TEMPORAL VARIATION AND SIZE CLASS DISTRIBUTION IN A HEPERTOLOGICAL ASSEMBLAGE FROM CÓRDOBA, ARGENTINA

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RESUMEN. — Desde el punto de vista de la conservación, conocer la abundancia, la diversidad, y los patrones de actividad de un ensamble herpetológico son medulares para comprender la dinámica de la comunidad y el modo de cómo es utilizado el hábitat.

En este proyecto propusimos cuatro hipótesis nulas: 1) La frecuencia de captura de cada una de las especies será similar en los dos años relevados. 2) La frecuencia de capturas de cada especie es similar durante los meses estudiados. 3) La actividad de cada especie es similar a la actividad del resto del ensamble. 4) Las proporciones de cada grupo etario de cada especie se mantienen constantes en el tiempo.

Durante este estudio fueron colectadas diecinueve especies, diez especies de Amphibia distribuidas en cuatro familias y nueve especies de Squamata distribuidas en siete familias.

En hábitats relativamente complicados que poseen una estructura vegetal compleja y presentan patrones de actividad herpetológica irregular, el uso de trampas de caída resulta uno de los pocos métodos eficientes para la evaluación de la actividad de animales terrestres. El uso de trampas de caída es un método efectivo para realizar inventarios herpetológicos pero los resultados deben ser tratados con precaución porque este método captura algunas especies más fácilmente que otras.

Los principales resultados obtenidos por este estudio fueron: La hipótesis 1 fue rechazada, para todas las especies exceptuando a *Mabuya dorsivittata*, que mostró frecuencias de actividad similares en ambos años, la hipótesis 2 también fue rechazada porque todas las especies mostraron significativas diferencias de actividad temporal. Las especies más variables fueron *Odontophrynus americanus* y *Bufo fernandezae*; la más constante *Pantodactylus schreibersi*. La tercera hipótesis fue rechazada para todas las especies salvo *Elachistocleis bicolor* que presentó un patrón de actividad similar al ensamble. La hipótesis 4 fue rechazada, los grupos etarios de cada especie cambió temporalmente debido al reclutamiento y el período de reclutamiento varió en y entre especies.

Durante el primer período el índice de diversidad mayor se registró en abril 1999 (5.46), durante el segundo período de estudio el mayor índice de diversidad se registró en enero 2000. Este estudio muestra la importancia de los estudios temporalmente extensos y enfatiza la importancia de comprender la variación temporal de la fenología, diversidad y patrones de actividad de los ensambles herpetológicos.

Palabras clave: Amphibia, Squamata, Argentina, ensamble, clases etarias.

ABSTRACT. — From a conservationist perspective, knowledge of the abundance, diversity, and activity patterns of a herpetological assemblage is essential to understand community dynamics and habitat utilization. We proposed four null hypotheses regarding the dynamics of an assemblage of amphibians and reptiles from Argentina: 1) The capture frequency of each species studied is similar during the two years; 2) The capture frequency of each species is similar in every month of each period; 3) The activity of each species is similar to that of every other species and 4) The proportion of each size class for each species is similar throughout the year.

During the study, nineteen species were collected: ten species of Amphibia belonging to four families, and nine species of Squamata, distributed among seven families.

In relatively complex habitats, with dense vegetation and very irregular herpetological activity, the pitfall method is one of the few efficient ways to evaluate terrestrial animal activity. Pitfall traps are an effective method to perform herpetological inventories, but results must be reported with caution because traps capture some species more easily than others.

The main results of this study were: Hypothesis 1 was rejected for all species except *Mabuya dosivittata*, which showed similar frequencies during both years. Hypothesis 2 was rejected, as all species showed significant seasonal differences. The most variable species were *Bufo fernandezae* and *Odontophrynus americanus*; the most constant was *Pantodactylus schreibersi*. Hypothesis 3 was rejected for all species; except *Elachistochleis bicolor* that showed a similar activity pattern as the assemblage. Hypothesis 4 was rejected, size groups of each species showed temporal variation due to recruitment and recruitment period varied in and between species. During the first period, the highest diversity index was registered in April 1999 (5.46). During the second year the highest diversity index recorded (6.85) was in January 2000. This study shows the importance of long-term studies for conservation purposes. It also emphasizes the importance of understanding variation of the phenologies of individual species and the variation of activity and diversity within assemblages between years.

Key words: Amphibia, Squamata, Argentina, assemblage, size classes.

INTRODUCTION

In Argentina, information on the diversity of herpetofauna has been obtained mainly from incidental collections and from collecting expeditions, but these sources do not provide information on the abundance of species within assemblages or their seasonal variation in activity patterns. Some herpetological census data have been published: (Basso, 1990; Vega and Bellagamba, 1990, 1994; Lavilla and Scrocchi, 1991; Cruz *et al.,* 1992; Martori and Aun, 1995; Lavilla *et al.,*1995). Few of these, however, were systematic and of long duration.

The information from international literature is quite rich in references of herpetological assemblages studies: (Gibbons and Bennett, 1974; Stockwell and Hunter, 1989; Winemiller and Pianka, 1990; Allmon, 1991; James, 1994; Grant *et al*., 1994; Semlitsch *et al*., 1996; Vitt and Zani, 1996; Hanlin *et al*., 2000; Donnelly *et al*., 2001a; Donnelly *et al.,* 2001b) among others.

From a conservationist perspective, knowledge of species richness, diversity, and activity patterns for any given animal is essential for the understanding of community dynamics and habitat utilization, no effective policy of conservation can be proposed if this information is not available. (Gibbons and Bennet, 1974).

Fitzgerald *et al.* (1999), in their study of lizard assemblages in the dry Chaco of Argentina, noted that assemblages can be structured by the way species use resources or how they are distributed over time. As seasons change from cold to warm and from dry to wet, activity patterns of the species can change also. Individual species phenologies can play an important role in timming reproduction and seasonal activity.

