GREEN-CHEEKED AMAZON *Amazona viridigenalis* **V**[9]

This popular cagebird, confined to tropical evergreen gallery forest and deciduous woodland in north-east Mexico, has been overexploited for trade and suffered from extensive habitat loss. A suite of actions, including surveys, studies, site protection and management, and local education campaigns, is required.

DISTRIBUTION The Green-cheeked (Red-crowned) Amazon is endemic to north-east Mexico in the lowlands and the lower slopes of the Sierra Madre Oriental between 26° (now apparently 24°) and 20°N, this constituting a modern range of only some 40,000 km^2; however, it has also established feral populations in Puerto Rico and in the cities of Miami, Los Angeles, San Diego and Brownsville, U.S.A., and Monterrey, Mexico.

Mexico Modern records are from Tamaulipas and San Luis Potosí; there appear to be no records in the past 50 years from Nuevo León and in the past 40 years from Veracruz, and indeed in his review of the species Clinton-Eitniear (1986) seems to regard Tamazunchale (which he gives as in Veracruz, although it is in San Luis Potosí) as its southernmost limit, with no records from south-east, east or even north-east of there. It is clear that the species now occurs in discontinuous pockets throughout its range, although it probably retains the capacity to disperse between sites (see Ecology); nevertheless, modern knowledge of its status and distribution within Mexico is wholly unsatisfactory. In the following account records are listed roughly from north to south, with coordinates taken from OG (1956a).

Nuevo León The species is known by late nineteenth century specimens from central Nuevo León at Monterrey and China (not Chitra as in Ridgway 1916, Inskipp *et al*. 1987), at around 25°40'N the two most northerly localities recorded (but see Remarks 1), plus Montemorelos and río Camacho (latter untraced, but not Comachio or Comacho as in Salvin and Godman 1888-1904, Salvadori 1891, Ridgway 1916; specimens in BMNH, MCZ, ROM, USNM). The only twentieth-century records of wild birds appear to be from Linares, where a large flock was seen, March 1939, and río Pablillo, 24°57'N 99°20'W (Sutton and Pettingill 1943), and La Unión, 20 km north-east of General Terán, where a specimen (in MVZ) was taken in July 1945 (see Remarks 1). However, since 1980 birds – presumably escapes or their descendants – have been present in San Pedro, a suburb of Monterrey, and since 1984 they have been noted as present throughout the year, nesting in San Pedro and being seen also on at least one occasion in southern Monterrey (A. M. Sada *in litt*. 1992).

Tamaulipas Records are from the centre and south of the state at: Jiménez (specimens in AMNH); Santa Leonor, untraced but at the base of the Sierra Madre Oriental north-west of Ciudad Victoria, judging from Phillips (1911); río Cruz (presumably río de la Cruz as in Ridgway 1916; now río Purificación), 23°58'N 98°42'W (Phillips 1911); río Martínez, close to the preceding (Phillips 1911); río Corona at 250 m (23°55'N 99°00'W in Gehlbach *et al*. 1976; also Sutton and Burleigh 1939, Ridgely 1981a); río Caballeros in the same region (Sutton and Burleigh 1939); Soto la Marina and the river of the same name (Ridgway 1916, Clinton-Eitniear 1986); Ciudad Victoria and the Sierra Madre Oriental above (i.e. to the west) (Ridgway 1916) and 17 km to the north (specimen in MNHUK); 15 km north-east of Zamorina, 23°20'N 97°58'W (specimen each in AMNH, DMNH); (El) Forlon, 23°14'N 98°48'W (Ridgway 1916); Acuña, 23°12'N 98°26'W, plus Santa María in the Sierra de Tamaulipas (Martin *et al.* 1954; also specimens in MLZ); the Presa de Español (Español dam) north of Aldama (Clinton-Eitniear 1986; but see Population); the Los Colorados Ranch, east-north-east of Aldama (see map in Pérez and Eguiarte 1989); Gómez Farías, 23°03'N 99°09'W (specimens in CM, DMNH, USNM), this area including the río Sabinas, 22°59'N 98°58'W (Clinton-Eitniear 1986), and specifically Rancho Rinconada (Sutton and Pettingill 1942), El Encino (Clinton-Eitniear 1988), Pano Ayuctle "sugar camp" and El Limon (specimens in AMNH, DMNH, FMNH and YPM; Pano Ayuctle is described in Eaton and Edwards 1948); Antiguo Morelos (specimen in MNHUK); Tampico (Ridgway 1916; see also under Veracruz).

