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# Alimentary habits of *Hydromedusa maximiliani* (Mikan, 1820) (Testudines, Chelidae) and its relation to prey availability in the environment

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**Abstract**. *Hydromedusa maximiliani* is endemic to mountainous regions, with distribution in the Atlantic Forest region along mountain ranges in Southeastern and part of northeastern Brazil. This work aimed at studying the feeding habits of a *H. maximiliani* population from Minas Gerais state, Southeastern Brazil. Specimens were captured, marked, measured and submitted to stomach washing. Pitfall traps were used to capture prey in terrestrial environments, and nets were used to collect macroinvertebrates in the aquatic environmental. We captured and recaptured a total of 33 individuals. From 16 samples of stomach content, we recorded aquatic insect larvae, crabs, and terrestrial invertebrates. In total, 16 categories of prey items were identified. These belonged to 16 orders and 70 families of Insecta, 3 families of Diplopoda, 2 families of Crustacea, and 13 families of Arachnida. Lepidoptera, Baetidae and Diplopoda reached maximum electivity. The most representative group in the diet was Insecta, especially those with aquatic larval phase. The information obtained in this study about the diet of *H. maximiliani* indicates this vertebrate as a potential predator for regulating the density of benthic macroinvertebrates, and our data corroborate other studies which also showed the importance of *H. maximiliani* as a predator essential to aquatic food web dynamics. These data will be useful in future studies dealing with the biomonitoring of *H. maximiliani*, and contributing to its preservation as well as to the preservation of habitats where this species lives.

**Key words.** Atlantic Rainforest; Brazil; Electivity; Feeding habits; Maximilian's snake-necked turtle.

## Introduction

*Hydromedusa maximiliani* (Mikan, 1820) (Testudines, Chelidae) occurs in southeastern and part of northeastern Brazil (Ernst and Barbour, 1989; Argôlo and Freitas, 2002; Souza et al., 2003; Souza, 2004a,b; Novelli and Sousa, 2007). This species is considered vulnerable (VU) according to categories and criterions of International Union for Conservation of Nature and Natural Resources (IUCN, 2010). The main threat to species with a restricted occurrence is the progressive destruction of habitat. In rivers it is caused by the removal of gallery forests, siltation and pollution by industrial and domestic garbage and agrochemical products (Rodrigues, 2005).

Dietary habits are one of the most investigated subjects in studies of the natural history of turtles and freshwater turtles. Freshwater turtles feed on aquatic and terrestrial vertebrates and invertebrates, carrion, and a great variety of plants, seeds and algae (Yamashita, 1990; Guix, Miranda and Nunes, 1992; Terán, 1992; Terán, Vogt and Soares, 1994; Souza and Abe, 1995a, 1997a,b, 1998; Lima, Magnusson and Costa, 1997; Portal et al., 2002; Balensifer, 2003; Malsavio et al., 2003; Souza, 2004a,b). The presence of terrestrial prey in stomach contents is reported by Bury (1986) and Georges, Norris and Wensing (1986) for the species *Clemmys marmorata* and *Chelodina longicollis*. Comparing the stomach contents with the prey items available in the environment, these authors found that terrestrial preys were ingested more probably because they fell on the water than due to active foraging by freshwater turtles in the terrestrial environment.

Studies on the diet composition of *H. maximiliani* have been previously carried out in the municipality

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of São Paulo by Yamashita (1990), Guix, Miranda and Nunes (1992), Souza and Abe (1995, 1997b), and Souza (1995, 2004a). Nevertheless, only a few works, such as Plummer and Farrar (1981), Macculloch and Secoy (1983), Bury (1986), and Georges, Norris and Wensing (1986), correlated prey available in the environment to prey ingested by other species of chelonians. Concerning Brazilian species, data of this nature still need to be obtained.

Seeking to obtain information that would help future biomonitoring studies that might contribute to *H. maximiliani*preservation, our goal in this work was to study the alimentary habits of specimens from Reserva Biológica Municipal Santa Cândida, in the municipality of Juiz de Fora, Minas Gerais State, Brazil.