In relatively complex habitats, with dense vegetation and variable activity of each species in response to the environmental conditions, the pitfall method is often the most efficient way to evaluate animal activity and relate activity to reproductive cycles, individual growth, and population level response to temperature and rainfall. These studies provide a wealth of information of the factors that may structure herpetological assemblages. The data can be used to generate predictions to be tested in natural communities (Semlitsch *et al.,* 1996).

The main questions that we formulated were: Which are the most common species?; Are all the species active at the same time?; Does their pattern of activity vary during the year?; At what time of the year are the young individuals recruited and what proportion for each species?

We proposed four null hypotheses related to functional aspects of the assemblage: 1) The capture frequency of each species studied in the two years is similar; 2) The capture frequency of each species is similar in every month of each season; 3) The capture frequency of each species is similar to that of every other species; 4) The proportion of each size class for each species is similar throughout the year

MATERIAL AND METHODS

Even though several methods exist to gather this information, pitfall traps are preferred, because detect variation in capture rate of terrestrial species that compose the herpetological assemblage permanently and through extended periods of time. Furthermore, the use of pitfall traps provides an efficient way to collect data per hour of effort. Behavioral traits and anatomical characteristics may affect the likelihood of capture of each species. Therefore, these should be considered when the results of trapping are analyzed, Stockwell and Hunter (1989) remark that the quantitative analyses of the data only reflect relative catchability and surface activity and not necessarily actual abundance.

The study area was sampled from July 1998 to June 2000, at the locality of Alto Alegre, (32º 22' S; 62º 53' W) Departamento Unión, Córdoba, Argentina, with 90 plastic pitfall traps of 30 cm diameter, and 40 cm deep (Bury and Corn, 1987; Vogt and Hine, 1982; Heyer *et al.*, 1994) in an environment characterized by dense patches of cortadera grasses, *Cortadeira selloana*. Three vegetation strata can be recognized: a first stratum composed of low grasses from 5 to 15 cm high, a second stratum dominated by the large cortadera grass islands and a seasonal succession of *Senecio pampeanus* and *Cardus* sp, and a third high stratum composed of bushes and trees, principally *Celtis tala*, *Geofrea decorticans* and *Prosopis alba* (Lutti *et al.*, 1979). The vegetation is distributed in patches, trees and bushes only occur in high sections of the land that never flood. The cortadera patches are a unique environment. They are quite large and dense in structure, from 3 to 10 meters in diameter, and they are covered with over 2 meters of sharp grass blades. A thick layer of decayed leaves covers the ground and offers a dense habitat for reptiles and amphibians.

A large shallow pond 1500 m away was the site of amphibian reproductive activity during the rainy season. During the rainy season, from November to March, the low areas in the grassland were periodically flooded. Winters are dry and cold, with many frosts in June and July. In summer, mean temperatures reach 26ºC with maximum temperatures over 38ºC. In winter, mean temperatures reach 10ºC with minimum temperatures below zero.

The pitfall traps were placed in six areas, in each area 14 traps were placed surrounding patches of cortadera grass. Plot locations were non- random and were chosen to represent the principal sub-habitat present in the site (Allmon, 1991). The study site measured 600 m in length and 300 m wide and was checked every 15 days, from July 1998 to June 2000. For each individual the snout-vent-length (SVL) was measured with a steel ruler to the nearest mm.

All specimens were collected, preserved in 10% formaldehyde, carefully washed, cataloged and conserved in 80% ethyl alcohol, and deposited in the herpetological collection of the Universidad Nacional de Río Cuarto, (UNRC, ZV).

During the study period some traps were lost and later replaced. To normalize the capture effort the quotient of the total captures for each species and the number of active traps by period were calculated (Campbell and Christman, 1982). Because species have different probabilities of being captured, we did not treat the data as indicators of absolute population density. The occurrence of animals in the traps is a result of the combination of population density, activity level, and the distance individuals move when active (James, 1994).

We contrasted the frequency of occurrence of each abundant species to the pooled frequency of other species during the 24 months of the study using goodness of fit χ^2 tests, to contrast the predictions of the null hypotheses. Contingency tables were used to examine the relative importance of each taxon in the assemblage through time. Deviations of the actual frequency of each species from its expected frequency were scaled in a +1 to –1 gradient to illustrate relative changes of frequency for each species (Fitzgerald *et al.*, 1999).

To compare similarity between seasons, monthly data were grouped and Morisita similarity index was calculated (Moreno, 2001), the results were presented as a dendrogram. For each year, months were grouped: summer (January, February and March), fall: (April, May and June), winter: (July, August and September) and spring: October, November and December).

The weather data were analyzed by Spearman correlation to compare the variation of temperature and rain with captures. Non-parametric analysis of variance (Kruskal Wallis) was used to compare species mean snout vent length (SVL) among the months to detect variation of frequency of size classes. Each species was divided into five size classes based on SVL depending on each species size range to compare the proportion of each size class among months.

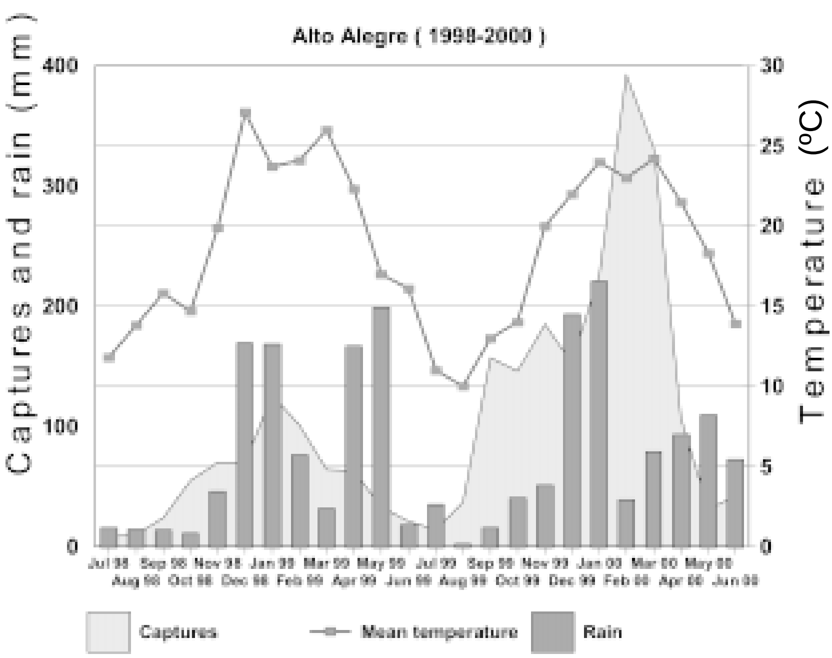

Figure 1. Mean temperature, represented by a line, rainfall, as bars and captures, as an area, in the study site of Alto Alegre, between July 1998 and June 2000.

