Wilson Bull., 102(2), 1990, pp. 309–313

SHORT COMMUNICATIONS

Introduced and invading birds in Belém, Brazil.—The region of the Brazilian Amazon port city of Belém Pará (Fig. 1), has undergone rapid change while the human population has grown from less than 300,000 in 1950 to over 1,000,000 in 1988. Once set in a landscape dominated by tropical rain forest, Belém today is a patchwork of residential areas, second-growth on both dry and flooded sites, industrial installations, and artificially maintained grassland. Only small patches of the original forest remain. Here we report on the status and distribution of six species of birds that have been introduced to Belém by man or have expanded their ranges to take advantage of habitat alteration. Introductions and range expansions can be viewed as opportunities for studying changes in community structure. In addition to the species treated below, the Budgerigar (*Melopsittacus undulatus*) and the White-throated Seedeater (*Sporophila albogularis*) have been introduced repeatedly as escaped cage birds in Belém in recent years, but apparently without becoming established.

Jandaya Parakeet (*Aratinga solstitialis jandaya*).—This parakeet has for a long time been reported as occurring in northeastern Brazil from Maranhão and the north of Goiás to the northern limits of Bahia (Pinto 1938, 1978; Forshaw 1978). Goeldi's (1894) old sight record of the species on the northern coast of the state of Pará has been ignored. More recently we have recorded it in inland eastern Pará near the Maranhão border and the Serra dos Carajás. The Jandaya Parakeet was first reported for Belém by Ridgely (1982), based on observations by Oatman. The Museu Goeldi houses a specimen (MPEG 35, 357) of a molting adult male with testes 3 × 2 mm collected in the Belém district of the Marambaia on 27 Apr. 1982. We estimated the Belém population of the Jandaya Parakeet at approximately 50 individuals in 1984, and it has since more than doubled. The species inhabits 2–10-m-high second-growth which is abundant at the periphery of the city. During our observations, the birds fed principally on fruits of certain Melastomataceae, mango (*Mangifera indica,* Anacardiaceae), caranã (*Mauritia huebneri,* Palmae), and various species of cecropia (*Cecropia* spp., Moraceae). Maize (*Zea mays*) and rice (*Oryza* spp.) from fields along the main roads that lead to Belém are also important components of the diet of this parakeet. They were nesting in pairs using natural and woodpecker-made hollows in trees at least 15 m tall. The reproductive season extends from August to December. In 1983 approximately eight pairs nested in an area of flooded second-growth in Marambaia. The distance between nests was about 50 m. No intraspecific aggression was observed, and individuals nesting in one cavity frequently landed on other pairs' nest trees and entered their nest cavities, especially early in the reproductive cycle. Between 55 and 60 days (average 58 days) elapsed between nest preparation and fledging of the young. The fledglings (one or two per nesting pair) were smaller and much greener than adults.

These parakeets moved and changed habitat preferences seasonally. In Marambaia the birds appeared sporadically from March through July, and then appeared regularly in numbers and reproduced in the flooded second-growth, followed by disappearance of the flocks and sporadic occurrence again. The origin of the Belém population of Jandaya Parakeets can be attributed to human influence. The vegetation that has replaced the original rain forest in most of the Belém district east to the border with Maranhão is readily colonized by the species. Commercial traders in live birds have probably had an important role in the dissemination of Jandayas as well. The Belém animal market traditionally has received large numbers of live birds from Ceará and Maranhão, including many Jandaya Parakeets. The latter are extraordinarily raucous, chew their cages aggressively, and often are liberated intentionally or escape to form colonizing populations (Oren and Novaes 1986). We consider the population of *A. s. jandaya* in Belém as established and expanding.

