# Risk of FeraCol baits to non-target invertebrates, native skinks, and weka

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## ABSTRACT

A paucity of data regarding the effects of FeraCol® baits (8 g/kg cholecalciferol) on non-target species was addressed by laboratory and pen evaluations of the acceptance of these baits by snails, earthworms, honeybees, weka, and skinks, and their effects on these species. Exposure to cholecalciferol did not kill earthworms, snails, or honeybees at the concentrations tested, therefore the risk of primary poisoning of invertebrates by FeraCol® paste is considered low. Following exposure, cholecalciferol residues (3.5–68.7 µg/g) were detected in earthworms, but not in snails. However, the risk of secondary poisoning to birds that feed on earthworms is considered low due to the relatively low cholecalciferol concentrations found in the earthworms, combined with the low toxicity of cholecalciferol to birds. Captive native skinks offered non-toxic FeraCol® bait (paste and cereal block) for three days, in the absence of alternative food, did not accept either bait type. Because the risk of exposure to these bait types appears low, the risk of primary poisoning of free-living native skinks by FeraCol® baits is accordingly considered to be very low. Captive weka consumed small quantities of non-toxic FeraCol® paste, but due to the apparent low toxicity of cholecalciferol to birds, and the low exposure risk, free-living weka are considered unlikely to be at risk from acute cholecalciferol toxicosis through primary poisoning.

Keywords: FeraCol, cholecalciferol, toxicity, invertebrates, skinks, weka, residues, non-target species



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# 1. Introduction

Although controversial at times, the use of vertebrate pesticides remains the cornerstone method of most pest management strategies in New Zealand, especially for introduced rats (*Rattus* spp.) and possums (*Trichosurus vulpecula*). Over recent years there has been a growing demand to expand the range of vertebrates pesticide products available to pest managers. This has led to the development of alternative baits, such as FeraCol® paste and block baits. Considerable effort goes into developing alternative and improved products and methods of pest control, and it is important to assess the risks of new products to non-target species. Such data allow the benefits of controlling pests by using poisons to be balanced against the risks.

Bait products containing the active ingredient cholecalciferol, such as FeraCol® baits (8 mg/kg cholecalciferol), have been developed for possum control as alternatives to brodifacoum or 1080 baits. Estimates of risk to field populations of non-target invertebrates, skinks, and birds can be made by assessing likely exposure to baits in captive trials, and any toxic effects of exposure to baits. However, there is little information with respect to the toxicity and persistence of cholecalciferol in non-target species, or the likely exposure of non-target animals, i.e. species which are likely to interact with the bait. This project aimed to provide additional data on the susceptibility to FeraCol® baits of non-target species: invertebrates—snails (*Cantareus aspersus*), earthworms (*Aporrectodea caliginosa*), and honeybees (*Apis mellifera*); reptiles—skinks (*Oligosoma lineoocellatum*); and birds—weka (*Gallirallus australis*). If these baits are attractive to snails, earthworms, or skinks, there is potential for primary poisoning, and for transfer of cholecalciferol into the food chain, and thus secondary poisoning of organisms higher up the food chain.

## 1.1 BACKGROUND TO FERACOL

Cholecalciferol (Vitamin $D_3$) is an acute toxin that was first registered for control of possums in 1995, in the form of cereal-based pellet bait containing 0.8% active ingredient. The FeraCol® paste formulation is an oil-based paste formulated with a peanut butter matrix and other flavours, incorporating cholecalciferol at 0.8%. The block bait form of FeraCol® (used for possums) comprises cereals and flavourings in a waxy block. FeraCol® is used throughout New Zealand to control mainly possums, and is now being developed to control rats. The risk of secondary poisoning can potentially be reduced by using these baits, and information to date shows they pose a lower risk to non-target species. Because of this lower risk, these types of baits are likely to be used more in the future.