We calculated Simpson's species diversity index and Margalef richness index to express the variation in diversity and the richness of the assemblage during the study period (Hanlin *et al.*, 2000).

RESULTS AND DISCUSSION

During the study period almost no surface activity was seen at the site while we checked the traps, whereas capture rates in the pitfall traps were high.

During the study, 19 species were collected from the pitfall traps: ten species of Amphibia belonging to four families, and nine species of Squamata, distributed among seven families (Cei, 1980, 1986). Snakes were captured accidentally only by hand (Table 1).

We defined two groups of species depending on their abundance in the captures, all species represented lower than 1% of the total captures were considered rare species. Seven species which represented the 94.36% of the captures were abundant and the remainder, which represented the 5.64% were rare.

The seven abundant species were: *Pantodactylus schreibersi* that was captured in all the months, the next most frequently captured was *Mabuya dorsivittata*, in 91.7% of the months, *Bufo fernandezae* followed with 87.5% of the months and *Elachistocleis bicolor* representing 83.3%. *Odontophrynus americanus* was collected in 79.2% of the months and *Leptodactylus latinasus* in 75%, *Leptodactylus gracilis* was collected in a 58.3% of the months (Plate 1).

Environmental correlations. — Temperature and rainfall were compared (Kruskal Wallis test) for the two periods, June 1998 to April 1999 and June 1999 to June 2000, considering the temperature and rainfall as variables and periods as factors. No significant difference in rainfall ($H_{(1,23)}$ = 0.03, p = 0.96) and temperature ($H_{(1,23)}$ = 0.45, p = 0.5) was observed between the two activity periods studied.

Rainfall ($\bar{x}$ = 78.28 mm, range 1-220 mm, s = 69.98) and mean temperatures ($\bar{x}$ =18.63ºC, range 10-27ºC, s = 5.14)

Anura

Bufonidae
Bufo fernandezae (446, 18.6%)
Bufo arenarum (6, 0.25%)

Leptodactylidae
Physalaemus biligonigerus (41.7%)
Odontophrynus americanus (331, 13.8%)
Leptodactylus ocellatus (17, 0.7%)
Leptodactylus gracilis (176, 7.35 %)
Leptodactylus mystacinus (18, 0.74%)
Leptodactylus latinasus (376, 15.7 %)

Microhylidae
Elachistocleis bicolor (475, 19.85 %)

Hylidae
Scinax nasicus (9, 0.37%)

Squamata

Teiidae
Tupinambis merianae (13, 0.54%)

Gymnophthalmidae
Pantodactylus schreibersi (376, 15.7 %)

Scincidae
Mabuya dorsivittata (102, 4.24 %)

Anguidae
Ophiodes intermedius (9, 0.37%)

Amphisbaenidae
Amphisbaena angustifrons (3, 0.12%).

Leptotyphlopidae
Leptotyphlops australis (3, 0.12%)

Colubridae
Liophis poecilogyrus (1, 0.4%)
Liophis anomalus (1, 0.4%)
Philodryas patagoniensis (1, 0.4%).

Table 1. List of species collected during the study period, the species in bold characters are the frequent species, the first number in parenthesis is the number of specimens, the second number is the percentage.

recorded during the study period were compared with overall captures (Fig. 1).

The correlation value (Spearman) was calculated between captures and rainfall (r = 0.24, $p < 0.05$), and between captures and mean temperature (r = 0.45, $p < 0.05$), showing positive correlation of captures with temperature.

Eight three-month seasons were compared by means of the Morisita quantitative similarity index to detect similarities between periods (Fig. 2). First fall and second spring presented the highest overlapping between seasons (94.4%); both winters were the most different (27.6%); both summers were similar (90.8%); falls and springs clustered together.

Temporal frequency of captures.— For temporal analysis, the data were grouped by month. Species richness, Simpson's index, and the number of individuals captured in each sample were compared (Fig. 3). During the first period, the maximum index of diversity (5.46) was registered in April 1999; in the second period the maximum value was registered in January 2000 (6.85). The maximum species richness was registered in January: 11 and 14 species.

Standardized capture numbers were obtained as the number of active traps during the month divided by the number of individuals of a given species during the same period. Figure 4 (a, b and c) illustrates the difference of the captures for the two periods. During the second period (June 1999 to June 2000) there is a large increase in amphibian captures and a moderate increase in reptile captures. *Bufo fernandezae* and *O. americanus* were frequently encountered (Fig. 3a), but their presence in large numbers was quite sporadic and was represented mainly by young individuals.

In February of 2000, 1.4 small individuals (15 mm) of *B. fernandezae* were collected per pitfall trap per month. In September 1999, 1.3 recently metamorphosed *O. americanus* per trap and per month were collected. These individuals had over-wintered as tadpoles.

The other three amphibians had a more extended activity period, *Leptodactylus latinasus* and *E. bicolor* showed a large peak in captures during the summer of 2000 and fewer captures in the warm season of 1999. There were almost no captures of these species during the winter. *Leptodactylus gracilis* showed a similar pattern but in lower numbers (Fig. 4b).

