AGRISCIENTIA, VIII: 75-78.

COMUNICACION

Analysis of Blue-fronted Amazon damage to a citrus orchard in Tucumán, Argentina

Navarro J.L., Martella, M.B. and Chediack, A.

ABSTRACT

Damage by Blue-fronted Amazon (*Amazona aestiva*) to citrus fruits was studied from May to September 1990 in an orchard in the NE of Tucumán province, Argentina. All fruits on the ground beneath 140 sampled trees (orange, lemon, and grapefruit) were counted. Only those fruits exhibiting the characteristic injury produced by Blue-fronted Amazons were accounted for damage estimates. The damage caused by this psittacid was low (1% in total), and of little economic significance for the orchardist. Oranges were the most affected citrus species (2% damage).

Key words: *Amazona aestiva* - parrot - damage - citrus

RESUMEN

El daño producido por el loro hablador (*Amazona aestiva*) a los frutos de cítricos fue estudiado desde mayo a setiembre de 1990 en una plantación en el NE de la provincia de Tucumán, Argentina. Se contaron todos los frutos que se encontraban en el suelo debajo de los 140 árboles muestreados (naranja, limón y pomelo). Sólo aquellos frutos con signos característicos de haber sido comidos por el loro hablador fueron tenidos en cuenta para la evaluación de daño. El daño causado por este psittácido resultó ser bajo (1% en total), representando una pérdida económica poco significativa para el productor. Las naranjas fueron los frutos más afectados (2% dañado).

J.L. Navarro y M.B. Martella, Centro de Zoología Aplicada, U.N.C. CC 122 - 5000 Córdoba, Argentina; A. Chediack, Córdoba 191 - 4000 San Miguel de Tucumán, Argentina.

Besides being economically important, bird damage may cause serious conflicts between agriculture and govenrment schemes regarding wildlife protection. This is the case of the Blue-fronted Amazon (*Amazona aestiva*) in Argentina. In spite of the decline of populations of this psittacid in the last 50 years (Nores and Yzurieta, in press) and of its classification in Appendix II of CITES (Convention on Trade in Endangered Species), the Blue-fronted Amazon is declared an agricultural pest in some provinces (Azpiroz and Villalba-Macías, 1989; Reynoso and Bucher, 1989). However, literature dealing with reliable assessments of losses caused by this bird is not available.

Main determinants of the decline in Blue-fronted Amazon numbers are habitat destruction by man and the pet-trade (Bucher and Martella, 1988). The pest status of this psittacid has encouraged the government to establish high export quotas for it (23.000 for

Fecha de recepción 6/6/91; fecha de aceptación 3/10/91.

1991; CITES, 1991) and, therefore, increases the harvesting of Blue-fronted Amazons.

In response to the concern generated, in 1990 we conducted a study to determine the citrus fruit losses due to Blue-fronted Amazons in an orchard where its owner reported problems with this parrot species.

The study area was a citrus orchard of 120 ha located near Burruyacú (26°36'S, 64°45'W), an important commercial fruit-planting region of NW Argentina, 75km NE from San Miguel de Tucumán. This orchard includes orange, lemon, graperfruit, mandarin orange, and 'kinoto' (*Poncirus trifoliata*) trees. As the amazons consume principally the first three fruits mentioned (Chediack, 1991), we assessed only damage regarding these citrus species (about 80 ha.). During the study, traditional control methods (manual scaring, trapping and shooting) were only sporadic.

We visited the orchard a total of five times (with about monthly intervals) throughout the period in which the amazons feed in this area (from late May to late September; Chediak, 1991). Twenty-eight tree rows out of 202 were selected using random numbers. These rows were flagged and on each we randomly chose five trees, marking them individually for sampling. We started the survey sampling the trees along the first flagged row at the western boundary of the orchard and we progressed eastward on subsequent visits (matching the path of harvesting). Trees inspected on each opportunity were 60, 30, 19, 31, and 50, respectively. We examined the first 18 rows immediately after harvesting (first two visits), whereas the rest were sampled before being harvested.