Cholecalciferol is a naturally occurring compound synthesised in animal skin by the action of sunlight on its precursor, 7-dehydrocholesterol (Eason & Wickstrom 2001). Cholecalciferol is converted to its toxic metabolite, 25-hydroxycholecalciferol, which acts by mobilising calcium stores from bones

into the blood stream, resulting in hypercalcemia and tissue calcification in the cardiovascular system, kidneys, stomach, lungs, and muscles (Eason et al. 2000). Death occurs as a result of renal or cardiac failure (Eason & Wickstrom 2001). The possum is more susceptible to cholecalciferol ($LD_{50}$ of 16.8 mg/kg) than dogs (80 mg/kg), and mallard ducks (2000 mg/kg) (Eason & Wickstrom 2001). Even amongst birds, considerable variation in susceptibility to cholecalciferol has been shown. Eason et al. (2000) orally dosed mallard ducks, canaries, and chickens at 2000 mg/kg. There was no mortality in the ducks, but 25% and 75% of the canaries and chickens, respectively, died. Weka fed cereal baits containing 0.1% (1 µg/kg) cholecalciferol to satiation showed no effects, suggesting that these birds are more tolerant to cholecalciferol than many other animals (Eason et al. 2000).

Eason et al. (2000) also found no mortality in ground weta (*Hemiandrus* sp.) orally dosed with cholecalciferol at up to 250 µg/g, indicating cholecalciferol is unlikely to have insecticidal properties. However, there have been no evaluations of the toxicity of cholecalciferol in any formulation to other invertebrate species. There is some information to indicate that reptiles also undergo hypercalcemia in response to cholecalciferol in the same way as mammals (Srivastav et al. 1995). Intramuscular injection of vitamin $D_3$ (2000 IU/100 g b.wt) in monitor lizards (*Varanus flavescens*) evoked serum hypercalcaemia on day 3 which progressed up to day 7. At day 14 a decline was noticed in the serum calcium level, which was followed by a rise from day 21 to day 28 (Swarup et al. 1987). However, no formal evaluations of toxicity have been reported for New Zealand reptile species. This study was conducted to provide data on the risks of FeraCol® use to non-target species not previously tested. The paste formulation was selected as this is presently the more commonly used bait and is considered to be more easily consumed by a range of non-target animals that the waxy block product.

# 2. Objectives

The objectives of the study were to assess the risk to non-target species of FeraCol® poisoning by:

- Determining toxicity of cholecalciferol to earthworms, common snails, and honeybees in standard laboratory toxicity tests.
- Monitoring behavioural responses of skinks and weka to non-toxic FeraCol® paste and measuring palatability.

# 3. Methods

## 3.1 EARTHWORM EXPERIMENTS

Laboratory colonies of the common pasture earthworm (*Aporrectodea caliginosa*) were established from adult earthworms collected in Canterbury, New Zealand. Colonies were maintained at the Landcare Research Animal Facility, Lincoln, in Templeton silt loam (3.8% organic matter) collected from the Selwyn District, Canterbury. The soil was air-dried for 24 hours to kill any extant earthworms and other macro-invertebrates, then sieved and rehydrated with distilled water to produce a moisture content of 25–30% by mass. Dry grass meal (spray-free lawn clippings) was added at the rate of 14 g per kilogram of dry soil to provide food for the earthworms. The pH of the reconstituted soil was 6.5–7. Adult earthworms were maintained in 10-litre plastic buckets full of this soil. The soil was changed at 28-day intervals and cocoons removed and maintained on wet filter paper until hatching. Juvenile earthworms were then placed in 10-litre plastic buckets containing the previously described soil, and reared to maturity. All earthworms were maintained at 20°C during this rearing phase.