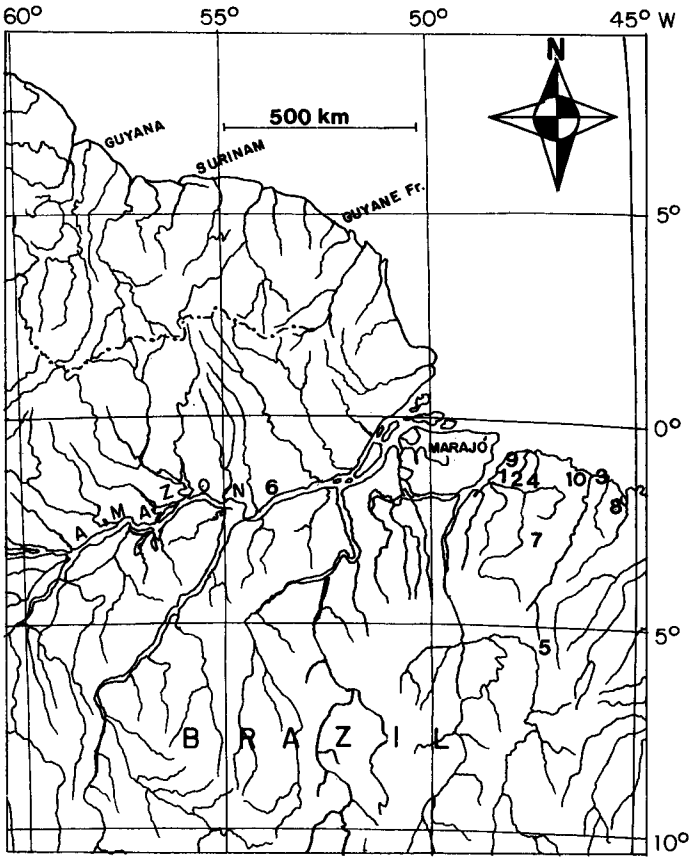

FIG. 1 Map of northeastern South America. Numbers indicate the following localities: (1) Belém; (2) Benevides; (3) Carutapera; (4) Castanhal; (5) Imperatriz; (6) Monte Alegre; (7) Paragominas; (8) Turiaçu; (9) Vigia; (10) Bragança.

Guira Cuckoo (*Guira guira*).—Before 1982, the Guira Cuckoo was not recorded in Belém. Now it is found in open fields and pastures near Tenoné and the extensive lawns of the Federal University of Pará (UFPa) and the Faculty of Agricultural Sciences (FCAP) in the district of Guamá. Approximately 60 individuals were resident in 1985 at the park-like habitat of the two universities. This population diminished in the rainy season (Jan.–Apr.), when flocks were small and scattered and had entered the second-growth bordering the lawns. In April the birds all returned to the lawns in flocks of up to 15 individuals. The birds fed (N = 200 observations) either on the ground (75% of observations) or the tops of trees and shrubs (25%). The diet consisted mostly of arthropods (especially Orthoptera), lizards (*Tropidurus* sp.) and frogs (*Hyla* sp.). We found communal nests in September (1), October (3), and November (1), 1984. The irregularly rounded nests, similar to those previously reported for the species (Davis 1940), were placed at the petiole bases of palm leaves 1.8–8.0 m above the ground. The November nest held 12 eggs. Since these first observations,

the Guira Cuckoo has expanded its population and spread to additional sites in the Belém region, and in 1988 it was commonly observed in open habitats.

Considering the extensive ornithological exploration of the region in the past and the conspicuousness of the Guira Cuckoo, it is clear that this species is a recent arrival in Belém that has colonized man-made habitat. The closest historical records for *G. guira* to Belém are Marajó Island and Bragança (Snethlage 1914, Pinto 1938, Novaes and Pimentel 1973), both of which are regions of extensive natural grasslands. The Guira Cuckoo has the habit of making long "kiting" flights using the wind (Sick 1985). The prevailing winds in Belém most of the year are from the NNE (Penteado 1968), favoring a Marajó origin for the Belém population. Such a hypothesis is further strengthened by the appearance of one Gray Monjita (*Xolmis cinerea*) at the Federal University campus in 1984, three Toco Toucans (*Ramphastos toco*) near Tenoné in July 1988, and five Peach-fronted Parakeets (*Aratinga aurea*) at the research campus of the Museu Goeldi in Jan. and Feb. 1989, all species most certainly vagrants from Marajó. There are no records for *G. quira* in areas of appropriate habitat between Belém and Bragança, making it unlikely that the Belém population was formed by individuals from the east.

Troupial (*Icterus icterus*).—Two distinct forms of *Icterus icterus* occur around Belém: *I. i. jamacaii,* with a black head, recorded from Maranhão through northeastern Brazil to Minas Gerais (Pinto 1944); and *I. i. croconotus,* with an orange head, distributed in the Amazon basin from Ecuador, Peru, and Bolivia to Guyana, Mato Grosso and western Pará (Pinto 1944, Blake 1968). The specimen records closest to Belém are Imperatriz, Maranhão (*I. i. jamacaii*) and Monte Alegre (*I. i. croconotus*), and *I. i. croconotus* is common in the delta region of the lower Amazon (Oren, pers. obs.). Our recent (1980–88) sight records of *I. i. jamacaii* from Turiaçu, Carutapera, Vigia, Benevides, Paragominas, and Castanhal suggest a natural westward expansion of the race. The earliest sight record for Belém is from 1981, since which date the bird has become increasingly common in the city. This subspecies of Troupial is also common in the live bird market, so escape from captivity probably has accelerated the natural range expansion already underway. The other subspecies, *I. i. croconotus,* was probably introduced to Belém as a cage bird. Although illegal, live bird commerce from the lower Amazon to Belém continues on a significant scale, and birds of this race are among the most valuable and sought-after. Both races can be found in Belém in second-growth woods and isolated trees with edible fruit. *I. i. jamacaii* is much more common than *I. i. croconotus,* and is usually found in pairs, whereas most observations of *I. i. croconotus* are of single individuals. The feral Troupials in Belém are extensively hunted by local people for the cage bird trade. Contact of these two distinctive forms in Belém should help establish whether they should be classified as separate species, or retained as subspecies of the same biological species; the latter treatment is followed by most recent authors.