San Luis Potosí Records are from the easternmost part of the state at: río del Naranjo, centred on Las Abritas, at 22°30'N 99°24'W (Clinton-Eitniear 1986); Ciudad del Maiz, March 1942 (specimen in MLZ); Rancho Martínez, 25 km south of Naranjo (see Remarks 2), October 1945 (specimen in MLZ); (Ciudad de) Valles, San Luis Potosí (Ridgway 1916), one specimen (in CM) from 13 km south, and another (in UMMZ) from 20 km east; Axtla (now Alfredo M. Terrazas), 21°28'N 98°51'W (specimen in

BirdLife International (1992) Threatened Birds of the Americas.
Cambridge, UK: BirdLife International.

CM) and along río Axtla (Sutton and Burleigh 1940b), though none was seen in 1983 (Clinton-Eitniear 1986); Xilitla (Davis 1952); along río Moctezuma, 6-8 km upstream from Tamazunchale (Sutton and Burleigh 1940b, Clinton-Eitniear 1986); and El Sol, 1.5 km north of Tamazunchale (specimen in ANSP). There is one wholly untraced locality in the state, this being "El Banito", where a male (in FMNH) was collected on 30 June 1940.

Veracruz Records are from the north and centre of the state at: río Tamesí near Rayón (San Antonio Rayón is at 22°25'N 98°25'W) in northern Veracruz (specimens in AMNH); "Tamesi near Tampico" (specimen in BMNH) and nearby on the río Tamesí at Paso del Haba (Chapman 1914b); Altamira (Richmond 1895); Laguna de Tamiahua, 50 km south of Tampico, where a male was taken in May 1944 (specimen in MLZ), and 30 km north of Naranjos (latter at 21°21'N 97°41'W), where two birds were taken in April 1960 (specimens in MVZ); "Tantina, near Tampico", June 1888 (female in BMNH; see also Salvin and Godman 1888-1904), i.e. presumably Tantima, 21°20'N 97°50'W; Potrero (del) Llano, 21°03'N 97°41'W, and 9 km north-west of Nautla (Lowery and Dalquest 1951); Colipa, 19°55'N 96°42'W (Salvin and Godman 1888-1904, Salvadori 1891; see Remarks 3); and, some 200 km further south and somewhat anomalously (though possibly as wintering birds), around San Andrés Tuxtla (Sclater 1857b).

U.S.A. Feral populations exist in a good number of localities in the U.S.A., notably (*California*) Los Angeles (Temple City district: Forshaw 1989), San Diego (J. Clinton-Eitniear *in litt.* 1987) and the San Gabriel valley (AOU 1983; also Froke 1981); (*Florida*) the Florida Keys, Miami, Fort Lauderdale and West Palm Beach (Owre 1973, Silva 1989a); (*Texas*) Brownsville (Lever 1987, J. Clinton-Eitniear *in litt.* 1987), although here the birds have proven to be winter visitors (October to March) and may represent genuine wanderers from Tamaulipas rather than part of a resident group whose summer quarters are unknown (Neck 1986, also Ridgely 1981a; *contra* Forshaw 1989, who attributed them to smugglers' panic releases: see Threats); and there are small ones on Puerto Rico (Lever 1987, Raffaele 1989) and Oahu in the Hawaiian Islands (AOU 1983, though not mentioned by Pratt *et al.* 1987).

POPULATION At the southernmost locality known for the species, around San Andrés Tuxtla, it was "common in the *tierra caliente*" some 140 years ago (Sclater 1857b); there have been no further reports from this area. However, the species's overall abundance seems unlikely to have altered drastically for another century: from the major period of bird study in the region, the late 1930s to early 1950s (e.g. Sutton and Burleigh 1939, 1940a,b, Sutton and Pettingill 1942, 1943, Sutton *et al.* 1942, Lowery and Dalquest 1951, Davis 1952, Martin *et al.* 1954, Zimmerman 1957), it is clear that the Green-cheeked Amazon was then generally relatively common ("abundant about Gómez Farías, where... considered a pest": Sutton and Burleigh 1939; "literally hundreds of them": Sutton 1951) in appropriate habitat from central Tamaulipas south to eastern San Luis Potosí and northern Veracruz (much less common in central Veracruz), and this view is reflected in the generalizing literature (e.g. Blake 1953, Edwards 1972). Even in the 1970s the species was regarded as "fairly common locally" (Ridgely 1981a), with one study (at río Corona) yielding figures of five males per 8 ha of riverine forest (Gehlbach *et al.* 1976) and another of 0.26 birds per ha in coastal Tamaulipas (see Pérez and Eguiarte 1989). Nevertheless, Ridgely (1981a) reported a consensus "that a large overall decline in the numbers of this species has taken place in the past several decades" so that "where formally hundreds could be seen, now one sees scattered pairs, or at most small flocks". Clinton-Eitniear (1986, 1988) provided figures from the *American Birds* Christmas Bird Counts since the early 1970s, but these do not help delineate any trend; on the other hand, he recorded a population at Presa de Español reducing from 30 pairs in 1979 through 14 pairs in 1983 to none at all in 1988, and he also indicated that while numbers are relatively low and declining in the north at río Corona, they remain healthy in the río Sabinas region (Neck 1986 reported an increase in numbers in this area in the 1970s, but a decrease at Gómez Farías). On the 600 ha (though now 4,000 ha) Los Colorados Ranch, 67 birds were estimated present in 1985, a 55% decline since 1976 (Pérez and Eguiarte 1989).