A 20% stock solution of cholecalciferol was prepared in corn oil and stored in glass jars in the dark until required. An Ultra turrax homogeniser was used to mix the cholecalciferol solution to an even emulsion with the amount of water required to make the soil up to 25% moisture content. The emulsion of cholecalciferol in water was mixed into the Templeton silt loam described above at 0, 250, 500, 750, and 1000 mg active ingredient (a.i.) per kilogram of soil (dry weight). There were four replicates of 10 earthworms in 1000 g of prepared soil for each treatment. Earthworms were weighed prior to addition to the soil and mortality and weight assessed weekly up to 28 days. Mortality was assessed by testing reaction to a mechanical stimulus applied to the anterior part of the earthworm. Growth was expressed as the mean percentage change in weight over the exposure period for each treatment. Jars were maintained at 20°C, constant light and 25% moisture for the duration of the experiment. At the termination of exposure, earthworms were placed in Petri dishes with wet filter paper to depurate (void gut contents) for 24 hours, and frozen for later tissue analysis.

## 3.2 SNAIL EXPERIMENTS

As a surrogate for native New Zealand snails, common garden snails (*Cantareus aspersus*) were maintained in groups in sealed 2-litre plastic containers with small air holes in the lid, and fed rabbit food pellets (Weston Milling, Rangiora) and fresh vegetable leaves. Twice weekly, uneaten leaves and rabbit pellets were removed and replaced with fresh material. Water was freely available in a shallow plastic container. Snails were obtained from an organic garden in Auckland and acclimatised to laboratory conditions for at least 7 days prior to experimentation.

Soil was prepared as above, with cholecalciferol at 0, 500, 750, and 1000 mg a.i./kg and 250 g of prepared soil was placed into four replicate 1-litre plastic containers for each treatment, and two snails placed in each container. Non-toxic cereal baits (control) were presented in two of these replicates while cereal baits containing 0.8% cholecalciferol were presented to the other two replicates. Snails were offered fresh baits twice a week (removing old pellets each time). Mortality was checked at weekly intervals. At the end of the exposure period snails were removed from soil and placed in Petri dishes with wet filter paper to depurate for 24 hours, then frozen for later cholecalciferol analysis.

## 3.3 HONEY BEE EXPERIMENTS

The toxicity of cholecalciferol to honeybees was determined according to the OECD guideline 213 (OECD 1997). Young adult worker bees (*Apis mellifera*) of a similar age were obtained from an adequately fed, disease-free hive one day before the test. Bees were acclimatised (10 per cage) to clean, well-ventilated cages constructed from wood and wire mesh. A diet of sucrose (50% w/v) was available *ad libitum* in a glass tube (c. 50 mm long and 10 mm wide). Two hours prior to experimentation food was withdrawn, so that all bees were equivalent in terms of their gut contents at the start of the test. Bees were kept in the dark at 25 ± 2°C, at a relative humidity of 50–70%.

A suspension of cholecalciferol was prepared by emulsifying a 50 : 50 mix of cholecalciferol gel (0.8%) with sugar water (500 grams per litre) using an Ultra-turrax homogeniser. This stock solution was then diluted with sugar water to produce working concentrations of 0, 300, 650, 1000, 1300, 2000, and 2650 µg a.i./mL. These cholecalciferol solutions (1 mL) were presented to 10 bees for 4 hours, after which they were removed and replaced with fresh uncontaminated sucrose *ad libitum* for the remainder of the trial. The amount of cholecalciferol solution consumed and mortality was recorded when the toxic food was removed, and mortality was also monitored after 24 and 48 hours. If mortality in bees offered cholecalciferol increased from 24 to 48 hours, whilst mortality in the control remained constant (≤10%), mortality was also assessed after 72 and 96 hours. A toxic standard (dimethoate; 500 g/litre a.i.) was included in the experiment, at three concentrations encompassing the 24 hour $LD_{50}$ of 0.10–0.35 µg a.i./bee. A stock solution of 500 µg/mL was made up by diluting 100 µL of dimethoate in 100 mL sugar water and then diluting this to 2.5, 10, and 20 µg/mL (0.05, 0.2, and 0.4 µg a.i./bee). During the toxic standards exposures, each test group of ten worker bees being exposed to the toxic standard was provided with 200 µL of sucrose containing the toxicant at the appropriate concentration.

