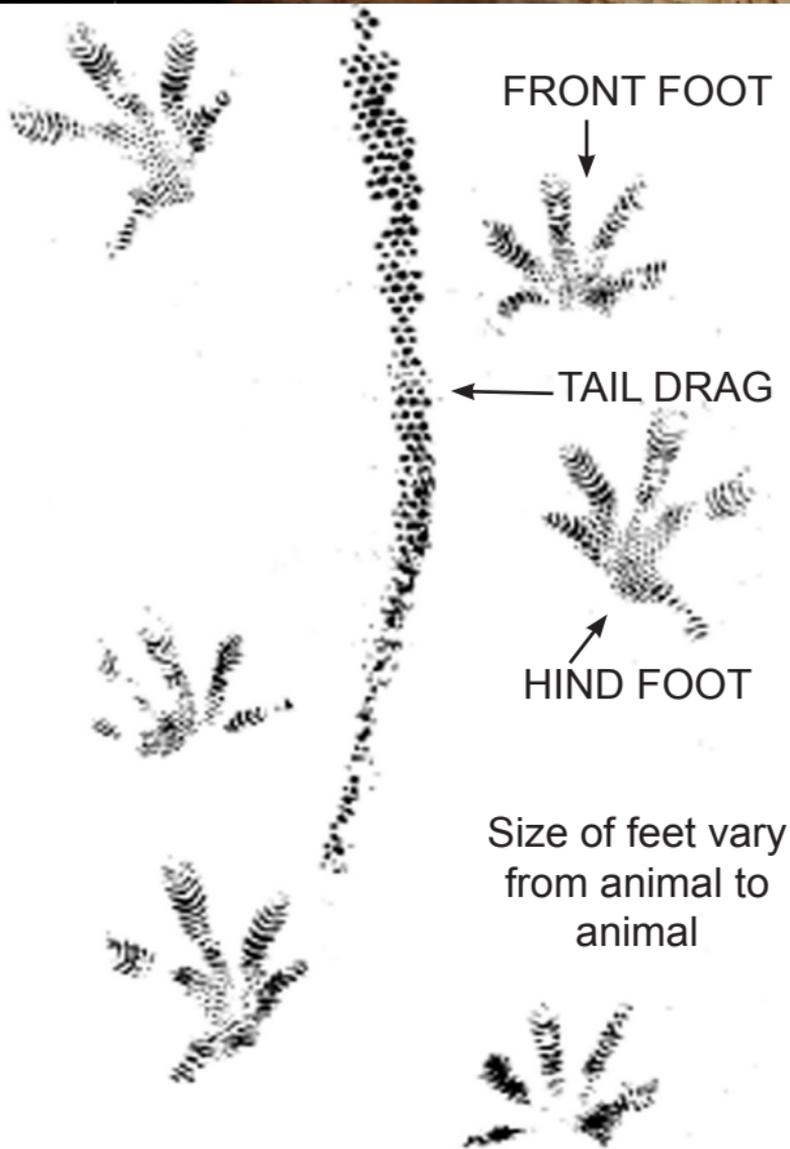
# TRACKING TUNNEL DISCOVERY ON TIRI

When volunteer Russell Fulton checked the tracking tunnels - set by DoC to monitor for rodent incursions on Tiritiri - he found a set of strange prints on a Black Trakka monitoring card. These were confirmed to be prints of a New Zealand brown gecko - probably Common gecko or Pacific gecko. A subsequent survey of the area at night found probable sign of geckos living in the crevices of cliffs near the tracking tunnel site. A brief search during the day of the cliff face and nearby rock outcrop found four brown geckos. Because the geckos were deep in rock crevices, their identify could not be confirmed, but it seems likely that they are the common gecko *Hoplodactylus maculatus*, a native New Zealand gecko which is actually quite rare on the mainland, but reaches greater numbers in places where introduced mammals have been eradicated.

Gotcha Traps tracking tunnels and monitoring cards can be left out for long periods and this provides a robust system for detecting rodents, lizards and other creatures that may be living in an area. Graeme Ussher (Natural Heritage Scientist, Auckland Regional Council) says "Tracking systems like these are extremely useful in helping to determine the presence of species that are difficult to locate."

"We have had gecko prints in our tunnels before in other places, but to find a species that was thought not to be present on Tiritiri is a real bonus." This discovery brings the total number of lizard species on the island to 3 (copper skink, moko skink, unidentified brown gecko), still well short of the estimated 10 species that once lived on Tiritiri, however DoC hope that other geckos or large skinks may also have survived on the island and may slowly make their presence known as their numbers increase.