Of the feral populations, that in Los Angeles is known to comprise several hundred birds (Forshaw 1989), that in (or near) Miami is at least 150 strong (Silva 1989a), being "commonly seen throughout metropolitan Miami and in Ft Lauderdale" (Owre 1973), while those in Brownsville, on Puerto

Rico and on Oahu remain small (Lever 1987, Raffaele 1989). That in Monterrey, Nuevo León, is thought to number a few hundred birds (A. M. Sada *in litt*. 1992).

ECOLOGY The Green-cheeked Amazon is a bird of the lusher parts of generally arid lowlands and foothills, thus occupying tropical evergreen gallery forest, deciduous woodland on slopes and in canyons, partially cleared and cultivated landscapes with woodlots and woodland patches (i.e. in forest edge) ranging up onto dry open pine-oak ridges as high as 1,200 m at least seasonally (Davis 1952, Martin *et al*. 1954, Edwards 1972, Forshaw 1978, Ridgely 1981a, Clinton-Eitniear 1988). The species will even occur, albeit in reduced numbers, in agricultural areas if a few large trees, needed for nesting and roosting, remain standing (Ridgely 1981a). The habitat at río Corona consists (or consisted) of tropical evergreen forest dominated by ebony *Pithecellobium flexicaule* with *Ehretia*, *Bumelia* and *Condolia* subdominant (Gehlbach *et al*. 1976); at río el Naranjo of montane wet-oak/sweetgum forest, brushland, arid upland grassland and dry oak forest (Clinton-Eitniear 1988). Forest destruction has led to birds occupying suboptimal habitat (Pérez and Eguiarte 1989). A feral population in the suburban San Gabriel valley, Los Angeles County, California, appeared to be self-sustaining in mature suburban vegetation, though concentrated to some degree on a large arboretum (Froke 1981). That in Puerto Rico occupies (at least in part) dry forest in the south of the island (see Remarks 1 under Puerto Rican Amazon *Amazona vittata*).

At río Corona, birds were seen feeding on *Pithecellobium* beans and *Ehretia anaqua* berries (Gehlbach *et al.* 1976, Gehlbach 1987), at río Naranjo on acorns and "exotic China Berries" *Melia azedarach* (Clinton-Eitniear 1988), and food generally appears to be taken opportunistically, with nuts, berries, buds, flowers and various fruit being consumed according to season, and pine-seeds being important at least for some populations (Sutton and Pettingill 1942, Martin *et al.* 1954, Clinton-Eitniear 1986). *Pithecellobium* seeds have also been recorded as food in Texas (Neck 1986). The feral San Gabriel valley population fed with feral Lilac-crowned Amazons *A. finschi* on at least 34 tree and shrub species, most commonly English walnut *Juglans regia* and sweetgum *Liquidambar styraciflua*; foraging mostly took place from 06h00 to 09h00 and from 16h00 to roosting, which occurred soon after sunset, and the period from 10h00 to 16h00 was spent resting in the shade (Froke 1981). In these feral birds there was a general increase in foraging flock size from summer through to winter (July–January), with greatest mean in December (32.5), reducing sharply in spring (March–June), with smallest mean in April (5.5); during the spring, one pair ate more flowers than seeds of *Chorisa*, and while feeding nestlings foraged on the flowers of ironbark *Eucalyptus sideroxylon* (Froke 1981). In Miami birds were seen to feed and breed in casuarina trees (Owre 1973).