## Material and Methods

This work was carried out on specimens of a *H. maximiliani* population located in Reserva Biológica Municipal Santa Cândida (RBMSC) (21º41'20" S, 43º20'40"W; datum: SAD69), municipality of Juiz de Fora, Zona da Mata, Minas Gerais, Brazil, from October 2004 to May 2005. The RBMSC has an area of 113 ha of secondary forest, classified as Montane Seasonal Semideciduous Forest, inserted in the Atlantic Forest domain. The climate is classified as Cwb of the Köppen classification, with hot and rainy summers. The annual rainfall average is 1500 mm, annual temperature average is 18.9 °C and the altitude ranges from 760 m to 960 m (Lafetá, 1998).

The turtles and aquatic macroinvertebrates were collected in RBMSC pond (15.6 m wide at the longest side, 11 m wide at the smallest side, 29 m length, with depth varying from 0.2 to 2.0 m), which is filled by Milho Branco streamlet, one of the Reserve's main streamlets. Sampling was carried out once a month during the study period between 08:00am to 05:00pm.

The freshwater turtles were captured with dip nets or manually, and each turtle was permanently marked (Cagle, 1939). In this species, sexing is done by the maximum size of the carapace and body mass, plus a distinct concavity in plastron present in males. Males are bigger and heavier than females (Souza and Abe; 1997a). The carapace's maximum length (CML) was measured with a Western® manual sliding calliper (to the nearest 0.1 mm), in a straight line from the anterior border to the posterior border of the carapace.

In order to collect stomach contents, turtles were immobilized in a stomach regurgitation device, similar to that used by Parmenter (1980), and submitted to stomach washing, as in Legler (1977), with a urethral catheter connected to a polypropylene syringe containing a NaCl 0.85% saline solution. We opened the individuals' oral cavities with the help of surgical pincers in one of the corners of their mouth, then we inserted a plastic tube measuring 1.5 cm in diameter and 3 cm in length between their jaw and maxilla, through which the catheter was introduced into their esophagus, and then injected approximately 5 ml of saline solution.

Each animal was placed separately inside a plastic box (70x35x40 cm) containing half a litre of water for approximately one hour, where the regurgitated material was collected, filtered in filter paper, fixed in formaldehyde at 10% for 14 hours, and stored in 80 ml-plastic recipients containing alcohol at 70%. The stomach washing process was carried out within less than three hours after the animal was captured (Georges, 1982). After all the procedures were done, the turtles were released at their original capture site.

An Olympus® SH40 stereoscopic microscope was used to identify and measure the arthropods found in the stomach contents. Prey items were measured with the help of millimetered paper, and their volume was calculated using the modified version of the ellipsoid formula (Magnusson et al., 2003). The analysis of the frequencies related to the total of stomach contents collected took into consideration sex and age (males, females and juveniles), and we determined the absolute and relative frequency of each prey item.

Twenty-five pitfall traps, made of 12-litre plastic buckets (25 cm in diameter), were used to capture potential prey available in terrestrial environment. These were distributed in one straight line, 2 m distant from each other and surrounded by 25 Berlese funnel traps and 25 PET traps, both made with 2-litre plastic bottles. All the traps were buried, with their openings at ground level, and perforated at the bottom to allow the flowing off pluvial waters. We installed a total of 75 traps along the right margin of RBMSC's pond, and inspected them monthly. The traps were opened all the time, totalling 240 days of sampling effort for each trap.

We collected aquatic macroinvertebrates with nets. The nets had a 65 cm deep and 40 cm diameter funnel, 0.6 mm mesh opening, and 1.5 m-long handle. Each sampling lasted 30 min, and we explored surface, vegetation and bottom of the pond. The sampling procedure consisted of drawing the net along the pond's lateral margins and barrage, totalising 90 min. The arthropods and macroinvertebrates collected were killed in ether and preserved in 80 ml plastic container containing alcohol at 70%. We used the keys of Burchel (1972), Borror and Delong (1988), Rocha (1999), and Carvalho and Calil (2000) to identify arthropods.

The similarity of female and males diets was calculated through the simplified Morisita's Similarity Index. Electivity was calculated with the Ivlev Electivity Index (Krebs, 1989). Spearman's correlation was used to test the relationship between CML *vs.* diet's volume and CML *vs.* maximum size of ingested prey. The significance level was $\alpha = 0.05$. Accumulation curve of prey species were built from the average of 1000 randomizations with EstimateS version 8.2.0 through the Bootstrap method (Colwell, 2006). Parameters were used as sampling days for prey in the environment and the number of samples obtained from animals regurgitate.