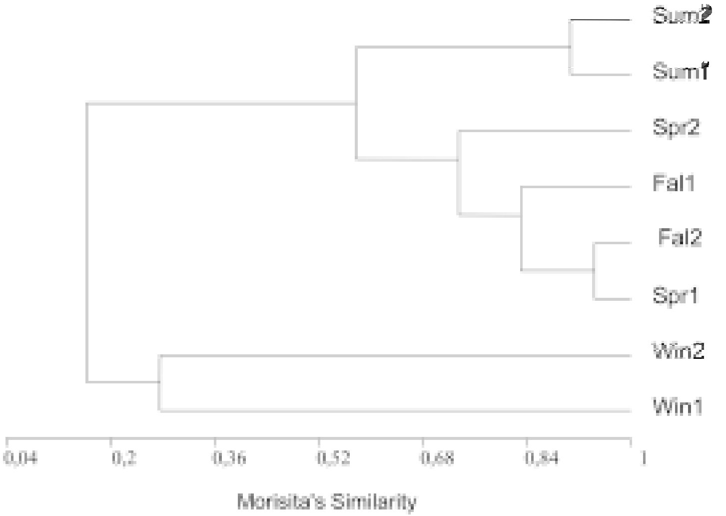

Figure 2. Phenogram representing similarities between seasons.

Plate 1. Photographs of the seven abundant species in the assemblage. a) *Bufo fernandezae,* b) *Odontophrynus americanus*, c) *Leptodactylus gracilis,* d) *Leptodactylus latinasus,* e) *Elachistocleis bicolor,* f) *Mabuya dorsivittata,* g) *Pantodactylus schreibersi*.

Species	Difference between years Hypothesis 1	Occurrence is similar every month? Hypothesis 2	Occurrence is proportional to the rest? Hypothesis 3
O. americanus	$\chi^2 = 290$ $p < 0.0001$	$\chi^2 = 1225$ $p < 0.0001$	$\chi^2 = 309$ $p < 0.0001$
L. latinasus	$\chi^2 = 106$ $p < 0.0001$	$\chi^2 = 958$ $p < 0.0001$	$\chi^2 = 82$ $p < 0.0001$
L. gracilis	$\chi^2 = 62$ $p < 0.0001$	$\chi^2 = 367$ $p < 0.0001$	$\chi^2 = 55$ $p < 0.0019$
E. bicolor	$\chi^2 = 120$ $p < 0.0001$	$\chi^2 = 451$ $p < 0.0001$	$\chi^2 = 32$ $p < 0.096$
B. fernandezae	$\chi^2 = 292$ $p < 0.0001$	$\chi^2 = 1275$ $p = 0.0001$	$\chi^2 = 78$ $p < 0.0001$
P. schreibersi	$\chi^2 = 43$ $p < 0.0001$	$\chi^2 = 89$ $p < 0.0001$	$\chi^2 = 310$ $p < 0.0001$
M. dorsivittata	$\chi^2 = 22$ $p < 0.02$	$\chi^2 = 163$ $p < 0.0001$	$\chi^2 = 118$ $p < 0.0001$
Other species	$\chi^2 = 126$ $p < 0.0001$	$\chi^2 = 661$ $p < 0.0001$	$\chi^2 = 118$ $p < 0.0001$

Table 2. Results of the χ^2 analysis for the three hypotheses proposed.

The two reptile species exhibited quite different patterns from the amphibians. Reptiles were relatively active in winter (Figure 4c), especially *P. schreibersi*, which curiously exhibited some low capture rates in summer and showed some inversions compared to the capture patterns of *M. dorsivittata* during February 1999 and 2000.

The results of the χ^2 tests for the three first hypotheses proposed are summarized in Table 2. Captures in both years were significantly different for all the species except *Mabuya dorsivittata* (χ^2 = 22, n = 102 p = 0.02 df = 12). *Odontophrynus americanus* and *B. fernandezae* showed the greatest differences, due mainly to the activity of juveniles during the second year (χ^2 = 290 n = 446 p = 0.0001; and χ^2 = 292 n = 331, p = 0.0001 df = 12).

The second null hypothesis (Fig. 5) predicted that the captures of each species were similar throughout the year. This hypothesis was rejected for all species. The capture patterns for *L. latinasus*, *L. gracilis,* and *E. bicolor* were quite similar and were more frequent during the warm months; the other two amphibians, *B. fernandezae* and *O. americanus* were quite explosive in occurrence.

The most constant species was *P. schreibersi,* (χ^2 = 89, n = 376 p =

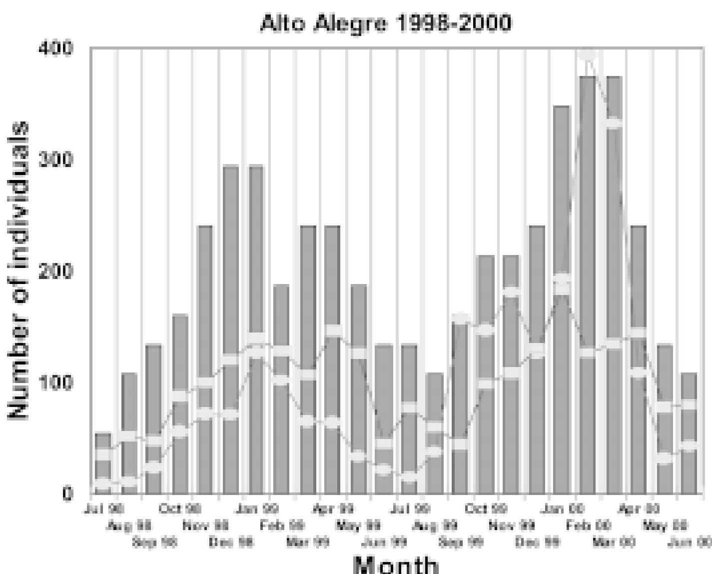

Figure 3. Species richness, represented as bars, total captures, as circles and Simpson diversity index as squares, for the study site during the period between July 1998 and June 2000.

