The Autecology of *Rhacodactylus auriculatus*: A Natural History Study of Gargoyle Geckos

A Thesis Presented to the Faculty of the
Department of Biology
Villanova University

In Partial Fulfillment of the
Requirements for the Degree of
Master of Science
In
Biology

by
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July, 2007

Under the Direction of
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Acknowledgments

I would like to thank those that served on my thesis committee. Dr. Aaron Bauer for the privilege and honor of studying under the guidance of a renowned herpetologist and scholar. Dr. Todd Jackman for his support and use of equipment in the field. Dr. Robert Curry for his editorial comments and assistance in the statistical design of the study during the proposal phase. Dr. Vikram Iyengar who aided in arthropod identification, editorial comments and statistical analysis during the defense stage of the thesis. And Dr. Lawrence Gray, from Utah Valley State College, for his assistance with niche breadth comparisons.

I also wish to thank Villanova University and the Department of Biology for funding my thesis research. Joe Pilcicki for acquiring many needed materials for the study and Joanne Prazenica for her care of the herps I left behind during field work.

Special gratitude must be expressed to the Province Sud - Direction des ressources naturelles specifically Joseph Manaute, Joël Delafenetre, and Jean-Marc Meriot; who provided not only permission to conduct field research but also accommodations and transportation within Parc Provincial de la Rivière Bleue. Joël Delafenetre, whose love of the native herpetafauna will continue to aid in their protection, also assisted in fieldwork on several occasions. Richard and Kay Ross, serving a mission in New Caledonia at the time, supplied transportation to Nouméa on several supply trips as well as accommodations in Nouméa and most importantly their friendship.

Most of all I would like to recognize my family for their love and support, especially my devoted wife Leslie Snyder who not only patiently tolerates my ambitions but provides support and encouragement. Leslie participated in all aspects of the fieldwork and was especially helpful at locating specimens.

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ABSTRACT

Ecological niches within squamate reptiles are delineated by diet, microhabitat use, and activity period. In the current study field data were gathered to characterize the ecology of *Rhacodactylus auriculatus* with regard to these three axes.

Rhacodactylus auriculatus regularly consume a wide taxonomic and ecological variety of arthropods, lizard prey including geckos and skinks, and various plant materials including flowers, flower parts, and sap. Based upon the variety of dietary constituents and the regularity with which they are utilized, *R. auriculatus* may have the most atypical of all gekkonid diets.

Rhacodactylus auriculatus partition microhabitat with conspecifics based on perch height, presumably to avoid aggressive interactions. Specimens were most active from one to four hours after sunset, temporally separating them from sympatric diurnal skinks.

As supported by dietary comparison with 30 gekkonid lizards, diet is more important in segregating *R. auriculatus* from sympatric gekkotans than is typically the case among lizards.

INTRODUCTION

Squamate reptiles partition their environment along three main axes: diet, microhabitat use, and activity period (Pianka 1973; Schoener 1977; Howard and Hailey 1999). Snakes generally partition resources based primarily on diet (Arnold 1993), whereas lizards divide resources chiefly by microhabitat use (Pianka 1973; Howard and Hailey 1999). Like most lizards, geckos presumably partition their environment by microhabitat use. However, many geckos are nocturnal, which temporally separates them from the majority of other lizard species. In addition to utilizing a distinctive microhabitat and activity period, some geckos have unusual diets (Bauer 1990). Such species may be substantially partitioned from other lizard species by all three niche axes.

Aspects of resource partitioning between the diplodactylid geckos and lygosomine skinks of New Caledonian have been reviewed by Bauer and Sadlier (2000). These two highly endemic lineages utilize different activity periods; New Caledonian skinks are primarily diurnal, whereas the geckos are nocturnal. New Caledonian lizards are also divided by areas of activity or microhabitat (terrestrial vs. arboreal), although evidence suggests that the division may not be as clear-cut as the temporal division. New Caledonian skinks are largely terrestrial, though some occasionally climb to low heights (Ineich and Sadlier 1991; Bauer and Sadlier 2000). New Caledonian geckos on the other hand are chiefly arboreal; however, there exists a gradient of habitat utilization within New Caledonian geckos which further partitions the native gecko species from each other. Species such as *Rhacodactylus leachianus* and *Lepidodactylus lugubris* represent one end of the spectrum; apart from occasionally descending to the ground for specialized activities, such as egg laying in *R. leachianus* (Henkel 1991), these species are exclusively arboreal. Other *Rhacodactylus* spp. and *Bavayia* spp. are primarily arboreal but are periodically active on the ground in order to move between vegetation or utilize diurnal retreat sites. *Nactus pelagicus* represents the other end of the spectrum and is primarily terrestrial (Bauer and Sadlier 1994b). Within overlapping activity periods and microhabitat, further partitioning of resources may take place by division of dietary resources. For similarly-sized species that occur in sympatry (e.g. *R. auriculatus*, *R. sarasinorum*, and *R. ciliatus*), diet may serve as the primary partition.

The ecology of the Gekkota has been grossly understudied (Vitt and Pianka 1994; Pianka and Vitt 2003). Due to the relatively small size and cryptic habits of most geckos, field data are difficult to gather. This is especially true of night-active, forest dwelling, arboreal species. The result has been a lack of even the most basic ecological information for most gekkonid species including diet, activity, and habitat utilization.

The present study took place in the broad context of an autecological study with the purpose of providing basic ecological data concerning the natural history of *R. auriculatus*. More specifically, the object of this study was to describe the diet, microhabitat, and activity period of *R. auriculatus*. As a result of this focus the present study is chiefly descriptive in nature.

Activity

Most lizards restrict their activity to a specific temporal period. They can be classified as primarily diurnal, nocturnal, or crepuscular; although, some diurnal species are active on warm nights and some nocturnal species show limited activity during the day (Vitt and Pianka 1994). Activity period affects many aspects of the natural history of an organism, including prey availability, temperature, and exposure to predation. Geckos are chiefly nocturnal; however, members of 20 of 106 genera of Gekkotans are strictly or partly diurnal (Bauer In press).

Microhabitat

Lizards often partition resources by specializing within a specific microhabitat. The microhabitat utilized by a species may be correlated with morphological features including presence of subdigital adhesive structures, length of digits, body width, tail length, body and head shape, and other morphological characteristics (Herrel et al. 2001; Zaaf et al. 2001; Elstrott and Irschick 2004). Microhabitats may be divided based on a variety of habitat features including substrate, plant species, perch height, perch diameter, and retreat sites (James and M'Closkey 2002).

Foot morphology as it relates to clinging ability may be highly correlated with microhabitat use in sympatric gekkonid species. Studies involving *Anolis* lizards revealed that lizards with relatively larger toepads had better clinging abilities and perched higher in the canopy (Elstrott and Irschick 2004). Within *Anolis* lizards it has been found that age and sex classes are separated by perch height (Pounds 1988). Adult males occupy the highest perches. Juveniles utilize the lowest perches and adult females occupy intermediate perches (Pounds 1988). If similar trends occur in gekkonids, perch diameter and perch height, may in part define microhabitat use and delineate the niches of sympatric congeners and possibly conspecifics.

Diet

The majority of gecko species are small, nocturnal insectivores and are important predators in many habitats. Aside from a few major studies (Pianka and Pianka 1976; Pianka and Huey 1978; Ming 1984; Bauer and DeVaney 1987; Bauer and Sadlier 1994a; Saenz 1996; Vitt and Zani 1997; Miranda and Andrade 2003) a large portion of dietary information for gekkonid lizards has come from anecdotal reports and captive animals. While they feed primarily on arthropods (Loveridge 1947; Kluge 1967; Bustard 1968; and Pianka and Pianka 1976), geckos have been reported to consume diverse prey items such as: plant parts, tadpoles, snakes, mice, birds, bats, and other lizards, often conspecifics (Bauer 1990). Both cannibalism (Polis and Myers 1985; Mitchell 1986) and vertebrate carnivory have been reported in geckos; however, most instances have been observed in captivity and are unlikely to occur with significant frequency under natural conditions (Bauer 1990).

Extant geckos range from 13 to 250 mm snout to vent length (SVL), allowing for extensive variation in diet. Due to the willingness of many gecko species to accept a variety of prey as long as they fall within an appropriate size range all excluding the largest terrestrial arthropods are preyed on by geckos (Bauer 1990).

Predation on vertebrates by non-serpentine lacertilians has generally been linked to large body size. Even within highly carnivorous groups, the young of many species feed primarily on arthropods. As individuals mature they slowly shift to vertebrate prey in parallel with increased body mass (Losos and Greene 1988).

Geckos are characterized by small body sizes and crepuscular or nocturnal habits, preadapting them to prey on arthropods. Most geckos are nocturnal insectivores with only 3-4 % of species having been implicated in vertebrate predation (Bauer 1990). However, a few gecko species do specialize on vertebrate prey. The pygopodid *Lialis* consumes skinks almost exclusively (Patchell and Shine 1986) and the Borneo cave-dwelling gecko *Cyrtodactylus cavernicolus* regularly feeds on baby swiflets that fall from nests on the cave walls (Harrison 1961).

Herbivory is the consumption of plant parts, including but not limited to: leaves, fruit, nectar, and flowers or flower parts. Only about 3% of lizard species are known to eat significant quantities of plant matter (King 1996). However, many species occasionally shift away from a strictly arthropod based diet, toward an omnivorous or herbivorous diet (Pough 1973; Schluter 1984; King 1996). Because plant matter is more difficult to digest and may result in substantially slower growth (Pough 1973; Schluter 1984), herbivory has been proposed as an obligatory move, which lizards will not make unless arthropods are insufficiently abundant (Perez and Corti 1993). Pianka (1973), on the other hand speculated that herbivory may be ecologically advantageous in that it permits a smaller foraging range and better predator avoidance, as the lizard can remain closer to a retreat site. While many hypotheses have been proposed, the only ecological variable that shows a strong positive correlation with herbivory is insularity (Van Damme 1999).

Folivory is the most specialized type of herbivory and leaves have not been reported as a significant part of any gekkonid diet. Folivory is usually coupled with morphological adaptations that allow for longer retention times in the digestive tract (Cooper and Vitt 2002). Plant material requires more time for breakdown than does animal matter; hence most folivorous lizards have enlarged colons that act as fermentation chambers. The colons of folivorous lizards are also more complex, involving valves or folds that decrease passage rates (Durtsche 2000). With folivory comes the need for long periods of high body temperature to efficiently digest high fiber/cellulose meals. It has been argued that large body size decreases predatory pressure, thus allowing prolonged basking periods (Janzen 1973).

It was believed that the majority of exclusively folivorous lizard species weigh more than 300 g (Sokol 1967; Pough 1973). However, a number of lizards weighing under 300 g have been shown to be primarily herbivorous (Van Damme 1999). While there is probably no absolute size threshold for herbivory in lizards, large body size is highly correlated with the phenomenon (Cooper and Vitt 2002).

The small size of gekkonid lizards and lack of relevant morphological adaptations preclude them from folivorous diets. According to Cooper and Vitt (2002) "Substantial plant consumption is conspicuously infrequent in Gekkonoidea, the exceptions being species from New Zealand (Whitaker 1987b) and New Caledonia (Bauer and Sadlier 1994a)." However, even within species reported to consume plant material, the ingestion of small amounts of leaf matter is often considered accidental (Perry and Brandeis 1992), and likely results from consuming a prey item adherent to the leaf (Bauer and Sadlier 1994a).

Although the consumption of leaves by geckos is generally reported as accidental, other types of herbivory have been reported and may constitute a significant portion of the diet in some cases. The ingestion of fruit, pollen, or nectar is usually considered to be indicative of plant use as a regular dietary component (Whitaker 1987a). Several geckos have been implicated in frugivory or nectivory including: *Hoplodactylus duvaceli*, *H. maculates*, *H. pacificus* (Eifler 1995; Whitaker 1987b), *Phelsuma* spp. (McKeown 1993), *Lepidodactylus lugubris* (Perry and Ritter 1999), *Rhacodactylus* spp. (Bauer and Sadlier 1994a), and *Naultinis grayii* (Whitaker 1987b). Furthermore, *Gehyra variegate, Gehyra dubia* and *G. australis* have been reported to feed on sap (Dell 1985; Couper et al. 1995; Letnic and Madden 1998).

The aforementioned use of fruit, pollen, and nectar in gecko diets is highly correlated with insularity (Bauer 1990; Perez and Corti 1993; Van Damme 1999; Cooper and Vitt 2002) and has been reported in the following genera: *Rhacodactylus* in New Caledonia (Bavay 1869; Bauer 1985), *Gehyra* in Fiji (Gibbons & Clunie 1984), *Hoplodactylus* in New Zealand (Whitaker 1987a, 1987b), and *Phelsuma* in the Mascarene islands (Vinson and Vinson 1969) and the Seychelles (Gardner 1984). This trend may be attributed to many factors including lower predation pressure (Janzen 1973; Van Damme 1999) and decreased arthropod abundance (Perez and Corti 1993). Flower parts, fruit, and nectar are low in cellulose and easily digested (Cooper and Vitt 2002). Due to the digestibility, and easy acquisition of these parts, no specialized morphological features are typically associated with their consumption by lizards (Cooper and Vitt 2002).

STUDY ORGANISM

Geckos account for 1100+ (~25 percent) of the 4,560 lizard species and occur throughout much of the Old and New World, with particularly high abundance in Old World deserts, tropical, and sub-tropical regions (Bauer 2002).

The genus *Rhacodactylus* is endemic to New Caledonia and consists of primarily nocturnal geckos characterized by large body size, prehensile tails, and subcaudal scansors (Bauer and Sadlier 2000). Before the introduction of rats, cats, dogs, and pigs, the top terrestrial predators in New Caledonia were the gecko *Rhacodactylus leachianus* with a maximum SVL of 255 mm, and members of the genus *Phoboscincus* – large (single known extant species up to 200mm maximum SVL), primarily terrestrial skinks (Bauer and Sadlier 2000). Other unusual adaptations have arisen within *Rhacodactylus*, such as the viviparous reproductive method of *Rhacodactylus trachyrhynchus* and the apparently highly carnivorous diet of *R. auriculatus* (Bauer and Sadlier 2000).

Rhacodactylus auriculatus is distinguishable from other *Rhacodactylus* species by enlarged bony protuberances on the posterodorsal aspect of the skull. *Rhacodactylus auriculatus* reaches a maximum adult body length of 125 mm and is further characterized by a large head, robust body, and slender cylindrical tail measuring 80-90% of the snout-to-vent length (SVL). Color is not a defining characteristic of the species as variation within *R. auriculatus* is extreme. The base coloration may be brown, reddish, gray, white, or even black. While banding or stripes are usually present these too may be absent, resulting in nearly patternless white individuals.

Rhacodactylus auriculatus is distributed continuously across the southern third of the New Caledonian mainland in suitable habitats and in isolated patches in the north (Whitaker et al. 2004). Northern populations may represent one or more new species (AMB, pers. com.). *Rhacodactylus auriculatus* occur from sea level to nearly 1000 m, and appear to be absent from the Isle of Pines (Bauer and Sadlier 2000). Within its range *R. auriculatus* occur primarily in ultramafic areas, which may have some connection to its distinctive diet.

Rhacodactylus auriculatus occurs in both humid forest and maquis (a shrub-dominated habitat underlain by ultramafic substrates). Unlike *Rhacodactylus chahoua*, *R. leachianus*, and *R. trachyrhynchus*, which are generally found high within the canopy of primary forest or on large trees, *R. auriculatus* utilizes shrubs, saplings, and strand vegetation and is often found within a few meters of the ground (Bauer and Sadlier 2000).

STUDY QUESTIONS

Diet

Preliminary research by Bauer and DeVaney (1987), Bauer and Russell (1990), and Bauer and Sadlier (1994a) suggests that the diet of *R. auriculatus* regularly includes: various arthropods, snails, plant material (various flower parts), and other lizard species, including *Bavayia* and *Caledoniscincus*. Due to the limited dietary data that are available for this species, many important questions remain unanswered. In this study additional dietary information was collected (see Materials and Methods) in order to further characterize the diet of *R. auriculatus*.

Question

What does the diet of R. *auriculatus* consist of?

Hypothesis

The diet of R. *auriculatus* regularly includes arthropods, vertebrate prey, and plant material. Also the number of empty stomachs will be higher during the cool season, in which this study takes place, than during warmer months.

Prediction 1

By total number of prey items, arthropods will comprise the most numerous group; however, by percent volume vertebrate prey items will constitute a disproportionately high portion of the overall diet as vertebrate prey items tend to be large.

Stomach dissections of R. *auriculatus* performed by Bauer (1994a) combined with data from Bauer and DeVaney (1987) and Bauer and Russell (1990), resulted in the collection of food items from the guts of 22 R. *auriculatus*. Six of the guts or ~27% contained lizard prey. Five contained *Caledoniscincus* spp. and one stomach contained a *Bavayia sauvagii* (Bauer and DeVaney 1987; Bauer and Sadlier 1994a). These results are of particular importance because the predation of other lizards by R. *auriculatus* took place under natural conditions and likely represents a common occurrence, as the specimens dissected were collected from the field and euthanized shortly thereafter.

Rhacodactylus auriculatus is primarily arboreal and nocturnal, whereas *Caledoniscincus* spp. are diurnal ground-dwelling species that retire to refuge sites at night. It appears unlikely from the natural history of either species that they would come in contact with each other on a regular basis. Further research, beyond this study, will be required to determine how and when such predation events take place.

Prediction 2

Plant material constitutes a regular dietary component for *R. auriculatus*.

Rhacodactylus auriculatus has been reported to feed on flowers and flower parts since the species was first described by Bavay in 1869. Bavay observed *R. auriculatus* feeding on *Geissois* flowers and this observation has been confirmed by Bauer and Sadlier, who reported the ingestion of flower parts from the same family (Cunoniaceae) (Bauer and Sadlier 1994a and 2001). Bauer and Sadlier (1994a, 2001) reported a gelatinous mass that appeared to be partially digested pollen. It is also likely that *R. auriculatus* consumes nectar from the same flowers. Nectar would be quickly absorbed and therefore difficult to observe from recovered stomach contents.

Prediction 3

During the cool season a higher proportion of empty stomachs will be found than during the warm season.

Data gathered in this study, from June 22-August 4, were compared with those collected by Bauer and DeVaney (1987) during May and June and Bauer and Sadlier (1994a) during October and December, to analyze seasonal variation in percentage of stomachs containing food items. The significance of empty stomachs were examined in light of findings by Huey et al. (2001) that suggest nocturnal lizards and those at higher trophic levels "run on empty" much more often than do diurnal lizards and lizards at lower trophic levels. In accordance with these findings a high proportion of empty stomachs in *R. auriculatus* is expected, as they are nocturnal and apparently occupy a high trophic position.

Microhabitat

Rhacodactylus auriculatus has been collected from both maquis and humid forest within its range (Bauer and Sadlier 2000). Maquis is typified by ultramafic soils and low shrubby heath-like vegetation (figure 1). In the maquis, humidity and temperature fluctuate more rapidly than in the humid forest (figure 2) where dense vegetation and tall trees buffer the effects of sun, wind, and rain (Jaffré 1980). Within these two habitats *R. auriculatus* are most frequently found perched on shrubs and saplings within a few meters of the ground (Bauer and Sadlier 2000). Some arboreal lizard species partition microhabitat based upon perch usage (Irschick et al. 2005; Elstrott and Irschick, 2004). In this study data were gathered in order to describe the perches that *R. auriculatus* utilize within these habitats.

Question

Is there a relationship between perch diameter or perch height and specimen size or sex within a population *R. auriculatus*?

Hypothesis

There is an intraspecific division of microhabitat use within *R. auriculatus* based on size and/or sex.

Prediction 1

Similarly sized individuals of both sexes occupy perches of similar height while smaller individuals occupy different perches than those occupied by adults, to avoid competition and possible aggressive interactions.

Prediction 2

Larger individuals occupy larger diameter perches and smaller individuals occupy smaller diameter perches regardless of sex.

Elstrott and Irschick (2004) found that foot morphology and microhabitat, more specifically perch height, are correlated in *Anolis* lizards. Irschick et al. (2005) found that different intraspecific age and sex classes within *Anolis carolinensis* lizards occupy different perches, and thus divide microhabitat use. Adult males occupy higher perches than adult

Figure 1.
Close ups showing typical vegetation in maquis habitat which is dominated by: Apocynaceae, Casuarinaceae, Cunoniaceae, Cyperaceae, Dilleniaceae, Epacridaceae, Euphorbiaceae, Gramineae, Myrtaceae, Orchidaceae, Proteaceae, Rhamnaceae, Rubiaceae, and Rutaceae. Central plant in a. is *Dracophyllum verticillatum* (Ericaceae). Central plant in b. is *Tristaniopsis glauca* (Myrtaceae).