Breeding activity (courtship, nest-hole occupation) commences in March (Sutton and Pettingill 1942; see also Sutton and Burleigh 1940b, Gehlbach *et al*. 1976), a female in DMNH taken 24 March (1957, río Sabinas) held an egg ready to lay, and another in MVZ taken 9 April (1960, Laguna de Tamiahua) had fully developed ovaries; moreover, three clutches of four, four and three eggs were taken near Ciudad Victoria (one) and northern Veracruz (two) in April 1953 and April 1960 respectively (specimens in WFVZ). However, courtship-flights are also recorded in mid-April (Martin *et al.* 1954), a female from 25 March had undeveloped ovaries (Sutton and Burleigh 1940a) and two male specimens from mid-April (1952, río Sabinas) in AMNH are labelled "not breeding condition" and "not full breeding". Feral birds in Los Angeles also start to breed in March/April (Forshaw 1978), although they show territorial or at least proprietorial interest in the nest-tree from the preceding September; in one case a pair evicted all other pairs (including those of Lilac-crowned Amazons) from the tree and its vicinity (an area of c.250 m^2), but after the eggs were laid they began to tolerate a second pair that took up residence in a hole 10 m away in the same tree, and eventually shared its territorial defence with them, the second pair fledging their young four weeks after the first (Froke 1981). In the wild one pair was seen to occupy an old hole of Lineated Woodpeckers *Dryocopus lineatus* c. 20 m up in a large cypress (Sutton and Pettingill 1942), and along the río Corona the species requires either abandoned nests of this woodpecker or large natural cavities in Montezuma cypress *Taxodium mucronatum* (Gelhbach 1987). However, six nests found on the Los Colorados Ranch in 1985 were 6-14 m up in the trunks of either *Bumelia laetivirens* or *Brosimum alicastrum* (Pérez and Eguiarte 1989). In captivity, the incubation period was 28 days and the fledging period about nine weeks (Lantermann 1982, Wozniak and Lantermann 1984). Feral birds

incubated for about 25-30 days and showed a fledging period of at most 55 days; parents began to resist food-begging demands of their young 2-3 months after fledging (Froke 1981).

The species is evidently nomadic in winter, being notably more abundant then at higher elevations and easily able to range over considerable distances between lusher areas to forage (Clinton-Eitniear 1986). This has been confirmed by recent studies showing that while the sympatric conspecific Yellow-headed Amazon *A. oratrix* (also threatened) and Red-lored Amazon *A. autumnalis* are year-round residents where they occur in Tamaulipas the Green-cheek gathers in large flocks and moves south (though possibly also north: see Distribution: U.S.A.) outside the breeding season, returning in February (E. Enkerlin *in litt*. 1992). Winter flocks in Veracruz reached up to 100 birds, these being active throughout the day (Lowery and Dalquest 1951). The species has been described as irregular in Nuevo León (Sutton and Pettingill 1943).

THREATS The Green-cheeked Amazon has suffered over the long term from habitat loss and in the past 20 years from a high level of exploitation for trade. However, in the Sierra de Tamaulipas, farmers shoot (or shot) many parrots raiding the maizefields for corn (Martin *et al.* 1954). The only natural predator reported is the Ornate Hawk-eagle *Spizaetus ornatus* (Sutton and Pettingill 1942).

Habitat loss Much of the species's range has been or is being modified for agricultural use, especially now for sorghum, and the gallery forests are gradually being degraded or cleared outright (Ridgely 1981a). Over 80% of the Tamaulipas lowlands have been cleared for agriculture and pasture (E. Enkerlin *in litt*. 1992). The apparent loss of the species from Nuevo León (see Distribution) is presumably attributable to habitat destruction, but the literature is weak on specific instances: the flooding of the río Corona valley through the Las Adjuntas dam submerged a considerable extent of important floodplain forest (Gehlbach *et al.* 1976, Ridgely 1981a), this area also being affected by lumbering, extensive clearance, gravel dredging, and increasing public use for bathing, washing and swimming (Gehlbach *et al.* 1976, Clinton-Eitniear 1986). Near another dam, the Presa de Español, habitat destruction was responsible for the local population decline to apparent extinction (Clinton-Eitniear 1986; see Population).