# GECKO TRACKS



Size of feet vary  
from animal to  
animal

Gecko Footprints Enlarged

# SPECIES-SPECIFIC IDENTIFICATION

Thorough research on the foot morphology of New Zealand lizards has been possible through the use of tracking tunnels for species-specific lizard identification and estimating relative population abundance.



**COMMON GECKO**  
(*Hoplodactylus maculatus*)  
*Semi-Aboreal species*





**DUVAUACEL'S GECKO**  
**(Hoplodactylus duvaucelii)**  
*Semi-Aboreal species*





**GREEN GECKO**  
**(*Naultinus elegans elegans*)**  
*Aboreal species*





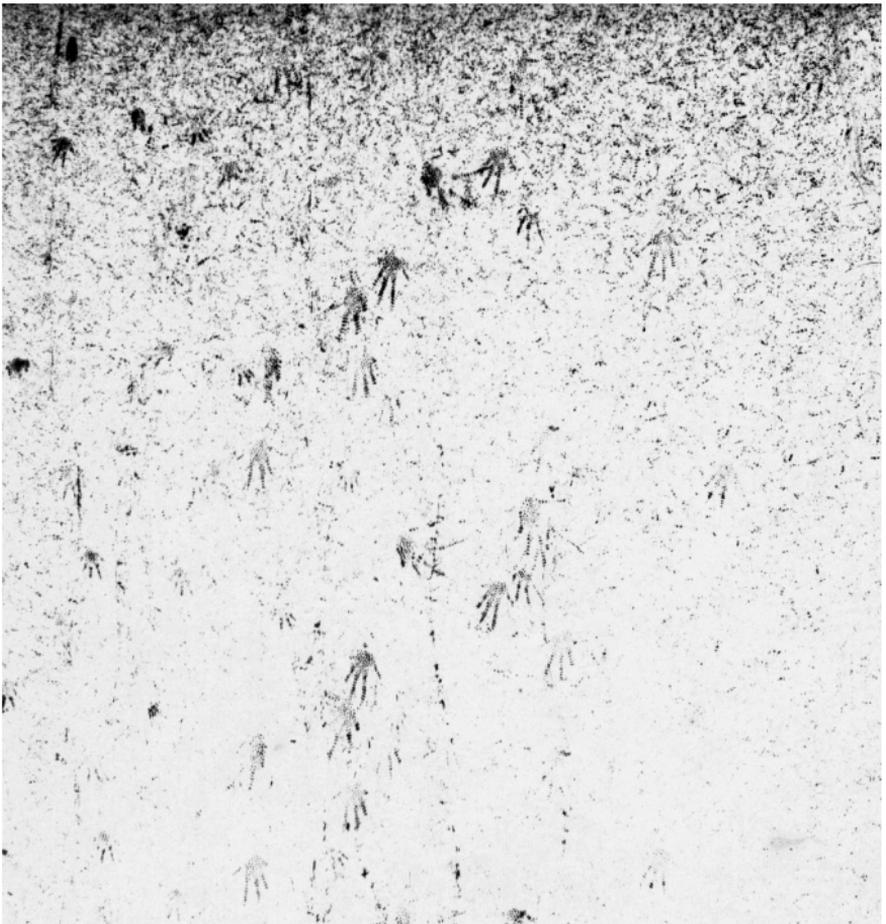
**FOREST GECKO**  
(*Hoplodactylus granulatus*)  
*Aboreal species*