Figure 2.
Close ups showing typical vegetation in humid forest habitat which is dominated by: Araucariaceae, Casuarinaceae, Clusiaceae, Dilleniaceae, Fabaceae, Lauraceae, Myrtaceae, Palmaceae, Pandanaceae, and Proteaceae.

females, both of which occupy higher perches than juveniles of either sex (Irschick et al. 2005). Similar results were found by Miranda and Andrade (2003) for the gecko *Gonatodes humeralis*. They found that during the rainy season the mean perch height for males was higher than for females. This however was only the case during the rainy season. During the dry season there was no significant difference for perch height between males and females.

Activity

Bauer and Sadlier (2000) reported *R. auriculatus* most active from sunset to 2100-2200 h, although some daytime activity occurs (Meier 1979; Bauer and Russell 1990), and individuals have also been found basking (Bauer and Vindum 1990). There are little data available for certain aspects related to the activity of *R. auriculatus* such as the temperature range over which activity occurs and the effect of precipitation and ambient light (lunar cycle) on activity.

Question

Do temperature, precipitation, and ambient light affect the activity of *R. auriculatus*?

Hypothesis

Temperature, precipitation and ambient light all affect the activity of *R. auriculatus*.

Prediction 1

Rhacodactylus auriculatus are more active at higher temperatures.

Prediction 2

Rhacodactylus auriculatus are more active after and during light rains.

Prediction 3

Rhacodactylus auriculatus are more active at higher levels of ambient light.

In order to ascertain the validity of these predictions the number of specimens found per hour of field work were compared to temperature, precipitation, and lunar cycle during that period of field work.

MATERIALS AND METHODS

The field work portion of this study, performed by the author and Leslie Snyder who served as a field assistant, took place on 30 nights from June 22, 2004 to August 4, 2004 during the New Caledonian cool season. On some nights field work was not performed because heavy rains made locating geckos by eye-shine nearly impossible. On several occasions we were accompanied by Parc Provincial de la Rivière Bleue employees, Joël Delafenetre and Jean-Marc Meriot, who were trained to gather basic morphological and ecological data for lizard species including the collection of stomach contents.

Study Site

New Caledonia is located in the Coral Sea, approximately equidistant from the east-central coast of Australia, northern New Zealand, and southeastern Papua New Guinea (figure 3). New Caledonia has a long and complex geologic history. It is Gondwanan in origin and has been isolated throughout much of its history (Kroenke 1984; Otte and Rentz 1985; Kroenke1996). Long periods of geographic isolation have contributed to New Caledonia becoming the most biogeographically interesting island in the Southwest Pacific (Keast 1996).

The study site, located within Le Parc Provincial de la Rivière Bleue --22° 06´ S, 166° 39´ E-- (figure 4), was selected because of its location in the center of the known contiguous

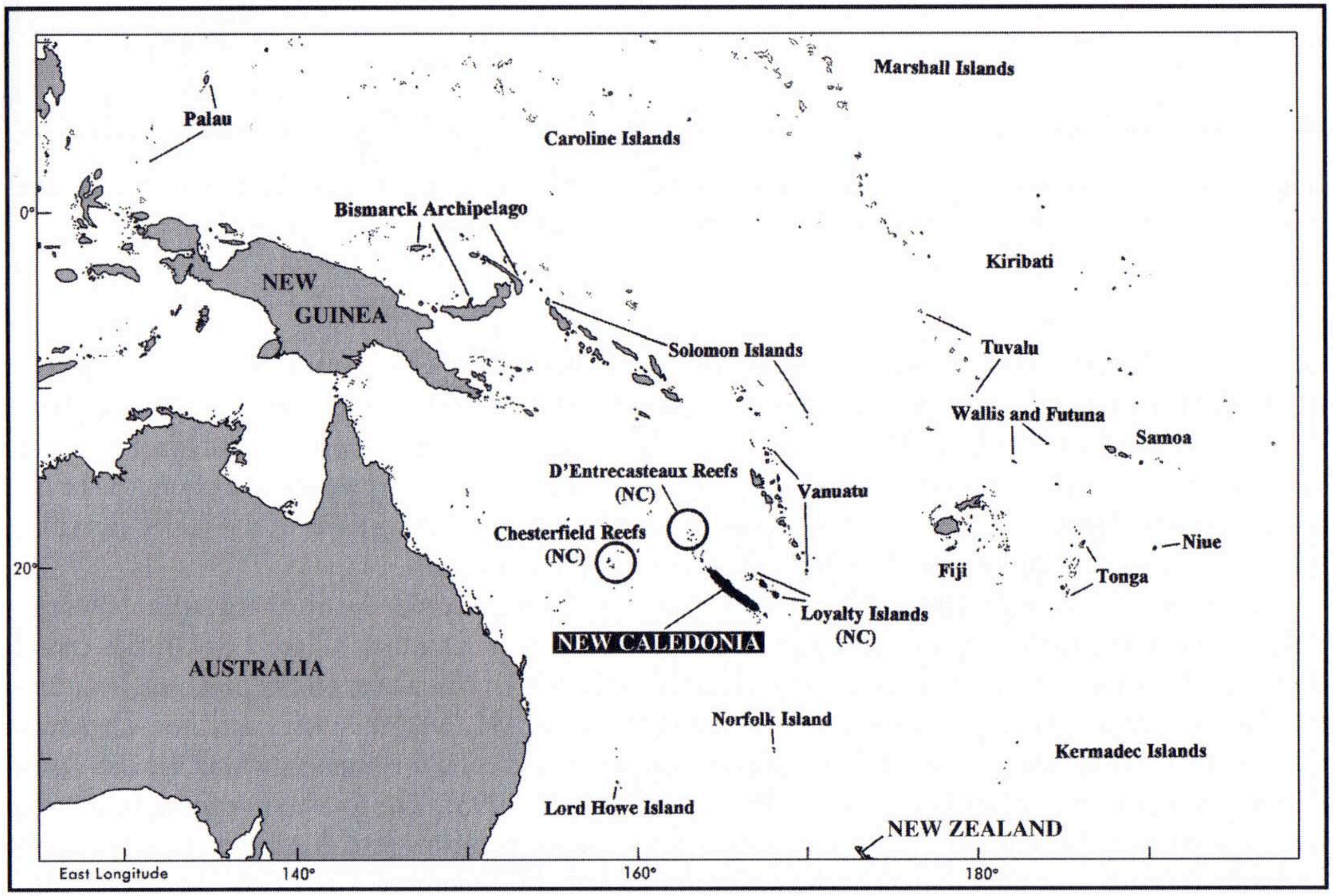


Figure 3.
Location of New Caledonia within the southwestern Pacific, Bauer and Sadlier (2000).

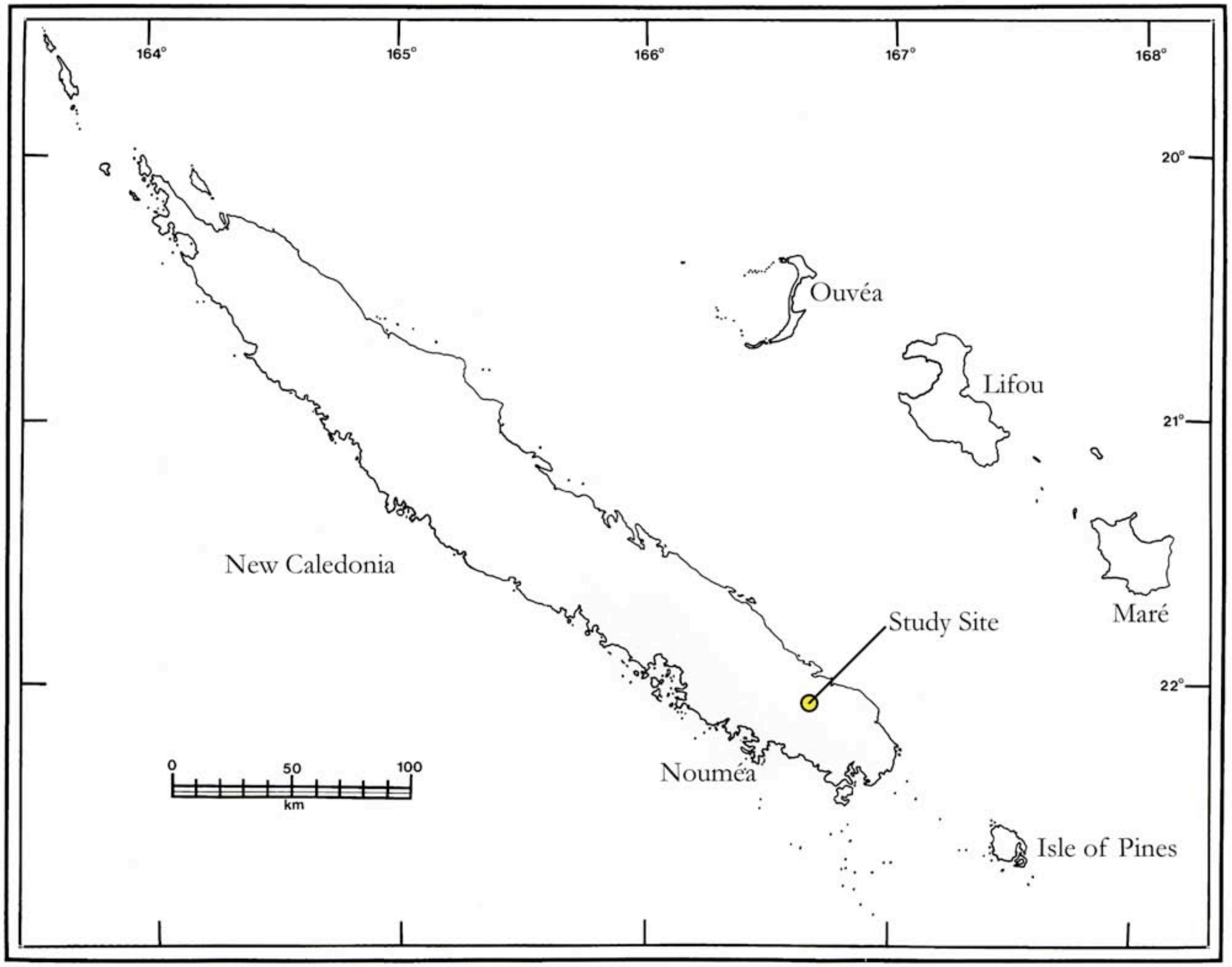


Figure 4.
Map of New Caledonia showing location of study site in Parc Provincial de la Rivière Bleue.

distribution of R. *auriculatus* (Bauer and Sadlier 2000). The site contained both humid forest and maquis habitats (figures 1 and 2); the two habitats in which R. *auriculatus* occur (Bauer and Sadlier 2000). The Province Sud government generously provided housing and transportation within the park. The housing utilized during the study was a refuge near Pont Germain hereafter referred to as the "Refuge" (figure 5b). Additionally, this study site allowed interaction with park workers and their training in scientific data collection techniques. The relationship established with the government and park workers will help make possible future field work.

Parc Rivière Bleue is a provincial park 43km east of Nouméa (the New Caledonian capital and chief city of Province Sud) and separated from the eastern coast by the hills of Yaté. Established in 1980, Parc Rivière Bleue comprises 9045 ha of maquis and humid forest. The park has virgin forests of *Araucaria* and *Agathis* including the "Grand kauri", estimated to be around 1,000 years old. The park is dominated by ultramafic formations covered with maquis vegetation. It is in this habitat that R. *auriculatus* is most frequently encountered (Bauer and Sadlier 2000). Numerous roads and walking trails within the park create edges were the vegetation is shorter and tangled; this ecotone appears to be particularly favorable for locating R. *auriculatus*, especially in humid forest habitats (AMB pers. com.).

Parc Rivière Bleue experiences a mild, oceanic, climate with temperatures similar to those of Nouméa. From November to mid-April the climate is warm and humid with February being the hottest month. The maximum temperatures in Nouméa (no specific temperature data was available for the Park) vary between 22°C and 28°C. July and August are the coolest months with minimum temperatures ranging between 11°C and 17°C (Logan and Cole 2001). According to Sautter (1981) the Park receives 2000-3000mm of annual

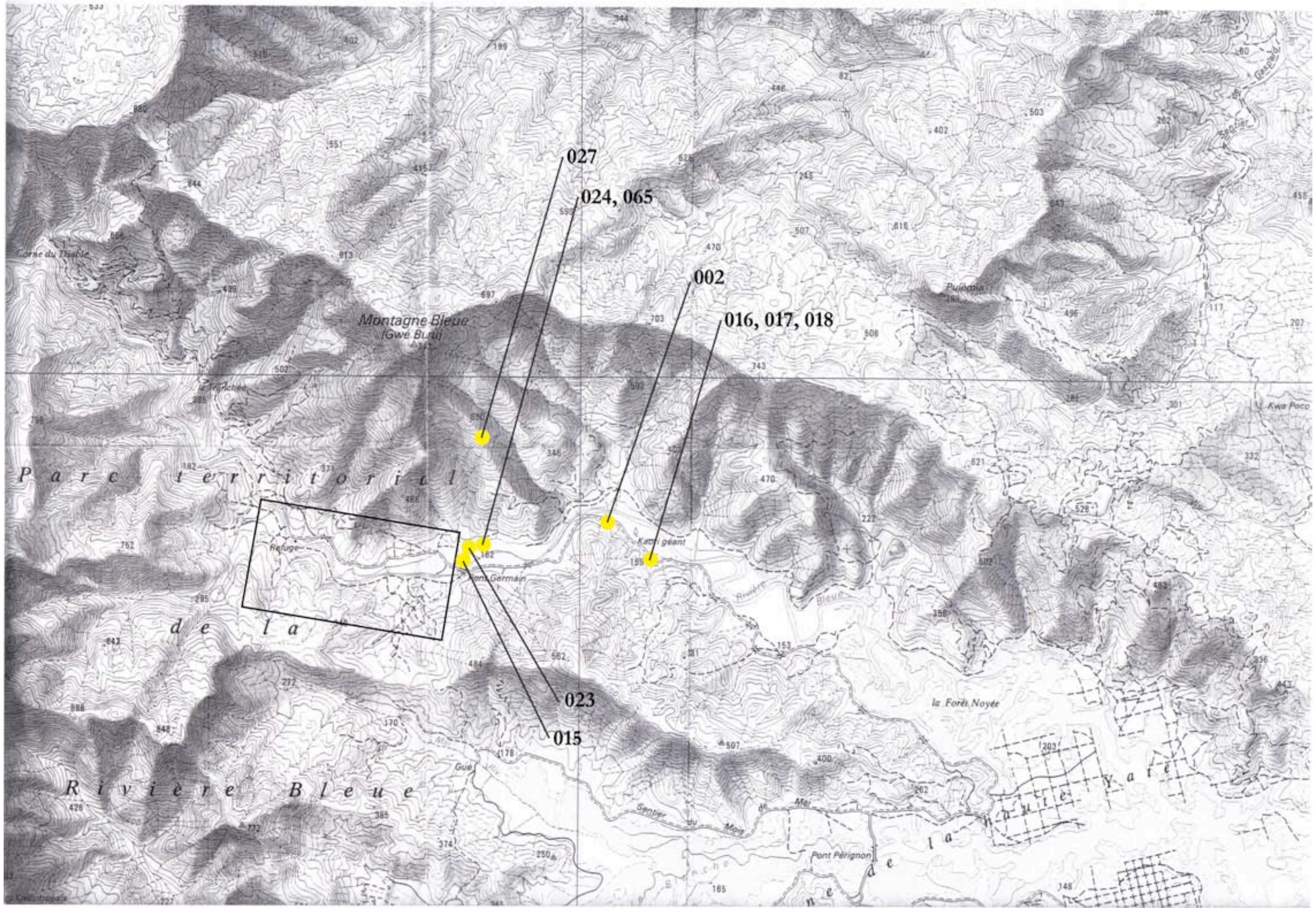


Figure 5a.
Study site where 102 *R. auriculatus* were recorded from June 22-August 4, 2004. The majority of specimens were captured in the inset, seen below as figure 5b.

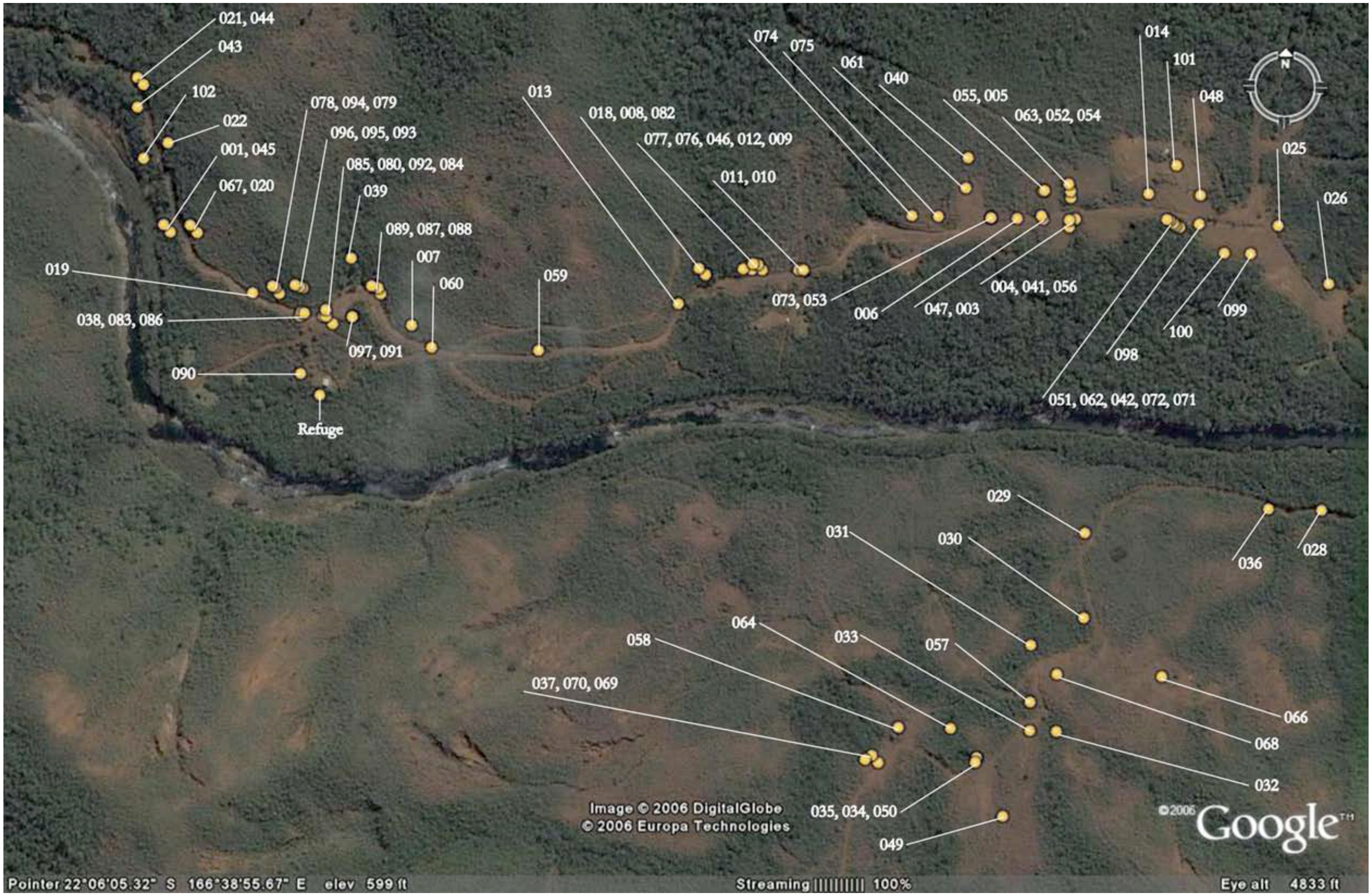


Figure 5b.
Inset of figure 5a where the majority of *R. auriculatus* specimens were recorded.
Base Image used with permission from Google, Inc. (Google Earth, 2006. http://earth.google.com/ accessed on July 20, 2006)

precipitation and the dry season is August to November, while January through May are the wettest months.

Capture of geckos

Each night transects were walked along the dirt roads that dissect Parc Rivière Bleu (figure 6). There were no predetermined criteria used for selecting where sampling would take place. Rather, sampling took place in the areas that were found to be most productive and continued, often over several consecutive nights, until recaptures became more common than new specimens. This approach was used in order to perform the maximum number of stomach flushings possible, as the principle focus of the study was dietary. Due to the nonrandom search method, used in order to maximize the number of specimens captured, there are limitations on how the data can be interpreted. For example, it would not be appropriate to use such data (nonrandom sampling) to determine demographics such as population density or number. Most evenings sampling began around 1800 hours and ended at 2200- 2230h; however, some nights searching continued until 0100h due to activity remaining high, presumably due to warm weather.

