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Diet of the Gray-Breasted Martin (Hirundinidae: *Progne chalybea*) in a wintering area in Maranhão, Brazil

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Resumo: **Dieta da Andorinha-doméstica-grande (Hirundinidae: *Progne chalybea*) em uma área de invernada no Maranhão, Brasil.** Andorinha-doméstica-grande *(Progne chalybea)* foi capturada em maio e agosto de 2004 para registro de dados da dieta em sua área de invernada no município de Presidente Dutra. Nove ordens de insetos foram encontradas em 27 conteúdos estomacais, e a ordem Hymenoptera correspondeu a 69,9% da dieta, sendo encontrada em todos os estômagos. Entretanto, insetos ápteros que são alados apenas no período reprodutivo como formigas e cupins corresponderam a quase 60% das presas identificadas em maio, enquanto que em agosto 90,5% das presas foram insetos sempre alados como Vespidae e outras ordens. Portanto, a dieta de *P. chalybea* é claramente sazonal devido às diferenças na frequência de captura de dois grupos de presas de acordo com a estação, o que indica um consumo "oportunístico" das presas provavelmente mais abundantes em cada estação.

Palavras-Chave: *Progne chalybea,* dieta, área de invernada, Brasil.

Key-Words: *Progne chalybea,* diet, wintering area, Brazil.

Migration is in many cases primarily an adaptation for exploiting seasonal peaks of resource abundance and avoiding seasonal resource depression. However, the benefit of increased resource availability is balanced by costs associated with the migratory process (time, energy and mortality) (Alerstam *et al.* 2003). Many birds are migratory (Eisenmann 1959; Eisenmann and Haverschmidt 1970; Butler 2003; Bugoni and Vooren 2004; Fredrizzi *et al.* 2004) and many bird genera incorporate a wide spectrum of residents, short-distance and long-distance migrants (Alerstam *et al.* 2003). Martins belong to the family Hirundinidae (Bull and Farrand 1977) and some of them are Neotropical migrants (Eisenmann 1959; Eisenmann and Haverschmidt 1970). Martins are specialized in the capture of flying insects on the air column (Ramstack *et al.* 1998; McCarty and Winkler 1999), especially insects of the orders Diptera, Odonata, Hymenoptera, Hemiptera and Lepidoptera (Walsh 1978, Dyrcz 1984, Turner 1984, McCarty and Winkler 1999), which frequently present seasonal variation in abundance (Wolda 1978, Kwok and Corlett 2002; Jetz *et al.* 2003).

Progne chalybea is a Neotropical migrant that reproduces in southern Brazil (Eisenmann and Haverschmidt 1970) and migrates to northern South America during the non-breeding period (April to September), where it occupies urban areas (Naka *et al.* 2002). While some studies of *P. chalybea* are available, relatively little is known about its ecology in wintering areas. This study presents some preliminary data on diet of the population of *P. chalybea* that winters in Presidente Dutra, in the Brazilian state of Maranhão.

The study was carried out in the Eletronorte property in the town of Presidente Dutra (05°16'04"S, 044°28'57"W) in the northeastern Brazilian state of Maranhão, where gray-breasted martins use electrical capacitors as roosts. Data was collected in May and August of 2004. Individuals of *P. chalybea* are electrocuted accidentally by the capacitors in which they roost. For the diet analysis, dead birds were collected on May, representing the wet season (136.75 mm of precipitation) and on August, in the dry season (no precipitation since June). The birds collected were placed immediately in a freezer and then taken to the Universidade Federal do Maranhão (UFMA) vertebrate laboratory, where the analysis of stomach contents was carried out.

A total of 27 stomachs were analyzed, 17 from May, and 10 from August. The whole digestive tract (esophagus, stomach and intestine) was removed from each individual and fixed in 70% ethanol (Lorentsen *et al.* 1998, Hedd and Gales 2001). Contents were observed using a stereoscopic microscope. Each prey item was identified to order according to Borror and DeLong (1988), and the number of heads of each taxon was counted. For analyses, taxa were also divided subsequently into winged apterans (reproductive ants and termites) and other winged insects, including wasps.

Composition. The analyses of stomach contents resulted in the identification of 4,599 individual preys, belonging to nine insect Orders. Hymenoptera was the most abundant, being found in all stomachs, and contributing to 69.9% of all prey items. The next most common orders were Hemiptera, Isop-

tera, Coleoptera and Diptera (Table 1). Most studies of hirundinid diets have been conducted during the breeding season, and were based on the observation of prey items taken to the nest (e.g. Dyrcz 1984, Turner 1984, Walsh 1978, McCarty and Winkler 1999). In the present study, it was possible to analyze stomach contents that revealed that Hymenopterans were the most common prey consumed. Studies of gray-breasted martins in breeding areas have also indicated the importance of hymenopterans, especially ants (74.7%), followed by Odonata (10%), Lepidoptera (9%) and Diptera (5%) (Dyrcz 1984). Johnston (1967) recorded 23% Hymenoptera, 16% Diptera, 15% Odonata, 14% Hemiptera and 12% Coleoptera in the stomach contents of *P. subis*. These analyses indicate that hymenopterans are the most important component of the diet. Of the insect orders recorded in the present study, only four (Coleoptera, Isoptera, Neuroptera and Ortoptera) were not recorded for *P. chalybea* at the breeding area in Barro Colorado (Dyrcz 1984).