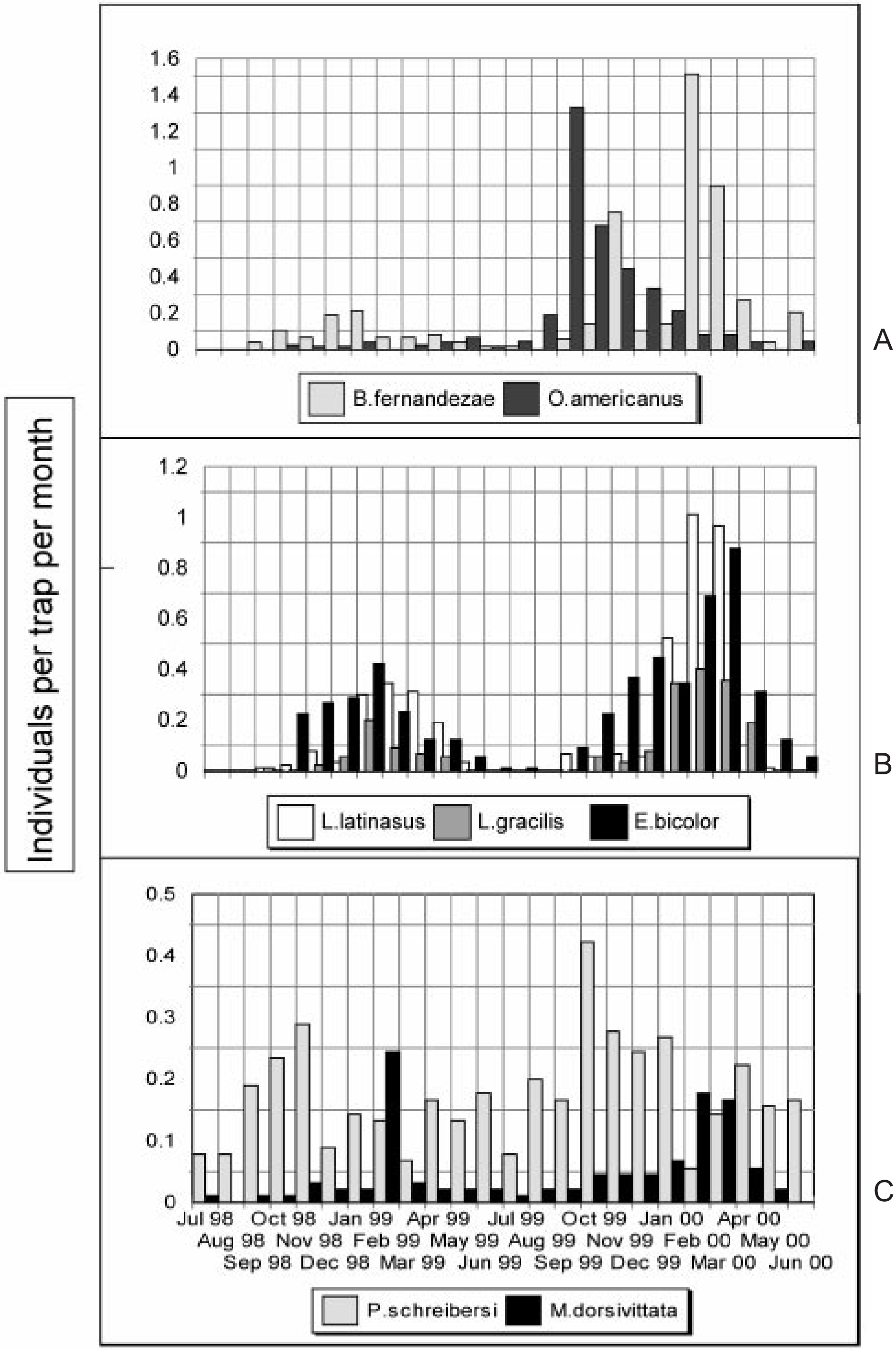

Figure 4. Relative number of individuals captured by pit trap per month, (capture effort). a) *Bufo fernandezae* and *Odontophrynus americanus*. b) *Leptodactylus latinasus, Leptodactylus gracilis* and *Elachistocleis bicolor*. c) *Pantodactylus schreibersi* and *Mabuya dorsivittata*.

0.0001, df = 24) and the most variable were *O. americanus* and *B. fernandezae* (χ^2 = 1225 p = 331 and χ^2 = 1275, N = 446 p = 0.0001 df = 24).

The third null hypothesis predicted that activity of each species would be similar to the pooled activities of other members of the assemblage. The results of the contingency table (Fig. 6) show the deviation from the expected occurrence for the seven species. This prediction was rejected for all species except *E. bicolor* and *L. gracilis* (χ^2 = 32, n = 475 p = 0.096 df = 24 and χ^2 = 55, n = 176 p = 0.0019 df = 24). The species with greatest difference of oc-