This work was licensed by Brazilian environmental office - IBAMA (Process nº 02015.003546/04-11), and was performed under the ethical principles adopted by COBEA (Colégio Brasileiro de Experimentação Animal), which were approved by the Ethics Committee - Comitê de Ética em Experimentação Animal of the Universidade Federal de Juiz de Fora (Protocol nº 011/2005-CEA).

## Results

We collected 33 specimens of *Hydromedusa maximiliani* (11 males, 12 females and nine juveniles). Only in 16 specimens (seven males, six females and three juveniles), regurgitation samples of stomach contents were obtained. We identified prey items as belonging to 16 categories (Table 1). In this study we verified the presence of terrestrial invertebrates, such as Diplopoda, Araneae, Coleoptera, Lepidoptera, and Homoptera in the stomach contents.

Through the analysis of the females' stomach contents (n = 6) we observed that the highest relative frequency was of Trichoptera larvae, from the family Leptoceridae, and the lowest was of the Araneae order. The highest absolute frequency of ingested prey was also of Leptoceridae larvae, and the lowest of larvae of other Diptera, adult Coleoptera, and Ephemeridae naiads. The lowest absolute frequency we found was of Diptera larvae, adult Ephemeridae and Coleoptera.

Our analysis of the females' stomach contents showed a great variation in the total average volume ingested (Diplopoda: 380.9 $mm^3$; and Chironomidae larva: 16.57 $mm^3$). The average total volume was 315 $mm^3$, but due to the high variation coefficient (VC = 145 %), we used the mean volume of each alimentary item in the data analysis.

In the females, we verified a great variation in the mean volume (161.9 $mm^3$; VC = 180 %) of the items ingested, due to the presence of an adult Coleoptera, with about 980 $mm^3$, equivalent to 31% of the total volume. On the other hand, we found 13 Diptera larvae of the family Chironomidae, with a total mean volume of 1.3 $mm^3$. Excluding these data, the average dropped to 84 $mm^3$ and the VC to 138%.

In the males (n = 7), we also registered great variation in the volumes of ingested prey (Odonata naiads: 1344.42 $mm^3$; and Ephemeroptera of the Baetidae family: 22.99 $mm^3$). The highest relative frequency we found was of Chironomidae larvae. The lowest relative frequency we found was of Baetidae nymphs, adult Gelastocoridae, and Lepidoptera larvae.

The average volume of each item ingested by the males was 62.6 $mm^3$ (± 53.4 $mm^3$), resulting in a VC of about 85% – much smaller than that of the females. The item that had the highest average volume for the males was Odonata naiads (149 $mm^3$), corresponding to 50% of the total volume, and with an absolute frequency of nine items. Curiously, the females ingested the same number of Odonata naiads, but these had a smaller average volume (60.7 $mm^3$). The item that had the smallest average volume was a Chinoromidae larva (0.97 $mm^3$); however, these were ingested in great quantity (n = 73). The females also ingested this item, but in a larger average volume (1.3 $mm^3$), and in lesser quantity (n = 13). The smallest total volume and frequency of occurrence we found were of nymphal and adult Hemiptera, and Coleoptera adults.

The *H. maximiliani* juveniles (n = 3) had an 89% average volume because of the ingestion of only one tadpole. All the individuals had the same absolute (n = 1) and relative (20%) frequency of the ingested items (Odonata naiad, Diptera larva, Homoptera of the Cicadelidae family, and Anura larva), although they ingested only one individual of each taxon (Table 1). Table 2 shows the absolute frequency, relative frequency, total volume and the volume expressed in a percentage of the prey ingested by the *H. maximiliani* juveniles captured in RBMSC.

The prey items similarly found in the diet of males and females were: Odonata naiads, larvae of Chironomidae, Diptera and Leptoceridae, adult Coleoptera and crustaceans of *T. fluviatilis*. The simplified Morisita's Similarity Index showed a high similarity (C = 0.822) between the males' and females' diet. There was no correlation between the CML (mean CML for males = 17.02 ± 3.26; and females = 14.38 ± 1.76) and diet volume ($r_s = 0.3342$; $p = 0.2233$). We also did not detect

**Table 1.** Absolute and relative frequency of prey items observed in the stomach contents of 11 males (M), 12 females (F) and nine juveniles (J) of *Hydromedusa maximiliani,* captured at Reserva Biológica Municipal Santa Cândida, Southeastern Brazil, from October 2004 to May 2005.