## 3.4 SKINK EXPOSURE TRIALS

Twenty wild-caught spotted skinks (*Oligosoma lineoocellatum)* were individually housed in plastic mouse cages with close-fitting fine wire mesh lids, in a controlled-environment room in the Landcare Research Animal Facility, Lincoln. Water in a shallow plastic container and food (wax moths, mealworms)

was provided *ad libitum*. Leaf litter and a piece of wood or rock with adequate crevices were provided as shelter. Skinks were checked daily and their general appearance and food intake monitored. They were also weighed every two weeks to ensure they were in good general health. Feeding trials were conducted in a separate enclosure, and skinks were returned to their normal cages once they had been used in a trial. All procedures involving skinks were approved by the Landcare Research Animal Ethics Committee (AEC 02/08/01).

The filming enclosures comprised two terraria (37 cm wide, 38 cm deep, and 75.5 cm long) sitting side by side with fitted wire mesh lids. A hole in the lid allowed video cameras to be mounted from above to film both enclosures simultaneously. The inside of the filming enclosures was washed down thoroughly with water (no detergent) between trials to remove any residual cues that may have affected feeding behaviour. Water was available *ad libitum* at all times. The bottom of each enclosure was lined with white (not slippery) paper for contrast during filming from above and the sides were made opaque to minimise external visual disturbance. Inside the filming enclosure were a 'shelter stack', a water container, and a container for offering bait. No additional lighting, other than the room lighting, was used during filming.

Eight skinks (4 males and 4 females) were used in a cross-over design to compare their reaction to the two non-toxic bait types (Table 1). Two individual skinks of the same sex, randomly selected and allocated to treatment, were weighed and each placed in a filming enclosure. Skinks were acclimatised for 2 days with no food available.

Baits were added on the morning of the third day. Approximately 5 g of non-toxic paste was placed in one enclosure, and a known weight (5 g) of non-toxic block bait with cinnamon, moistened with 1 mL of water to the other enclosure. The same amounts of bait were weighed out and placed outside the filming enclosure to monitor weight change. Filming ran during the day for 8 hours, during which time the skinks were not disturbed. Skinks were filmed for 8 hours per day for 3 days. At the end of each day of filming both baits were removed and weighed. No food was available overnight and fresh bait was added to the enclosures each morning. After this the skinks were removed from the filming enclosure, weighed and returned to their normal cage with normal diet and water available *ad libitum*. Videos were analysed and time spent investigating the bait, frequency of investigation, and time spent eating was recorded as well as general activity (Appendix 1).

TABLE 1. EXPERIMENTAL LAYOUT FOR SKINK FEEDING TRIALS.

| SKINKS | NON-TOXIC FIRST RUN | NON-TOXIC SECOND RUN |
|---|---|---|
| Female 1 | Paste | Block |
| Female 2 | Block | Paste |
| Female 3 | Paste | Block |
| Female 4 | Block | Paste |
| Male 1 | Paste | Block |
| Male 2 | Block | Paste |
| Male 3 | Paste | Block |
| Male 4 | Block | Paste |

### 3.5 WEKA EXPOSURE EXPERIMENTS

Weka (n = 3) housed together at Willowbank Wildlife Park were offered non-toxic Feracol® paste bait on two separate occasions to determine its palatability. A total of 1000 g of non-toxic FeraColâ paste was placed in a plastic container in the enclosure for 24 hours, and the interaction of weka with the bait recorded using a video camera. Weka were not provided with alternative food. We noted 'investigatory behaviours' and feeding on baits as in the skink trial. This allowed us to estimate how palatable weka find the bait, and how much and how often an individual bird could be expected to consume. All procedures involving weka were approved by the Landcare Research Animal Ethics Committee (AEC 02/08/01).