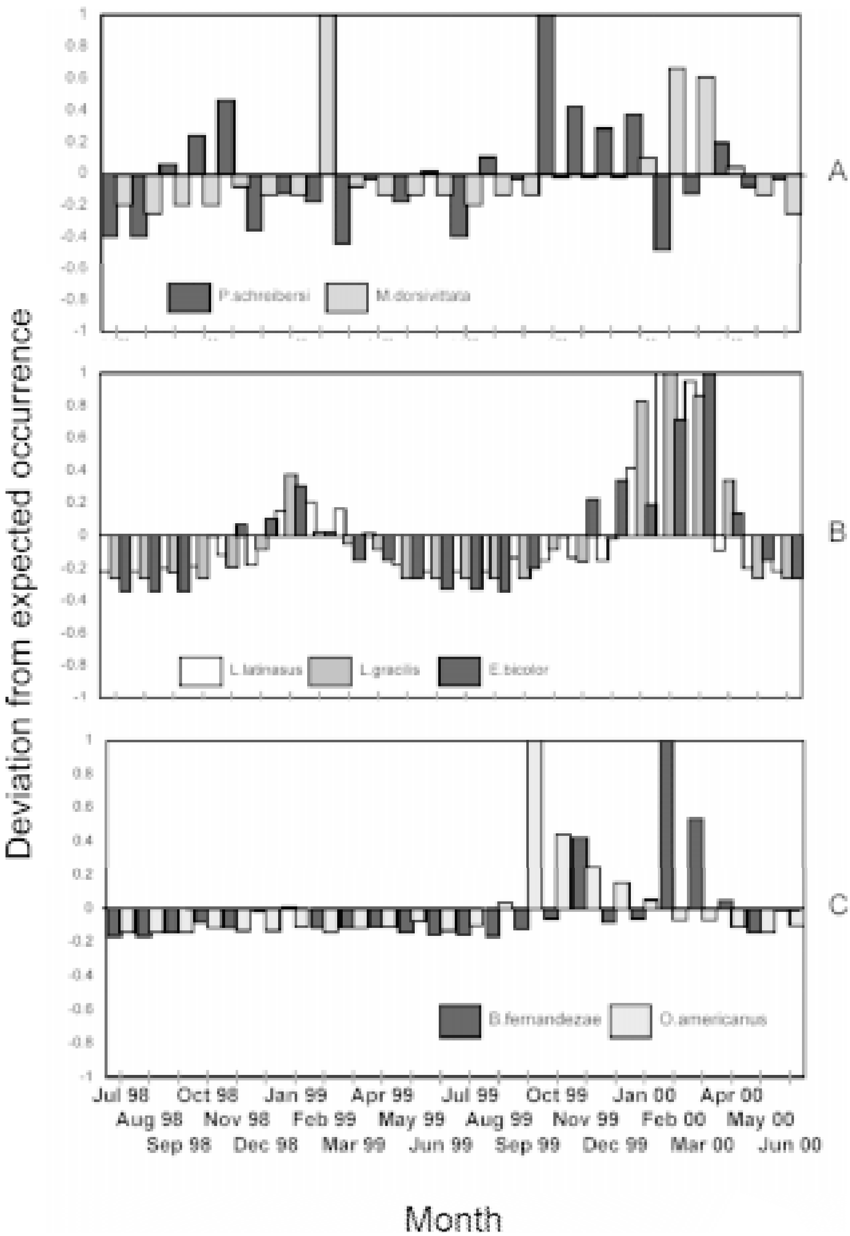

Figure 5. Deviations from the expected occurrence (contingency tables). The monthly number of captures of each species were contrasted with its mean frequency of capture. Deviations from the expected frequencies were scaled from 1 to -1.

currence from overall captures was *P. schreibersi* (χ^2 = 310, n = 376 p = 0.0001 df = 24).

General pattern of activity.— *Bufo fernandezae* and *O. americanus* are terrestrial wide-foragers, and both are explosive breeders that use permanent ponds for reproduction. *Bufo* has rapid metamorphosis whereas *Odontophrynus* tadpoles overwinter and metamorphose the following season. The large capture record for September and October 1999 corresponds to *O. americanus* froglets; during the first year juvenile of this species were not collected. *Bufo fernandezae* presented two cohorts during the 1999-2000 season, one in spring and one in summer. During 1998-1999, juvenile recruitment was lower and occurred only in spring.

The results obtained for the contin-

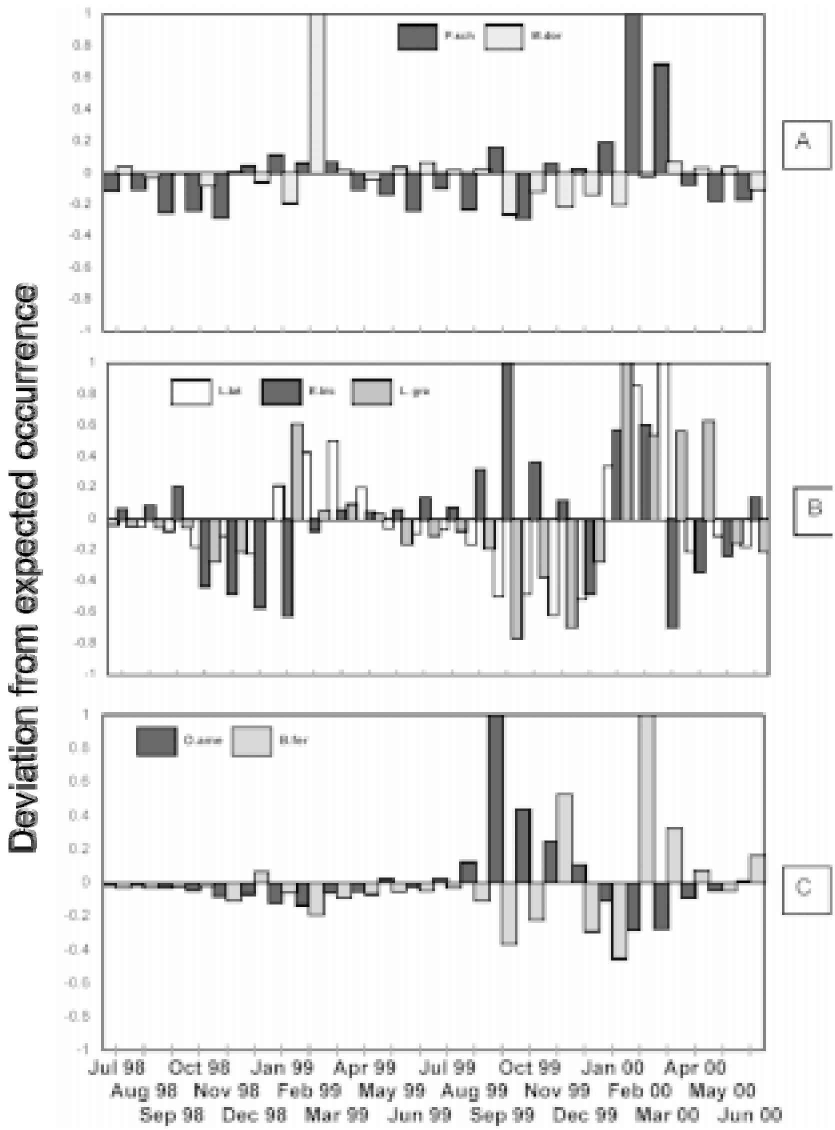

Figure 6. Deviations from the expected occurrence (contingency tables). The monthly number of captures of each species were contrasted with the pooled frequency of the other species. Deviations from the expected frequencies were scaled from 1 to -1.

gency tables for *B. fernandezae* and *O. americanus*, when each species is compared to its mean activity (Fig. 5) and to the activity frequency of the rest of the species (Fig. 6), show a different pattern than the rest of the species of the assemblage. During most of the study they are below the expected values and during a short period of the second year over the expected values; population explosions are due to recruitment.