Trade Trade apparently developed as a major factor in the late 1960s, with well over 2,000 birds being imported legally into the U.S.A. between 1968 and 1972 (Lever 1987), and towards the end of the 1970s thousands or even tens of thousands of birds were still being imported almost exclusively into the U.S.A. (Ridgely 1981a). Between October 1979 and June 1980, 3,279 were legally imported into the U.S.A. (Roet *et al.* 1981), and over the period 1977-1980 the figure was 7,452 (Clinton-Eitniear 1988, 1989). Despite a ban on this trade (see Measures Taken), smuggling has kept the threat alive with (e.g.) only pairs nesting in the remotest sites at Gómez Farías managing to fledge young (Clinton-Eitniear 1988). Even on a relatively well protected site such as the Los Colorados Ranch, amazon parrot nests (three species) suffered 30% loss to trappers in 1985 (Pérez and Eguiarte 1989). The smugglers' habit of releasing birds at the first sign of detection (Forshaw 1989) compromises any hope of releasing confiscations back into the wild. The trappers' inevitable damage of nests when taking chicks usually results in the site being permanently abandoned (Gildardo 1976).

MEASURES TAKEN There are no protected areas for the species other than a few small tracts of habitat preserved through private ownership and management (Ridgely 1981a). At río el Naranjo, a patch of forest used as a roost adjacent to the El Salto hydroelectric plant is protected by the army (Clinton-Eitniear 1986). Commercial export was banned (as urged by Ridgely 1981a) on 20 September 1982, and appears to have been effective: thus net imports recorded by CITES officials were 586 in 1981, 1,727 in 1982, 99 in 1983, and two in 1984 (Inskipp *et al.* 1987); nevertheless, smuggling continues (see Threats).

MEASURES PROPOSED Protection of certain key areas has been urged, such as in the río Sabinas valley (Ridgely 1981a) and at Gómez Farías (Clinton-Eitniear 1986); see Remarks 4. A comprehensive survey and a detailed study of the species are warranted, to determine the best and most feasible sites for conservation, bringing to bear the relevant biological information on the species's year-round requirements and capacity for long-term population maintenance; the detailed study, by E. Enkerlin (supported by AFA), has already started. Apart from this, the planting of appropriate fruiting shrubs and trees, the

financial reward of local people for allowing birds to fledge, a campaign to generate local pride in the species by indicating its endemism in north-eastern Mexico, and the erection of nest-boxes where they are unlikely to be robbed are all proposed (Clinton-Eitniear 1988, J. Clinton-Eitniear *in litt.* 1988). Some of these measures now form the basis of a joint programme between the Universidad Autónoma de Tamaulipas and the Center for the Study of Tropical Birds: thus the nest-box deployment, at Los Colorados Ranch in Tamaulipas (see Distribution) where Yellow-headed Amazons also stand to benefit), has already begun with the support of the Avicultural Society of America (*AFA Watchbird* 18,1 [1991]: 51), an educational poster is being produced (J. Clinton-Eitniear *in litt.* 1991), and a scheme is being developed to return confiscated birds to the wild (*AFA Watchbird* 18,4 [1991]: 56). A key element in a conservation strategy for both amazons may be the encouragement and commitment of landowners to preserving tracts of habitat and to guarding the birds, particularly when nesting, with the aid of their staff (E. Enkerlin *in litt*. 1992). Study of certain feral populations, such as that in Monterrey, is to be encouraged.

Captive breeding If this is to be of help (by replacing demand for wild-caught birds), as many holders as possible should cooperate and accurate records must be kept (Clinton-Eitniear 1988); in a survey in 1989 the number of captive pairs in the U.S.A. was 184, their total offspring 271, and the total number of birds 1,096, giving strong hope of a minimum sustainable population of 200 pairs (Clinton-Eitniear 1989); a (regional) studbook is being developed (*AFA Watchbird* 18,1 [1991]: 50).

REMARKS (1) The specimen from China was actually taken at a river 15 “leagues” (i.e. 75 km) to the south; the previous day (18 April 1891) the same collector (W. Lloyd) took a specimen (also in USNM) at “El Union” in Tamaulipas, which may be the same as the “La Unión” north-east of General Terán at which a specimen was taken in 1945, although not in Tamaulipas. (2) It is assumed here that the Naranjo in question is that just north of the state border inside Tamaulipas. (3) Ridgway (1916) gives Misantla (south of Colipa) as a locality, but this appears to be a misinterpretation of Salvin and Godman (1888-1904), who found the species to the north of Misantla (i.e. Colipa). (4) Since the Green-cheeked Amazon is partially sympatric with the also threatened Yellow-headed Amazon, the choice of areas to protect may to some extent be determined by sites at which both species occur; the río Corona valley is one such area (Ridgely 1981a). The río Corona floodplain forest is in fact part of a major biome (Tamaulipan Dry Forest) which in the mid-1970s was not represented even in a planned reserve, and is of further interest for being part of the drainage system that demarcates the Neotropical from the Nearctic avifauna (Gehlbach *et al.* 1976).