Red-cowled Cardinal (*Paroaria dominicana*).—This is another species brought to Belém by the commercial trade in live birds. It is common in captivity in northeastern Brazil, its presumed point of origin, and is common in the market of Belém, more for its colorful plumage than its song. We have scattered records (1983–88) from various districts of urban Belém (Marco, Telégrafo, Marambaia, Nazaré, Praça da República) of groups of 2–5 individuals. Most of these records are from areas of intense human traffic and were probably recent escapes from captivity. We have no evidence of breeding.

House Sparrow (*Passer domesticus*).—The House Sparrow was introduced to Brazil at Rio de Janeiro at the beginning of this century (Sick 1959). Subsequent introductions and natural expansion of established populations have spread the species widely in Brazil. *Passer domesticus* was introduced in Belém between 1925 and 1927, but the small flock from Rio de Janeiro quickly died out; Sick (1959) hypothesized that problems in adapting to the wet Belém climate were important in the introduction's failure. In the 1960s feral populations

of House Sparrows began to appear in Brazilian Amazonia, advancing along new highways (Müller 1967, Smith 1973) and along the coast (Smith 1980). The species was first noted in Belém in 1978 and has since increased in abundance and distribution in the city. It is essentially an urban bird, common in the port dock area, city squares, and gasoline stations. The birds have not been recorded in two large wooded, urban parks (Museu Paraense Emilio Goeldi and Bosque Rodrigues Alves), nor do they enter native second-growth. The three districts where the birds are most common (Cidade Velha, Comércio, and Icoaraci) are undergoing rapid architectural modification, but they still have an abundance of old houses with eaves and cavities used for nesting. In the rest of the city, the flocks of *P. domesticus* are small (≤six individuals) and scattered, and the birds are notably shy, avoiding the approach of people. Nesting was observed almost year round with the following records: Feb. (3 nests), Mar. (5), May (2), July (2), Oct. (3), Nov. (1), and Dec. (2). Nests were in eaves and roof cavities and even traffic lights. The birds foraged on the ground among foliage or rarely made short flights after alate termites and other small arthropods. They fed on a wide variety of foods, including popcorn, nematodes, insects, flowers, fruits, and grass seeds. The Belém population of House Sparrow is well-established and expanding. The current population distributed throughout the urban zone is estimated at around 1000 individuals.

Common Waxbill (*Estrilda astrild*).—The Common Waxbill was introduced to Brazil at Rio de Janeiro in the last century (Santos 1948; Sick 1968, 1985). Since then the species has spread to many urban centers and their surroundings, including Manaus and Belém (Pinto 1944, Sick 1968, Oren and Smith 1981). Most of this spread can be linked directly to human actions through the bird trade and intentional liberations of these waxbills (Sick 1968, Oren and Smith 1981).

Escaped birds brought to Belém by bird dealers in the 1970s are probably responsible for the local establishment of this species. We have observed the Common Waxbill in the following districts: Cidade Velha, Guamá, Marco, Marambaia, Nazaré, São Braz, Souza, and Telégrafo. The population is estimated to be 300–500 individuals.

These birds fed (N = 120 observations) on four species of grasses: *Panicum maximum* (80% of observations), *P. purpurascens* (10%), *Paspalum conspersum* (8%), and *Echinochloa* sp. (2%). The birds were found in groups of 2–25 (median = 18, N = 80 flocks). Flocks diminished in size during the breeding season (Sept.–Dec.). The use of the native grass *Paspalum conspersum* as a seed source for *E. astrild* is interesting, because Oren and Smith (1981) reported that in Manaus the birds ignored other native grasses of the same genus, notably *P. repens*. Many interspecific interactions were observed between *E. astrild* and native finches.