The other three species of frogs show a smooth wave with positive peaks during the wet season and negative peaks during the dry season; their rate of recruitment was much smaller and recently metamorphosed froglets were not found at the site.

Leptodactylus gracilis and *L. latinasus* lay eggs in terrestrial foam nests (Duellman and Trueb, 1986) and tadpoles live in temporal ponds. Recruitment occurs in summer, early summer for *L. latinasus* and late summer for *L. gracilis*. In *E. bicolor*, recruitment was in spring during the first year and in summer during the second year. The biology of *E. bicolor* is not well known, but the proportion of recruitment of these three species was similar and contrasts with the large proportion of recently metamorphosed individuals found in *Bufo* and *Odontophrynus*.

The activity pattern for these three species was quite similar, especially *E. bicolor* and *L. latinasus*. *Leptodactylus gracilis* was relatively less active during the second year. Adult frequencies in *O. americanus* and *B. fernandezae* were relatively low and similar during both periods. The frequency pattern for each species is reflected by the contingency tables, by the high χ^2 values obtained by *Odontophrynus* and *Bufo*, the relatively high value for *L. latinasus,* and the lower values for *E. bicolor* and *L. gracilis*. *Leptodactylus gracilis* and *E. bicolor* presented a similar pattern when their occurrence was compared with the activity of the assemblage (Table 1, Hypothesis 3).

All amphibians ceased their activity in winter, whereas reptiles were captured throughout the study period.

The most significant difference observed between *M. dorsivittata* and P. *schreibersi* was the inversion in activity apparent during both years in February. *Mabuya* is a viviparous lizard that mates in late summer. This species is abundant in the area but is underestimated in our samples because individuals live on the cortadera grass, and they seldom move through the leaf litter. During the reproductive period they are more active; they leave their territories and compete and probably exclude *Pantodactylus,* which are leaf litter inhabitants. During the reproductive period of *Mabuya,* the captures of *Pantodactylus* were reduced, but later captures increased during fall.

Young *M. dorsivittata* are born in summer and were collected in relatively low numbers during the season. Juvenile *P. schreibersi* were first captured in February; eggs were laid in December, and adults were present throughout the winter. Females lay only two eggs but the reproductive period is long and more than one clutch is produced (Martori and Gallego, unpublished data). The two lizards were relatively constant during both years, with increased captures for *M. dorsovittata* in late summer and *P. schreibersi* in spring. Extended activity periods of these species contrasts with the reduced activity cycle of teiids gekkonids and tropidurids (Martori and Aún, 1993, 1995; Aún and Martori, 1994, 1998) that live at a similar latitude; this might be due to the particular microhabitat conditions that allow tropical species to survive in more seasonal environments.

Population structure and body size variation.— The frequency of body size groups changed through time. The most constant species in body size distribution throughout the year were *M. dorsivittata, L. gracilis* and *E. bicolor:*

($H_{(11,88)}$ = 12.44, p = 0.189; $H_{(11,154)}$ = 17.38, p = 0.043; $H_{(11,455)}$ = 19.35, p = 0.022). Thus, the null hypothesis is not rejected. The most different frequencies of SVL sizes during the study period were found for *O. americanus* and *B. fernandezae*, ($H_{(11,298)}$ = 70.75, p = 0.0001; $H_{(11,415)}$ = 76.44, p = 0.0001). The other species, *P. schreibersi* and *L. latinasus*, had intermediate values ($H_{(11,350)}$ = 52.64, p = 0.001; $H_{(11,335)}$ = 40.47, p = 0.001).

In *B. fernandezae* only individuals over 15 mm were included in the study (Table 3). They left the pond as froglets measuring 8 mm in such large quantities that they distorted the size group distributions. In *O. americanus* only individuals over 20 mm were considered. They emerged from the pond measuring 18 mm. Only periods with more than 10 captures were included to avoid percentage distortions due to small sample size.

During the first period very few *O. americanus* were active. During the second period, many small individuals were present from September to November, representing almost 80% of each sample. From December to March the best represented size group consisted of individuals measuring from 26 to 35 mm; adults were very scarce. *B. fernandezae* was present in both periods but were more abundant during the second period. Adults represented an important part of the active population, showing recruitment of juvenile individuals from October to January during the first period and from December to March in the second period. The two *Leptodactylus* species and *E. bicolor* were similar in frequency pattern (Table 3). These species lay smaller clutches and are not explosive breeders.

Adults of *E. bicolor* were the most frequent size groups, and fewer froglets were captured as compared to *Bufo* and *Odontophrynus*. This species showed considerable variation in the recruitment period. During the first period the highest percentage of young individuals were collected from October to December, and for the second period the highest percentage was from February to May.

Mabuya dorsivittata is underrepresented in our samples because they do not move frequently on the ground and spend most of their time on the vegetation. Recruitment was from December to May during both periods. In February a large increase of captures was recorded, mainly represented by the occurrence of adult individuals. Frequencies of occurrence were quite even in *P. schreibersi*. They were least abundant in February, coinciding with an increase in *M. dorsivittata* captures. Recruitment was concentrated in late summer and fall, at which time about 50% of the individuals were in the 20-30 mm size groups.

Pitfall traps are an effective method for carrying out herpetological inventories, but results must be interpreted with caution because traps capture some species more easily than others. It is also recommended to use more than one sampling device (Enge, 2001) but in our case the distance to the study site and economic restrictions did not allow us to spend more time in the field.

However, because sampling methods were similar during the study period, relative abundance of species and relative variation of age groups of each species between months provide a good data base useful to understand the dynamics of the assemblage over time. Activity patterns and reproductive cycles played an important role in the temporal structure of this fluctuating assemblage.