# 4. Results and discussion

### 4.1 EARTHWORM EXPERIMENTS

Nil mortality was observed in any treatment group. Traces of cholecalciferol were found in earthworms from all treatment groups, except for the controls, 28 days after exposure (Table 2), indicating that earthworms can take up cholecalciferol from soil, and retain residues within body tissues for at least 28 days. However, there was no correlation between body residues and soil concentrations (r = –0.17, $P = 0.789$).

TABLE 2. MEAN CHOLECALCIFEROL RESIDUES IN *A. caliginosa* EXPOSED FOR 4 WEEKS TO SOIL CONTAINING CHOLECALCIFEROL.

| NOMINAL CONCENTRATION OF CHOLECALCIFEROL IN SOIL (mg/kg) (dry weight) | CHOLECALCIFEROL RESIDUES IN EARTHWORMS ( µg/g) (wet weight) |
|---|---|
| Corn oil control | 0 |
| 250 | 68.7 |
| 500 | 39.4 |
| 750 | 3.5 |
| 1000 | 17.6 |

A one-way ANOVA of earthworm weight data showed that growth was not significantly different ($P > 0.05$ in all cases) between treatments. Earthworms in all treatments increased body weight by 45–59%.

Soil amended with cholecalciferol at 1000 mg a.i./kg is equivalent to the distribution of cholecalciferol from 125 g FeraCol® paste (at 0.8%) into 1 kg of soil. In the field, this scenario is highly unlikely as FeraCol® is not usually placed on the ground, but is placed in paper bags (usually 20 g of paste per bag), which are stapled to trees. Furthermore, cholecalciferol has very low solubility and is unlikely to leach from baits into the soil (Booth et al. 1999;

Morgan 2002). Accidental spillage of cholecalciferol baits in the field, or if bait was removed and cached by rodents, could result in higher soil concentrations, but given the nature of the paste product this is unlikely, and the impacts would only be very localised.

Earthworms contaminated with cholecalciferol are a potential source for secondary exposure to non-target birds and also to invertebrates, such as snails and carabid beetles (Lukasiewicz 1996). Using acute toxicity data, assessments of theoretical risk can be made. For instance, the acute oral $LD_{50}$ of cholecalciferol to the Northern bobwhite, (*Colinus virginianus*), is 528 mg/kg (Erikson & Urban 2002). Using the highest residues reported here in earthworms (68.7 µg/g), and assuming a bodyweight of 200 g for a mature bird, a Northern bobwhite would have to consume approximately 1.5 kg of contaminated earthworms to ingest a lethal dose. While species-specific differences are evident for birds, the Northern bobwhite is the most sensitive species tested to date.

Based on these results, secondary poisoning of birds is highly unlikely, because this experiment created an extreme situation of contamination, and even under this scenario the amount of contaminated earthworms that birds would have to eat to be 'at risk' far exceeds the amount of food that birds may eat. Due to the paucity of toxicity data for other invertebrates, such as beetles, determination of the secondary poisoning risk that earthworms pose to other invertebrates cannot be determined.

## 4.2 SNAIL EXPERIMENTS

No mortality was observed in any of the snails exposed to cholecalciferol for any treatment, and no cholecalciferol residues were found in any of the snails tested. Green-coloured excrement was found on the soil surface indicating that snails had actually consumed bait, rather than just avoided it. The absence of residues in snails indicates that they are very unlikely to pose a secondary poisoning risk to other animals.