| TAXON | Absolute frequency / age class | | | Relative frequency / age class | | |
|---|---|---|---|---|---|---|
| | M | F | J | M | F | J |
| **INVERTEBRATES** | | | | | | |
| **Class Insecta** | | | | | | |
| Order Odonata | | | | | | |
| Libelullidae (N) | | 2 | | | 3.9 | |
| Family not identified (N) | 9 | 9 | 1 | 7 | 17.6 | 20 |
| Order Diptera | | | | | | |
| Chironomidae (L) | 73 | 13 | | 57.0 | 25.5 | |
| Family not identified (L) | 3 | 1 | 1 | 3 | 2 | 20 |
| Order Trichoptera | | | | | | |
| Leptoceridae (L) | 36 | 14 | | 28.1 | 27.5 | |
| Order Coleoptera (A) | 2 | 1 | | 1.6 | 2 | |
| (L) | | 4 | | | | |
| Order Ephemeroptera | | | | | | |
| Ephemeridae (L) | | 1 | | | 2 | |
| Baetidae (L) | 1 | | | 0.8 | | |
| Order Hemiptera | | | | | | |
| Gelastocoridae (A) | 1 | | | 0.8 | | |
| Order Lepidoptera (L) | 1 | | | 0.8 | | |
| Order Homoptera | | | | | | |
| Cicadelidae (A) | | | 1 | | | 20 |
| **Class Arachnida** | | | | | | |
| Order Araneae (A) | | 1 | | | 2 | |
| **Class Diplopoda (A)** | | 2 | | | 3.9 | |
| **Class Malacostraca** | | | | | | |
| Order Decapoda | | | | | | |
| Trichodactylidae | | | | | | |
| *Trichodactylus fluviatilis* (A) | 2 | 3 | 1 | 1.6 | 5.9 | 20 |
| **VERTEBRATES** | | | | | | |
| **Class Amphibia (Anura – L)** | | | 1 | | | 20 |
| Total | 128 | 51 | 5 | 100 | 100 | 100 |

A- adult; N - naiad; L - larvae.

a correlation between the CML and the largest volume of ingested prey (rs = 0.1394; p = 0.6202).

A total of 2,274 individuals belonging to the phylum Arthropoda were collected from the aquatic and terrestrial environments sampled at RBMSC. These belonged to the classes Insecta, Diplopoda, Malacostraca and Arachnida. There were individuals from 16 orders and 70 families of Insecta, 3 families of Diplopoda, 2 families of Crustacea, and 13 families of Arachnida. Although a prey item of the class Amphibia (Anura larvae) was found in the stomach content of a juvenile and was also observed in the environment, it was not possible to obtain samples during the collection of the prey available in the environment.

**Table 2.** Absolute frequency (f), relative frequency (f%), total volume (V) and volume expressed as percentage (V%) of the items ingested by nine *Hydromedusa maximiliani* juveniles, captured at Reserva Biológica Municipal Santa Cândida, Southeastern Brazil, from October 2004 to May 2005.

| TAXON | Stage | f | f% | V ($mm^3$) | V% |
|---|---|---|---|---|---|
| **Class Insecta** | | | | | |
| Order Odonata | | | | | |
| Libellulidae | naiad | | | | |
| Family not identified | naiad | 1 | 20 | 3.14 | 1 |
| Order Diptera | larvae | 1 | 20 | 0.07 | 0 |
| Order Homoptera | | | | | |
| Cicadelidae | adult | 1 | 20 | 2.09 | 0.6 |
| **Class Amphibia (Anura)** | larvae | 1 | 20 | 287.38 | 89.1 |
| **Class Malacostraca** | | | | | |
| Order Decapoda | | | | | |
| Trichodactylidae | adult | 1 | 20 | 29.90 | 9.3 |
| Total | | 5 | 100 | 322.57 | 100 |

The relative frequency of occurrence of arthropods sampled in the stomach contents and collected in the different environments shows that some items, though found in the environments, were not ingested by the snake-necked turtles (Table 3). The Ivlev Electivity Index, when analysed for the arthropods collected in the environments and those present in the regurgitation of the turtles, showed a maximum electivity (E = 1.0) for Lepidoptera and Diplopoda larvae, followed by *T. fluviatilis* (E = 0.897) and Ephemeridae (E = 0.692), Leptoceridae larvae (E = 0.560), Coleoptera (E = 0.387), Araneae adults (E = 0.375), Chironomidae larvae (E = 0.200), and Odonata naiads (E = 0.036). The highest values of occurrence frequency of prey found in the turtles stomach contents were aquatic organisms. However, we also found prey items of terrestrial origin. The analysis of relative frequency of arthropods collected in terrestrial traps showed high values for Hemiptera and Diptera. The curves of estimated richness of prey showed that the diet of *H. maximiliani* covers fewer species than those available in the environment, especially in the aquatic environment (Fig. 1).