Geckos were primarily located by eye shine, although several were seen on perches based on body shape alone. After specimens were located they were captured by hand and a numbered digital photograph of each animal was taken (see figure 7). The following locality and morphological data were then recorded for each specimen: perch height (m), perch diameter (mm), altitude (m), GPS coordinates (deg. min. sec.), SVL (mm), total body mass (g), tail condition (original vs. not, see appendix 1 for results), and sex (M or F) for individuals large enough to be sexed visually. Tail condition was determined by the presence or absence of the distinct demarcation that occurs between the patterned body and the

Figure 6.
Transects, in the study site, through maquis (a.) and humid forest (b.). Maquis corresponds to site 004 on figure 5b. Humid forest corresponds to site 002 on figure 5a.

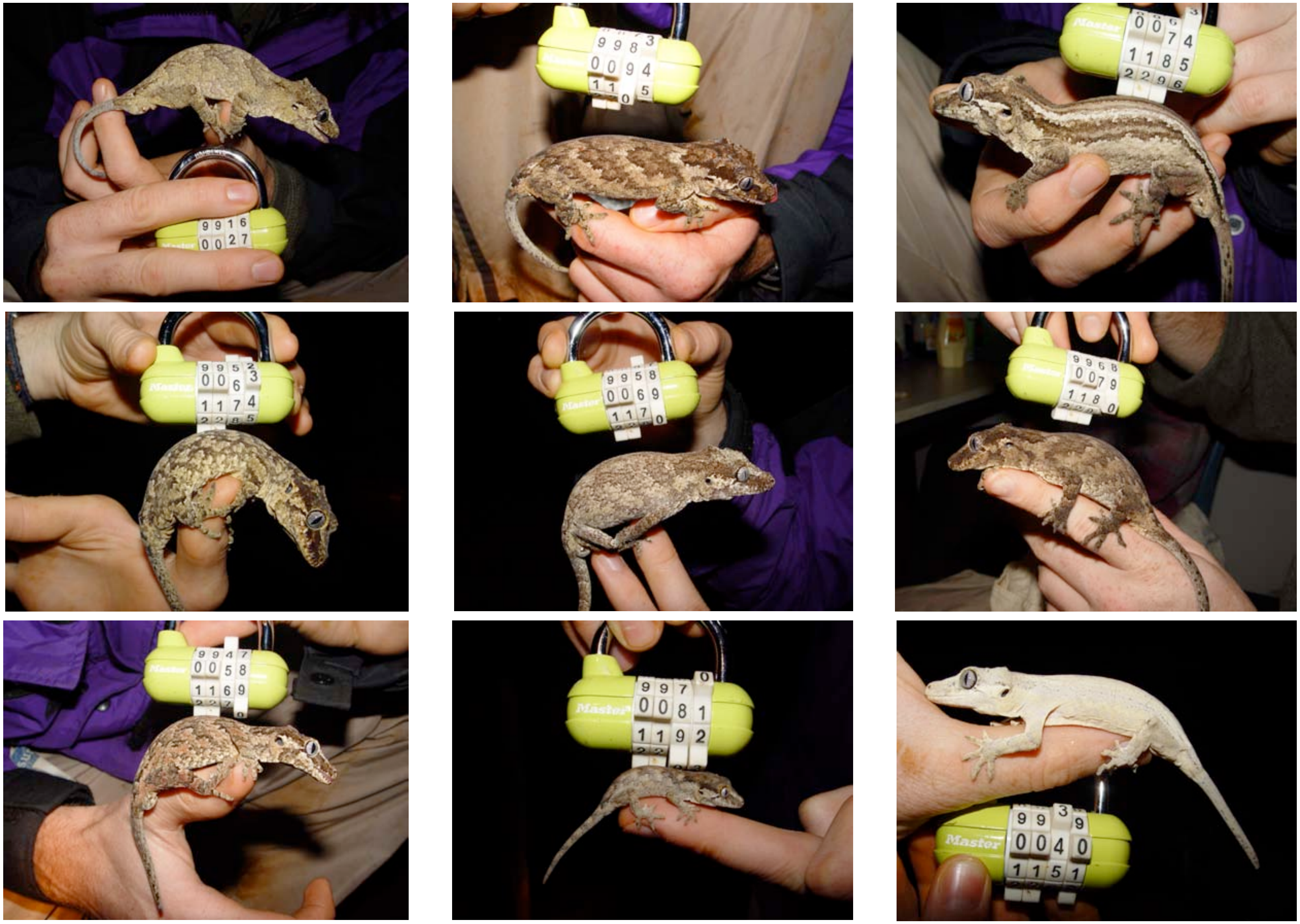


Figure 7.
Representatives of the 102 specimens captured, note variation in color, pattern, and size.

patternless regenerated tail. Sex was determined in mature individuals by the presence or absence of hemipenial bulges. Immature individuals were recorded as juvenile (J -- for raw data see appendix 1).

Collection of stomach contents

Specimen mouths' were opened by applying gentle pressure on the anterior portion of the upper jaw. In order to keep the specimens mouth open during stomach flushing, a plastic cuff fashioned from a portion of a syringe barrel was placed into the open mouth. A human infant feeding tube connected to a 10 cc syringe (Figure 8) was then fed down the throat to center of the stomach. Prior to inserting the tube into the stomach it was measured against the outside of the body to predetermine the proper depth of insertion. The optimal location for the end of the tube is in the center of the stomach, which is typically located just posterior to the forelimbs (Legler 1977; Legler and Sullivan 1979; James 1990).

Infant feeding tubes were used for flushing as the sub-terminal holes in the feeding tubes decrease the pressure placed on the pyloric sphincter, which would take place when using an open ended tube. The geckos were held, head down, over a piece of cheese cloth and water was rapidly forced into the stomach. The amount of water injected into the stomach was determined by the size of the individual (approximately 10 cc for adult specimens). This was repeated 3-5 times unless the bolus was regurgitated sooner; in which case one additional flushing took place to ensure the removal of all stomach contents. Stomach contents were placed in labeled containers of 70% alcohol. The tube and cuff were removed from the specimen and the gecko was returned to the capture site.

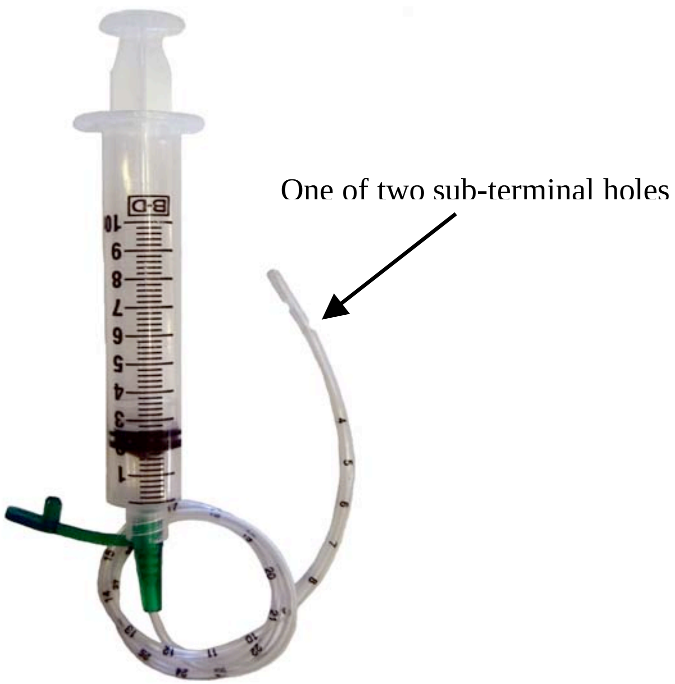


Figure 8a.
Device used for stomach flushing (human infant feeding tube connected to 10 cc syringe).

Figure 8b.
Insertion of tube used for stomach flushing, notice plastic cuff placed in mouth to maintain in open position during procedure.

While there is potential for some inaccuracy using the stomach flushing method, it has been found to be highly reliable at recovering stomach contents (Legler 1977; Legler and Sullivan 1979). The alternative to stomach flushing is to euthanize and dissect the specimen. This was not allowed under the permit I was granted by the government of the Province Sud, nor was it deemed necessary. In order to verify that the method used in the current study was effective, during the course of field work specimens were fed insects and stomach flushed 10 minutes later. This was performed on two separate specimens and in both cases the insect was easily recovered within two stomach flushings.

Observation

Initially all R. *auriculatus* were marked with a unique number by use of a fast drying oil-based reflective paint. This was done so that the animals would be easily relocated by use of headlamps. Marking done by this same method was used to relocate sleeping green iguanas with a 96% success rate (Rand 1988). At Parc Rivière Bleue, however, there are abundant patches of reflective white lichens on the trees. Due to this, the use of reflective paint was very inefficient and was discontinued after five days. Instead, a permanent black marker was used to label each gecko with a number on the ventral surface of the body that corresponded with the number used in the digital photograph. These markings were often visible before recapturing the animal, on a subsequent occasion, due to their habit of perching perpendicularly on small branches (see figure 9). The markings made with the sharpie marker remained until the subsequent shed (ecdysis), upon which the label is completely lost. The time period between ecdysis is dependent upon growth rate and typically occurs several times throughout the year. It has been shown that during cooler periods reptiles eat less and are less likely to undergo ecdysis (Alexander and Brooks 1999).

Figure 9.
Perpendicular manner in which *R. auriculatus* are most frequently found perched.

During the study period no specimens were noted as having lost their marking. However, the morphological measurements that were recorded, in combination with the color photograph that was taken of each specimen (figure 7) served as a secondary method of identifying individuals. There is a high degree of variability in color and pattern in *R. auriculatus* which makes individuals highly distinguishable.

Radio Tracking

During the course of field work, a relationship was established with local scientists that were radio tracking the endemic national bird, the Kagu (*Rhynochetos jubatus*). They graciously supplied their expertise and tracking equipment over a nine day period. An adult female *R. auriculatus* (specimen number 78, see appendix 1) was captured approximately 100 m north-northwest from the refuge (see site 078, figure 5b). A 1.5 g transmitter designed for parakeets was attached by use of super glue and cheese cloth (Cobb et al. 2005). The transmitter was glued to the back of the animal just posterior to the forelimbs. A thin layer of cheesecloth was then glued over the top of the transmitter and to the skin in order to secure the transmitter. The transmitter fell off three times and was reattached to the same individual using the same method over a five day period.

Statistical Analysis

The dietary portion of the current study is expressed as the percent by number, volume, and weight for the various food item classes that comprise the diet of *R. auriculatus*. The total number of stomachs containing each item is also reported. Single factor ANOVAs and regression analyses were performed in order to determine the relationship, if any, between morphological, microhabitat, and environmental parameters including perch height and diameter as they relate to weight, SVL, and sex, as well as temperature, ambient light, and precipitation as they relate to average hourly catch rate.

Dietary niche breadth was calculated, by number and volume of items in each category, for *R. auriculatus* (table 4 – see discussion) and each gecko species for which raw data were available (table 3 – see discussion), using the Shannon index of diversity (Pianka 1966; Peet 1974; Pielou 1977; Castanzo and Bauer 1993; Vitt 1995; Castanzo and Bauer 1997). Shed skins were not included in the analysis nor were data from the combined category "lizards including shed skins" (table 3 – combined only where insufficient information was available in literature to separate shed skins from other vertebrate material).

RESULTS

Diet

There were 102 captures during the study, which represent 88 unique specimens. Fourteen total recaptures occurred during the study. Six specimens were recaptured once and four specimens were recaptured twice (see appendix 1). Upon recapture a photograph with the next sequential specimen number was taken (figure 10) and the original specimen number was noted. Specimens that weighed less than 12 grams, or had been stomach flushed within the last week were not stomach flushed. A total of 66 stomach flushings were performed, three of which were previously stomach flushed following prior capture. No specimen was stomach flushed on more than two occasions.

Food items were found in 14 of the 66 (21.2%) stomachs flushed, yielding a total of 18 items (table 1). Fifteen of the 18 items were animal prey, 13 of which were arthropods, comprising 86.7% by number and 93.9% by volume of the total animal prey items

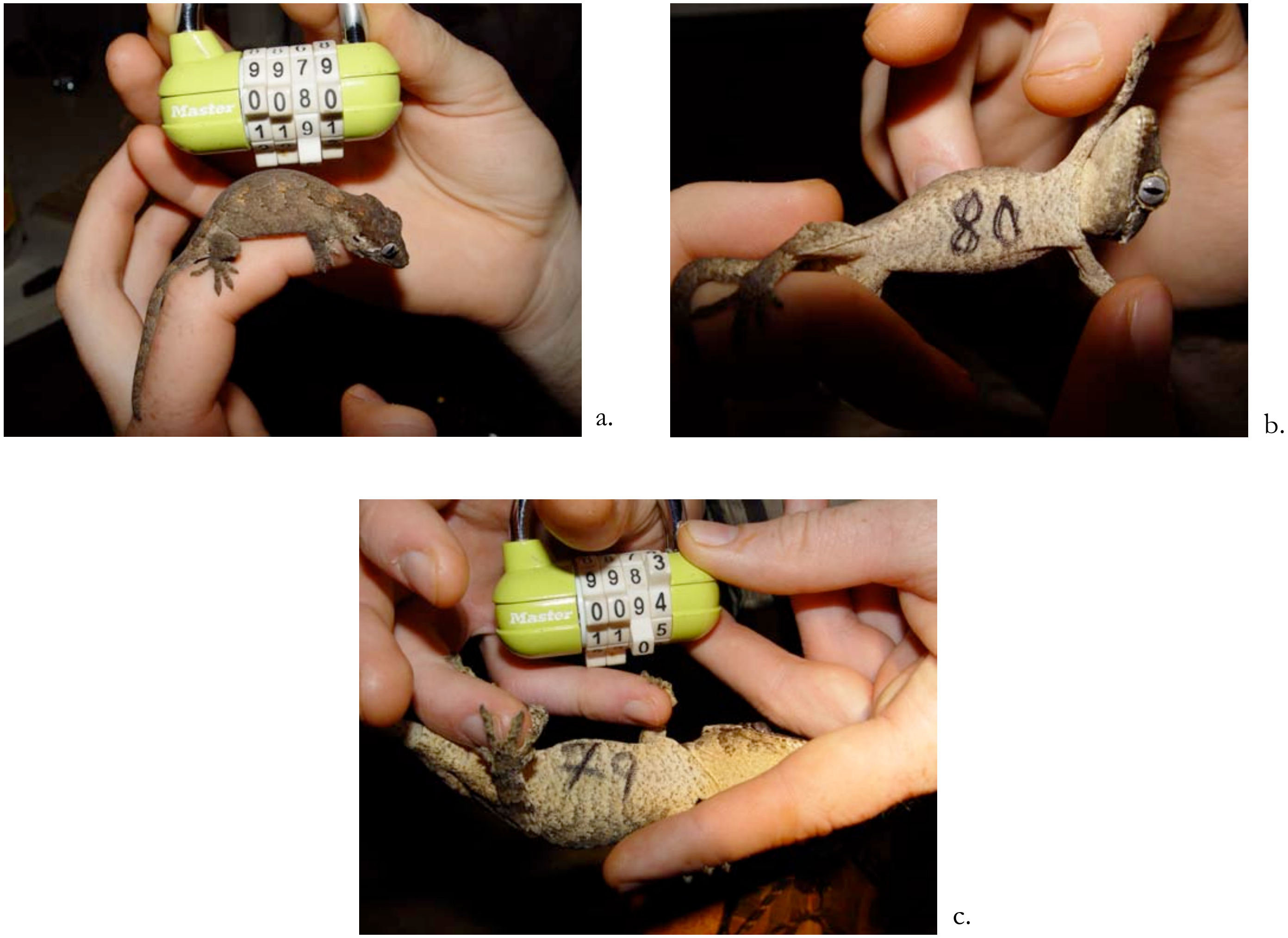


Figure 10.
Each *R. auriculatus* was photographed with a specimen number (a.) and marked with the corresponding number on the ventral surface using a permanent sharpie marker (b.). For each recapture a new photograph was taken with the next sequential specimen number (c.).

Prey Taxon	**Items**		**Stomachs**		**Volume**		**Weight**	
	number	% total	number	% total	cm^3	% total	g	% total
Araneae	1	6.7	1	7.1	0.15	12.6	0.09	17.6
Diptera								
Tupulidae	2	13.3	2	14.3	0.03	2.5	0.04	7.8
Coleoptera								
adult	3	20.0	3	21.4	0.05	4.2	0.05	9.8
larvae	3	20.0	3	21.4	0.23	19.3	0.17	33.3
Lepidoptera								
adult	2	13.3	2	14.3	0.22	18.4	0.06	11.8
larvae	1	6.7	1	7.1	0.05	4.2		
Phasmotidae	1	6.7	1	7.1	0.39	32.7	0.07	13.7
Caledoniscincus atropunctatus	1	6.7	1	7.1	0.01	0.8	0.02	3.9
Gecko								
Bavayia spp.	1	6.7	1	7.1	0.06	5.3	0.01	2.0
Total Animal Prey	15	100	14	100	1.19	100	0.51	100
Other stomach contents								
Shed gecko skin	2		2	14.3	2.26		0.79	
Gelatinous mass	1		1	7.1	0.3			

Table 1.
Stomach contents of 14 specimens of *Rhacodactylus auriculatus*

recovered. Two vertebrate prey items constituting 13.3% by number and 6.1% by volume of the total animal prey were recovered. One was the front arm of a skink, identified as *Caledoniscincus atropunctatus* by comparison with preserved specimens. The second was the thoracic region and humerus of a small gecko. Both were recovered from different adult male *R. auriculatus* captured in the open maquis. The recovered gecko is most likely a juvenile *Bavayia septuiclavis* as they are abundant in the area; however, *B. geitaina* and *B. sauvagii* are also possible candidates. Remaining items included shed gecko skin, found in two stomachs, and an unidentifiable gelatinous mass recovered from one stomach.

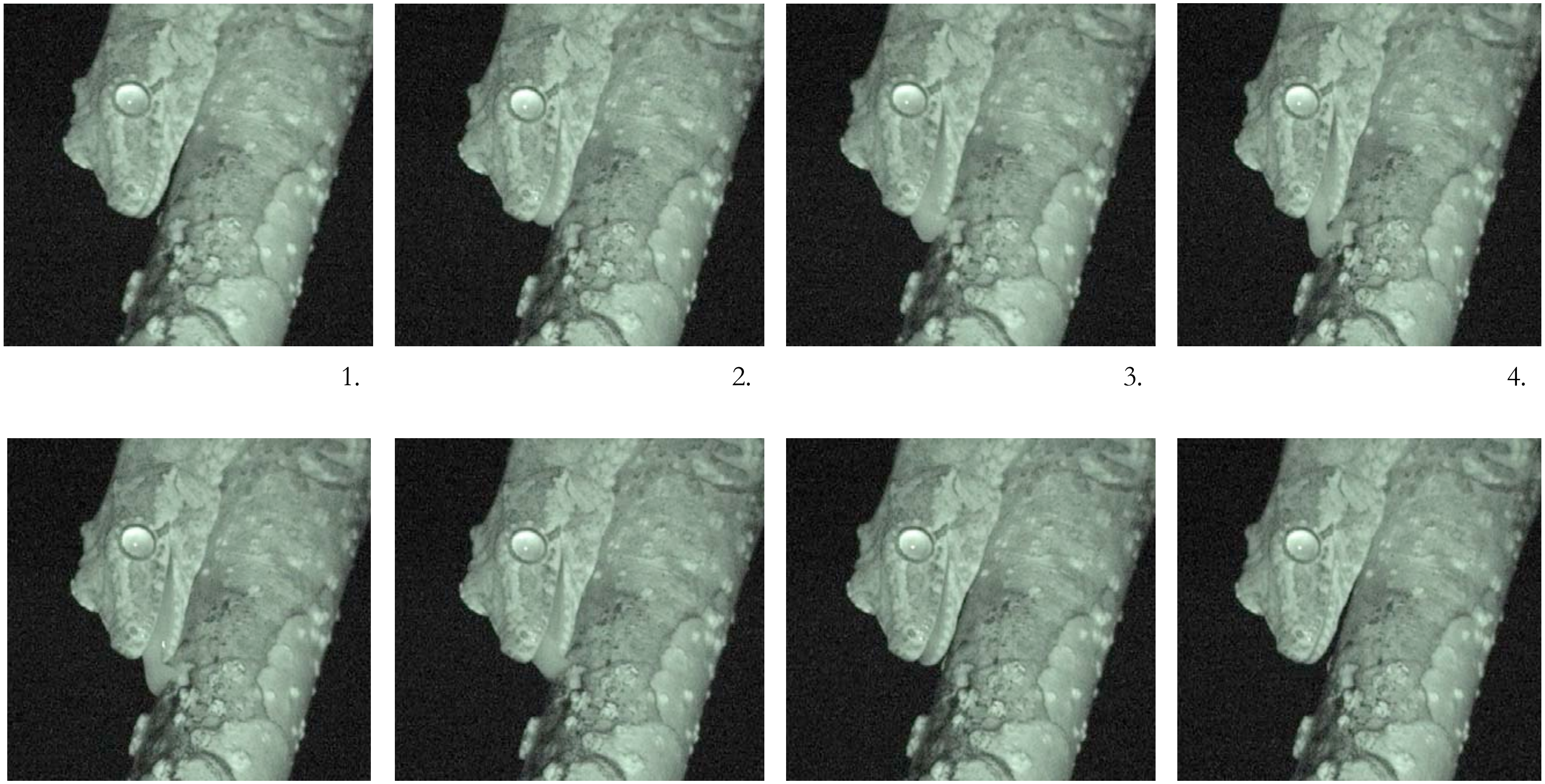
An adult female (36g, 122.8mm SVL) was seen drinking tree sap from a *Cunonia macrophylla* (see figures 11a and 11b) over a period of three nights. During the day she moved onto surrounding vegetation within a few meters; returning each night to feed on the sap. Infrared video of the specimen feeding on the sap was taken on one night (see figure 12). The video was analyzed and during a period of sixty nine minutes and fifty six seconds the specimen licked the sap covered wound 662 times or 9.47 times per minute. When filming began the individual was already licking the wound and continued to do so after filming ended. Licking was intermittent; several consecutive licks were followed by pauses of varying lengths and then numerous additional licks.