## 4.3 HONEY BEE EXPERIMENTS

Cholecalciferol was not toxic to honey bees at doses up to 265 µg a.i./bee (Table 3). Based on the amount of bait consumed, and assuming an approximate weight of 100 mg per bee (Root & Root 1940) the actual exposure dose can be calculated. Bees exposed to cholecalciferol at 130 µg a.i./bee consumed cholecalciferol at 25.4 mg/kg. This compares favourably with an estimated $LD_{50}$ for bees (on a body weight basis) of 8 mg/kg for 1080 (Booth & Wickstrom 1999), and indicates that cholecalciferol is at least 3-fold less toxic to honey bees than is 1080. Furthermore, food consumption declined with increasing cholecalciferol concentrations. Bees exposed to cholecalciferol at 265 µg/bee did not consume a measurable amount of bait. This indicates that honeybees will avoid cholecalciferol in a dose-dependent manner, but due to high variability in consumption, a significant difference to the control ($P$ = 0.022)

TABLE 3. ACUTE TOXICITY AND CONSUMPTION OF CHOLECALCIFEROL BAIT SOLUTION BY HONEYBEES.

| TREATMENT | BAIT CONSUMPTION PER BEE (mg) | CHOLECALCIFEROL EATEN PER BEE (mg/kg) | MORTALITY (%) |
|---|---|---|---|
| Water control | 3.33 ± 1.2 | 0 | 10 ± 14.1 |
| Sugar water control | 8.35 ± 2.96 | 0 | 12.5 ± 9.6 |
| 30 µg a.i./bee | 1.25 ± 1.25 | 3.75 | 7.5 ± 5.0 |
| 130 µg a.i./bee | 1.95 ± 0.8 | 25.35 | 12.5 ± 9.6 |
| 265 µg a.i./bee | 0 ± 0 | 0 | 15 ± 5.8 |

was only evident at the highest concentration tested. However, this concentration (2650 µg/mL) is almost 3 times lower than the concentration found in FeraCol® paste (8000 µg/g). Therefore bees are likely to avoid paste bait, and contamination of honey by cholecalciferol residues is unlikely based on these results.

The 24 hour $LD_{50}$ for the toxic standard dimethoate was 0.32 µg a.i./bee, indicating that the toxicity test was valid.

## 4.4 SKINK EXPOSURE TRIALS

Skinks offered non-toxic paste or cereal block on two occasions for 24 hours (3 days of 8 hours per day) investigated the bait (sniffed), but did not eat any of the bait (Table 4 and Appendix 1). FeraCol® products are therefore not likely to pose a significant risk of poisoning to spotted skinks.

TABLE 4. BEHAVIOUR OF SKINKS OFFERED FERACOL® PASTE AND CEREAL BLOCK BAITS.

| BAIT | TIME* ACTIVE (mins) | TIME* AT DRINKER (mins) | TIME* INVESTIGATING BAIT (mins) |
|---|---|---|---|
| Paste bait (trial 1) | 259 | 4.7 | 1.7 |
| Paste bait (trial 2) | 149 | 0.8 | 0.1 |
| Cereal block (trial 1) | 278 | 4.0 | 1.4 |
| Cereal block (trial 2) | 179 | 21.9 | 0.3 |

* Times are averages per skink per 8 hour day (n = 8 skinks, 3 days).

## 4.5 WEKA EXPOSURE EXPERIMENTS

Weka offered non-toxic paste for 24 hours on two separate occasions (trials) investigated the bait and consumed a total of 28.8 and 103.5 g of paste in the first and second trial respectively (Table 5). This equates to a mean of 9.6 and 34.5 g of paste per bird, or in the case of toxic bait, consumption of 77 and 276 mg cholecalciferol per bird in trial 1 and 2, respectively. Assuming an

TABLE 5. BEHAVIOUR OF WEKA OFFERED FERACOL PASTE.

| BAIT | BAIT EATEN (g) | TIME* INVESTIGATING/NEAR BAIT (mins) | ENCOUNTERS WITH BAIT |
|---|---|---|---|
| Trial 1 | 28.77 | 9 | 3 |
| Trial 2 | 103.47 | 17 | 5 |

* Times are total time per night for the three weka.

average weight of 850 g per bird, and that each bird ate the same amount, the dose that weka consumed was 90 and 325 mg cholecalciferol per kilogramme in trial 1 and 2, respectively. The $LD_{50}$ for cholecalciferol for Mallard ducks and canaries appears to be greater than 2000 mg per kilogramme, while chickens appear to be more sensitive (75% mortality at 2000 mg/kg; Eason et al. 2000). Because of the low consumption of paste bait by weka and the normal method of bait application (in paper bags stapled to trees), it is unlikely that weka are at serious risk from cholecalciferol toxicosis following the correct application of FeraCol® paste in the field.

