

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

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RESUMO: Ciclo de muda da Andorinha-doméstica-grande (Hirundinidae: *Progne chalybea*) no estado do Maranhão, Brasil. Entre abril e outubro de 2004 a andorinha-doméstica-grande (*Progne chalybea*) foi capturada mensalmente para registro do ciclo de muda no município de Presidente Dutra. Os primeiros indivíduos de *P. chalybea* foram capturados em maio e 34,5% estavam mudando a 7ª primária e 31% estavam mudando a 5ª retriz. Em agosto 60% dos indivíduos capturados apresentavam muda completa de rêmiges e 76% apresentavam muda completa de retrizes. Em setembro foram capturados apenas três indivíduos de *P. chalybea* que provavelmente não puderam migrar por não terem concluído o ciclo de muda, por não terem alcançado o peso ideal para a migração ou por apresentarem infestação excessiva de parasitas não permitindo a migração. Portanto pode-se concluir que o município de Presidente Dutra funciona como área de invernada de populações de *P. chalybea* do período de maio a agosto, sendo que a muda provavelmente inicia-se nos sítios de reprodução e é concluída na área de invernada antes da migração de retorno.

PALAVRAS-CHAVE: *Progne chalybea*, ciclo de muda, área de invernada, Brasil.

KEY-WORDS: *Progne chalybea*, molt cycle, wintering area, Brazil.

Ecological and biogeographic factors like seasonality, spatiotemporal distributions of resources, habitats, predation and competition are the basic driving forces for migration (Alerstam *et al.* 2003). Molting is related directly to migrations and reproduction and is an important process resulting in a new set of feathers (Holmgren and Hedenström 1995). Molt and migration are energy demanding activities and consequently are commonly separated in time and generally do not overlap (Svensson and Merilä 1996). Some birds molt on breeding grounds immediately after breeding (summer molt), others migrate to wintering grounds before molt is initiated (winter molt) whereas some birds have biannual molt (summer and winter) and molt migration (Holmgren and Hedenström 1995).

Martins belong to the family Hirundinidae (Bull and Farand 1977) and most of the temperate species are migratory (Igl and Johnson 1997). Three species of the genus *Progne* occur in Brazil: *P. subis* (Purple Martin), *P. modesta* (Southern Martin) and *P. chalybea* (Gray-breasted Martin) (Souza 2002). *Progne chalybea domestica* 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). In martins, there are two annual molts, one before and one after breeding, although individual variation may be observed (Azevedo Junior *et al.* 2001). The molting sequence of the primaries in *Progne* is the same as that of the majority of passeriforms: the primary remiges molt from the most internal (P1) to the most external (P9),

while the rectrices change from the central pair to the extremities (Niles 1972).

The aim of the present study is provide some information on molting patterns of the population of *P. chalybea* that winters in Presidente Dutra, in the Brazilian state of Maranhão. The primary questions answered with this study were: a) Which period the species remains in its wintering area (when the birds arrive and when the birds leave the area)?; b) The individuals initiate and complete its molt in the wintering area?

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 from April to October, 2004. Martins were captured using one nylon mist net (12 m long, with a 36 mm mesh), which was opened in the height of the capacitors in which they roost at 17:40 h to coincide with the arrival of the birds. All martins captured were examined to evaluate molting patterns of the remiges (primary feathers) and rectrices. Birds were not banded.

In April individuals of *Progne subis* were in the area, but they have gone in May when the first individuals of *P. chalybea* were captured. In May, 29 *P. chalybea* were captured, of which 34.5% presented molting of P7 (Figure 1a) and 31% of R5 (Figure 2a). Individuals that presented molting of P1 (10,3%) and R1 (6,9%), and one individual that presented no molting may correspond to residents or individuals that could not migrate to its breeding area in the previous year. In June and July most of the individuals presented molting of P8 and