Microhabitat

Of 102 *R. auriculatus* recorded, 13 were found in humid forest while 89 were found in maquis (Figures 5a and 5b). The average perch diameter for specimens recorded in the humid forest was 40±46.9mm and the average perch height was 1.8±0.839m. The average perch diameter and height for specimens recorded in the maquis was 21±23.2mm and

Figure 11a
Location near Refuge (site 038 on figure 5b) where *R. auriculatus* was found feeding on sap (Inset shows feeding site).

Figure 11b
Inset of figure 11a (photo taken from different angle).
Close up of sap feeding site on *Cunonia macrophylla* plant.



1. 2. 3. 4.

5. 6. 7. 8.

Figure 12.
Representative images taken from seventy minutes of film in which an adult female *R. auriculatus* licked the sap covered wound of a *Cunonia macrophylla* plant 662 times. Filming began around 20:00 hrs.

1.8±1.07m, respectively. As search effort was not recorded, from this point forward results will be provided without distinction of habitat type.

The difference between mean perch height usage for males, females, and juveniles was compared using analysis of variance (ANOVA) and was found to be statistically significant (P= 0.0493 – table 2a). Female *R. auriculatus* occupied the highest perches on average (2.0±1.23m), while males and juveniles occupied average perch heights of 1.9±0.890m and 1.4±0.736m, respectively (figure13).

The relationship between perch height and weight was found to be statistically significant (r^2= 0.0647, f ratio= 6.71, degrees of freedom= 1, 97; P value=0.0111). Specifically, heavier animals were more likely to be found on higher perches (see figure 14). The relationship between perch height and SVL approached significance (P= 0.0774) suggesting that greater SVL may be correlated with use of higher perches (table 2a and figure 15).

Adult male *R. auriculatus* were found on perches with the largest average diameter (30.8±37.5mm), while juveniles utilized the smallest average perch diameter (17.9±25.4mm), and adult females occupied intermediate perches (21.2±15.9mm). The results of an ANOVA comparing perch diameter usage between males, females and juveniles was not statistically significant and is summarized in table 2a. There were also no statistically significant differences found for the relationship between perch diameter and weight or SVL (table 2a).

ANOVAs		**R^2**	**F**	**d.f.**	**P**
Perch Height	Sex	☐	3.11	2, 91	**0.0493**
Perch Diameter	Sex	☐	1.66	2, 84	0.196
Regression Analyses					
Perch Height	Weight	0.0647	6.71	1, 97	**0.0111**
Perch Height	SVL	0.0318	3.19	1, 97	0.0774
Perch Diameter	Weight	0.00832	0.369	1, 97	0.814
Perch Diameter	SVL	0.00228	0.639	1, 97	0.221

Table 2a.
Correlations between various morphological features of *R. auriculatus* and selected microhabitat parameters.

Regression Analyses		**R^2**	**F**	**d.f.**	**P**
Temperature	Average Hourly Catch Rate	0.0292	0.751	1, 25	0.394
Ambient Light	Average Hourly Catch Rate	0.0896	2.75	1, 28	0.108
t-Test			**t Stat**		
Precipitation	Average Hourly Catch Rate		0.495	26	0.313

Table 2b.
Correlations between various climatic data and hourly catch rate.

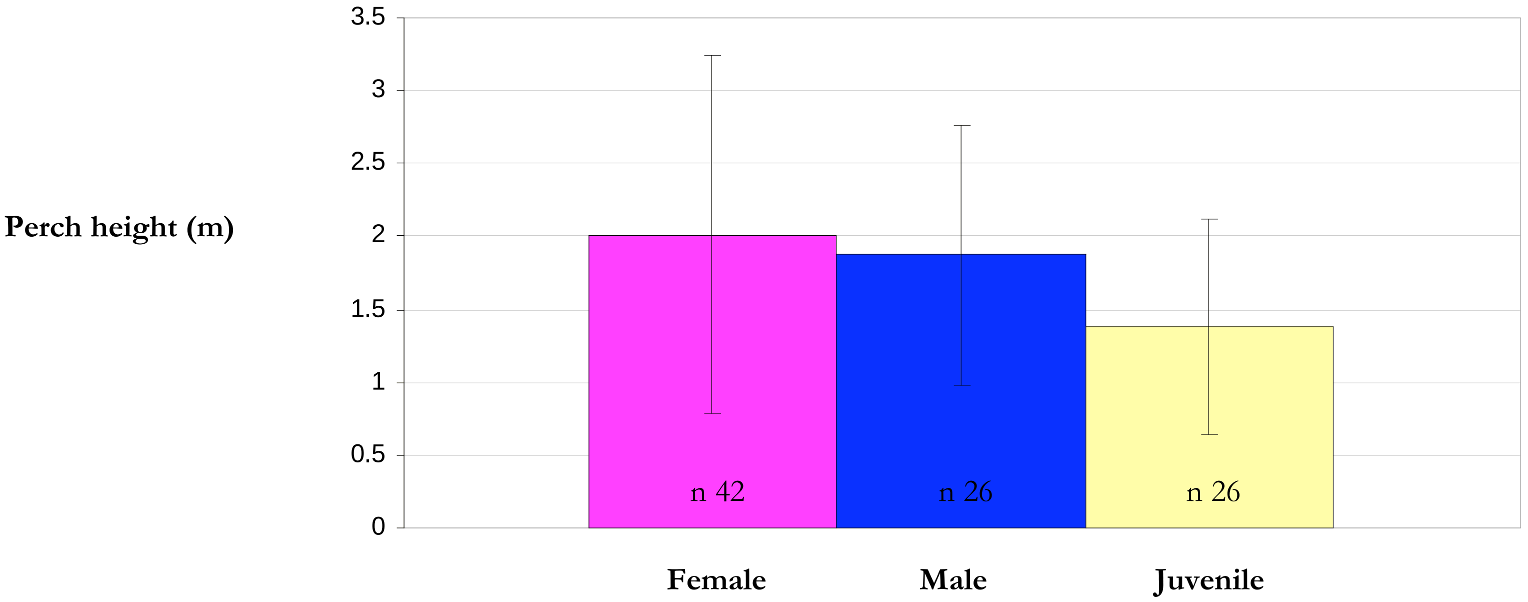


Figure 13.
There is a significant difference between the mean perch height of male, female, and juvenile R. *auriculatus* (F= 3.11; df= 2, 91; P= 0.0493)

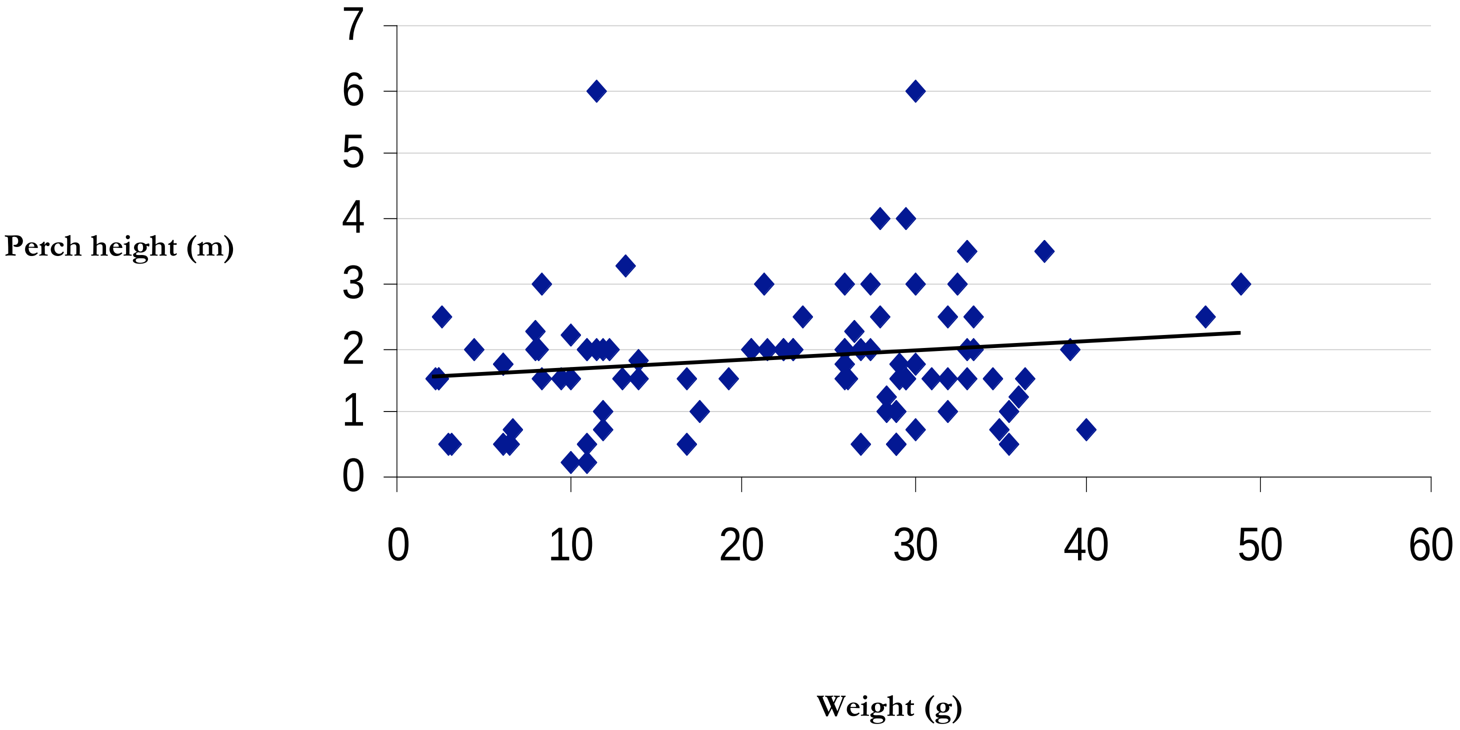


Figure 14.
Perch height is positively correlated with weight (R^2= 0.0647; F= 6.71; df= 1, 97; P= 0.0111)

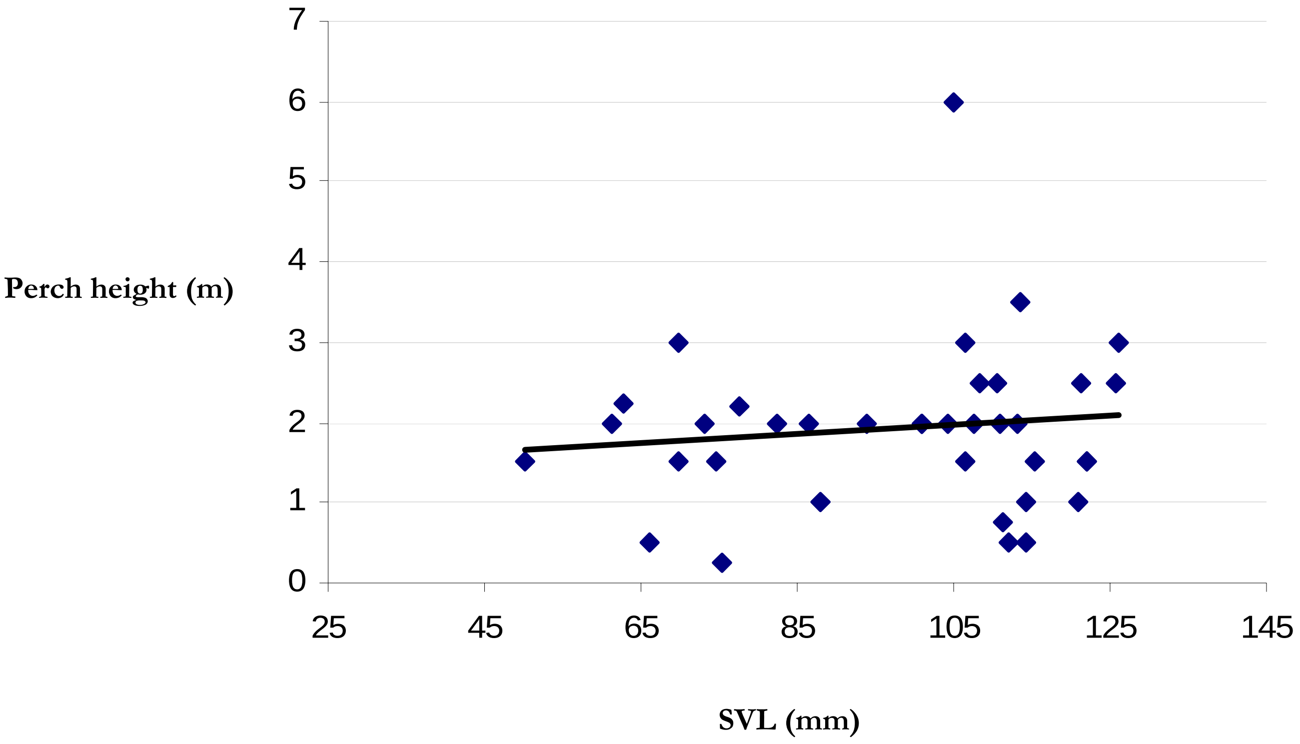


Figure 15.
Although the relationship is not statistically significant, there is a positive trend between perch height and with snout vent length (SVL) in R. *auriculatus* (R^2= 0.0318; F= 3.19; df= 1, 97; P= 0.0774)

Activity

All specimens were captured between 18:05 and 00:10 hrs. Apart from the specimen tracked with a radio transmitter no daytime activity was observed. The individual that was radio tracked was observed gradually rotating around the branch it was perched on throughout the day, presumably to thermoregulate. The movements did not change the perch height or location; rather, just the position around the diameter of the perch.

Specimens were captured from 43 minutes after sunset until six hours and 38 minutes after sunset. The highest catch rates occurred between one and four hours after sunset (figure 16). It is important to note however, that these results are not the product of random sampling. There was a large degree of variability in search effort due to both the number of searchers (we were accompanied by park employees, ranging in number from one to three individuals, on five occasions during the study period) as well as observer bias due to rain, cold, and fatigue.

The relationship between temperature and average hourly catch rate was slightly negative but was not statistically significant (table 2b and figure 17).

There was a positive correlation between average hourly catch rate and ambient light. However, the results were not significant (P= 0.108 –table 2b). The highest average hourly catch rate (2.29) occurred at 90% ambient light (figure 18).

Ambient light was calculated by using data from the U.S. Naval Observatory site (http://aa.usno.navy.mil/data/docs/RS_OneDay.html). At this site data are provided, based upon latitude and longitude, for both percent reflected visible moonlight and moonrise/set. For the purpose of the present study, the percent of reflected visible moon light for each sample period was compared with moonrise/set to assure that the moon was

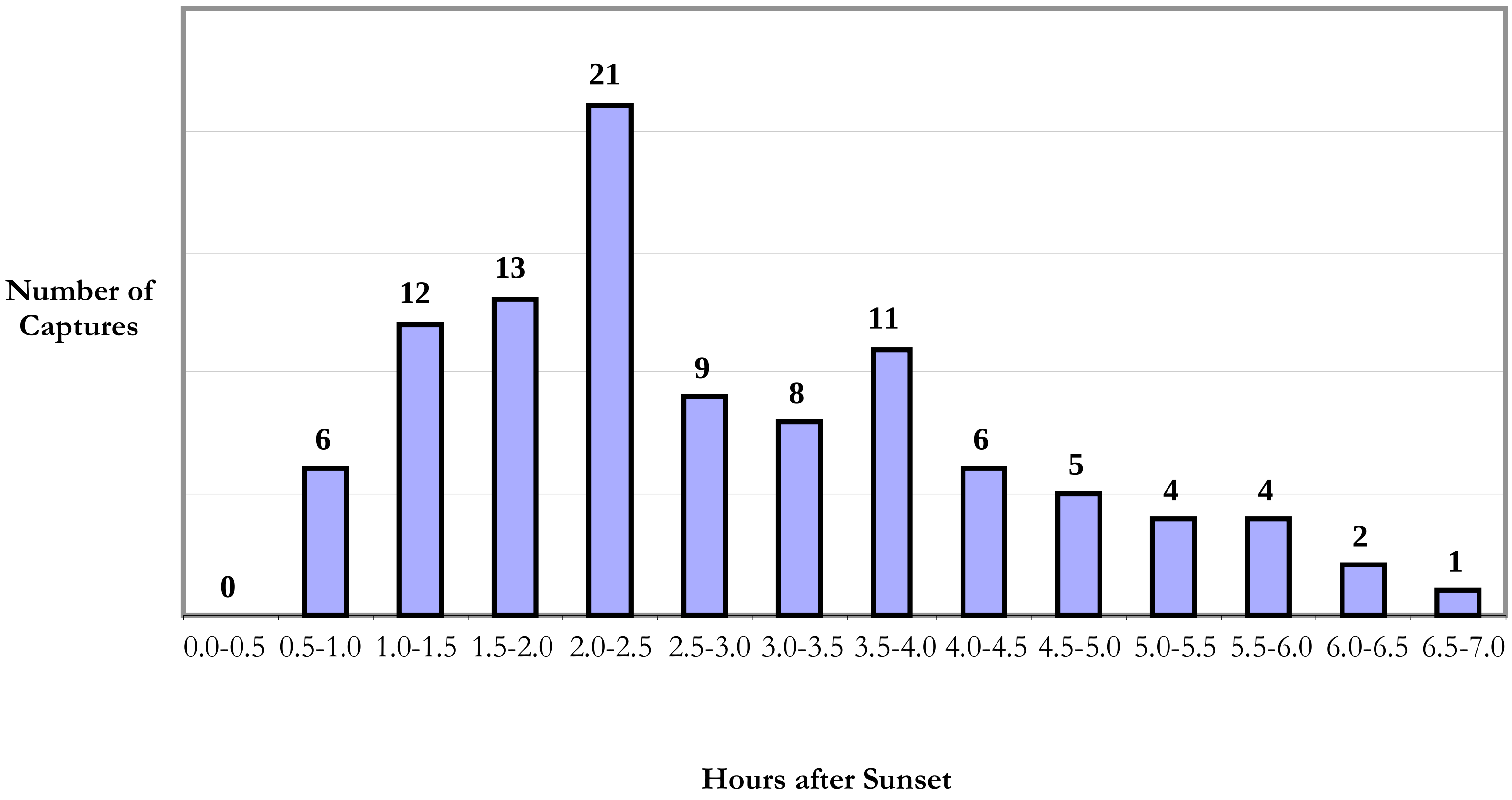


Figure 16.
Diel distribution of captures, shown as the number of specimens captured during each half-hour interval after sunset. Note that the highest catch rates occurred between one and four hours after sunset.

