RED-TAILED AMAZON *Amazona brasiliensis* **E**[2]

At the end of the 1980s some 3,000 of these parrots survived in a very small area of coastal São Paulo and adjacent Paraná states, Brazil, moving daily between Atlantic Forest feeding areas and mangrove and littoral forest roosting and breeding areas. Despite some formal protection within reserves, the remaining populations are declining precipitously as a result of trapping, hunting, loss of nest-trees, and land development.

DISTRIBUTION The Red-tailed Amazon (see Remarks 1) is confined to an area of some 600,000 ha on the eastern slopes of the Serra do Mar, including coastal lowlands and islands, in south-eastern São Paulo and eastern Paraná states, Brazil, specifically between (and including) the areas around Itanhaém in the north (see Remarks 2) and Guaratuba in the south (to 25°52'S) (Sick 1985, Scherer Neto 1989, Straube 1990; also P. Martuscelli *in litt*. 1991). That it formerly extended into Santa Catarina and Rio Grande do Sul (Camargo 1962, Sick 1969, Pinto 1978) seems to be completely mistaken, since the positive evidence is tenuous and the negative evidence (the three records in question are all from upland *Araucaria*-rich habitat: Camargo 1962), when set against information in Ecology below, overwhelming. Forshaw (1989) nevertheless continued to indicate a range from São Paulo to Rio Grande do Sul.

São Paulo The species occurs throughout the coastal belt from the municipalities of Itanhaém and Cananéia down to Ariri and the Ilha do Cardoso (Scherer Neto 1989). Prior to this elucidation, records were from near Iguape on the ribeirão do Braço Grande (not "Rio Branco" as in Silva 1989a), municipality of Pariquera-Açu (Camargo 1962), July 1898 (two specimens in MZUSP), this then being a regular breeding locality (von Ihering 1898); and Morrete (on the mainland, not on Ilha do Cardoso, as in Pinto 1938), 15 km south of Cananéia, September 1934 (Camargo 1962; specimen in MZUSP; see Remarks 3). A claim that an article and letters by a Brazil-based aviculturist reveal, in combination, that he obtained birds from along the rio Paranapanema some 500 km west of São Paulo (Bertagnolio 1983) is difficult to accept (see also Remarks 4).

Paraná The species occurs along almost the entire coastal belt, mostly at under 700 m, from Guaraqueçaba through Antonina and Paranaguá to Guaratuba, including the islands of Baía de Paranaguá, namely Ilha do Mel, Ilha das Peças, Ilha Rasa da Cotinga, Ilha do Superagüi, Ilha do Pinheiro and others (Scherer Neto 1989). Prior to this elucidation, the only record was of a bird collected in January 1821 from a flock on the Ilha do Mel, where the species was frequent (von Pelzeln 1868-1871).

Santa Catarina The only record from Santa Catarina is a specimen from Lages (Lajes) (von Ihering 1899a), as clarified by Camargo (1962; see Remarks 5); there have been no more recent records in Santa Catarina (Sick *et al*. 1981 *contra* King 1978-1979; see Remarks 6), and this one seems highly improbable. However, the species's occurrence as far south as Guaratuba in Paraná (see above) suggests the possibility of its at least occasional presence across the border; indeed, a range map in Scherer Neto and Martuscelli (1992) includes the north-easternmost corner of the state.

Rio Grande do Sul Von Ihering (1899a) reported seeing a specimen from São Francisco de Paula (he actually wrote "Cima da Serra" and indicated it was close to the Santa Catarina border), in the north-east highlands (Camargo 1962, Belton 1984-1985). The species has never been found since (Belton 1984-1985, Scherer Neto 1989); this record seems highly improbable, but in any case most or all potentially suitable habitat in the state has been destroyed (Ridgely 1981a).

POPULATION Because it was so little known (it is extremely rare in museum collections), as recently as 10 years ago the Red-tailed Amazon was considered probably the most endangered mainland Neotropical parrot after the possibly extinct Glaucous Macaw *Anodorhynchus glaucus*; for, although in the past it was presumably at least locally numerous, a major decrease in numbers was assumed to have occurred in this century, brought about by the near-total deforestation of most of its (assumed former) range (Ridgely 1981a). In fact, subsequent fieldwork indicated that the total population stood at around 3,000 (Scherer Neto 1988), this somewhat upgrading the estimate of 2,000-2,500 in Diefenbach and Goldhammer (1986) and tending to indicate that the assumption of a major decrease may, in fact, have been mistaken. Nevertheless, new studies in 1991/1992 have shown that there is indeed a major population decline under way, such that in the near future the species will be reduced to a few hundred birds, like certain Caribbean amazons (Scherer Neto and Martuscelli 1992).