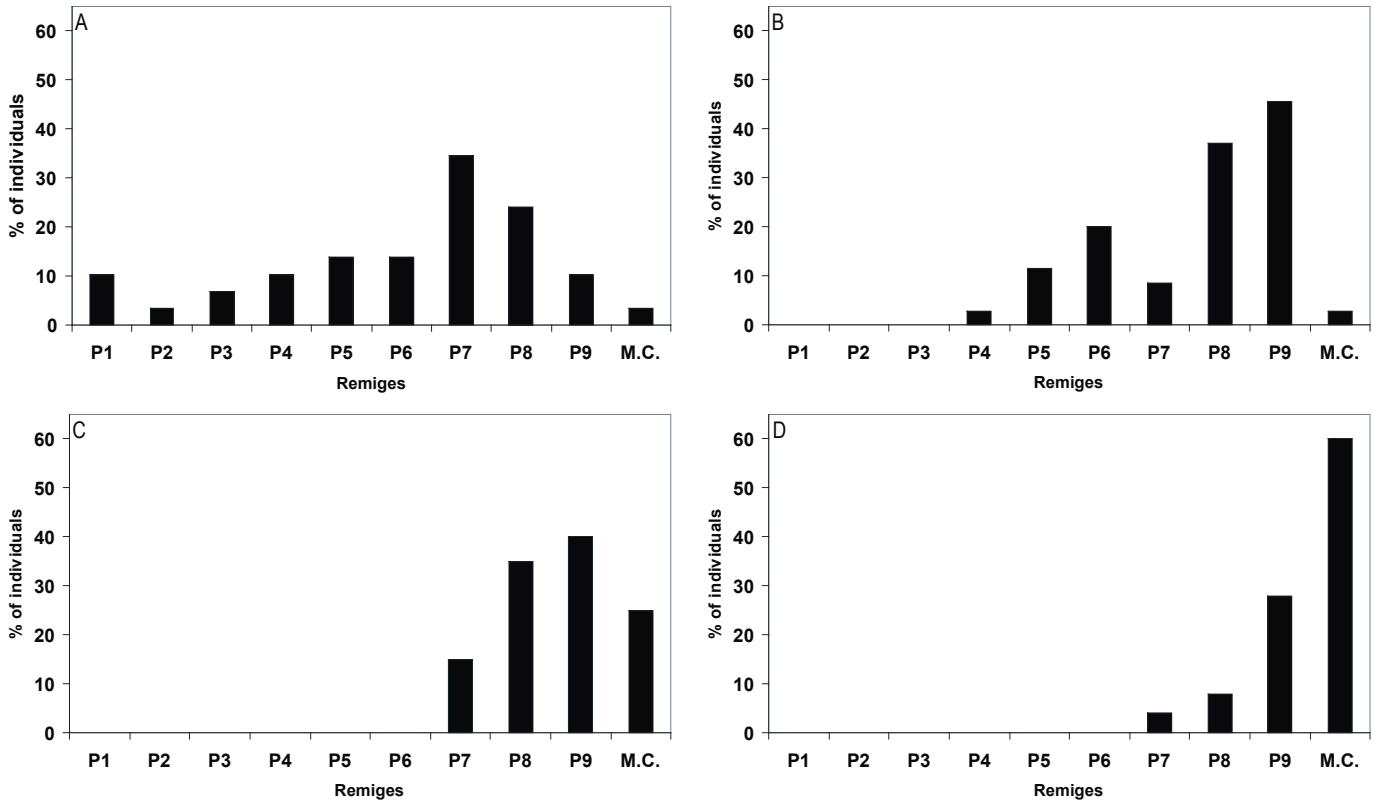


FIGURE 1: MOLTING PATTERN OF PRIMARY REMIGES IN *PROGNE CHALYBEA* WINTERING IN PRESIDENTE DUTRA. (A) May, n = 29; (B) June, n = 35; (C) July, n = 20; (D) August, n = 25. M.C. = Molt Completed.