# 5. Conclusions

- Common pasture earthworms (*Aporrectodea caliginosa*) were not adversely affected by cholecalciferol at the highest soil concentration tested, i.e. 1000 mg/kg, which is very unlikely to occur when using FeraCol® for pest control.
- Cholecalciferol residues were found in earthworms after exposure to all treatments. However, the residues were very low, and therefore the risk of secondary poisoning of predators by earthworms is very low.
- Cholecalciferol did not cause mortality in common garden snails (*Cantareus aspersus*) at soil concentrations up to 1000 mg/kg and no residues were found in tissue, indicating that both primary poisoning of native snails and secondary poisoning of snail predators is highly unlikely.
- Skinks offered FeraCol® paste and cereal block did not eat any bait, indicating that non-target poisoning of skinks is highly unlikely.
- Weka consumed FeraCol® paste, but due to the small amount eaten and the relative insensitivity of birds to cholecalciferol, FeraCol® paste is unlikely to pose a high risk to these birds.

# 6. Recommendations

- Because of the apparent low toxicity of cholecalciferol to the non-target species tested in this research, FeraCol® paste baits are likely to present a low secondary poisoning risk compared with other vertebrate pesticides.
- These results should be made available to pest control managers to encourage usage of bait with low potential for non-target impacts.

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# Appendix 1

## SKINK FEEDING TRIALS

Skink feeding trials showing skink activity, frequency of periods of activity, and interaction of skinks with the bait or drinker.

**Trial 1**

| SKINK NUMBER | NIGHT | TREAT-MENT | AMOUNT EATEN (g) | DURATION ACTIVE (min) | FREQUENCY OF ACTIVITY (min) | DURATION AT DRINKER (min) | ENCOUNTERS WITH DRINKER | DURATION AT BAIT (min) | ENCOUNTERS WITH BAIT |
|---|---|---|---|---|---|---|---|---|---|
| 4000 M | 1 | bait | 0 | 325 | 13 | 2 | 4 | 5 | 7 |
| 4000 M | 2 | bait | 0 | 324 | 16 | 10 | 3 | 2 | 3 |
| 4000 M | 3 | bait | 0 | 341 | 17 | 6 | 2 | 5 | 4 |
| 5005 M | 1 | paste | 0 | 293 | 21 | 3 | 4 | 1 | 3 |
| 5005 M | 2 | paste | 0 | 263 | 27 | 3 | 6 | 0 | 1 |
| 5005 M | 3 | paste | 0 | 306 | 20 | 4 | 3 | 0 | 2 |
| 300 F | 1 | paste | 0 | 225 | 28 | 6 | 3 | 0 | 0 |
| 300 F | 2 | paste | 0 | 185 | 24 | 6 | 6 | 3 | 3 |
| 300 F | 3 | paste | 0 | 314 | 25 | 3 | 4 | 3 | 2 |
| 1 F | 1 | bait | 0 | 98 | 25 | 2 | 2 | 0 | 0 |
| 1 F | 2 | bait | 0 | 112 | 23 | 1 | 3 | 0 | 0 |
| 1 F | 3 | bait | 0 | 130 | 16 | 3 | 1 | 0 | 0 |
| 4200 F | 1 | paste | 0 | 219 | 15 | 0 | 3 | 0 | 0 |
| 4200 F | 2 | paste | 0 | 298 | 13 | 13 | 2 | 0 | 1 |
| 4200 F | 3 | paste | 0 | 333 | 13 | 8 | 7 | 1 | 3 |
| 400 M | 1 | bait | 0 | 353 | 17 | 2 | 3 | 1 | 3 |
| 400 M | 2 | bait | 0 | 337 | 17 | 2 | 4 | 1 | 1 |
| 400 M | 3 | bait | 0 | 368 | 17 | 3 | 7 | 0 | 3 |
| 200 F | 1 | bait | 0 | 295 | 28 | 4 | 4 | 0 | 2 |
| 200 F | 3 | bait | 0 | 317 | 24 | 5 | 6 | 1 | 2 |
| 10 M | 1 | paste | 0 | 176 | 29 | 3 | 3 | 4 | 2 |
| 10 M | 3 | paste | 0 | 277 | 28 | 1 | 5 | 7 | 4 |