Variability in capture and sizes found during this study points out the importance of long-term studies for conservation purposes and emphasizes the importance of understanding variation of phenologies of individual species that is determined by their life histories and climatic constraints. Most of the decisions made concerning wildlife conservation

Bufo fernandezae												
year	1998			1999						2000		
size %	jj	as	on	dj	fm	am	jj	as	on	dj	fm	am
15-30	0.0	0.0	43.8	19.4	0.0	0.0	0.0	0.0	0.0	50.0	72.9	39.5
31-40	0.0	0.0	31.3	25.0	37.5	15.4	0.0	0.0	1.2	4.5	23.8	52.6
41-50	0.0	0.0	18.8	41.7	62.5	69.2	0.0	0.0	23.5	22.7	1.4	7.9
51-60	0.0	0.0	6.3	11.1	0.0	7.7	0.0	0.0	42.0	9.1	1.4	0.0
< 61	0.0	0.0	0.0	2.8	0.0	7.7	0.0	0.0	33.3	13.6	0.5	0.0
n	0	0	16	36	16	13	0	0	81	22	210	38
Odontophrynus americanus												
year	1998			1999						2000		
size %	jj	as	on	dj	fm	am	jj	as	on	dj	fm	am
20-25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	84.8	56.5	13.6	6.3	0.0
26-30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.4	27.8	38.6	31.3	0.0
31-35	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.4	25.0	31.3	0.0
36-40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	11.4	25.0	0.0
41-45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	8.3	11.4	6.3	0.0
n	0	0	0	0	0	0	0	132	108	44	16	0
Leptodactylus gracilis												
year	1998			1999						2000		
size %	jj	as	on	dj	fm	am	jj	as	on	dj	fm	am
15 - 24	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0	15.8	0.0	8.3
25 - 34	0.0	0.0	0.0	13.0	10.0	0.0	0.0	0.0	0.0	52.6	69.9	66.7
35 - 44	0.0	0.0	0.0	52.2	70.0	0.0	0.0	0.0	0.0	18.4	27.4	20.8
45 - 54	0.0	0.0	0.0	34.8	10.0	0.0	0.0	0.0	0.0	13.2	2.7	4.2
< 55	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
n	0	0	0	23	10	0	0	0	0	38	73	24
Leptodactylus latinasus												
year	1998			1999						2000		
size %	jj	as	on	dj	fm	am	jj	as	on	dj	fm	am
12 - 17	0.0	0.0	0.0	31.0	13.3	0.0	0.0	0.0	0.0	9.6	0.6	0.0
18 - 22	0.0	0.0	10.0	34.5	11.1	0.0	0.0	0.0	0.0	25.0	0.6	0.0
23 - 27	0.0	0.0	40.0	10.3	44.4	33.3	0.0	0.0	0.0	46.2	44.7	6.3
28 - 32	0.0	0.0	40.0	20.7	15.6	47.6	0.0	0.0	83.3	13.5	50.9	81.3
33 - 37	0.0	0.0	10.0	3.4	15.6	19.0	0.0	0.0	16.7	5.8	3.1	12.5
n	0	0	10	29	45	21	0	0	12	52	161	16
Elachistocleis bicolor												
year	1998			1999						2000		
size %	jj	as	on	dj	fm	am	jj	as	on	dj	fm	am
18-22	0.0	0.0	33.3	10.3	0.0	0.0	0.0	0.0	0.0	0.0	23.6	33.9
23-25	0.0	0.0	28.9	30.9	20.8	11.8	0.0	0.0	18.6	15.8	35.4	22.6
26-28	0.0	0.0	8.9	32.4	37.5	47.1	0.0	0.0	50.8	34.2	26.8	21.0
29-31	0.0	0.0	17.8	16.2	37.5	23.5	0.0	0.0	18.6	38.2	7.9	12.9
32-35	0.0	0.0	11.1	10.3	4.2	17.6	0.0	0.0	11.9	11.8	6.3	9.7
n	0	0	45	68	24	17	0	0	59	76	127	62
Mabuya dorsivittata												
year	1998			1999						2000		
size %	jj	as	on	dj	fm	am	jj	as	on	dj	fm	am
> 40	33.3	0.0	0.0	25.0	29.2	20.0	0.0	0.0	0.0	22.2	10.7	0.0
41-50	33.3	0.0	20.0	25.0	8.3	80.0	33.3	66.7	0.0	0.0	32.1	62.5
51-60	33.3	0.0	0.0	25.0	16.7	0.0	66.7	33.3	57.1	33.3	10.7	12.5
61-70	0.0	0.0	80.0	25.0	29.2	0.0	0.0	0.0	28.6	0.0	32.1	25.0
< 70	0.0	0.0	0.0	0.0	16.7	0.0	0.0	0.0	14.3	44.4	14.3	0.0
n	3	0	5	4	24	5	3	3	7	9	28	8
Pantodactylus schreibersi												
year	1998			1999						2000		
size %	jj	as	on	dj	fm	am	jj	as	on	dj	fm	am
20 - 25	0.0	4.0	0.0	0.0	50.0	28.6	17.4	2.9	0.0	0.0	33.3	18.2
26 - 30	0.0	4.0	6.1	0.0	12.5	17.9	34.8	22.9	0.0	0.0	8.3	38.6
31 - 35	0.0	32.0	20.4	0.0	6.3	28.6	17.4	45.7	52.3	22.0	8.3	22.7
36 - 40	0.0	52.0	57.1	82.6	6.3	7.1	17.4	22.9	36.9	56.0	33.3	4.5
< 41	0.0	8.0	16.3	17.4	25.0	17.9	13.0	5.7	10.8	22.0	16.7	15.9
n	0	25	49	23	16	28	23	35	65	50	12	44

Table 3. Relative bimonthly frequencies of size groups for the study period, in the first column the size sections for each species, in the last line the sample size for each species.

are formed with little background knowledge, and in many cases ignorance of the conservation status of assemblages (Lavilla *et al.,* 2000). Often the herpetofauna is not considered in conservation projects. When we started this project, although we had experience in collecting in this region and had consulted literature about the area, we were surprised by the diversity and variability of this fauna. If the basic parameters for each species, such as abundance, temporal activity and recruitment are not evaluated in long term projects, at least for the common species, there is no way to predict if wildlife is actually declining and what can be done to prevent or at least to mitigate their extinction.

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