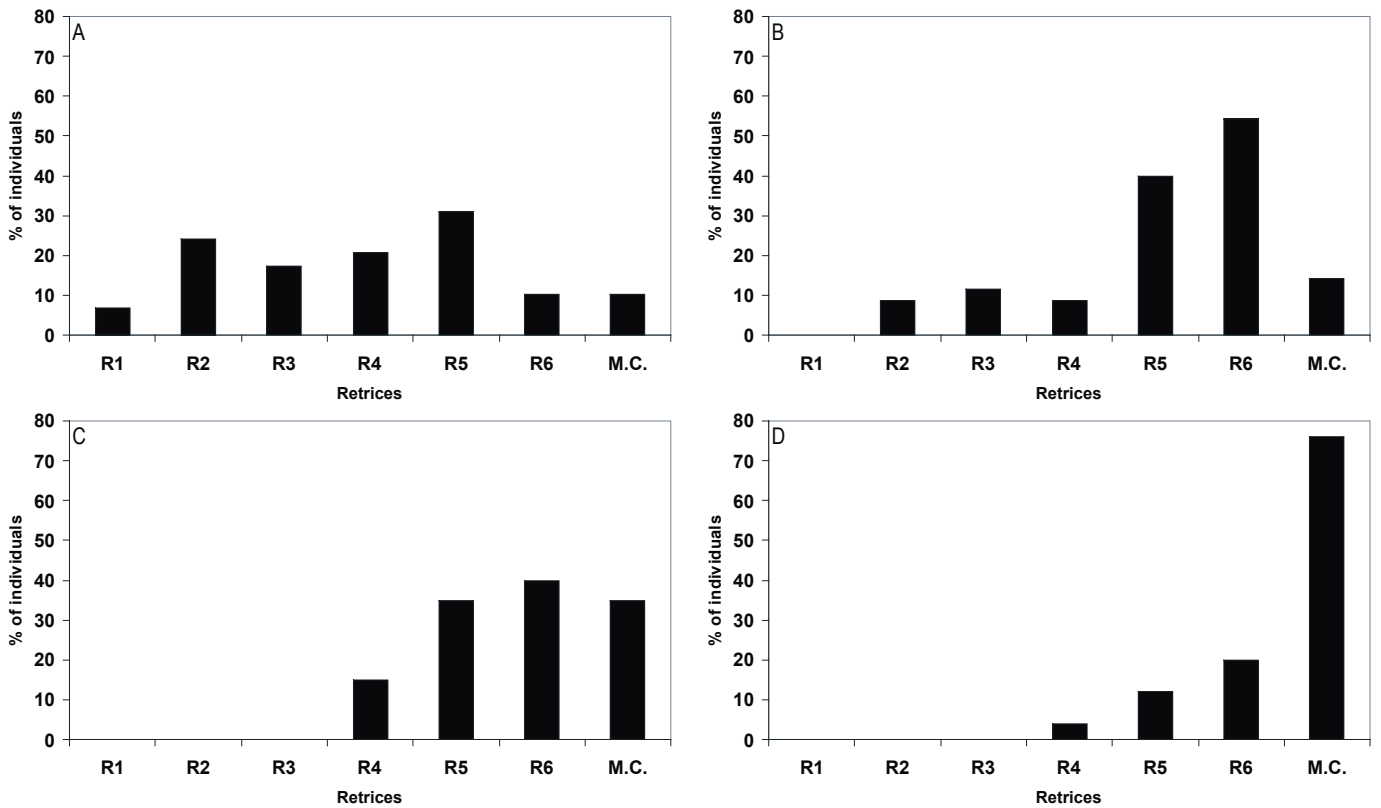


FIGURE 2: MOLTING PATTERN OF RECTRICES IN *PROGNE CHALYBEA* WINTERING IN PRESIDENTE DUTRA. (A) May, n = 29; (B) June, n = 35; (C) July, n = 20; (D) August, n = 25. M.C. = Molt Completed.

P9 (Figure 1b, c) and R5 and R6 (Figure 2b, c). However in July a great number of individuals (35%) had already completed the molt of rectrices (Figure 2c). In the first fortnight of August 60% of captured birds presented full molt of the remiges, so they had completed the change of their primary feathers, and 76% had finished molting the rectrices.

Between May and August, the study area was occupied by a flock of approximately 100,000 individuals of *P. chalybea*. In September and October, this flock contained no more than one hundred members. In September, it was possible to capture only three individuals that probably could not migrate; one was below normal weight (35 g), one was apparently ill, with bloating of the skin, and the third was a juvenile. It was not possible to capture any birds in October.

The fact that a great number of the martins captured in May presented molting of P7 indicates that the molt begins at the breeding sites, before migration to wintering areas. Eisenmann (1959) reported that breeding and molting occurred during distinct periods of the year in *P. chalybea*, which is characterized by a more rapid molt cycle, and permits a longer breeding season in comparison with *P. subis*, which breeds in the temperate zone. The results of the present study suggest that the birds that winter in Presidente Dutra present an annual molt cycle, arriving in April with the molt already initiated and leaving the wintering area in August after the molt of primary feathers and rectrices was completed.

The reduction in the numbers of individuals present at the site in September and October suggests that the population had returned to its breeding area. A similar molting pattern was found in the population that winters in São Luís, capital of the state of Maranhão, although the molt cycle stretched from May to October, pointing to a small variation among populations or among years (J. M. Maia Filho *unpublished data*).

The presence of some Martins at Presidente Dutra in September and October may be related to at least two factors: (a) individuals that did not conclude the molt cycle (possibly immature birds) or were unable to reach the ideal weight for migration; (b) individuals with excessive infestation of parasites that were unable to migrate. Studies of shorebirds (Scolopacidae and Charadriidae) have shown that juveniles and birds that do not complete the molt cycle, or reach the necessary weight for migration, will stay in the wintering area until the following migration season (Marks 1993, Azevedo Júnior *et al.* 2001, Fredrizzi *et al.* 2004).

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