# SKINK TRACKS

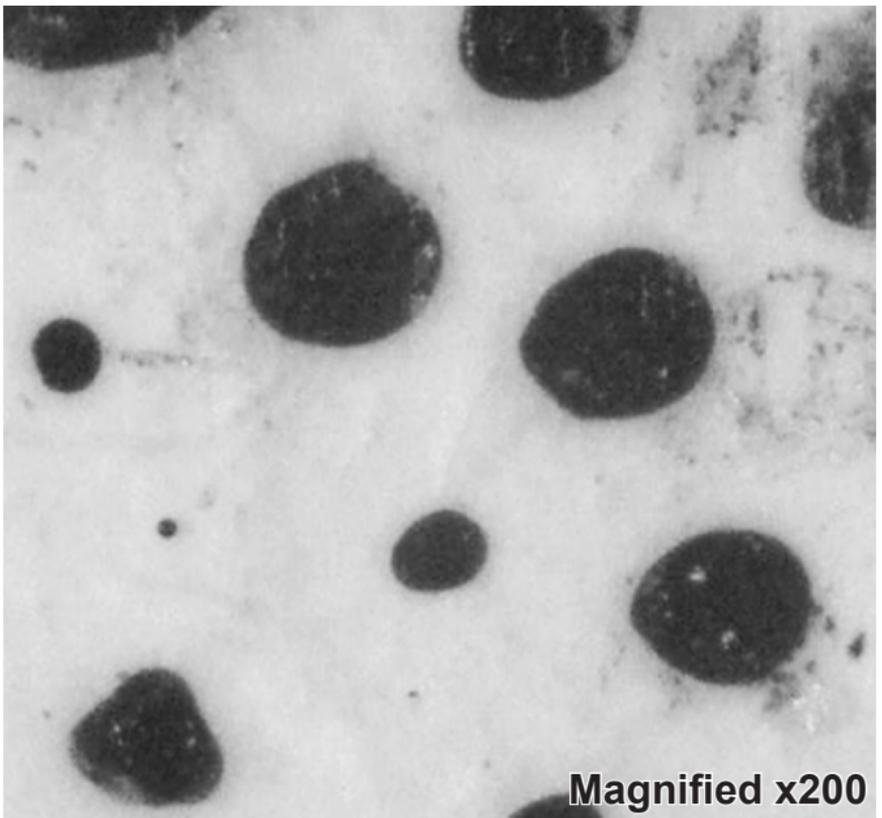
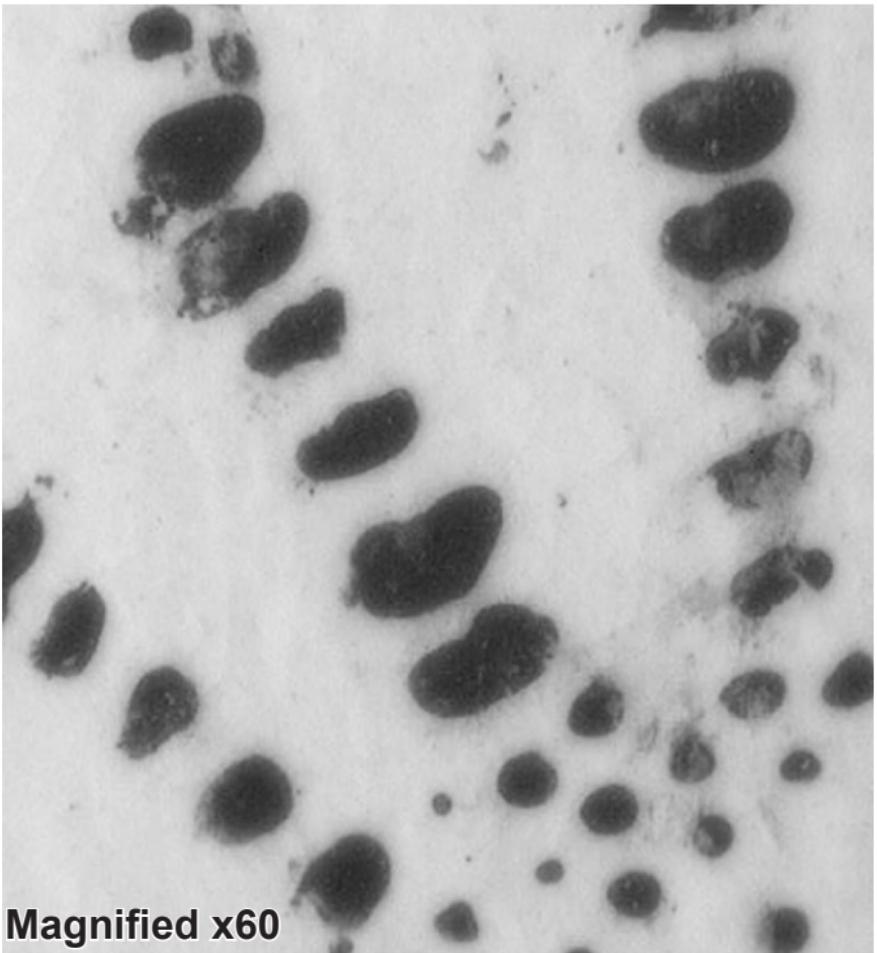


Skink tracks are often recorded. The tracks can be magnified and at 60x and 200x the lamella on the underside of the feet can be readily observed.