Nesting records are from Sept. (1 nest), Oct. (2), Nov. (1), and Dec. (1). Of these, three were in acacia (*Cassia siamea*) and two in India almond (*Terminalia catappa*) trees, both of Asian origin and widely planted in Belém. The nest, placed 2–3.5 m up, was constructed principally of stems of *P. maximum*. The three nests accessible for inspection contained 4, 4, and 7 eggs, respectively. Peaks of foraging activity were noted at 07:00–09:00 (45% of observations) and 14:00–16:00 (35%). Cloud cover and precipitation were important factors in changes in this general pattern.

Because *E. astrild* is little valued by local bird dealers, it is not persecuted for the cage bird trade. Its population appears to be growing. The species has recently colonized the city of Castanhal, 80 km east of Belém, where it was first recorded in 1984 (JMCS pers. obs.).

LITERATURE CITED

BLAKE, E. R. 1968. Family Icteridae, Pp. 138–202 *in* Checklist of birds of the world, vol. 14 (R. A. Paynter, Jr., ed.). Museum of Comparative Zoology, Cambridge, Massachusetts.

DAVIS, D. E. 1940. Social nesting habits of *Guira gouira*. Auk 57:472–484.
FORSHAW, J. M. 1978. Parrots of the world, 2nd ed. David & Charles, London, England.
GOELDI, E. 1894. As aves do Brasil. Livraria Classica de Alves & Co., Rio de Janeiro, Brazil.
MÜLLER, P. 1967. Zur Verbreitung von Passer domesticus in Brasilien. J. Ornith. 108: 497–499.
NOVAES, F. C. AND T. PIMENTEL. 1973. Observações sobre a avifauna dos campos de Bragança, Estado do Pará. Publ. Avul. Mus. Para. Emilio Goeldi, 20:229–246.
OREN, D. C. AND F. C. NOVAES. 1986. Observations on the Golden Parakeet (*Aratinga guarouba*) in northern Brazil. Biol. Conserv. 36:329–337.
——— AND N. J. H. SMITH. 1981. Notes on the status of the Common African Waxbill in Amazonia. Wilson Bull. 93:281–282.
PENTEADO, A. R. 1968. Belém: estudo de geografia urbana. Universidade Federal do Pará, Belém, Brazil.
PINTO, O. M. O. 1938. Catálogo das aves do Brasil, la parte. Departamento de Zoologia, Secretaria de Agricultura, Indústria e Comércio, São Paulo, Brazil.
———. 1944. Catálogo das aves do Brasil, 2a parte. Departamento de Zoologia, Secretaria de Agricultura, Indústria e Comércio, São Paulo, Brazil.
———. 1978. Novo catálogo das aves do Brasil, 1a parte. Empresa Gráfica da Revista dos Tribunais, São Paulo, Brazil.
RIDGELY, R. 1982. The current distribution and status of mainland Neotropical parrots. Pp. 233–384 *in* Conservation of new world parrots (R. F. Pasquier, ed.). Internat. Coun. Bird Preserv. Tech. Publ. No. 1.
SANTOS, E. 1948. Pássaros do Brasil, 2a edição. R. Briguiet, Rio de Janeiro, Brazil.
SICK, H. 1959. A invasão da América do Sul pelo pardal, *Passer domesticus* Linnaeus 1758, com referência especial ao Brasil. Bol. Mus. Nac. Rio de J. Zool. 207:1–31.
———. 1968. Uber in Südamerika eingeführte Vogelarten. Zool. Beitr. 19:298–306.
———. 1985. Ornitologia brasileira: uma introdução, Two vol. Editora Universidade de Brasilia, Brasilia, Brazil.
SMITH, N. J. H. 1973. House Sparrows (*Passer domesticus*) in the Amazon. Condor 75: 242–243.
———. 1980. Further advances of House Sparrows into the Brazilian Amazon. Condor 82:109–111.
SNETHLAGE, E. 1914. Catálogo das aves amazônicas. Bol. Mus. Goeldi 8.

JOSÉ MARIA CARDOSO DA SILVA AND DAVID C. OREN, *Depto. Zoologia, Museu Paraense Emilio Goeldi, C.P. 399, 66.040 Belém, Pará, Brazil.* *Received 5 Jan. 1989, accepted 7 Oct. 1989.*

Wilson Bull., 102(2), 1990, pp. 313–317

Double-brooding by Florida Burrowing Owls.—While conducting a study to determine the impact of urban development on Florida Burrowing Owls (*Athene cunicularia floridana*), we discovered five instances of double-brooding (defined here as raising two broods in the same calendar year). Double-brooding has not been previously documented in Burrowing Owls (Bent 1938, Butts 1973), but most information on the breeding biology of this species comes from studies of Western Burrowing Owl (*A. c. hypugaea*) populations that are migratory or breeding in areas where climate probably precludes multiple breeding attempts