## Discussion

Most frequent prey were aquatic insect larvae and terrestrial invertebrates of the class Insecta, as also observed by Souza (1995) and Souza and Abe (1995, 1997b, 1998). Yamashita (1990) identified vestiges of several orders of insects, such as Coleoptera, Isoptera, Hemiptera, Neuroptera, and several non-identified insect larvae, in the feces of five specimens of *H. maximiliani*. We also found Coleoptera and Hemiptera in our study, but we did not observe Isoptera and Neuroptera in the turtles' diet. The crustacean was relatively infrequent in samples, in contrast to the findings of Yamashita (1990) that observed the decapod *Aegla odebrechtii* as the most frequent item in his sample. Even though this author observed no vestige of vertebrates in the faecal analysis, Souza (1995) found eggs and bones of anuran amphibian in the stomach contents of adult individuals, and in our study we found Anura larvae in the stomach of a juvenile. The vegetal fragments found in the *H. maximiliani* stomach contents, analysed in this study was disregarded in the statistical analysis, because their presence may be related to the ingestion of Trichoptera larvae of the family Leptoceridae, that live in shelters made of twigs pieces during their growth.

The ingestion of terrestrial invertebrates, which presumably fell in to the water, was also recorded in the stomach contents by other authors (Folkerts, 1968; Mahmoud, 1968; Georges, 1982; Bury, 1986; Chessman, 1986; Georges, Norris and Wensing, 1986; Souza, 1995; Souza and Abe, 1995) for various freshwater turtle species.

We found a smaller richness of prey items (n = 15) in the *H. maximiliani* stomach content than Souza (1995) (n = 39) or Souza and Abe (1995, 1998) (n = 39) did in Parque Estadual de Carlos Botelho (PECB), São Paulo

**Table 3.** Absolute and relative frequency of arthropods sampled in the stomach contents of adult *Hydromedusa maximiliani* and recorded in environmental, at Reserva Biológica Municipal Santa Cândida, Southeastern Brazil, from October 2004 to May 2005.

| TAXON | Stomach contents | Stomach contents | Environment absolute | Environment relative |
|---|---|---|---|---|
| **Class Insecta** | | | | |
| Blattodea | 0 | 0 | 17 | 0.75 |
| Coleoptera | 7 | 3.85 | 115 | 5.06 |
| Dermaptera | 0 | 0 | 3 | 0.13 |
| Diptera | 91 | 50.00 | 702 | 30.87 |
| Ephemeroptera | 2 | 1.10 | 4 | 0.18 |
| Hemiptera | 1 | 0.55 | 765 | 33.64 |
| Hymenoptera | 0 | 0 | 49 | 2.15 |
| Isoptera | 0 | 0 | 10 | 0.44 |
| Lepidoptera | 1 | 0.55 | 2 | 0.09 |
| Odonata | 21 | 11.54 | 184 | 8.09 |
| Orthoptera | 0 | 0 | 179 | 7.87 |
| Phasmida | 0 | 0 | 1 | 0.04 |
| Plecoptera | 0 | 0 | 1 | 0.04 |
| Thysanoptera | 0 | 0 | 3 | 0.13 |
| Trichoptera | 50 | 27.47 | 155 | 6.82 |
| **Class Diplopoda** | 2 | 1.10 | 34 | 1.50 |
| **Class** | | | | |
| Isopoda | 0 | 0.00 | 7 | 0.31 |
| Decapoda | 6 | 3.30 | 3 | 0.13 |
| **Class Arachnida** | | | | |
| Araneae | 1 | 0.05 | 28 | 1.23 |
| Opiliones | 0 | 0 | 12 | 0.53 |
| Total | 182 | 100 | 2,274 | 100 |

state. The difference in richness prey items recorded probably reflects the difference in the sampling, since these authors sample size was larger. The results of these authors differ from ours results in relation to frequencies (numeric and relative) of items recorded. Unlike our results, Souza (1995) and Souza and Abe (1998) observed the highest numeric frequency in females was of crustaceans of the family Hyalellidae, *Hyalella pernix*. The lowest absolute frequency we found was of Diptera larvae, adult Ephemeridae and Coleoptera, but in Souza (1995) and Souza and Abe (1998), it was individuals from the groups Araneae, Belostomatidae, Gryllidae, Dytiscidae, *Grumicha* from the Seristocomatidae family, and bones of anuran amphibian. Besides these specimens, the last two authors also registered individuals belonging to the Termitidae and Culicidae family.