Blue-fronted Amazons have a feeding behavior that is common to several psittacids that feed from trees: they trim a fruit with their beak, then they transfer the item to one foot and manipulate the fruit to bite out and chew several pieces until they drop it (Smith, 1972; Chediack, 1991). Therefore, we examined the ground beneath each sampled tree and counted those fruits that showed characteristic injuries caused by Blue-fronted Amazons (Fig. 1). Fruits fallen from causes different from parrot attack (due to drought, wind or bad harvesting techniques) were also recorded, but we did not account them for damage estimates. All fruits under sampled trees were removed to avoid counting them in subsequent opportunities.

Figure 1: Organge fruit showing the characteristic injury produced by a Blue-fronted Amazon.

The uneven distribution of citrus species within the orchard derived in small sample sizes that, in turn, resulted in unacceptably wide confidence intervals for damage on lemons in the first and fourth visit, for oranges in the second and third, and for grapefruits in all but the first visit. This was conveniently solved by pooling data from consecutive visits. Thus, we refer hereafter as sample A to those data collected in the first

Table. 1: Overall damage to citrus caused by Blue-fronted Amazons at the orchard studied.

Citrus fruit	Total fruits grown: Picked	Damaged by amazons	(% ± 95% C.I.)	Value of damage due to amazons $(US): Total	Per 250 trees (= 1ha)
Lemon	1.407.400	3.584	(0,3 ± 0,12)	33	4,60
Orange	2.250.000	45.782	(2,0 ± 0,55)	417	26,10
Grapefruit	205.200	25	(0,0 ± 0,00)	1	0,60
TOTAL	3.862.600	49.391	(1,3 ± 0,39)	451	

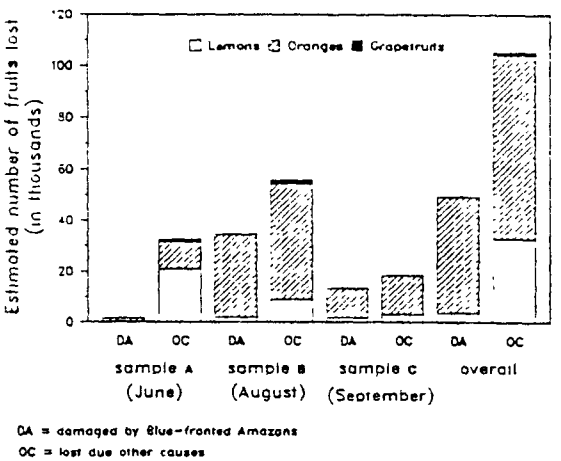

Figure 2: Variation of losses of citrus fruits at the orchard studied in relation to date

and second visit, and sample B to data from the third and fourth visit. Values obtained in these two samples correspond approximately to 10 June and 13 August, i e the intermediate point of time between each respective pair of visits The sample C refers to data from the fifth visit (22 September), it being a resample of the 50 trees included in the sample B This grouping method resulted in overall damage estimates being based on data from 30 76, and 32 different trees (lemon, orange and grapefruit, respectively)

Total losses per tree due to parrot attack and due to other causes were calculated for lemons and oranges by adding the respective average loss per tree for the sample A to the values obtained in B and C on the same tree For grapefruits we used the mea· of the sample A only, as 90% of that species had been picked by that date We estimated total quantities of fruits affected as the product of the overall mean loss per tree of each citrus species by the respective number of trees in the orchard

The parrot damage sustained by a citrus species is given as the number of fruit damaged expressed as a percentage of fruits grown for each species The owner of the orchard and other citrus growers supplied quantities of fruit grown and average net prices obtained

The total damage caused by Blue-fronted Amazons was slightly greater than 1% (Table 1) Damage was significantly higher in orange than in lemon or grapefruit trees (Mann-Whitney test; oranges vs. lemons: $Z = 3,38$, $P < 0,001$, oranges vs grapefruits· $z = 7,25$, $P < 0,001$). Damage varied considerably among sampling opportunities (Fig 2). Although Blue-fronted Amazons were in the vicinities since early May, noticeable damage to citrus fruits did not occur until late June Amazons continued to feed on fruit until October, by which time all the marketable produce had been picked (Chediack, 1991) Most of the damage (more than 70% damaged fruit) occurred between mid-July to mid-August

