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# Clutch size and oviposition site of *Kentropyx calcarata* Spix, 1825 in southern Bahia, Brazil

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Egg-laying habits of a species play an important role in population dynamics (Rand, 1967), since some types of sites chosen may offer better protection from predators, and provide optimum environmental conditions to the survival and development of juveniles (Rand, 1967). Likewise, clutch size and egg volume are essential to the study of life history traits because they allow an understanding on how energy is allocated for reproduction (Werneck et al., 2009).

Species of the lizard genus *Kentropyx* (Squamata: Teiidae) are widely distributed in South America and comprise nine species subdivided in three monophyletic groups: *calcarata*, *paulensis* and *striata* (Werneck et al., 2009). The species of the *calcarata* group are associated with forest ecosystems and occur in the Amazon Basin and the Atlantic Forest of Brazil (Gallagher, Dixon and Schmidly, 1986). *Kentropyx calcarata* Spix 1825 can be found in open and sunny microhabitats within forests (Avila-Pires, 1995). Eggs can be found in nests buried in the sand (Vitt, 1991) or in rotten trunks (Magnusson and Lima, 1984), but there is no hitherto record of eggs deposited in bromeliads. In our study we examine some aspects of clutch site and size, egg volume and juveniles of *K. calcarata*.

Eggs of *K. calcarata* were found inside bromeliads of the genus *Areococcus* Brogn at a Mussununga Forest, a type of wet forest characterized by short trees, located on sandy soil (Thomas, 2003) which was part of a larger Atlantic Forest patch. The eggs were found on fieldwork trips between December 2011 and January 2012. The study site is located at Reserva Particular do Patrimônio Natural Boa União, Acuípe, Ilhéus, Bahia, Brazil (S 15°04'35,1''/ W 39°03'01,5''), comprising an area of 1.12 km². Bromeliads containing eggs were cut at the base, placed into plastic bags and taken to the laboratory during the following day. Both eggs and hatchlings were weighted with an electronic scale (Shimadzu BL3200H) with 0.01 precision and measured with a caliper of 0.01 cm of precision. We calculated egg volume with the formula for a spheroid, where w is egg width and l is egg length, and compared our results statistically with those presented in literature using a t test for independent observations when variances are different. Two voucher specimens were deposited at "Laboratório de Vertebrados da Universidade Estadual do Sudoeste da Bahia" (MHNJCH 406 and 407) while the other hatched individuals were returned to the field. Three oviposition sites were encountered inside bromeliads, which contained different numbers of eggs. Not all eggs and hatchlings could be measured because several eggs had already hatched, and the hatchlings were already gone (eggs measured = 22, total eggs inside the three bromeliads = 26). The first and third clutches

**Figure 1.** Eggs of *Kentropyx calcarata* in a bromeliad from the Atlantic Forest of Southern Bahia, Brazil.

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**Table 1.** Egg volume (in mm³) of *Kentropyx* observed in this study and obtained from the literature. Values indicate x ± SD and sample size (in parentheses). Values of literature as summarized in Werneck et al. (2009).

| Species | Egg Volume | Literature |
|---|---|---|
| ***K. calcarata*** | 921.16 ± 149,13 (16) | Werneck et al. (2009) |
| ***K. calcarata*** | 1592.61±671.12 (4) | this study |

consisted of eggs stuck to each other (Fig. 1). The first one, comprising three eggs, had a total weight of 7.8g and the third, formed by four eggs weighted 4.1g. Only one egg in the second bromeliad contained an embryo inside, the rest were represented by nineteen shells (Fig. 2). The volume of *K. calcarata* eggs (mean ± SD = 1592.61 ± 671.12 mm³; range 1145.87 – 2591.82 mm³) was different (t=0.0029, α= 0.005, df=3) from anterior records found in the literature (Table 1). Egg volume values are presented in Table 2 and measurements of hatchlings (Fig. 3) in Table 3.

Egg counts at oviposition sites of *K. calcarata* range from three (this study) to 827 (Magnusson and Lima, 1984). However, the clutches per female range from 3 (this study; Werneck et al., 2009) to 9 (Werneck et al., 2009). Clutch sizes from other species within the genus have been reported: a single female of *K. viridistriga* depositing a maximum of twelve eggs and *K. vanzoi* which deposits only one egg (Werneck et al., 2009). The majority of the 20 eggs found in one of the bromeliads were yellowish and appeared to be older than the others. Magnusson and Lima (1984) observed nests of *K. calcarata* with 21 and 27 eggs in rotten trunks and stated that the nests contained eggs from different females. Vitt (1991) reported on two records of *K. calcarata* nests in sun-exposed sand near a small stream containing 4 and 6 eggs. Those eggs could be related to multiple clutches of a unique female or more probably, a communal oviposition site (Rand, 1967) since Vitt (1991) observed that females of this species do not have a second set of vitellogenic follicles that are indicative of a second clutch. The mean volume of eggs was superior

**Figure 2.** Communal oviposition site of *Kentropyx calcarata* in Southern Bahia, Brazil.

**Table 2.** Egg volume (in mm³) of *Kentropyx calcarata* four eggs found in bromeliads at Southern Bahia, Brazil.

| | Egg volume (mm³) |
|---|---|
| **1** | 2591.82 |
| **2** | 1145.88 |
| **3** | 1298.65 |
| **4** | 1334.13 |
| **Mean ± SD** | 1592.62 ± 671.12 |

**Figure 3.** *Kentropyx calcarata* hatchling from Southern Bahia, Brazil.

to the values provided for *K. calcarata* by Werneck et al. (2009) and statistically different. *Kentropyx calcarata* has a wide distribution range and the ecological and ethological aspects of most populations remain poorly known. Differences therefore may be related to different environmental conditions.

Former data on *K. calcarata* hatchlings reported individuals of 34.2 ± 0.05 mm snout-vent length (SVL) and weights of 0.989 ± 0.18g (Vitt, 1991). These findings are similar to our own data of 36.1 ± 1.9 mm SVL and 1.02 ± 0.09 g weight. However, the hatchlings in our study presented tail length of 73.06 ± 2.41 mm while the hatchlings reported by Vitt (1991) had statistically ($t=2.26$, $\alpha=0.05$) shorter tails (64.7 ± 0.9mm).

It is not uncommon to find bromeliads serving as shelter, breeding and foraging site to some arthropods, amphibians (Frank and Lounibos, 2009) and even lizard species (Families Scincidae and Gekkonidae) (Henle and Knogge, 2009). Species of the genus *Eutrophis* use bromeliads as microhabitat (Huang, 2006) and *Anolis alutaceus* deposits eggs inside bromeliads (Dunn, 1926). *Kentropyx calcarata*, as observed in our study, uses bromeliads as a strategically oviposition site that allows hiding the eggs from predators.

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**Table 3.** Summary of morphological data of *Kentropyx calcarata* hatchlings (in mm) from the Atlantic Forest of Southern Bahia, Brazil. Values indicate ± SD and SVL = Snout-Vent-Length. The asterisks marks the voucher specimens.

| | HATCHLINGS | | |
|---|---|---|---|
| | SVL (mm) | tail length (mm) | weight (g) |
| **1*** | 38.1 | 73.3 | 0.87 |
| **2*** | 36.8 | 76.7 | 1.09 |
| **3** | 36.3 | 73.0 | 1.11 |
| **4** | 32.1 | 72.3 | 1.03 |
| **5** | 37.0 | 70.0 | 1 |
| **Mean ± SD** | 36.6 ± 2.31 | 73.06 ± 2.41 | 1.02 ± 0.09 |

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