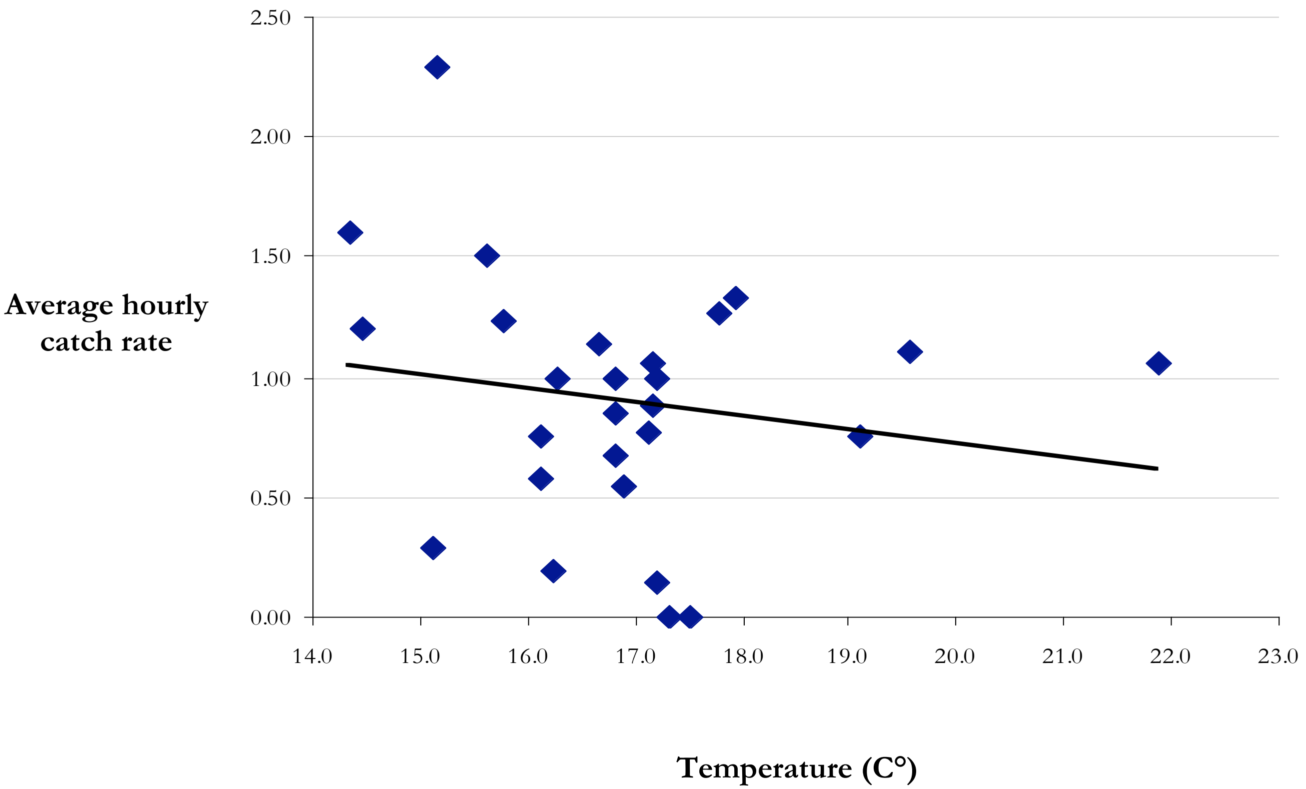


Figure 17.
There was no relationship between average hourly catch rate and increased temperature. (R^2= 0.0292; F= 0.751; df= 1, 25; P= 0.394)

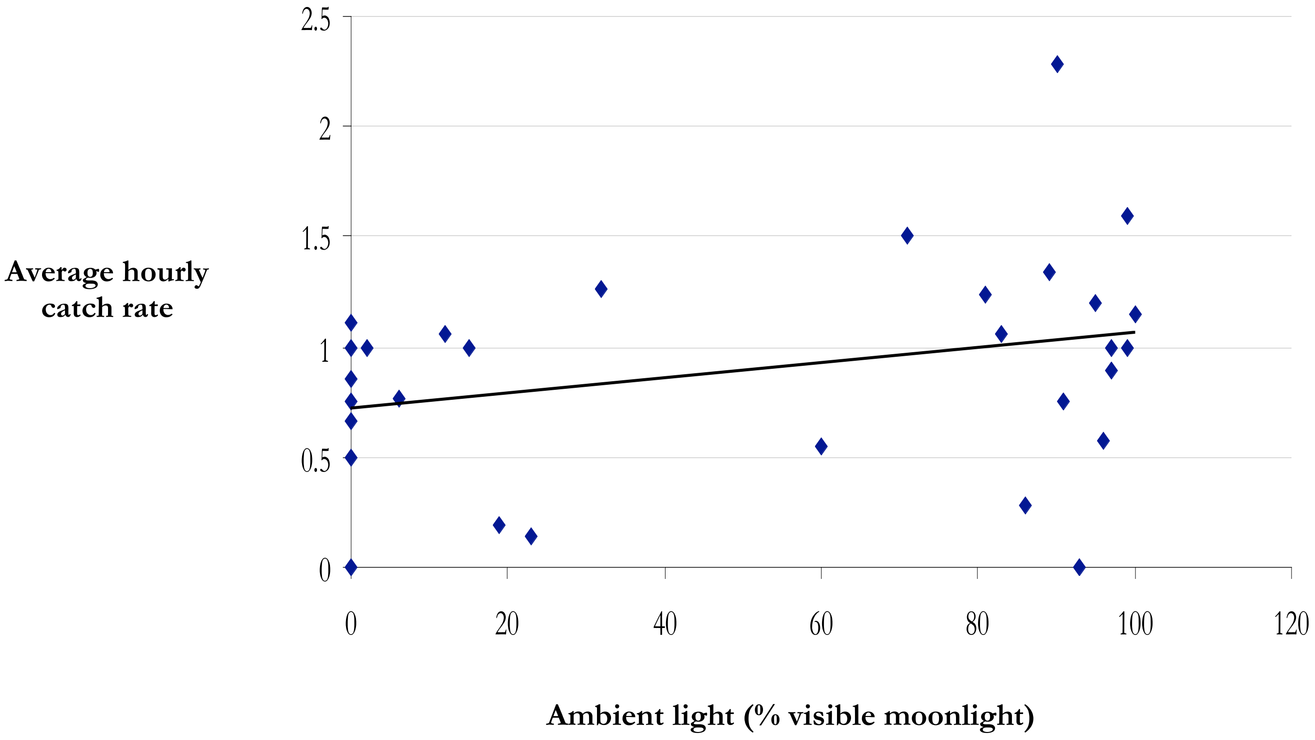


Figure 18.
Although the relationship is not statistically significant, there is a positive trend between average hourly catch rate and the percent of reflected moonlight – full moon is equal to 100%. (R^2= 0.0896; F= 2.75; df= 1, 28; P= 0.108).

above the horizon during that period. If the moon was not above the horizon during the sampling period, the ambient light was recorded as 0% for the purpose of the analysis.

Field observations suggested that light precipitation was correlated with increased activity in *R. auriculatus*; however, this was not found to be statistically significant due to reasons explained in the discussion. The average hourly catch rate during and after precipitation was 0.92 while the average hourly catch rate without precipitation was 0.82 (table 2b).

DISCUSSION

Diet

As predicted, arthropods were the most numerous dietary constituent recovered, representing 86.7% by number and 95.9% by volume of the total animal prey consumed. The disproportionately high volume of arthropods compared to the number of items in the diet, is due to the relatively large size of the single phasmid and arachnid, and the two lepidopterans that were consumed (table 1). Other than the consumption of a few relatively large prey items (also mentioned by Bauer and Sadlier 1994a), the arthropod portion of the diet was unremarkable.

Contrary to the prediction made, vertebrate prey did not constitute a higher percent by volume than by number (6.1% by volume for 13.3% by number) of the prey items recovered. This is most likely due to the extremely fragmented and digested condition in which the vertebrate material was recovered. The volume of the single skink recovered during the study was calculated only for the arm, as it is unknown whether the rest of the skink was consumed. It is likely that if an item were difficult to recover via stomach flushing it would be a large one such as this (approx. 97mm total length). Large items would be more difficult to recover, because the continuous volume of water required to dislodge and recover the item from the stomach would be much greater than that required to recover smaller items. Due to the use of 10cc syringes and the time between refilling the syringe, a limited volume of water could be pumped into the stomach, perhaps less than would be ideal for recovering very large items. Although remnants of the gecko were sufficient to determine that all or nearly the entire gecko was consumed, the volume was calculated based upon measurements of the actual remnants rather than estimating the original size of the animal. The conservative means by which the volume of vertebrate prey was calculated may underplay its importance in the diet of *R. auriculatus*. A similarly sized *C. atropunctatus* was identified by comparison of the recovered forearm to a preserved specimen. The volume of an entire *C. atropunctatus* of comparable forearm length would be approximately 1.8cm^3 and 97mm in total length. If the entire skink were consumed (as it may have been) lizard prey would represent 62.4% by volume of the total animal prey consumed. The gecko would have also accounted for a much higher percent by volume of the total animal prey had it not been recovered in an extremely digested state. The majority of insects recovered via stomach flushing, including the single phasmid, which accounted for 32.7% by volume of the total animal prey, showed little signs of digestion.

Lizard prey in the diet of *R. auriculatus* has been reported by Bauer and DeVaney (1987), Bauer and Sadlier (1994a), and Seipp and Henkel (2000) who observed a *R. auriculatus* stalk and consume a *Bavaya septuiclavis* in the wild. Seipp and Henkel (2000) make an unsubstantiated claim that “wild *R. auriculatus* have proved to be partly cannibalistic”. While it is highly possible that *R. auriculatus* occasionally consume much smaller conspecifics, no verified reports of such occurrences having taken place in the wild were found in the literature. The results of the present study, along with the previous studies mentioned above, indicate that lizard prey is utilized in both the New Caledonian summer and winter, although more so during the summer when lizard activity is higher and a lower proportion of empty stomachs were found. The increased use of lizard prey items in the warm season does not refer to a higher proportion of lizard prey items in the diet compared to other constituents, but rather to the higher percent of lizard prey items found per stomach examined. During the study that took place in the warm season 23.81% of specimens examined contained lizard prey items (Bauer and Sadlier 1994a); whereas, 11.11% (Bauer and DeVaney 1987) and 3.03% (present study) of stomachs examined during the cool season contained lizard prey.

The ingestion of flower parts by *R. auriculatus* has been reported since the species was described in 1869 by Bavay, who observed *R. auriculatus* feeding on flowers of an unspecified plant in the family Cunoniaceae. Bauer and Sadlier (1994a) confirmed this observation, when they recovered anthers, stamens, and possibly pollen (a gelatinous mass was believed to be partially digested pollen) from either the family Cunoniaceae or Myrtaceae, from the stomach of a preserved specimen. Bauer and Sadlier (2001) further substantiate previous reports by observing *R. auriculatus* active on flowering *Geissois* spp. (Cunoniaceae).

In the present study, the discovery of *R. auriculatus* feeding on the sap of *Cunonia macrophylla* constitutes the first field-based report of *R. auriculatus* feeding on sap and further supports the regular dietary use of Cunoniaceae spp. by *R. auriculatus* (Bavay 1869; Bauer and Sadlier 1994a). Although no recognizable plant material, other than a small fragment of wood that a coleopteran was still adherent to, was recovered via stomach flushing, the discovery of sap in the diet of *R. auriculatus* corroborates the prediction that plant matter constitutes a regular dietary component. Plant material such as leaves and wood fragments in the diet of gekkonid lizards are typically purported to be accidentally ingested, usually associated with the consumption of a prey item that was adherent to the plant material. No positive identification was made for the gelatinous mass, recovered via stomach flushing; however, it is most likely nectar or tree sap (Bauer and Sadlier 1994a).

In the present study 14 of the 66 (21.2%) stomachs flushed from June 22-August 4, 2004 contained food items. Bauer and DeVaney (1987) found food items in two of nine (22%) *R. auriculatus* stomachs collected from May-June 1985. In contrast, 19 of 21 (90.5%) specimens contained food items in Bauer and Sadlier's 1994 dietary examination of *R. auriculatus* specimens collected in December 1978; however, a portion of the contents recovered were in the hindgut.

The collection of both stomach and hindgut contents by Bauer and Sadlier (1994a) was possible due to the dissection of preserved specimens. All of the lizard and plant parts found during the study were contained in the stomach and approximately one third of the arthropod remnants were contained in the hindgut (AMB, pers. com.). In the present study, stomach flushing was employed in order to eliminate the need to euthanize specimens. This method allowed for the recovery of food items contained in the stomach only.

As predicted the occurrence of empty stomachs found in the current study was higher than that found by Bauer and Sadlier (1994a), for specimens collected during the warm season. There is a large disparity between the percent of empty stomachs found during the cool season, 78.8% (present study) and 77.8% (Bauer and DeVaney 1987) compared to 9.5% empty stomachs found by in the warm season (Bauer and Sadlier 1994a). Cooler temperatures reduce the activity levels of ectothermic predators and their cold blooded prey including arthropods and lizards. A reduction in activity reduces both the likelihood of obtaining prey and the need to do so (Huey et al. 2001).

Microhabitat

Rhacodactylus auriculatus has been recorded from open and closed maquis as well as humid forest Bauer and Sadlier (2000). *Rhacodactylus auriculatus* are typically located on shrubs and saplings only a few meters above the ground (Bauer and Sadlier 2000). Seipp and Henkel (2000) state that *R. auriculatus* are usually found on trees and shrubs reaching three to five meters, and note that specimens have also been found on fence posts, on the ground, under rocks, and under the loose bark of trees.

In the present study all specimens were found perched on trees and shrubs; however, park workers at the study site reported having seen *R. auriculatus* on the ground during the summer months. Such activity may be necessary for *R. auriculatus* to seek out mates and may increase the ability of *R. auriculatus* to encounter and consume primarily terrestrial skink species.

In the present study the majority (89 or 87.3%) of *R. auriculatus* were found in the maquis, 13 (12.7%) were recorded in the humid forest. All *R. auriculatus* found in the humid forest were located along the roadside or at the ecotone with maquis, within a maximum distance of two meters, the majority being located within one meter. Deeper within the humid forest several gecko species were recorded including *R. ciliatus*, *R. sarasinorum*, *Eurydactylodes symmetricus*, *Bavayia septuiclavis*, and *Bavayia geitaina*. However, *B. septuiclavis* appeared to be much more common along the edges of roads and the border of humid forest and maquis. None of the previously mentioned species were recorded in the maquis except for *B. septuiclavis* which was found only within the denser closed maquis and not in the sparsely vegetated open maquis. The primary use of maquis and humid forest edge habitats by *R. auriculatus* appears to separate them substantially from similarly sized geckos, including their congeners R. *ciliatus* and R. *sarasinorum*. This division in microhabitat use may serve to reduce competition between these sympatric species.

While the difference in perch diameter between habitats (maquis vs. humid forest) was not statistically significant, due to the small number of specimens captured in the humid forest, it is of interest that the results of this study suggest that R. *auriculatus* may select perches based upon height rather than perch diameter. In the humid forest specimens were found on much larger diameter perches but at the same height as in the maquis. The significance of this is unknown; however, it may be correlated with a feeding technique such as capturing *Bavayia* spp. as they emerge from their terrestrial daytime retreats and climb into the vegetation. More research is required to determine the factors upon which perch selection is based in R. *auriculatus*, and potential explanations for such selection.

As predicted there was a statistically significant correlation found between size (weight) and perch height (figure 14). Heavier individuals were more likely to be found on higher perches than lighter individuals. Seipp and Henkel (2000) noted that young R. *leachianus* occupied much lower perches than did adults. Although it may be expected that lighter individuals would occupy higher more slender perches, the territorial nature of gekkonids may make lower perches more practical, for escaping larger aggressive conspecifics. It has been proposed that conspecific perch division serves to reduce aggressive interactions (Pounds 1988; Irschick et al. 2005).

Contrary to prediction, there was a significant difference in mean perch height usage by males, females, and juveniles. Females and juveniles occupied the highest and lowest perches respectively, while and males occupied intermediate perches. These findings are further discussed in a later section (*Rhacodactylus auriculatus* ecology in context).

Results from the present study do not corroborate the prediction that larger individuals would be found on larger diameter perches. Regression analyses comparing both SVL and weight with perch diameter did not produce statistically significant results (table 2a).

Activity

Bauer and Sadlier (2000) reported R. *auriculatus* as most active from sunset to 2100-2200 h. In the present study the highest catch rates occurred from one to four hours after sunset (1900-2200 h). Daytime basking was observed in the present study and has also been reported by Bauer and Vindum (1990). Aside from basking, no daytime activity was observed in the current study; however diurnal activity has been reported by Meier (1979) and Bauer (1990).

Contrary to prediction, temperatures within the range recorded (14.3-21.9°C) at the beginning of field work each night, appear to have had little effect on the perching activity of R. *auriculatus*. Even on the coldest nights individuals still perched; however, it is likely that hunting effort was affected by temperature. Unfortunately, due to the low number of specimens from which stomach contents were recovered, there were insufficient data to obtain meaningful results for correlations between stomach contents and temperature of the corresponding or previous day.

The average hourly catch rate was higher during and after light precipitation (0.92 vs. 0.82). These results support the prediction; however, they were not statistically significant, due in part to two factors. First, when rains became too heavy, field work ceased due to difficulties with capture and data recording. Second, and perhaps more important, the primary search method used was locating specimens via eye shine. Droplets of water on the vegetation are similar in size and reflect light back in much the same manner as do gecko eyes, although less orange than do the eyes of R. *auriculatus*. While wet vegetation did not make locating geckos impossible it did greatly hinder efforts to do so using eye shine. These two factors reduced the success of locating specimens during and immediately after precipitation and presumably decreased the disparity between the results of hourly catch rate with and without precipitation.

In the present study there was a positive correlation between hourly catch rate and ambient light from the moon, as predicted. However, the results were not statistically significant, due to several factors including the low number of lunar cycles over which the study took place and other compounding variables, including precipitation and temperature. The correlation approached significance (P=0.108 – table 2b) and would have likely been significant had the sample period been extended over additional lunar cycles. This phenomenon of increased activity at higher ambient light in nocturnal reptiles is likely due to an increased ability to locate prey items. However, it should be noted that under higher ambient light conditions prey species may reduce activity in order to avoid predation themselves (Perry and Fisher 2005). Higher ambient light conditions may cause R. *auriculatus* to be more vulnerable to predation from potential predators such as barn owls (*Tyto alba*). The results of this study indicate however that the benefits of increased activity during moonlit nights outweighed the risks for R. *auriculatus*, under the conditions in which the study took place.