Seasonality. Whereas 76.6% (n = 3,039) of prey recorded in May were hymenopterans, hemipterans and coleopterans were the most common prey in August, with 36.3% (n = 229) and 35.6% (n = 223) of identified items, respectively (Figure 1). Winged apteran insects – ants (Formicidae) and termites (Isoptera) – provided almost 60% (n = 2,297) of identified prey in May, whereas in August, 90.5% (n = 571) of prey were winged insects (Vespidae and remaining orders) (Figure 2). This pattern characterize seasonality, with the capture of the two different types of insect being dependent on season. The diet of *Progne chalybea* is clearly seasonal, given the remarkable difference in the frequency of capture of the principal prey groups according to season, which may indicates an "opportunistic" consumption of preys according to season. Winged apteran insects (ants and termites) were the most consumed in May (wet season), whereas winged insects, primarily coleopterans and hemipterans, were most important in August (dry season). Turner (1984) also recorded increased wet season consumption of termites and ants in the hirundinid *Phaeoprogne tapera.* The marked seasonal peak in the abundance of ants and termites that occurs during the wet season (Kwok and Corlett 2002, Jetz *et al.* 2003) results in increased availability of this resource, reflected in the seasonal variation in the diet of *P. chalybea.* The temporary, opportunistic exploitation of this resource may be vital to the physiological needs of these active foragers, given the energetic requirements of flight.

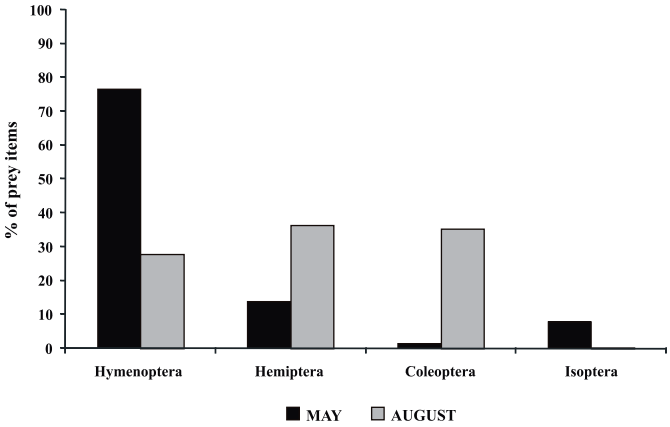

FIGURE 1. Diet of *Progne chalybea* according to the percentage of prey consumed and the occurrence of prey in 17 stomachs collected in May 29th (wet season) and 10 stomachs collected in August 11th (dry season) at the wintering area in Presidente Dutra.

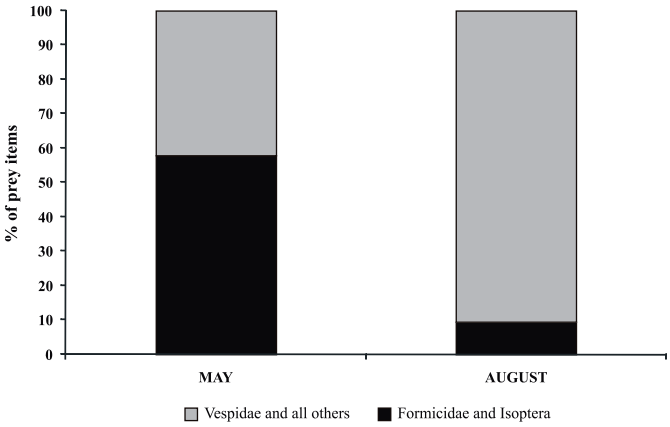

FIGURE 2. Diet of *Progne chalybea* according to the relative proportions of winged apterans (Formicidae and Isoptera) and winged insects (Vespidae and all others) collected from 17 stomachs in May 29th (wet season) and 10 stomachs collected in August 11th (dry season) at the wintering area in Presidente Dutra.

TABLE 1. Diet of *Progne chalybea* according to the percentage of prey items and the occurrence of prey in stomach contents collected from a wintering site at Presidente Dutra, in the Brazilian state of Maranhão. Total of 27 stomachs collected in May and August, 2004.

Order	Prey items		Stomachs	
	n	%	n	%
Hymenoptera	3,215	69.9	27	100
Hemiptera	775	16.9	27	100
Isoptera	316	6.9	12	44.4
Coleoptera	274	6.0	22	81.5
Diptera	11	0.2	10	37
Odonata	3	0.1	2	7.4
Lepidoptera	2	0	2	7.4
Neuroptera	2	0	2	7.4
Orthoptera	1	0	1	3.7

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