*Trial 2 is on next page >>*

**Trial 2**

| SKINK NUMBER | NIGHT | TREAT-MENT | AMOUNT EATEN (g) | DURATION ACTIVE (min) | FREQUENCY OF ACTIVITY (min) | DURATION AT DRINKER (min) | ENCOUNTERS WITH DRINKER | DURATION AT BAIT (min) | ENCOUNTERS WITH BAIT |
|---|---|---|---|---|---|---|---|---|---|
| 4000 M | 1 | paste | 0 | 100 | 17 | 0 | 0 | 0 | 0 |
| 4000 M | 2 | paste | 0 | 120 | 12 | 0 | 2 | 1 | 1 |
| 4000 M | 3 | paste | 0 | 276 | 12 | 1 | 1 | 0 | 0 |
| 5005 M | 1 | bait | 0 | 255 | 22 | 0 | 0 | 0 | 0 |
| 5005 M | 2 | bait | 0 | 203 | 21 | 0 | 0 | 0 | 0 |
| 5005 M | 3 | bait | 0 | 138 | 11 | 0 | 0 | 0 | 0 |
| 300 F | 1 | bait | 0 | 323 | 23 | 66 | 11 | 1 | 3 |
| 300 F | 2 | bait | 0 | 91 | 25 | 31 | 5 | 1 | 2 |
| 300 F | 3 | bait | 0 | 51 | 21 | 0 | 1 | 1 | 1 |
| 1 F | 1 | paste | 0 | 106 | 29 | 0 | 1 | 0 | 2 |
| 1 F | 2 | paste | 0 | 121 | 22 | 1 | 2 | 0 | 3 |
| 1 F | 3 | paste | 0 | 108 | 24 | 1 | 2 | 0 | 1 |
| 4200 F | 1 | bait | 0 | 84 | 14 | 0 | 2 | 0 | 0 |
| 4200 F | 2 | bait | 0 | 41 | 6 | 1 | 1 | 0 | 0 |
| 4200 F | 3 | bait | 0 | 122 | 10 | 5 | 2 | 0 | 0 |
| 400 M | 1 | paste | 0 | 103 | 8 | 0 | 0 | 0 | 0 |
| 400 M | 2 | paste | 0 | 301 | 11 | 3 | 2 | 0 | 1 |
| 400 M | 3 | paste | 0 | 11 | 2 | 0 | 0 | 0 | 0 |
| 200 F | 1 | paste | 0 | 210 | 30 | 0 | 0 | 0 | 1 |
| 200 F | 2 | paste | 0 | 192 | 29 | 4 | 4 | 0 | 0 |
| 200 F | 3 | paste | 0 | 144 | 19 | 0 | 0 | 0 | 0 |
| 10 M | 1 | bait | 0 | 244 | 18 | 0 | 1 | 0 | 1 |
| 10 M | 2 | bait | 0 | 364 | 16 | 0 | 0 | 0 | 1 |
| 10 M | 3 | bait | 0 | 232 | 11 | 160 | 4 | 0 | 1 |