**ACTUAL SIZE**

# SKINK TRACKS





Moco



Hindfoot



Forefoot (variants)



Whitakeri



Hindfoot



Forefoot (variants)



Ornate



Hindfoot



Forefoot (variants)



Waimatense



Hindfoot



Forefoot (variants)



Otagense



Hindfoot

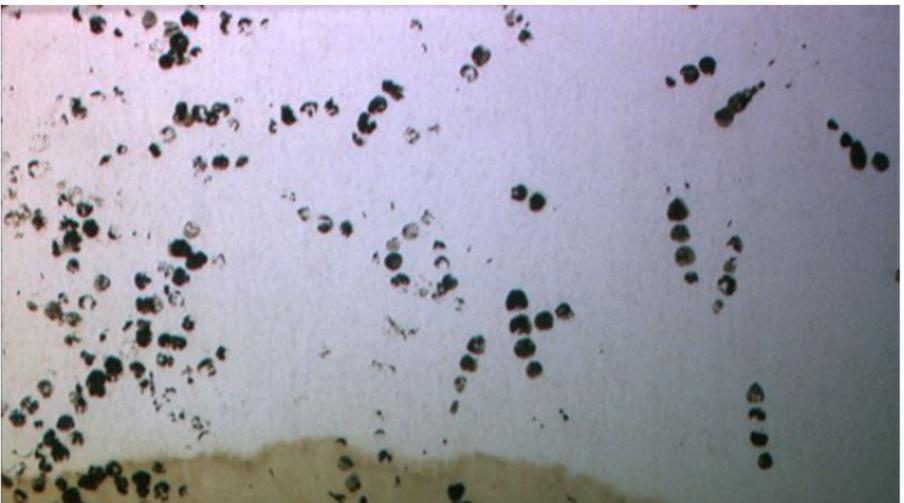


Forefoot (variants)

# GROUND WETA TRACKS



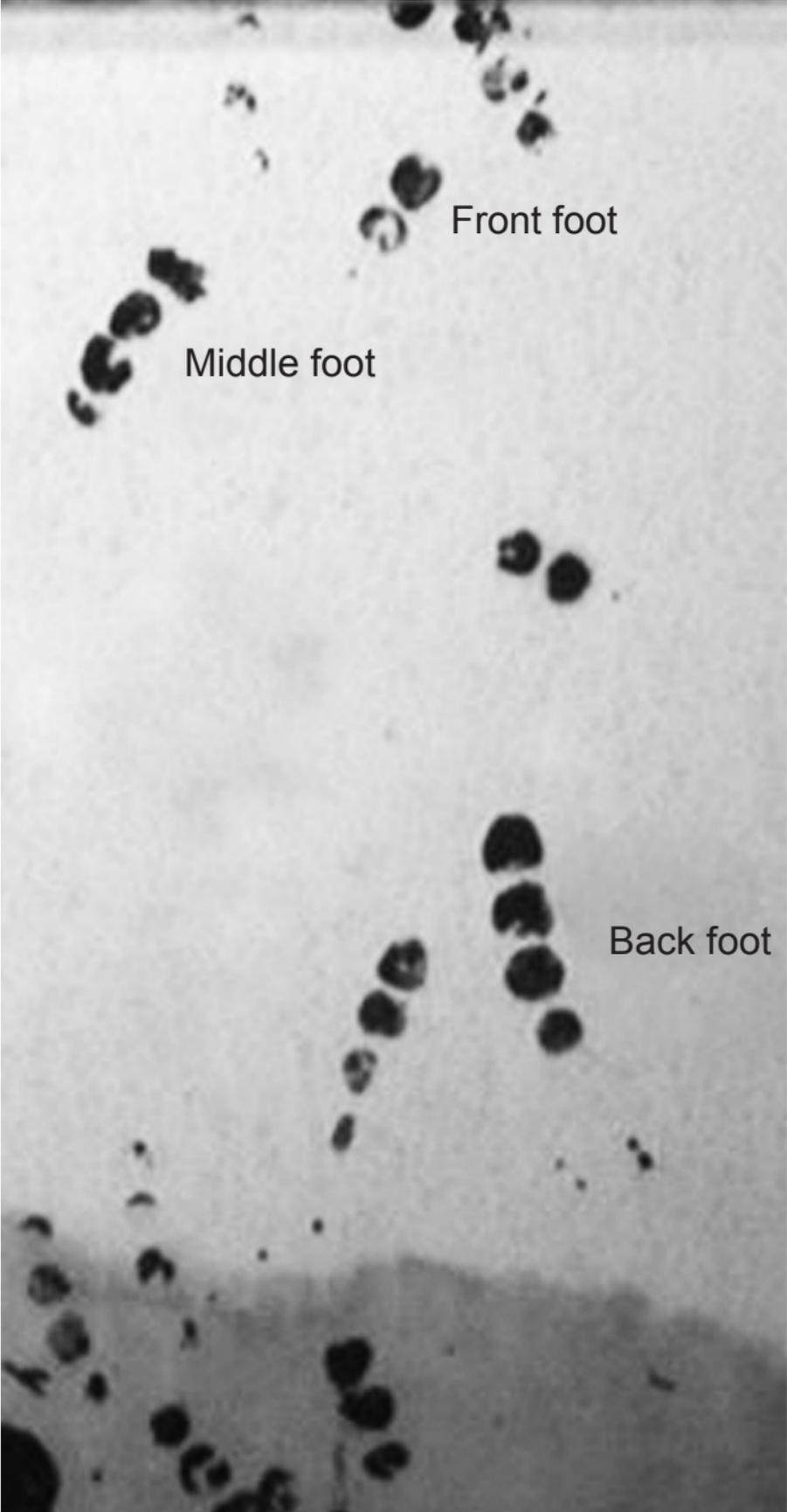
The Black Trakka system is being used in research programmes on the Giant Weta. The animals are lured by peanut butter. The pad structure varies on different species.