The major aggregations found in São Paulo in 1984/1985 were in the municipality of Iguape, where a maximum of 120 birds in several groups was seen; the biggest single flock, at a site 35 km from

Iguape (on the road to Pariquera-Açu), consisted of 96 birds (Scherer Neto 1989). Small numbers roosted in the vicinity of the headquarters at Ilha do Cardoso State Park in December 1987, when a maximum of six birds was seen; at this time there was a report from local people that these parrots were much commoner in winter, with "hundreds" present, which requires confirmation (D. F. Stotz *in litt*. 1988); the island's population has subsequently been reported as around 145 birds (P. Martuscelli *in litt*. 1991).

The highest numbers in Paraná in this same period were found on the islands in Baía de Paranaguá: Ilha das Peças (179-343), Ilha do Mel (69-241) (where the species was frequent and in flocks, 1821: von Pelzeln 1868-1871), Ilha Rasa da Cotinga (45-188) and Ilha do Superagüi (0-250) (Scherer Neto 1989). A separate count was carried out monthly from December 1984 to December 1985 on the small Ilha do Pinheiro, an important "roosting island" to which birds come from Ilha das Peças and Ilha do Superagüi: numbers varied from 370 in February to 754 in August, with a second peak of 650 in January (Scherer Neto 1989).

ECOLOGY The Red-tailed Amazon may be characterized as an Atlantic Forest endemic, but it is no less dependent on the adjacent vegetation ("sand-plain forest") along coasts and on inshore estuarine islands including mangroves, where most breeding and roosting (seasonally in large flocks, e.g. up to 400 pairs) occurs (Scherer Neto 1988, P. Martuscelli *in litt*. 1991). It keeps strictly to the lowlands, ranging mainly up to 300-400 m in the low foothills, and hence does not occur in *Araucaria* forest and is nowhere sympatric with Red-spectacled Amazon *Amazona pretrei* (*contra* Sick 1969, 1972, Forshaw 1978), although it is marginally sympatric with Vinaceous Amazon *A. vinacea*, apparently (e.g.) in the Jacupiranga State Park (Diefenbach and Goldhammer 1986, Scherer Neto 1989; see relevant accounts). Characteristic trees of the habitat are *Luehea* and *Andira* spp. as well as species from the Lauraceae and Sapotaceae; common palms are *Arecastrum* and *Euterpe edulis* (Diefenbach and Goldhammer 1986). Habitat on the islands to which the birds move to breed and roost is restinga and halophytic flora (Ilha do Mel) (Camargo 1962); Ilha Comprida is a sandy, deltaic island with mangrove, caixeta *Tabebuia* and gerivá palms *Arecastrum romanzoffianum* growing on swampy terrain (C. Yamashita *in litt.* 1991); Ilha do Cardoso is a massif covered with wet forest with mangrove in the swampy lower areas (C. Yamashita *in litt.* 1991).

Food is chiefly found in thick forest, with fruit of over 42 species of tree being identified to date (in four cases also the leaves; in five others also the flowers); guanandi *Callophyllum brasiliense* is an important resource, being involved in six out of 83 feeding records, and also being a frequent nest-tree (Scherer Neto 1989). Earlier reports mention flowers of *Erythrina speciosa* being consumed during the summer at roosts in mangroves, as well as *Euphorbia* and *Myrcia* fruits (Scherer Neto 1988, 1989; also P. Scherer Neto *in litt*. 1986). Birds were noted to feed in pairs or flocks up to and over 20 (Scherer Neto 1989).

They nest in holes usually high in both live and dead trees (often in groups of dead, hollow *Mauritia* palms in swampy areas: confirmed in Bertagnolio 1981, 1983), on average the cavity being 8 m above ground (highest 16 m), although nests have been found only 1.5 m up in small trees; inaccessible sites in thick forest, swamp or floodplain protect nests against predators (Scherer Neto 1988; also Diefenbach and Goldhammer 1986). Six of a total of 18 nests were in guanandi trees on the Ilhas do Mel and Rasa da Cotinga, with two in gerivá palms on the Ilha Comprida and two in fig trees *Ficus enormis* at mainland sites; other trees included jacarerama *Laplacea fruticosa*, pau-óleo *Copaifera trapezifolia* and guape *Eugenia hiemalis* (Scherer Neto 1989). Nests can be as close as 40 m (average of six nests 79 m) on the Ilha do Mel (Scherer Neto 1989). Breeding runs from September through to February (although the extremes for nest finds are 6 August and 5 March), when the last birds fledge; clutch-size is 2-4 (maximum young seen fledged is three), incubation lasts 28-30 days, and the fledging period is 50-55 days (Scherer Neto 1988, 1989; also P. Scherer Neto *in litt.* 1986, Diefenbach and Goldhammer 1986).