The monetary cost of the damage caused to citrus fruits by Blue-fronted Amazons was, on the most severely affected species, about $(US) 26 per ha (Table 1) Nonetheless, the loss ascribed to causes other than parrots (68% of total loss) was significantly higher than that produced by parrots (Two-tailed Paired Rank test; $Z = 7,45$, $n = 190$, $P < 0,001$) (Fig 2)

Citrus fruit losses due to Blue-fronted Amazons are very low even if traditional control methods are only sporadic. Indeed, the 2% damage recorded in oranges —the most affected species— is not economically important for the orchardist. Comparatively, the damage caused by amazons is much lower than the almost 9% produced by Rose-ringed Parakeets (*Psittacula krameri*) in citrus orchards in Pakistan (Shafi *et al.*, 1986).

Damage increased at a time that coincided with the low availability of wild seeds of a native tree, the "cebil colorado" (*Anadenanthera colubrina; Leguminosae*) A previous study provided some basis to think that, while these seeds are available, amazons prefer them to citrus fruits (Chediack and Martella, unpubl. data). Therefore, we suspect that the damage to fruit reflects the birds' shortage of natural food. This topic and the preference for oranges showed by Blue-fronted Amazons merit a more detailed study, because it may provide valuable clues for deciding on suitable orchard management techniques

Some minor sources of bias must be mentioned, such as a few cases in which amazons carried the fruit for consumption outside the orchard, or bit out pieces of some fruits without trimming them from the tree, or accidentally dropped a fruit before biting it. Also, some fallen fruits could have disappeared before being counted However, these circumstances were infrequent during field observations of the feeding behavior of Blue-fronted Amazons (Chediack, 1991). Therefore, values presented here should be considered to illustrate a reliable order of magnitude.

Concluding, we believe that in spite of what the citrus grower denounces, Blue-fronted Amazons seem not to be a serious problem for the orchard studied and presumably for most of citrus orchards that surround our study area. However, one must keep in mind that bird damage is seldom evenly distributed (some orchardists being adversely affected more than others). Therefore, additional information on a larger scale is urgently needed from this and other regions affected to revise the pest status in which this species has been classified until this day

ACKNOWLEDGMENTS

We thank C. Luque for making his property available and providing us the data on fruit picked, and C. Chediack for giving us the prices obtained for the fruit. We are also grateful for the field help of E Nadal, P. Hervás, A. Hervás, M.E. Alvarez and A Aquino. M. Nores, E.H. Bucher and three anonymous referees made valuable comments on the manuscript.

BIBLIOGRAPHY

Azpiroz, A. and J.S. Villalba-Macías, 1989. Exportaciones de Psittaciformes de la República Argentina (año 1987). TRAFFIC Sudamérica.

Bucher, E.H. and M.B. Martellá, 1988. Preliminary report on the current status of *Amazona aestiva* in the western Chaco, Argentina. Parrotletter 1:9-10.

CITES, 1991. Psittaciformes Quotas for Argentina. TRAFFIC Bulletin 12:22.

Chediack, A., 1991. Etoecología de la alimentación del loro hablador *Amazona aestiva* durante el período no reproductivo, en Burruyacú - Tucumán. Seminario (unedited). Fac. Cs. Nat. e Inst. M. Lillo (Univ. Nac. Tucumán).

Nores, M. and D. Yzurieta, In press. On the status of Argentina parrots. Proceedings of the 2nd International Meeting of the Parrot Specialist Group. Curitiba, Brazil.

Reynoso, H. and E.H. Bucher, 1989. Situación legal de la fauna silvestre en la República Argentina. Ambiente y Recursos Naturales 6:22-32.

Shafi, M.M., A.A. Khan and I. Hussain, 1986. Parakeet, *Psittacula krameri* (Scopoli), damage to citrus fruits in Punjab, Pakistan. Bombay Nat. Hist. Society. 83:438-444.

Smith, G.A., 1972. "Handedness" in parrots. Ibis 114:109-110.