Rhacodactylus auriculatus ecology in context

In a review of 30 gekkonid species (table 3) the mean arthropod portion of the diet was 91.74±7.98% by volume and ranged from 64.78% for *Nephrurus vertebralis*, to 99.23% for

Carphodactylidae

	Nephrurus laevissimus[1]		*Nephrurus levis*[1]		*Nephrurus vertebralis*[1]	
Habitat	Terrestrial		Terrestrial		Terrestrial	
Prey Taxon	Number	Volume	Number	Volume	Number	Volume
Arthropoda						
Collembola	_	_	_	_	_	_
Myriapoda	_	_	_	_	_	_
Chilopoda	1.58(8)	3.72(0.97)	3.45(2)	5.77(0.55)	11.11(4)	16.19(0.80)
Diplopoda	_	_	_	_	_	_
Crustacea	_	_	_	_	_	_
Isopoda	0.40(2)	0.54(0.14)	_	_	_	_
Amphipoda	_	_	_	_	_	_
Decapoda	_	_	_	_	_	_
Arachnida	_	_	_	_	_	_
Araneae	20.75(105)	12.85(3.35)	22.41(13)	20.46(1.95)	44.44(16)	24.09(1.19)
Scorpiones	0.99(5)	1.42(0.37)	6.90(4)	12.49(1.19)	13.89(5)	15.38(0.76)
Pseudoescorpiones	_	_	_	_	_	_
Acarinae	_	_	_	_	_	_
Opiliones	_	_	_	_	_	_
Insecta	_	_	_	_	_	_
Thysanura	0.20(1)	0.19(0.05)	1.72(1)	0.84(0.08)	_	_
Homoptera/Hemiptera	3.56(18)	1.27(0.33)	_	_	_	_
Thysanoptera	_	_	_	_	_	_
Psocoptera	_	_	_	_	_	_
Neuroptera	_	_	_	_	_	_
Coleoptera (adult)	46.64(236)	29.60(7.72)	18.97(11)	13.54(1.29)	5.56(2)	3.44(0.17)
Coleoptera (larvae)	_	_	_	_	_	_
Diptera	_	_	_	_	_	_
Trichoptera	_	_	_	_	_	_
Lepidoptera (adult)	0.20(1)	0.69(0.18)	_	_	_	_
Lepidoptera (larvae)	_	_	_	_	_	_
Hymenoptera	_	_	_	_	_	_
Formicidae	2.96(15)	0.31(0.08)	_	_	_	_
Mantodea and phasmidae	_	_	_	_	_	_
Orthoptera	8.50(43)	18.94(4.94)	17.24(10)	20.57(1.96)	13.89(5)	5.26(0.26)
Blattidae	3.36(17)	9.59(2.50)	8.62(5)	6.82(0.65)	_	_
Isoptera	0.59(3)	0.12(0.03)	_	_	_	_
Dermaptera	_	_	_	_	_	_
Unspecified Larvae *	3.95(20)	4.72(1.23)	17.24(10)	11.33(1.08)	_	_
Insect Pupae	_	_	_	_	_	_
Unidentified Arthropoda**	4.35(22)	3.53(0.92)	3.45(2)	1.68(0.16)	2.78(1)	0.40(0.02)
Total Arthropoda	**98.02(496)**	**87.46(22.81)**	**100.00(58)**	**93.49(8.91)**	**91.67(33)**	**64.78(3.20)**
Mollusca	_	_	_	_	_	_
Total Mollusca	_	_	_	_	_	_
Plantae	1.38(7)	0.61(0.16)	_	_	_	_
Total Plant	**1.38(7)**	**0.61(0.16)**	_	_	_	_
Fungi	_	_	_	_	_	_
Total Fungi	_	_	_	_	_	_
Vertebrata	_	_	_	_	_	_
Lizards	_	_	_	_	_	_
Lizards including shed skin***	0.59(3)	6.1(1.59)	_	_	8.33(3)	34.82(1.72)
Total Vertebrata	**0.59(3)**	**6.1(1.59)**	_	_	**8.33(3)**	**34.82(1.72)**
Shed skin	_	_	_	_	_	_
Total Shed Skin	_	_	_	_	_	_
Unidentified	_	5.83(1.52)	_	6.51(0.62)	_	0.40(0.02)
Total Unidentified	_	**5.83(1.52)**	_	**6.51(0.62)**	_	**0.40(0.02)**
Grand Total	**100.00(506)**	**100.00(26.08)**	**100.00(58)**	**100.00(9.53)**	**100.00(36)**	**100.00(4.94)**
	1.74	2.03	1.95	2.06	1.45	1.48
Number of Specimens (with food)	173(145)	_	36(24)	_	14(14)	_
% Specimens with food	83.82	_	66.67	_	100	_
Number of prey items	_	_	_	_	_	_

Diplodactylidae

	Bavayia cyclura[4]	*Bavayia sauvagii*[4]	*Diplodactylus conspicillatus*[1]		*Diplodactylus pulcher*[1]		*Diplodactylus stenodactylus*[1]	
Habitat	Arboreal	Arboreal	Terrestrial		Terrestrial		Terrestrial	
Prey Taxon	Number	Number	Number	Volume	Number	Volume	Number	Volume
Arthropoda								
Collembola	_	1.11(1)	_	_	_	_	_	_
Myriapoda	_	_	_	_	_	_	_	_
Chilopoda	_	_	_	_	_	_	_	_
Diplopoda	_	_	_	_	_	_	_	_
Crustacea	_	1.11(1)	_	_	_	_	_	_
Isopoda	_	15.56(14)	_	_	_	_	_	_
Amphipoda	_	_	_	_	_	_	_	_
Decapoda	_	_	_	_	_	_	_	_
Arachnida	_	_	_	_	_	_	_	_
Araneae	20.00(1)	7.78(7)	_	_	_	_	13.98(13)	9.39(0.20)
Scorpiones	_	1.11(1)	_	_	_	_	_	_
Pseudoescorpiones	_	_	_	_	_	_	_	_
Acarinae	_	_	_	_	_	_	_	_
Opiliones	_	_	_	_	_	_	_	_
Insecta	_	_	_	_	_	_	_	_
Thysanura	_	_	_	_	_	_	1.08(1)	1.88(0.04)
Homoptera/Hemiptera	_	2.22(2)	_	_	_	_	7.53(7)	7.04(0.15)
Thysanoptera	_	_	_	_	_	_	_	_
Psocoptera	_	_	_	_	_	_	_	_
Neuroptera	_	_	_	_	_	_	_	_
Coleoptera (adult)	40.00(2)	11.11(10)	_	_	_	_	31.18(29)	30.52(0.65)
Coleoptera (larvae)	_	3.33(3)	_	_	_	_	_	_
Diptera	_	1.11(1)	_	_	_	_	9.68(9)	10.80(0.23)
Trichoptera	_	_	_	_	_	_	_	_
Lepidoptera (adult)	_	2.22(2)	_	_	_	_	7.53(7)	13.15(0.28)
Lepidoptera (larvae)	_	4.44(4)	_	_	_	_	_	_
Hymenoptera	_	5.56(5)	_	_	_	_	_	_
Formicidae	20.00(1)	1.11(1)	_	_	_	_	_	_
Mantodea and phasmidae	_	_	_	_	_	_	_	_
Orthoptera	_	26.67(24)	_	_	_	_	2.15(2)	6.57(0.14)
Blattidae	_	1.11(1)	_	_	_	_	_	_
Isoptera	_	_	100.00(330)	98.81(3.31)	98.77(160)	95.19(0.99)	16.13(15)	5.63(0.12)
Dermaptera	_	_	_	_	_	_	_	_
Unspecified Larvae *	_	_	_	_	_	_	1.08(1)	3.29(0.07)
Insect Pupae	_	_	_	_	_	_	_	_
Unidentified Arthropoda**	_	1.11(1)	_	_	_	_	9.68(9)	5.63(0.12)
Total Arthropoda	**80.00(4)**	**86.67(78)**	**100.00(330)**	**98.81(3.31)**	**98.77(160)**	**95.19(0.99)**	**100.00(93)**	**93.90(2.00)**
Mollusca	20.00(1)	_	_	_	_	_	_	_
Total Mollusca	**20.00(1)**	_	_	_	_	_	_	_
Plantae	_	1.11(1)	_	_	1.23(2)	1.92(0.02)	_	_
Total Plant	_	**1.11(1)**	_	_	**1.23(2)**	**1.92(0.02)**	_	_
Fungi	_	_	_	_	_	_	_	_
Total Fungi	_	_	_	_	_	_	_	_
Vertebrata	_	_	_	_	_	_	_	_
Lizards	_	_	_	_	_	_	_	_
Lizards including shed skin***	_	_	_	_	_	_	_	_
Total Vertebrata	_	_	_	_	_	_	_	_
Shed skin	_	8.89(8)	_	_	_	_	_	_
Total Shed Skin	_	**8.89(8)**	_	_	_	_	_	_
Unidentified	_	3.33(3)	_	1.19(0.04)	_	2.88(0.03)	_	6.10(0.13)
Total Unidentified	_	**3.33(3)**	_	**1.19(0.04)**	_	**2.88(0.03)**	_	**6.10(0.13)**
Grand Total	**100.00(5)**	**100.00(90)**	**100.00(330)**	**100.00(3.35)**	**100.00(162)**	**100.00(1.04)**	**100.00(93)**	**100.00(2.13)**
	1.33	2.30	0.00	0.06	0.07	0.23	1.95	2.14
Number of Specimens (with food)	3(2)	118(54)	55(21)	_	25(10)	_	43(40)	_
% Specimens with food	66.67	45.76	38.18	_	40	_	93.02	_
Number of prey items	_	_	_	_	_	_	_	_

Diplodactylidae

	Strophurus ciliaris[1]		*Strophurus elderi*[1]		*Strophurus strophurus*[1]	
Habitat	Intermediate		Terrestrial		Intermediate	
Prey Taxon	Number	Volume	Number	Volume	Number	Volume
Arthropoda						
Collembola	_	_	_	_	_	_
Myriapoda	_	_	_	_	_	_
Chilopoda	_	_	_	_	_	_
Diplopoda	_	_	_	_	_	_
Crustacea	_	_	_	_	_	_
Isopoda	0.61(1)	0.32(0.04)	_	_	0.84(1)	0.77(0.05)
Amphipoda	_	_	_	_	_	_
Decapoda	_	_	_	_	_	_
Arachnida	_	_	_	_	_	_
Araneae	12.27(20)	11.35(1.41)	20.55(15)	23.68(0.27)	20.17(24)	26.47(1.71)
Scorpiones	0.61(1)	0.40(0.05)	_	_	_	_
Pseudoescorpiones	_	_	_	_	_	_
Acarinae	_	_	_	_	0.84(1)	0.31(0.02)
Opiliones	_	_	_	_	_	_
Insecta	_	_	_	_	_	_
Thysanura	_	_	_	_	0.84(1)	0.62(0.04)
Homoptera/Hemiptera	4.91(8)	1.85(0.23)	16.44(12)	9.65(0.11)	7.56(9)	3.87(0.25)
Thysanoptera	_	_	_	_	_	_
Psocoptera	_	_	_	_	_	_
Neuroptera	1.23(2)	1.13(0.14)	_	_	0.84(1)	0.15(0.01)
Coleoptera (adult)	38.65(63)	17.87(2.22)	8.22(6)	10.53(0.12)	39.50(47)	15.79(1.02)
Coleoptera (larvae)	_	_	_	_	_	_
Diptera	_	_	8.22(6)	3.51(0.04)	_	_
Trichoptera	_	_	_	_	_	_
Lepidoptera (adult)	1.23(2)	1.05(0.13)	1.37(1)	1.75(0.02)	3.36(4)	7.59(0.49)
Lepidoptera (larvae)	_	_	_	_	_	_
Hymenoptera	1.23(2)	_	1.37(1)	0.88(0.01)	_	_
Formicidae	1.23(2)	0.24(0.03)	1.37(1)	0.88(0.01)	_	_
Mantodea and phasmidae	2.45(4)	8.29(1.03)	_	_	0.84(1)	0.77(0.05)
Orthoptera	7.36(12)	27.86(3.46)	2.74(2)	13.16(0.15)	3.36(4)	12.23(0.79)
Blattidae	4.29(7)	7.00(0.87)	2.74(2)	7.89(0.09)	8.40(10)	15.94(1.03)
Isoptera	_	_	27.40(20)	15.79(0.18)	_	_
Dermaptera	_	_	_	_	_	_
Unspecified Larvae *	17.18(28)	19.57(2.43)	2.74(2)	6.14(0.07)	6.72(8)	10.99(0.71)
Insect Pupae	_	_	_	_	_	_
Unidentified Arthropoda**	4.91(8)	1.77(0.22)	5.48(4)	4.39(0.05)	6.72(8)	3.72(0.24)
Total Arthropoda	**98.16(160)**	**98.71(12.26)**	**98.63(72)**	**98.25(1.12)**	**100.00(119)**	**99.23(6.41)**
Mollusca	_	_	_	_	_	_
Total Mollusca	_	_	_	_	_	_
Plantae	1.23(2)	0.56(0.07)	1.37(1)	0.88(0.01)	_	_
Total Plant	**1.23(2)**	**0.56(0.07)**	**1.37(1)**	**0.88(0.01)**	_	_
Fungi	_	_	_	_	_	_
Total Fungi	_	_	_	_	_	_
Vertebrata	_	_	_	_	_	_
Lizards	_	_	_	_	_	_
Lizards including shed skin***	0.61(1)	0.08(0.01)	_	_	_	_
Total Vertebrata	**0.61(1)**	**0.08(0.01)**	_	_	_	_
Shed skin	_	_	_	_	_	_
Total Shed Skin	_	_	_	_	_	_
Unidentified	_	0.64(0.08)	_	0.88(0.01)	_	0.77(0.05)
Total Unidentified	_	**0.64(0.08)**	_	**0.88(0.01)**	_	**0.77(0.05)**
Grand Total	**100.00(163)**	**100.00(12.42)**	**100.00(73)**	**100.00(1.14)**	**100.00(119)**	**100.00(6.46)**
	1.98	1.98	2.08	2.23	1.89	2.05
Number of Specimens (with food)	75(61)	_	26(21)	_	53(43)	_
% Specimens with food	81.33	_	80.77	_	81.13	_
Number of prey items	_	_	_	_	_	_

	Diplodactylidae		**Gekkonidae**				
	Rhynchoedura ornata[1]		*Chondrodactylus angulifer*[2]	*Chondrodactylus bibronii*[2]	*Colopus wahlbergi*[2]	*Gehyra variegata*[1]	
Habitat	Terrestrial		Terrestrial	Arboreal	Terrestrial	Arboreal	
Prey Taxon	Number	Volume	Volume	Volume	Volume	Number	Volume
Arthropoda							
Collembola	0.14(2)	0.06(0.01)	_	_	_	_	_
Myriapoda	_	_	_	_	_	_	_
Chilopoda	_	_	_	_	_	0.10(1)	0.24(0.06)
Diplopoda	_	_	_	_	_	_	_
Crustacea	_	_	_	_	_	_	_
Isopoda	_	_	_	_	_	0.80(8)	1.14(0.28)
Amphipoda	_	_	_	_	_	_	_
Decapoda	_	_	_	_	_	_	_
Arachnida	_	_	_	_	_	_	_
Araneae	0.07(1)	0.11(0.01)	1.9	1.6	5.5	7.21(72)	11.06(2.72)
Scorpiones	_	_	10.5	1.0	0.2	0.10(1)	0.61(0.15)
Pseudoescorpiones	_	_	_	_	_	0.30(3)	0.12(0.03)
Acarinae	_	_	_	_	_	_	_
Opiliones	_	_	_	_	_	_	_
Insecta	_	_	_	_	_	_	_
Thysanura	_	_	_	_	_	0.30(3)	0.33(0.08)
Homoptera/Hemiptera	_	_	_	0.3	0.1	11.32(113)	7.60(1.87)
Thysanoptera	_	_	_	_	_	_	_
Psocoptera	_	_	_	_	_	_	_
Neuroptera	_	_	_	_	_	0.20(2)	1.22(0.3)
Coleoptera (adult)	_	_	10.9	16.9	_	10.32(103)	9.55(2.35)
Coleoptera (larvae)	_	_	_	_	_	_	_
Diptera	_	_	_	_	_	_	_
Trichoptera	_	_	_	_	_	_	_
Lepidoptera (adult)	_	_	_	2.2	_	1.70(17)	2.52(0.62)
Lepidoptera (larvae)	_	_	_	7.4	2.6	_	_
Hymenoptera	_	_	_	_	_	0.50(5)	1.14(0.28)
Formicidae	0.07(1)	0.11(0.01)	0.5	3.7	3.5	0.70(7)	0.61(0.15)
Mantodea and phasmidae	_	_	_	_	_	0.20(2)	0.37(0.09)
Orthoptera	_	_	12.4	4.4	7.1	2.40(24)	10.98(2.7)
Blattidae	_	_	0.4	1.4	0.9	1.40(14)	6.54(1.61)
Isoptera	99.10(1428)	95.69(8.44)	45.7	51.3	63.6	53.71(536)	30.98(7.62)
Dermaptera	_	_	_	_	_	_	_
Unspecified Larvae *	_	_	_	_	_	2.00(20)	4.88(1.2)
Insect Pupae	_	_	_	_	_	0.10(1)	1.22(0.3)
Unidentified Arthropoda**	0.07(1)	0.06(0.01)	3.6	4.3	12.4	5.51(55)	2.40(0.59)
Total Arthropoda* **	**99.44(1433)**	**96.03(8.47)**	**85.9**	**94.5**	**95.9**	**98.90(987)**	**93.50(23)**
Mollusca	_	_	_	_	_	_	_
Total Mollusca	_	_	_	_	_	_	_
Plantae	0.56(8)	0.34(0.03)	_	_	_	0.10(1)	0.16(0.04)
Total Plant	**0.56(8)**	**0.34(0.03)**	_	_	_	**0.10(1)**	**0.16(0.04)**
Fungi	_	_	_	_	_	_	_
Total Fungi	_	_	_	_	_	_	_
Vertebrata	_	_	_	_	_	_	_
Lizards	_	_	_	_	_	_	_
Lizards including shed skin****	_	_	8.9	2	2.1	1.00(10)	2.76(0.68)
Total Vertebrata	_	_	**8.9**	**2**	**2.1**	**1.00(10)**	**2.76(0.68)**
Shed skin	_	_	_	_	_	_	_
Total Shed Skin	_	_	_	_	_	_	_
Unidentified	_	3.63(0.32)	4.8	3.5	5.1	_	3.58(0.88)
Total Unidentified	_	**3.63(0.32)**	**4.8**	**3.5**	**5.1**	_	**3.58(0.88)**
Grand Total	**100.00(1441)**	**100.00(8.82)**	**99.6**	**100**	**103.1**	**100.00(998)**	**100.00(24.60)**
Niche Breadth*****	0.06	0.21	_	_	_	1.66	2.28
Number of Specimens (with food)	274(155)	_	_ (304)	_ (114)	_ (79)	287(232)	_
% Specimens with food	56.57	_	_	_	_	80.84	_
Number of prey items	_	_	4821	1487	308	_	_

	Gekkonidae					
	Gonatodes humeralis[8]		*Gymnodactylus geckoides*[5]	*Hemidactylus frenatus*[3]		*Hemidactylus mabouia*[5]
Habitat	Arboreal		Terrestrial	Arboreal		Arboreal
Prey Taxon	Number	Volume	Volume	Number	Volume	Volume
Arthropoda						
Collembola	0.89(5)	0.03(<0.01)	_	_	_	_
Myriapoda	_	_	_	_	_	_
Chilopoda	0.89(5)	0.36(0.01)	0.17(0.02)	_	_	_
Diplopoda	0.36(2)	2.26(0.06)	0.17(0.02)	_	_	_
Crustacea	_	_	_	_	_	_
Isopoda	0.36(2)	0.08(<0.01)	1.20(0.14)	_	_	1.24(0.03)
Amphipoda	_	_	_	_	_	_
Decapoda	_	_	_	_	_	_
Arachnida	_	_	_	_	_	_
Araneae	6.42(36)	15.46(0.39)	8.92(1.04)	_	_	4.98(0.12)
Scorpiones	_	_	0.26(0.03)	_	_	_
Pseudoescorpiones	0.89(5)	0.72(0.02)	0.17(0.02)	_	_	_
Acarinae	1.43(8)	0.05(<0.01)	_	_	_	_
Opiliones	0.36(2)	3.66(0.09)	_	_	_	_
Insecta	_	_	_	_	_	_
Thysanura	_	_	0.60(0.07)	_	_	_
Homoptera/Hemiptera	1.78(10)	4.11(0.1)	2.49(0.29)	1.48(12)	3.62	1.66(0.04)
Thysanoptera	_	_	_	_	_	_
Psocoptera	_	_	_	_	_	_
Neuroptera	_	_	_	_	_	_
Coleoptera (adult)	17.11(96)	12.72(0.32)	0.69(0.08)	0.74(6)	0.93	3.32(0.08)
Coleoptera (larvae)	_	_	_	_	_	_
Diptera	3.03(17)	8.44(0.21)	0.26(0.03)	5.67(46)	11.13	4.56(0.11)
Trichoptera	_	_	_	_	_	_
Lepidoptera (adult)	0.53(3)	3.48(0.09)	4.29(0.50)	0.86(7)	6.30	17.01(0.41)
Lepidoptera (larvae)	_	_	_	1.85(15)	13.34	_
Hymenoptera	3.92(22)	5.00(0.13)	0.60(0.07)	86.93(705)	59.55	_
Formicidae	_	_	2.14(0.25)	_	_	0.41(0.01)
Mantodea and phasmidae	_	_	_	_	_	_
Orthoptera	1.07(6)	1.95(0.05)	7.03(0.82)	0.49(4)	0.49	21.99(0.53)
Blattidae	_	_	_	1.23(10)	2.58	38.59(0.93)
Isoptera	26.74(150)	5.67(0.14)	49.49(5.77)	0.62(5)	1.17	0.83(0.02)
Dermaptera	_	_	1.46(0.17)	_	_	_
Unspecified Larvae *	5.70(32)	8.87(0.22)	11.23(1.31)	_	_	1.66(0.04)
Insect Pupae	2.50(14)	7.03(0.18)	_	_	_	_
Unidentified Arthropoda**	_	_	_	_	_	_
Total Arthropoda	**73.98(415)**	**79.89(2.01)**	**91.17(10.63)**	**99.88(810)**	**99.09**	**96.27(2.32)**
Mollusca	19.61(110)	7.07(0.18)	_	_	_	_
Total Mollusca	**19.61(110)**	**7.07(0.18)**	**3.17(0.37)**	_	_	_
Plantae	0.18(1)	0.02(<0.01)	_	_	_	_
Total Plant	**0.18(1)**	**0.02(<0.01)**	**0.09(0.01)**	_	_	_
Fungi	0.36(2)	0.06(<0.01)	_	_	_	_
Total Fungi	**0.36(2)**	**0.06(<0.01)**	_	_	_	_
Vertebrata	_	_	_	_	_	_
Lizards	_	_	5.57(0.65)	_	_	3.73(0.09)
Lizards including shed skin***	_	_	_	_	_	_
Total Vertebrata	_	_	**5.57(0.65)**	_	_	**3.73(0.09)**
Shed skin	1.78(10)	5.41(0.14)	_	_	_	_
Total Shed Skin	**1.78(10)**	**5.41(0.14)**	_	_	_	_
Unidentified	4.10(23)	7.55(0.19)	_	0.12(1)	0.89	_
Total Unidentified	**4.10(23)**	**7.55(0.19)**	_	**0.12(1)**	**0.89**	_
Grand Total	**100.00(561)**	**100.00(2.51)**	**100.00(11.66)**	**100.00(811)**	**99.98**	**100(2.41)**
	2.22	2.62	1.86	0.62	_	1.78
Number of Specimens (with food)	124(_)	_	_	77(75)	_	_
% Specimens with food	_	_	_	97.40	_	_
Number of prey items	_	_	_	_	_	_