THREATS A decade ago the Red-tailed Amazon was believed highly threatened by habitat destruction (Sick and Teixeira 1979, Ridgely 1981a); this is now recognized to be true only in São Paulo, where there is rapid forest loss (Scherer Neto 1989), while forest cover in Paraná is now known to be relatively stable (P. Scherer Neto *in litt*. 1986). Intensive wood exploitation on Ilha Comprida was a cause for concern in the mid-1980s because of its impact on nest-site availability (P. Scherer Neto *in litt*. 1986). Indeed, the island was then reportedly being divided into housing lots (C. Torres *in litt*. 1985) and being developed as a weekend resort with a bridge planned (Diefenbach and Goldhammer 1986); all of this is now

accelerating (Scherer Neto 1989, C. Yamashita *in litt.* 1991), and by 1992 half the island was deforested or otherwise disturbed, while the other half was largely parcelled out in illegal plots of land (Scherer Neto and Martuscelli 1992). The creation of pasture for buffalo leads to competition between this animal and the parrots for the fruit of *Erythrina speciosa* along stream margins, and the former push over gerivá palms to get at their fruit, thus reducing both food-supply and nest-sites (Scherer Neto and Martuscelli 1992). However, the wholesale clearance of forest is less an immediate problem than: cutting of palms and of guanandi (used by the species for nesting) to make fishing boats, since the albeit low human population of the region subsists on fish (Scherer Neto 1988, 1989); cutting of *Euterpe* palms (used by the species for food and roosting) to make salads (see, e.g., Threats under Blue-bellied Parrot *Triclaria malachitacea*); exploitation of caixeta trees for the pencil industry, as these are also used for nesting (P. Martuscelli *in litt*. 1991). Clearance of trees for crops on the 15 ha Ilha do Pinheiro was a cause for alarm in October 1983 (W. Belton *in litt.* 1983).

Illegal trade in the species has long been a problem, and has resulted in the diminution of the wild population (Scherer Neto 1988), although until around 1988 (see below) it almost exclusively served internal markets: a bird acquired in the U.K. (presumably in the 1950s) from a merchant navy steward (Maxwell 1960) presumably derived from a chance transaction in Brazil. In the early 1980s in the markets of southern São Paulo state the species sold for as little as $10 a bird, although elsewhere in Brazil it was much more expensive (C. Torres *in litt*. 1985). Most of the birds seen in the late 1970s being offered for sale came from the Ilha Comprida (P. Scherer Neto *in litt*. 1986), but it is now known that young are taken from nests also in Cananéia and Iguape municipalities and on Ilhas do Mel, das Peças and Rasa da Cotinga, with fishermen and other locals fixing steps up to certain nests so as to take the young annually without cutting the trees (Scherer Neto 1989); in 1984/1985 the actions of trappers resulted in the failure of every nest being studied (Diefenbach and Goldhammer 1986), and this happened again in 1991/1992 when all seven nests under study were "destroyed" to capture the young (P. Scherer Neto *in litt*. 1992 to R. Wirth). Thus illegal trade continues (P. Martuscelli *in litt*. 1991); in the late 1980s the number in captivity was known to exceed 50 (Silva 1989a), but has now risen: Scherer Neto (1989) knew of 50 inside Brazil, 30 outside, but he indicated several hundred inside Brazil and a large number of birds being smuggled to Europe in the period 1988-1990 (Scherer Neto 1991a). The latest evidence is of a major illicit exploitation, 20% simply for "personal" local consumption, 80% for commerce, most of it abroad (to the U.S.A. and Europe, mainly Germany): in the municipality of Cananéia alone (one quarter of the species's range), 356 birds were taken from the wild for either eating or trade in the 1991/1992 breeding season (Scherer Neto and Martuscelli 1992).

A further factor of concern is hunting: in 1982 50 birds were reportedly shot dead at the roost on Ilha do Pinheiro and many others left dying, apparently for no other reason than pleasure (Scherer Neto 1988, 1989). However, it was believed that birds may also be shot for food in southern São Paulo (C. Torres *in litt*. 1985), and this was confirmed by experience in 1989 again on Ilha do Pinheiro and 1990 at Ariri when some 100 birds were killed at each site (Scherer Neto and Martuscelli 1992).

Owls can reportedly reduce breeding success to near-zero in some cases where birds nest semi-colonially in more open situations in marshes (Bertagnolio 1981, 1983); moreover, dead palms snap off in bad weather, and in 1983 nine young died at one site through this cause (Diefenbach and Goldhammer 1986; also Scherer Neto and Martuscelli 1992).