The highest relative frequency we found was of Chironomidae larvae, while in Souza (1995) and Souza and Abe (1998) it was Leptoceridae larvae. The lowest relative frequency we found was of Baetidae nymphs, adult Gelastocoridae, and Lepidoptera larvae. In Souza (1995) and Souza and Abe (1998) it was Hirudinea, *Massartella* of the family Leptophlebiidae, *Tupiperla* of the family Gripopterygidae, Euthyplociidae, *Grumicha*, Naucoridae, Leptophlebiidae, Gomphidae, Elmidae, and bones of anuran amphibians.

The highest absolute frequency of prey ingested by males was of Chironomidae larvae, while in Souza (1995) and Souza and Abe (1998) it was Leptoceridae larvae. The lowest frequency we found was of Baetidae nymph, adult Gelastocoridae and Lepidoptera

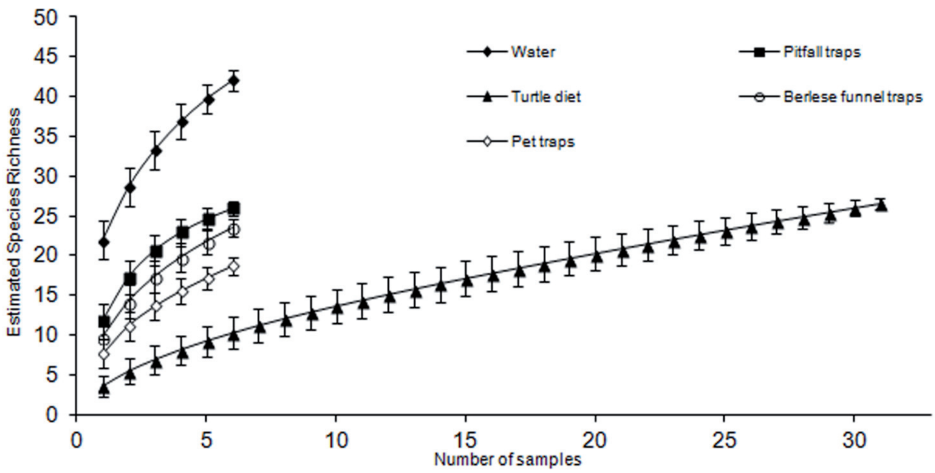


**Figure 1.** Accumulation curve of the prey species registered in Reserva Biológica Municipal Santa Cândida, Southeastern Brazil, in terrestrial environments (collected through PET traps, pitfall traps and Berlese funnel traps), aquatic environment and in *Hydromedusa maximiliani* diet. Vertical bars represent standard deviation of the estimated values.

larvae, while in Souza (1995) it was Hirudinea, Leptophlebiidae, Naucoridae, Elmidae, Gomphidae, *Campylocia*, *Tupiperla*, and the same was observed by Souza and Abe (1998), in addition to *Massartella* and *Grumicha* sp.

Souza (1995) and Souza and Abe (1998) found *H. pernix* as the item with the highest frequency of occurrence. The items recorded by these authors as the ones with the smallest frequency of occurrence were Megapodagrionidae, Gryllidae, Belostomatidae, Chironomidae, Tipulidae, Glossosomatidae, *Tupiperla*, *Anacroneuria* from the Perlidae family, Pyrilidae and Anura eggs. The smallest numeric frequency found by these authors was of the prey items Gryllidae, Belostomatidae, Tipulidae, Coleoptera, Dytiscidae, *Grumicha*, *A. paulensis*, and Anura bones.

The simplified Morisita's Similarity Index showed a high similarity between the diet of males and females. Opposite to what was observed in our study, Souza and Abe (1998) found a smaller overlap between males' and juveniles' diets, and a larger one between females' and juveniles' diets. Our low individuals sampling compared to the study of Souza and Abe (1998) may be interfering on our results. Therefore, more samples would be needed to state with security these differences between the results.