	Gekkonidae							
	Hemidactylus turcicus[6]		*Heteronotia binoei*[1]		*Lygodactylus capensis*[2]	*Lygodactylus klugei*[5]	*Nactus pelagicus*[4]	*Pachydactylus capensis*[2]
Habitat	Arboreal		Terrestrial		Arboreal	Arboreal	Terrestrial	Terrestrial
Prey Taxon	Number	Volume	Number	Volume	Volume	Volume	Number	Volume
Arthropoda								
Collembola	3.55(20)	0.06(0.01)	_	_	_	_	_	_
Myriapoda	_	_	_	_	_	_	_	_
Chilopoda	0.35(2)	0.04(0.01)	2.13(1)	3.11(0.05)	_	0.11(0.01)	_	_
Diplopoda	_	_	_	_	_	_	_	_
Crustacea	_	_	_	_	_	_	4.55(1)	_
Isopoda	14.89(84)	22.46(3.12)	_	_	_	0.11(0.01)	9.09(2)	_
Amphipoda	_	_	_	_	_	_	4.55(1)	_
Decapoda	_	_	_	_	_	_	_	_
Arachnida	_	_	_	_	_	_	_	_
Araneae	7.45(42)	2.93(0.41)	17.02(8)	10.56(0.17)	11.4	8.56(0.79)	13.64(3)	3.5
Scorpiones	_	_	_	_	_	_	_	3.4
Pseudoescorpiones	_	_	_	_	_	0.11(0.01)	_	_
Acarinae	0.35(2)	<0.01(<0.01)	2.13(1)	1.24(0.02)	_	0.76(0.07)	_	_
Opiliones	_	_	_	_	_	_	_	_
Insecta	_	_	_	_	_	_	_	_
Thysanura	_	_	_	_	_	1.84(0.17)	_	_
Homoptera/Hemiptera	14.01(79)	5.67(0.79)	8.51(4)	4.97(0.08)	8.3	8.88(0.82)	_	1.8
Thysanoptera	_	_	_	_	_	0.22(0.02)	_	_
Psocoptera	16.49(93)	1.99(0.28)	_	_	_	0.65(0.06)	_	_
Neuroptera	0.53(3)	0.40(0.06)	_	_	_	_	_	_
Coleoptera (adult)	3.55(20)	3.38(0.47)	8.51(4)	6.21(0.1)	6.5	17.88(1.65)	9.09(2)	10.2
Coleoptera (larvae)	_	_	_	_	_	_	9.09(2)	_
Diptera	11.35(64)	1.69(0.24)	_	_	_	22.21(2.05)	_	_
Trichoptera	0.35(2)	0.14(0.02)	_	_	_	_	_	_
Lepidoptera (adult)	7.80(44)	23.03(3.20)	4.26(2)	8.70(0.14)	_	6.18(0.57)	_	5.3
Lepidoptera (larvae)	_	_	_	_	0.6	_	4.55(1)	2.8
Hymenoptera	3.37(19)	1.68(0.23)	2.13(1)	0.62(0.01)	_	3.58(0.33)	_	_
Formicidae	_	_	8.51(4)	4.97(0.08)	29.3	2.82(0.26)	4.55(1)	2.6
Mantodea and phasmidae	_	_	_	_	_	0.22(0.02)	_	_
Orthoptera	11.52(65)	34.40(4.78)	2.13(1)	12.42(0.20)	9.0	2.71(0.25)	22.73(5)	8.8
Blattidae	1.24(7)	0.03(<0.01)	2.13(1)	10.56(0.17)	_	0.11(0.01)	_	0.9
Isoptera	_	_	8.51(4)	8.07(0.13)	10.2	4.12(0.38)	_	32.0
Dermaptera	1.60(9)	0.72(0.10)	_	_	_	0.87(0.08)	_	_
Unspecified Larvae *	_	_	10.64(5)	5.59(0.09)	_	12.24(1.13)	_	_
Insect Pupae	_	_	_	_	_	_	_	_
Unidentified Arthropoda**	_	_	10.64(5)	4.35(0.07)	7.2	_	_	14.8
Total Arthropoda	**98.40(555)**	**98.62(13.70)**	**87.23(41)**	**81.37(1.31)**	**82.5**	**94.15(8.69)**	**81.82(18)**	**86.1**
Mollusca	1.60(9)	0.40(0.06)	_	_	_	1.19(0.11)	_	_
Total Mollusca	**1.60(9)**	**0.4(0.06)**	_	_	_	**1.19(0.11)**	_	_
Plantae	_	_	2.13(1)	1.24(0.02)	_	0.22(0.02)	9.09(2)	_
Total Plant	_	_	**2.13(1)**	**1.24(0.02)**	_	**0.22(0.02)**	**9.09(2)**	_
Fungi	_	_	_	_	_	_	_	_
Total Fungi	_	_	_	_	_	_	_	_
Vertebrata	_	_	_	_	_	_	_	_
Lizards	_	_	_	_	_	4.44(0.41)	_	_
Lizards including shed skin***	_	_	10.64(5)	11.8(0.19)	3	_	_	6.1
Total Vertebrata	_	_	**10.64(5)**	**11.8(0.19)**	**3**	**4.44(0.41)**	_	**6.1**
Shed skin	_	_	_	_	_	_	4.55(1)	_
Total Shed Skin	_	_	_	_	_	_	**4.55(1)**	_
Unidentified	_	0.98(0.14)	_	5.59(0.09)	9.3	_	4.55(1)	7.7
Total Unidentified	_	**0.98(0.14)**	_	**5.59(0.09)**	**9.3**	_	**4.55(1)**	**7.7**
Grand Total	**100.00(564)**	**100.00(13.89)**	**100.00(47)**	**100.00(1.61)**	**94.8**	**100.00(9.23)**	**100.00(22)**	**99.9**
	2.37	1.80	2.40	2.51	_	2.39	2.24	_
Number of Specimens (with food)	197(167)	_	41(27)	_	_ (20)	_	27(10)	_ (43)
% Specimens with food	84.77	_	65.85	_	_	_	37.04	_
Number of prey items	_	_	_	_	79	_	_	232

	Gekkonidae				
	Pachydactylus rugosus[2]	*Phyllopezus pollicaris*[5]	*Ptenopus garrulus*[2]	*Thecadactylus rapicauda*[7]	
Habitat	Intermediate	Arboreal	Terrestrial	Arboreal	
Prey Taxon	Volume	Volume	Volume	Number	Volume
Arthropoda					
Collembola	_	_	_	_	_
Myriapoda	_	_	_	_	_
Chilopoda	_	_	_	_	_
Diplopoda	_	1.57(0.15)	_	5.71(4)	1.46(0.49)
Crustacea	_	_	_	_	_
Isopoda	_	0.21(0.02)	_	2.86(2)	0.21(0.07)
Amphipoda	_	_	_	_	_
Decapoda	_	_	_	_	_
Arachnida	_	_	_	_	_
Araneae	3.5	14.03(1.34)	2.5	7.14(5)	4.48(1.51)
Scorpiones	_	_	_	_	_
Pseudoescorpiones	_	_	_	_	_
Acarinae	_	_	_	_	_
Opiliones	_	_	_	_	_
Insecta	_	_	_	_	_
Thysanura	_	_	_	_	_
Homoptera/Hemiptera	5.2	4.08(0.39)	0.8	2.86(2)	0.45(0.15)
Thysanoptera	_	_	_	_	_
Psocoptera	_	_	_	_	_
Neuroptera	_	0.21(0.02)	_	_	_
Coleoptera (adult)	12.0	6.6(0.63)	7.2	7.14(5)	2.10(0.71)
Coleoptera (larvae)	_	_	_	_	_
Diptera	_	0.73(0.07)	_	_	_
Trichoptera	_	_	_	_	_
Lepidoptera (adult)	22.6	10.16(0.97)	0.2	2.86(2)	1.75(0.59)
Lepidoptera (larvae)	1.2	_	_	_	_
Hymenoptera	_	_	_	1.43(1)	0.56(0.19)
Formicidae	0.6	10.58(1.01)	12.6	4.29(3)	0.07(0.02)
Mantodea and phasmidae	_	_	_	1.43(1)	0.02(0.01)
Orthoptera	4.1	23.87(2.28)	2.1	20.00(14)	24.30(8.20)
Blattidae	14.9	7.54(0.72)	0.3	37.14(26)	61.6(20.79)
Isoptera	8.2	9.84(0.94)	62.2	1.43(1)	0.02(0.01)
Dermaptera	_	1.26(0.12)	_	_	_
Unspecified Larvae *	_	5.65(0.54)	_	2.86(2)	0.43(0.14)
Insect Pupae	_	_	_	_	_
Unidentified Arthropoda**	11.6	_	6.5	_	_
Total Arthropoda	**83.9**	**96.34(9.20)**	**94.4**	**97.15(68)**	**97.44(32.89)**
Mollusca	_	_	_	_	_
Total Mollusca	_	_	_	_	_
Plantae	_	_	_	_	_
Total Plant	_	_	_	_	_
Fungi	_	_	_	_	_
Total Fungi	_	_	_	_	_
Vertebrata	_	_	_	_	_
Lizards	_	**3.66(0.35)**	_	_	_
Lizards including shed skin***	4.4	_	0.2	_	_
Total Vertebrata	**4.4**	**3.66(0.35)**	**0.2**	_	_
Shed skin	_	_	_	2.86(2)	2.56(0.87)
Total Shed Skin	_	_	_	**2.86(2)**	**2.56(0.87)**
Unidentified	11.8	_	5.1	_	_
Total Unidentified	**11.8**	_	**5.1**	_	_
Grand Total	**100.1**	**100.00(9.55)**	**99.7**	**100.00(70)**	**100.00(33.76)**
	_	2.29	_	1.98	1.10
Number of Specimens (with food)	_ (17)	_	_ (331)	44(_)	_
% Specimens with food	_	_	_	_	_
Number of prey items	64	_	1935	_	_

Table 3. Dietary information for 30 gecko species (organized by family and alphabetized) percent by number and percent by volume of prey items for each species. Total number and total volume are listed in parentheses where available. Superscripts following species name denotes source of data: 1 Pianka and Pianka 1976; 2 Pianka and Huey 1978; 3 Ming 1984; 4 Bauer and Devaney 1987; 5 Vitt 1995; 6 Saenz 1996; 7 Vitt and Zani 1997; 8 Miranda and Andrade 2003. As used in this table, arboreal refers to climbing species that are most active on vertical surfaces (not necessarily trees), intermediate refers to species that are active on both vertical and horizontal substrates, and terrestrial refers to species that climb little or not at all. *Vitt (1995) combined larvae and pupae. Because gekkonids accounted for 4 of 13 species examined in the study, and pupae are typically not a major portion of gecko diets, there may be no pupae included with the combined larvae and pupae data for gekkonids; However, if pupae are included with the larvae data for gekkonids it would account for an insignificant portion of the category. ** The unidentified arthropod portion of the diet was identified to Insecta by Pianka and Pianka 1976 and Bauer and DeVaney 1987. *** The apparent contradictory difference between percent by volume and percent by number for some species is due to the percent by volume being calculated based upon the identified items while the percent by number is based upon the total number of items in the diet, including unidentified items. The number of unidentified items is listed below in a separate category. ****Category includes vertebrates (8 geckos –one of which was consumed as carrion, 2 lizard tails, and 2 unidentified bones) plus shed skin from Pianka and Huey 1987. The species which consumed the aforementioned material were not designated, and therefore skins and lizard prey could not be separated into different categories. *****Niche breadth was calculated, using the Shannon diversity index, for those species for which raw volumetric or numerical data were available.

Diplodactylus strophurus (0.77% was unidentified and may have also been arthropod). The diet of *R. auriculatus* was comprised of 29.87% by volume of arthropods (Volumetric data available from present study only –note that this number was heavily skewed by the ingestion of shed skins, 60.27% by volume). By number the mean arthropod portion of the diet for the 30 species reviewed was 94.14±8.13% and ranged from 73.98% for *Gonatodes humeralis* to 100% for *Nephrurus levis*, *Diplodactylus conspicillatus*, *D. stenodactylus*, and *Strophurus strophurus*. The arthropod portion of the diet of *R. auriculatus* (data from Bauer and DeVaney 1987, Bauer and Sadlier 1994a, and present study) was 81.31% by number (table 4).

With regard to the arthropod constituent of the diet, *R. auriculatus* is typical of most gekkonids, given that it includes a wide taxonomic variety of items (table 4); however, there is a tendency toward large prey items. A single phasmid accounted for 32.7% by volume, and only 6.7% by number, of the total prey items (excluding shed skins and the unidentified gelatinous mass) in the present study (tables 1 and 5). Bauer and Sadlier (1994a) also noted a tendency toward large arthropod prey and specifically mentioned orthopterans and a single phasmid, although they did not report volumes or weights (except for the weight of the single *Caledoniscincus austrocaledonicu*s that was recovered in its entirety—0.58 g).

The regular consumption of vertebrates by geckos is rare (notable exceptions include: the pygopodid *Lialis* (Patchell and Shine 1986), *Cyrtodactylus cavernicolus* (Harrison 1961), and *Gekko gecko* (Boulenger 1912; Smith 1935). While specialization on vertebrate prey is rare in geckos, many species occasionally prey on vertebrates, most often other geckos (Bauer 1990).

In the review of 30 species (table 3) vertebrate material comprised a mean of 3.69±6.96% by volume and 1.11±2.99% by number of the overall diet (table 5). By volume vertebrate material ranged from 0.00% (11 species) to a notably high 34.82% (table 5) for

Nephrurus vertebralis (table 3 –potentially includes shed skins). By number the range was 0.00% (14 species – difference due to calculations being based only on identified prey items) to 10.64% (table 5) for *Heteronotia binoei* (table 3 –also potentially including shed skin). Due to the manner in which Pianka and Pianka (1976) and Pianka and Huey (1978) combined lizard prey and shed skins in their dietary analyses, it was not possible to separate shed skins from the other vertebrate material for 18 lizard species including *Nephrurus vertebralis* and *Heteronotia binoei* (probably only shed skin), which had the highest portion of vertebrate prey by percent volume and percent number respectively. However, where possible these two categories were separated in order to better characterize the predation of vertebrates.

If shed skins are combined with vertebrate material in the diet of *R. auriculatus*, They account for a higher percent by percent volume and percent number than for any other gekkonid reviewed, 62.14% and 12.84% respectively (table 3 and 4). Not including shed skins the vertebrate portion of the diet for *R. auriculatus* was 1.87% by volume (this value is markedly understated due to the availability of volumetric data for only two vertebrate items – both of which were in extremely fragmented and digested states – see discussion diet). The vertebrate percent by number portion of the diet (7.34% –table 4) was nearly seven times the mean for the 30 species reviewed. It is important to note that for the four species for which shed skin data were available the mean was 3.99±2.02 by volume and 4.52±3.13 by number and ranged as high as 5.41% by volume and 8.89% by number (table 5). This indicates that the vertebrate portion of the diet of 18 of the 30 geckos included in table 3 may be significantly overstated by both percent by volume and percent by number.

The regularity with which *R. auriculatus* consumes vertebrate prey items, in this case saurian prey, is atypical of gekkonids. Lizard prey items were found in 14.29% (present study), 26.32% (Bauer and Sadlier 1994a), and 50% (Bauer and DeVaney 1987) of stomachs containing food items and on this basis vertebrate prey constitutes an important dietary component for *R. auriculatus*.

Plant material recovered in the diets of 30 geckos constituted a mean of 0.22±0.46% by volume and 0.97±2.08% by number (table 3). *Diplodactylus pulcher* consumed the highest percent by volume (1.92%) of plant material and *Nactus pelagicus* consumed the highest percent by number (9.09%).

No volumetric data were available for the plant portion of the diet in *Rhacodactylus auriculatus* and no recognizable plant material was recovered via stomach flushing during the present study. However, during the present study an adult female was observed consuming sap over a period of three days (figure 12). Sap may be too rapidly absorbed to be reliably recovered via stomach flushing, or may be difficult to recognize in recovered stomach contents. Therefore sap and perhaps other substances that would be quickly absorbed (e.g. nectar) may have been overlooked on several occasions. Plant material accounted for 2.75% by number of the diet of *R. auriculatus* (table 4). This value is admittedly conservative as it does not include the observation of the consumption of sap on three occasions, and reduces the recovery of 14 anthers, 20 stamens, and one leaf (Bauer and Sadlier 1994a) to 3 items. The consumption of flower parts has been reported in the diet of *R. auriculatus* by Bavay (1869), Bauer and DeVaney (1987) and Bauer and Sadlier (1994a). The consumption of sap reported in the present study constitutes the first report for the species and further supports the importance of plant material in the diet of *R. auriculatus*.

Rhacodactylus auriculatus, along with the majority of gecko species, consumes a variety of arthropods; although, with a propensity toward large soft bodied taxa (e.g. phasmids). The species is known to regularly consume saurian prey as well as plant material including: flowers, flower parts (including nectar and pollen), and sap. Based upon the variety of

	Rhacodactylus auriculatus	
Prey Taxon	Number	Volume
	Arthropoda	
Myriapoda		
Chilopoda	0.92(1) [2]	–
Arachnida		
Araneae	11.01(12) [2&3]	4.00(0.15) [3]
Insecta		
Hemiptera		
Cicadidae	0.92(1) [2]	–
Coleoptera (adult)	13.76(15) [2&3]	1.33(0.05) [3]
Coleoptera (larvae)	2.75(3) [3]	6.13(0.23) [3]
Diptera		
Tupulidae	2.75(3) [2&3]	0.80(0.03) [3]
Lepidoptera (adult)	2.75(3) [2&3]	5.87(0.22) [3]
Lepidoptera (larvae)	29.36(32) [2&3]	1.33(0.05) [3]
Hymenoptera	1.83(2) [2]	–
Formicidae	0.92(1) [2]	–
Phasmatodea	1.83(2) [2&3]	10.40(0.39) [3]
Orthoptera		
Gryllidae	1.83(2) [2]	–
Gryllacridoidea	3.67(4) [2]	–
Ensifera	1.83(2) [2]	–
Blattidae	3.67(4) [2]	–
Unidentified Insecta	2.75(3) [1&2]	–
Total Arthropoda	**82.57(90)**	**29.87(1.12)**
	Mollusca	
Pulmonata	0.92(1) [2]	–
Total Mollusca	**0.92(1)**	_
	Plantae	
Plant Material*	2.75(3) [2]	_
Total Plant	**2.75(3)**	_
	Vertebrata	
Bavayia	1.83(2) [1&3]	1.60(0.06) [3]
Caledoniscincus	5.50(6) [2&3]	0.27(0.01) [3]
Total Vertebrata	**7.34(8)**	**1.87(0.07))** [3]
Shed skin	5.50(6) [2&3]	60.27(2.26) [3]
Total Shed Skin	**5.50(6)** [2&3]	**60.27(2.26)** [3]
Unidentified	0.92(1) [3]	8.00(0.30) [3]
Total Unidentified	**0.92(1)**	**8.00(0.3)**
Grand Total	**100.00(109)**	**100.00(3.75)**
Niche breadth	2.43	1.94

Table 4. Diet of Rhacodactylus auriculatus_ percent by number and percent by volume of prey items. Total number and total volume are listed in parentheses where available. Superscripts next to data denote source: 1 Bauer and DeVaney 1987; 2 Bauer and Sadlier; 3 Snyder (present study) *Note that in the Bauer Sadlier (1994) study 14 anthers, 20 stamens, and one leaf were recovered (they reported the leaf as accidental ingestion). In order to not overemphasize the significance of these findings, they are reported above as 3 plant items. This was also done because the plant matter was found in three specimens and is likely more representative of three feeding events than 35 feeding events (as would be suggested by including each part individually).

dietary constituents and the regularity with which they are utilized, *R. auriculatus* may have the most atypical of all gekkonid diets. The aforementioned assertion is supported in part by dietary niche breadth comparisons based on number of prey items consumed by prey category (tables 4 and 5). As calculated by number of items in each prey category, *R. auriculatus* had the highest dietary niche breadth of any species reviewed. The mean dietary niche breadth, by number, for 19 species of gekkonids (table 3) was 1.59±0.81 and ranged from 0-2.40. *Rhacodactylus auriculatus* had a dietary niche breadth of 2.43 by number (table 4). By volume *R. auriculatus* had a dietary niche breadth of 1.94 (table 4). The 19 species for which raw volumetric dietary data were available had a mean dietary niche breadth of 1.74±0.78 and a range of 0.06-2.62. The comparatively lower dietary niche breadth by volume, respective to other gecko species, is due to two factors. First, as previously mentioned *R. auriculatus* has a propensity toward large soft bodied prey items. Second, unlike numerical data, volumetric data were only available from the present study reducing the number of prey categories from 21 to 10.