MEASURES TAKEN The species is protected under Brazilian law (Bernardes *et al*. 1990), listed on Appendix I of CITES, and treated as endangered under the U.S. Endangered Species Act (Nowak 1990). The lack of protected areas within its range noted by Ridgely (1981a) appears to have been rectified: there are now at least 12, namely (in São Paulo) the Juréia Ecological Station (presence not proved but probable), Chuá Ecological Station, Cananéia–Iguape–Peruíbe Environmental Protection Area, Jacupiranga State Park (150,000 ha), Serra do Mar State Park and Ilha do Cardoso State Park (22,500 ha), and (in Paraná) the Superagüi National Park (21,400 ha; only decreed on 25 April 1989), Guaraqueçaba Ecological Station, Guaraqueçaba Environmental Protection Area, Ilha do Mel Ecological Station, Serra Negra State Park and the recently declared Ilha do Pinheiro "Area of Relevant Ecological Interest" (Scherer Neto 1989). Scherer Neto (1988, 1989) also referred to a scheme for erecting nest-boxes at certain sites, although the success of this measure has not yet been indicated. In 1991, further work on the species, reported in Scherer Neto and Martuscelli (1992), was initiated as a joint project of The Nature Conservancy and Fundação SOS-Mata Atlântica.

MEASURES PROPOSED The Red-tailed Amazon was considered a species for which a concerted captive programme might be genuinely worthwhile, using already captive birds (Ridgely 1981a), and given the steep decline currently in progress this has also been called for in order to create and maintain a gene bank for the species (Scherer Neto and Martuscelli 1992). However, Scherer Neto's (1988, 1989) work has shown that the priorities for this species lie in adequate protection of habitat, proper management of existing protected areas, and the identification and protection of key sites, plus the continued vigilance of authorities against illegal poaching, hunting and cutting of trees; he has called for continued monitoring and study of the populations in the known breeding and roosting sites, linked with a special education programme for guards and local inhabitants (these are also proposed in Scherer Neto and Martuscelli 1992). Despite its recent protection (see Measures Taken), the tiny but critically important Ilha do Pinheiro surely merits inclusion in the adjacent Superagüi National Park.

REMARKS (1) Camargo (1962) treated the Red-tailed Amazon as a race within a polytypic species that also includes Blue-cheeked Amazon *A. dufresniana* and Red-browed Amazon *A. rhodocorytha*, and in this he was followed by Meyer de Schauensee (1966, 1982); but King (1978-1979), Ridgely (1981a), Sick (1985) and Forshaw (1989) all preferred to maintain its specific identity, and their judgement is followed here. (2) Silva (1989a) gave "Vale do Ribeira" as the northern limit, and both Sick and Teixeira (1979) and Diefenbach and Goldhammer (1986) also mentioned the rio Ribeira valley for the species; Itanhaém is further north, and the Ribeira valley is a generalization for the Pariquera-Açu, near Iguape. (3) MZUSP also has a São Paulo skin from "Ilha Grande", dated July 1970, which cannot be traced; it is possibly a mistake for Ilha Comprida. (4) Finsch (1867-1868) and von Pelzeln (1868-1871) began publishing their work simultaneously, so the former was in correspondence with the latter over J. Natterer's observations of parrots. Under the entry for *Amazona brasiliensis* Finsch cited a letter from von Pelzeln that mentioned not only the details about Ilha do Mel as published in von Pelzeln (1868-1871) but also a locality "an Bord von Menalha" (possibly "on the bank of the rio Menalha"). The itinerary at the start of von Pelzeln (1868-1871) reveals that this "site" was visited on 20 January 1821 between stays at (and therefore obviously close to) Itararé, and indicates, as some kind of geographical qualifier, that it was in or close to "Höhe von Guairussu" (Guairussu heights). This curious record would tend to support the supposed report of breeding inland in Bertagnolio (1983), were it not for the fact that elsewhere in von Pelzeln (1868-1871) he used "an Bord" to indicate "aboard ship". Evidently the Menalha was one; in other words a total misunderstanding originally surrounded J. Natterer's notes about this part of his journey, compounded by the single date involved, by the mention of "Guairussu heights", and by the association with this parrot (none of which makes any sense even now). (5) Lages is not in Rio Grande do Sul (*contra* Pinto 1978). (6) King (1978-1979) stated that "most of the recent records are from Santa Catarina", and although Ridgely (1981a) pointed out that this seems to have no foundation, it may derive from a mistaken translation of Sick (1969), who wrote that more (meaning further) records in the literature refer to Santa Catarina and Rio Grande do Sul.