Trichoptera Leptoceridae larvae and Diptera Chironomidae larvae predominated in the stomach contents of male and female *H. maximiliani* from RBMSC, as also observed by Souza (1995) and Souza and Abe (1995, 1997b, 1998) in the individuals they analysed from PECB. These were followed by other items, consumed in different ways, but frequently found in our study (Odonata naiads, other Diptera larvae) and also recorded in Souza (1995) and Souza and Abe (1995, 1997b, 1998). The species of Decapoda crustacean differed between the studied areas: individuals of the species *T. fluviatilis* were found in diet of *H. maximiliani* from RBMSC, while *A. paulensis* was registered as prey item in PECB. This difference occurs because of the different geographical distribution range of species, since *A. paulensis* does not occur in Minas Gerais state (Bond-Buckup and Buckup, 1998), and the only crustaceans species recorded in *H. maximiliani* diet and RBMSC pond was *T. fluviatilis* (Gomides et al., 2009).

Distinct alimentary habits may be explained by habitat separation. Souza (1995) found that prey could be distributed in different ways in the streamlets. Therefore, the juvenile specimens consumed prey, such as *H. pernix*, from sites with calmer water, while the males, females could feed on different prey species, such as Trichoptera, that occur in the faster-flowing sites of rivers.

We also did not find any correlation between the CML and ingested volume or CML and maximum ingested volume, though Souza and Abe (1998) observed a tendency in the consumption of bigger prey as the chelonians grew bigger. We noticed that the adults can eat prey of any size, as also reported by Mahmoud (1968) and Georges (1982) for other species of Testudinata. A larger sample would better explain whether this trend actually exists in our studied population.

Macculloch and Secoy (1983) also found that Chironomidae larvae and Ephemeroptera and Odonata naiads, often found in the stomachs of turtles of the species *C. picta* and *C. bellii*, were also collected in the environment. Parmenter (1980), using Ivlev Electivity Index in three different habitats near Aiken, South Carolina, southeastern of the United States of America, found differences between the availability of food and the prey selected by the turtle *Trachemys scripta scripta* among three analysed areas.

The higher relative frequency of Diptera larvae in the stomach contents of *H. maximiliani* may also be related to the high density of these prey in the aquatic environment, though the same relation did not occur for Leptoceridae larvae, as was also observed by Georges, Norris and Wensing (1986) in relation to the ones available in the environment and the ones consumed by *C. longicollis*. Plummer and Farrar (1981), while analysing samples of the substrate in shallow waters to compare them with the diet of *T. muticus*, observed that Trichoptera larvae apparently reach high densities in sampling sites and in stomachs of females found in these sites, suggesting that the diet may be related to the availability of potential prey.

Macculloch and Secoy (1983) compared the stomach contents with the availability of prey in the environment and found that *C. picta bellii* did not feed principally upon the prey that was most abundant. The absence of a direct relationship between abundance of prey in the sampled environments and the composition and size of prey present in diet of *H. maximiliani* in our study implies that the turtle is a category of selective predator, as described by Jaksic (2001). Despite the difference in size of samples performed in environment and stomach contents, we can observe the selectivity in *H. maximiliani* diet, which the richness is lower than that available in the studied area.

In our study, we found crabs in the stomach contents, but these were not the items with the highest electivity. The low relative frequency of the *T. fluviatilis* sampled in the aquatic environment may be related to the cryptic and nightly habits of these crabs, and also to the fact that they stay hidden in burrows, cracks, rock hollows, submersed trunks or amongst leaves and roots of aquatic vegetation, as reported by Magalhães (1999), making the collection of these specimens difficult, despite their being found in the stomach contents of *H. maximiliani*.

The information we obtained about the diet of *H. maximiliani* showed the importance of biological interaction in a preserved environment, indicating this vertebrate as a potential predator for regulating the density of benthic macroinvertebrates, such as Diptera and Trichoptera larvae, in aquatic ecosystems. Our data corroborates other studies (Yamashita, 1990; Guix, Miranda and Nunes, 1992; Souza and Abe, 1995; 1997b; Souza 1995; 2004a) which also showed the importance of *H. maximiliani* as a predator essential to aquatic food web dynamics. The differences in importance of prey items among *H. maximiliani* populations enhance the effect of local availability of prey on diet composition and our results suggest that this freshwater turtle is a selective predator. Therefore, these data will help future studies that deal with the biomonitoring of *H. maximiliani*, thus contributing to its preservation as well as to the preservation of the habitat were this species lives.

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