While dietary niche breadth comparisons are useful in comparing diets (Pianka 1966; Castanzo and Bauer 1993; Vitt 1995; Castanzo and Bauer 1997). As a caveat it should be noted that dietary niche breadth comparisons account only for the number of categories utilized and do not describe the taxonomic or ecologically diversity of the categories. *Rhacodactylus auriculatus*, as previously mentioned in this section, has a wide taxonomic and ecological range of dietary constituents including various arthropods, vertebrates, and plant materials.

	Terrestrial Volume	Terrestrial Number	Intermediate Volume	Intermediate Number	Arboreal Volume	Arboreal Number	**Total Volume**	**Total Number**
Arthropod								
Number of values	14	10	3	2	10	7	**27**	**19**
Mean	90.20±8.95	95.56±6.44	93.95±8.70	99.08±1.30	93.23±6.63	90.71±10.51	**91.74±7.98**	**94.14±8.13**
Range Min–Max	64.78–98.81	81.82–100.00	83.90–99.23	98.16–100.00	79.89–99.09	73.98–99.88	**64.78–99.23**	**73.98–100.00**
Plant								
Number of values	14	10	3	2	10	7	**27**	**19**
Mean	0.36±0.60	1.58±2.75	0.19±0.32	0.62±0.87	0.04±0.08	0.2±0.41	**0.22±0.46**	**0.97±2.08**
Range Min–Max	0.00–1.92	0.00–9.09	0.00–0.56	0.00–1.23	0.00–0.22	0.00–1.11	**0.00–1.92**	**0.00–9.09**
Vertebrate (excluding skins where possible)								
Number of values	14	10	3	2	10	7	**27**	**19**
Mean	5.40±9.33	1.96±4.01	1.49±2.52	0.31±0.43	1.96±1.80	0.14±0.38	**3.69±6.96**	**1.11±2.99**
Range Min–Max	0.00–34.82	0.00–10.64	0.00–4.40	0.00–0.61	0.00–4.44	0.00–1.00	**0.00–34.82**	**0.00–10.64**
Shed skin*								
Number of values	_	_	_	_	_	_	**2**	**4**
Average	_	_	_	_	_	_	**3.99±2.02**	**4.52±3.13**
Range Min–Max	_	_	_	_	_	_	**2.56–5.41**	**1.78–8.89**
Specimens with Food in Stomach								
Number of values	_	10	_	2	_	5	_	**17**
Mean	_	66.19±23.09	_	81.23±0.14	_	75.09±19.72	_	**70.58±20.73**
Range Min–Max	_	37.04–100.00	_	81.13–81.33	_	45.76–97.4	_	**37.04–100.00**

Table 5. Select summary statistics, by habitat type, for dietary constituents and mean number of specimens containing food in stomach. Derived from values in table 3. *Due to the low number of values available for shed skin only the total was calculated.

The mean percentage of stomachs containing food in the 30 species reviewed was 70.58±20.73% and ranged from 37.04-100% (table 3). The percentage of stomachs containing food in *R. auriculatus* ranged from 21.21% to 90.48%, between the three studies from which data were analyzed (table 4). The percent of *R. auriculatus* stomachs containing food items appears to be highly correlated to the season in which the sampling took place (table 6 and also discussion – diet).

Although the proportion of empty stomachs found in the present study and Bauer and DeVaney (1987), for *R. auriculatus* (table 6), is higher than other taxa reviewed in the present study (table 3) and by Huey et al. (2001), the high proportion of empty stomach is not entirely unexpected as *R. auriculatus* occupies the position most correlated with high proportion of empty stomachs for each trend described by Huey et al. (2001). Huey et al. (2001) found that gekkonids had the highest percent of empty stomachs of all lizard species reviewed. Dietary data on the proportion of empty stomachs suggest that the trophic position of a species plays an important role in hunting success. Species at lower tropic levels have a lower proportion of empty stomachs while those occupying higher tropic levels "run on empty" more often (Huey et al. 2001). *Rhacodactylus auriculatus*, which occupies a high tropic position, would thus be expected to have a high proportion of empty stomachs. Furthermore, *R. auriculatus* is nocturnal. Huey et al. (2001) found that nocturnal lizard species had significantly more empty stomachs than did diurnal species. In their review they found this trend to be consistent within as well as across phylogenies including gekkonids. However, they found that both diurnal and nocturnal geckos had a higher percent of empty stomachs than did other North American, African, and Australian lizards. The proportion of empty stomachs found in *R. auriculatus* is likely due in part to phylogeny, high trophic

Source of Data	Bauer and DeVaney 1987	Bauer and Sadlier 1994	Snyder (present study)
Collection date	May 18 - Jun 11, 1985	Dec, 1978	Jun 22 - Aug 4, 2004
Specimens examined	9	21	66
Specimens with food	2	19	14
Total food items	2	89	18
% Specimens with food	22.22	90.48	21.21

Table 6. Sources of data and dates of collection for diet of *R. auriculatus*.

position, and the nocturnal habit of the species (Huey et al. 2001), and significantly accentuated during the cool season.

There is little information available for perch use in gekkonid lizards. Pianka and Pianka (1976) reported height above ground for three species they considered to be arboreal. However, no distinction was made between size, age or sex when reporting height above ground. Miranda and Andrade (2003) reported perch height data for *Gonatodes humeralis*. They found that the mean perch height for males and females during the rainy season was 70.1±52.4 cm and 33.6±31.1 cm, respectively. While this difference was statistically significant during the rainy season, there was no significant difference in mean perch height during the dry season.

In the current study there was a statistically significant difference found for mean perch height between male, female, and juvenile *R. auriculatus* (table 2a). There was also a significant difference found for the relationship between perch height and weight (figure 14 and table 2a). Specifically, heavier individuals were more likely to be found on higher perches. As the present study took place during the dry cool season it would be interesting to repeat the measurements during the warm wet season when activity is higher to see if the results would be more significant or if any of the groups (males, female, or juveniles) would change their relative mean height positions. No perch diameter data comparing different size, age, or sex classes within gekkonid lizard species were available in published literature.

Ambient light levels have varying affects on the activity level of nocturnal reptile species. It has been theorized that nocturnal snakes have a higher foraging success rate during the darker phases of the moon and that decreased ambient light reduces predation risks from owls and large mammals. There is much evidence to support this theory. Fisher and Case (Fisher and Case 2000; Case and Fisher 2001, unpublished data) found that the nocturnal snake *Rhinocheilus lecontei* is most active at new moon when ambient light is lowest. This same trend was found in the following snake species: *Crotalus cerastes* (Bouskila, 2001), *Lycodonomorphus bicolor* (Madsen and Osterkamp 1982), *Acrochordus arafurae* (Houston and Shine 1994), *Corallus grenadensis* (Henderson 2002) and in various life stages of both *Crotalus viridis* (Clarke et al. 1996) and *Phyllorhynchus decurtatus* (Lotz, in press). There are, however, notable exceptions (see Brattstrom and Schwenkmeyer 1951).

The few studies that have been done on nocturnal geckos suggest that they are more active on moonlit nights. Bouskila et al. (1992) and Reichmann (1998) found that *Stenodactylus doriae* (a terrestrial, nocturnal, desert-dwelling gecko) is most active on moonlit nights; although, they stay much closer to trees and use the shaded side of bushes to forage on moonlit nights. The authors of the study attributed this behavior to predator avoidance. In addition to moonlight, artificial light has been reported to increase activity in edificarian geckos such as *Hemidactylus frenatus* and *Lepidodactylus lugubris* by affording highly productive foraging sites (Perry and Fisher 2005).

In the current study, the increased catch rate per hour of field work for *R. auriculatus* during higher ambient light conditions, may indicate that *R. auriculatus* has greater foraging success during higher ambient light conditions. It appears that the benefit of increased foraging success outweighs the possible risk of increased predation. This may be expected as *R. auriculatus* occupies a high trophic position.

Due to the difficulty of studying nocturnal forest-dwelling species, relatively little is known about the ecology of arboreal night active geckos (Vitt and Pianka 1994; Pianka and Vitt 2003). The information gathered in this study helps elucidate the natural history of *R. auriculatus* and provides the context in which further studies and hypothesis testing may take place. Many questions relating to the ecology of *R. auriculatus* have yet to be answered such as: When and where *R. auriculatus* prey on diurnal skink species? How ubiquitous is sap usage in the diet of *R. auriculatus*? Does sap consumption vary with season? Does perch height usage as it relates to sex or individual size vary seasonally?

Due to the relatively short period over which the study took place, and compounding variables, further research is needed in order to substantiate the positive trends found in the current study between hourly catch rate and ambient light, precipitation, and temperature. These environmental parameters should be compared with metrics describing the hunting success of *R. auriculatus* during varying temperature, ambient light, and precipitation conditions.

The results of this study will be provided to Parc Provincial de la Rivière Bleue and may be useful in the implementation or continuation of conservation measures such as continued support to keep the Park closed at night when *R. auriculatus* is most active and most vulnerable to illegal collecting. Further research and conservation measures will aid in the continued success of a species that faces: habitat destruction due to nickel mining, predation by introduced animals including: black and Polynesian rats, dogs, cats, and pigs, as well as exploitation by the illegal pet trade.

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APPENDIX 1

Rhacodactylus auriculatus

Specimen Number	Recapture number	Sex	Original tail	SVL (mm)	Weight (g)	Time	Date	Perch Diameter (mm)	Perch Height (m)	GPS Coordinates	
1		M	N	110.45	32	18:30	22-Jun	20	2.5	22°05'58"S	166°38'36"E
2		M	N	125.9	47	18:50	23-Jun	6	—	22°05'44"S	166°40'28"E
3		F	N	111.39	40	18:30	24-Jun	—	0.75	22°05'57"S	166°39'09"E
4		J	Y	62.7	8	18:37	24-Jun	—	2.25	22°05'57"S	166°39'10"E
5		F	N	122.2	32	18:57	24-Jun	—	1.5	22°05'56"S	166°39'09"E
6		J	Y	77.32	11.5	20:45	24-Jun	—	—	22°05'57"S	166°39'08"E
7		F	Y	110.39	28.5	18:10	29-Jun	—	—	22°06'01"S	166°38'45"E
8		J	Y	69.93	8.5	19:51	29-Jun	20	3	22°05'59"S	166°38'56"E
9		F	Y	106.6	26	20:40	29-Jun	20	1.5	22°05'59"S	166°38'58"E
10		F	Y	107.45	22.5	21:10	29-Jun	20	2	22°05'59"S	166°39'00"E
11		M	N	108.43	23.5	21:20	29-Jun	—	2.5	22°05'59"S	166°39'00"E
12		F	Y	113.35	37.5	21:25	29-Jun	20	3.5	22°05'59"S	166°38'58"E
13		J	Y	77.76	10	19:25	30-Jun	20	—	22°06'00"S	166°38'55"E
14		M	N	122.04	34.5	20:20	30-Jun	—	1.5	22°05'56"S	166°39'13"E
15		M	N	123.97	44.5	21:05	30-Jun	55	—	22°06'00"S	166°39'23"E
16		J	Y	64.48	7	18:45	1-Jul	—	—	22°06'00"S	166°40'41"E
17		F	N	126.18	49	19:05	1-Jul	—	3	22°06'00"S	166°40'41"E
18		J	Y	61.27	4.5	19:20	1-Jul	—	2	22°06'00"S	166°40'41"E
19		F	Y	114.15	29	18:40	2-Jul	35	0.5	22°06'00"S	166°38'39"E
20		J	Y	75.27	10	19:30	2-Jul	8	0.25	22°05'58"S	166°38'37"E
21		F	Y	113.1	33.5	20:10	2-Jul	50	2	22°05'53"S	166°38'35"E
22		M	N	112.12	27	21:40	2-Jul	20	0.5	22°05'55"S	166°38'36"E
23		M	N	114.3	28.5	21:10	3-Jul	8	1	22°05'54"S	166°39'27"E
24		F	N	120.91	35.5	21:55	3-Jul	55	1	22°05'53"S	166°39'34"E
25		F	N	124.87	38.5	22:35	3-Jul	20	—	22°05'57"S	166°39'18"E
26		F	N	115.37	29.5	18:05	4-Jul	8	1.5	22°05'59"S	166°39'20"E
27		M	N	121.31	33.5	20:55	4-Jul	150	2.5	22°05'27"S	166°39'24"E
28		J	Y	69.95	9.5	18:50	5-Jul	—	1.5	22°06'07"S	166°39'20"E
29		F	N	93.76	20.5	19:30	5-Jul	—	2	22°06'08"S	166°39'11"E
30		J	Y	73.11	8	20:05	5-Jul	8	2	22°06'11"S	166°39'11"E
31		M	N	100.94	21.5	20:20	5-Jul	15	2	22°06'12"S	166°39'09"E
32		J	Y	66.13	6.5	20:50	5-Jul	8	0.5	22°06'15"S	166°39'09"E
33		F	Y	104.94	30	21:00	5-Jul	5	6	22°06'15"S	166°39'10"E
34		F	Y	106.47	26	21:20	5-Jul	20	3	22°06'16"S	166°39'07"E
35		M	Y	100.98	23	21:25	5-Jul	20	2	22°06'16"S	166°39'07"E
36		F	N	104.31	22.5	18:50	12-Jul	4	2	22°06'07"S	166°39'18"E
37		J	Y	50.18	2.25	20:15	12-Jul	125	1.5	22°06'16"S	166°39'03"E
38		J	Y	87.96	12	19:10	13-Jul	6	1	22°06'01"S	166°38'41"E
39		M	N	111.01	26	19:15	13-Jul	15	2	22°05'59"S	166°38'43"E
40		F	N	86.42	11.5	20:35	13-Jul	20	2	22°05'55"S	166°39'06"E
41		J	Y	74.72	8.5	18:40	14-Jul	20	1.5	22°05'57"S	166°39'10"E
42		F	N	82.24	11	19:10	14-Jul	16	2	22°05'57"S	166°39'14"E
43		F	N	98.4	17.5	19:40	15-Jul	15	1	22°05'54"S	166°38'35"E
44		J	Y	84.41	11	20:20	15-Jul	50	0.25	22°05'53"S	166°38'35"E
45		M	N	114.87	26	21:20	15-Jul	50	2	22°05'58"S	166°38'37"E
46		M	Y	108.92	28	19:15	16-Jul	6	2.5	22°05'59"S	166°38'58"E
47		M	N	108.97	27.5	20:40	16-Jul	20	3	22°05'57"S	166°39'09"E
48		J	Y	80.83	11	21:35	16-Jul	15	2	22°05'56"S	166°39'15"E
49		M	N	111.02	30	19:35	18-Jul	150	0.75	22°06'18"S	166°39'08"E
50	34	F	Y	112.85	27	20:35	18-Jul	15	2	22°06'16"S	166°39'07"E
51		J	Y	83.53	14	21:40	18-Jul	6	1.5	22°05'57"S	166°39'14"E

Specimen Number	Recapture number	Sex	Original tail	SVL (mm)	Weight (g)	Time	Date	Perch Diameter (mm)	Perch Height (m)	GPS Coordinates	
52		M	N	116.8	32	22:00	18-Jul	10	1	22°05'56"S	166°39'10"E
53		F	Y	110	26.5	22:25	18-Jul	50	2.25	22°05'57"S	166°39'07"E
54		F	N	121.82	32.5	19:30	19-Jul	14	3	22°05'56"S	166°39'10"E
55		J	Y	76.52	8.25	19:20	20-Jul	8	2	22°05'56"S	166°39'09"E
56		J	Y	48.5	2.5	19:50	20-Jul	7	1.5	22°05'57"S	166°39'10"E
57		M	Y	96.06	16.75	21:30	20-Jul	35	1.5	22°06'14"S	166°39'09"E
58		M	N	98.5	19.25	22:20	20-Jul	22	1.5	22°06'15"S	166°39'04"E
59		J	Y	69.18	6.25	18:37	21-Jul	11	0.5	22°06'02"S	166°38'50"E
60		F	Y	109.5	20.5	19:05	21-Jul	—	2	22°06'02"S	166°38'46"E
61	40	F	N	90.29	12	20:40	21-Jul	27	0.75	22°05'56"S	166°39'06"E
62	51	J	Y	83.5	13	21:25	21-Jul	3	1.5	22°05'57"S	166°39'14"E
63	54	F	N	118.2	33	22:30	21-Jul	17	2	22°05'56"S	166°39'10"E
64		J	Y	75.03	10	20:55	22-Jul	8	1.5	22°06'15"S	166°39'06"E
65		J	Y	52.01	3	19:10	26-Jul	3	0.5	22°05'53"S	166°39'34"E
66		F	N	112.8	30	22:05	26-Jul	75	3	22°06'13"S	166°39'14"E
67		F	Y	107.34	31	23:40	26-Jul	8	1.5	22°05'58"S	166°38'36"E
68		J	Y	49.01	3.25	20:05	27-Jul	5	0.5	22°06'13"S	166°39'10"E
69		M	Y	113.87	28	21:15	27-Jul	21	4	22°06'16"S	166°39'03"E
70		F	Y	101.76	23	21:20	27-Jul	8	2	22°06'16"S	166°39'03"E
71	51	F	Y	83.53	14	22:35	27-Jul	7	—	22°05'57"S	166°39'14"E
72	42	F	N	82.05	12	22:37	27-Jul	10	2	22°05'57"S	166°39'14"E
73	40	F	N	86.42	11.5	23:05	27-Jul	14	6	22°05'57"S	166°39'07"E
74		M	N	114.95	28.5	23:20	27-Jul	16	1.25	22°05'57"S	166°39'04"E
75		F	N	114.02	26	23:40	27-Jul	8	1.75	22°05'57"S	166°39'05"E
76		F	Y	83.53	13.25	18:55	28-Jul	—	3.25	22°05'59"S	166°38'58"E
77	46	M	Y	112.4	29.5	19:25	28-Jul	15	4	22°05'59"S	166°38'58"E
78		F	N	122.8	36	19:45	28-Jul	—	1.25	22°06'00"S	166°38'40"E
79		F	N	122.5	33	19:48	28-Jul	12	3.5	22°06'00"S	166°38'40"E
80		J	Y	72.3	6.25	19:49	28-Jul	6	1.75	22°06'01"S	166°38'42"E
81		J	Y	48.25	2.7	23:15	28-Jul	21	2.5	22°05'59"S	166°38'56"E
82		F	N	123.44	35.5	23:30	28-Jul	15	0.5	22°05'59"S	166°38'56"E
83		J	Y	71.77	6.75	18:30	29-Jul	30	0.75	22°06'01"S	166°38'41"E
84		F	Y	87.15	12.25	18:31	29-Jul	6	2	22°06'01"S	166°38'42"E
85	79	F	N	119.23	36.5	18:32	29-Jul	12	1.5	22°06'01"S	166°38'42"E
86		F	N	106.27	29	18:33	29-Jul	18	0.5	22°06'01"S	166°38'41"E
87		J	Y	50.12	2.5	19:40	29-Jul	30	1.5	22°06'00"S	166°38'44"E
88		M	Y	95.72	16.75	19:45	29-Jul	28	0.5	22°06'00"S	166°38'44"E
89		J	Y	86.63	11	20:00	29-Jul	3	0.5	22°06'00"S	166°38'44"E
90		F	Y	113.37	30	0:10	29-Jul	12	1.75	22°06'03"S	166°38'41"E
91		M	N	114.93	29.25	19:45	30-Jul	20	1.75	22°06'01"S	166°38'43"E
92	80	J	Y	72.3	6.25	19:50	30-Jul	8	1.75	22°06'01"S	166°38'42"E
93	86	F	N	106.27	29	19:55	30-Jul	30	0.5	22°06'00"S	166°38'41"E
94	79	F	N	122.5	33	19:38	31-Jul	40	1.5	22°06'00"S	166°38'40"E
95		M	N	113.85	26.25	19:40	31-Jul	40	1.5	22°06'00"S	166°38'41"E
96	86	F	N	106.27	29	19:40	31-Jul	30	1	22°06'00"S	166°38'41"E
97	91	M	N	114.93	29.25	19:50	31-Jul	35	1.5	22°06'01"S	166°38'43"E
98		F	Y	113.84	35	18:25	2-Aug	37	0.75	22°05'57"S	166°39'15"E
99		M	N	113.15	29.5	18:45	2-Aug	17	1.5	22°05'58"S	166°39'16"E
100		M	N	125.31	39	19:05	2-Aug	2	2	22°05'58"S	166°39'17"E
101		M	Y	113.24	27.5	19:40	2-Aug	5	2	22°05'55"S	166°39'14"E
102		F	Y	100.52	21.25	20:05	4-Aug	10	3	22°05'56"S	166°38'35"E