In cave Weta three of the four pads on the hind foot are merged into one large pad.

# GROUND WETA TRACKS

Enlarged



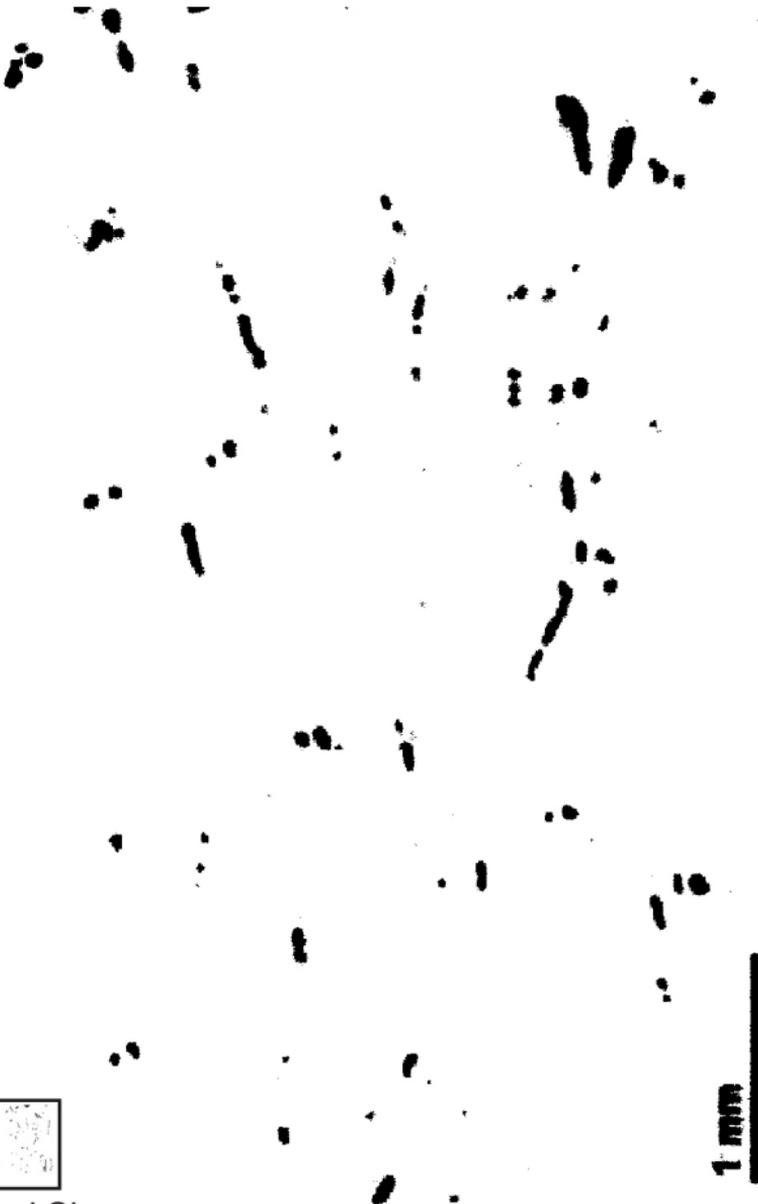


# ANT TRACKS

These ant tracks have been magnified 30x. The tracking ink has been developed to allow for such small animals to track without them

becoming trapped in the ink.

Both the viscosity and tack of the ink allow for sufficient ink to be retained on the feet and yet still flow down to the underside to make track recording possible.



Actual Size



# BLACK COCKROACH TRACKS



Magnified image of the Black Cockroach tracks,  
often mistaken for Weta tracks.

# CARABID BEETLE TRACKS



# EUROPEAN EARWIG TRACKS



Image magnified approx 5x

NOTES: