

# PARROT CONSERVATION IN THE LESSER ANTILLES WITH SOME COMPARISON TO THE PUERTO RICAN EFFORTS

Colmore S. Christian

*Forestry & Wildlife Division, Botanical Gardens, Roseau, Dominica, West Indies*

Thomas E. Lacher, Jr

*Archbold Tropical Research Center, Clemson University, Clemson, SC 29634-1019, USA*

Michael P. Zamore

*Forestry & Wildlife Division, Botanical Gardens, Roseau, Dominica, West Indies*

Thomas D. Potts & G. Wesley Burnett

*Parks, Recreation & Tourism Management Department, Clemson University, Clemson, SC 29634-1005, USA*

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## Abstract

*There are four endemic species of Amazona parrots in the Lesser Antilles, namely the imperial or Sisserou parrot Amazona imperialis and the red-necked or Jaco parrot A. arausiaca of the Commonwealth of Dominica, the St Lucia parrot A. versicolor of St Lucia, and the St Vincent parrot A. guildingii of St Vincent and The Grenadines. Seven other endemic members of the same family, Psittacidae, have become extinct in the region in historical times. These four extant species are now all threatened by deforestation, predation, illegal hunting and collecting, and natural disasters. Measures for parrot conservation consist of environmental education, habitat protection, enforcement of appropriate legislation, and enhancement of wild breeding and captive breeding. These approaches are reviewed for each of the islands and compared with the relatively successful but much more expensive conservation measures adopted for the Puerto Rican parrot A. vittata in the Commonwealth of Puerto Rico. Recommendations are made for future conservation emphasis and research. Copyright © 1996 Published by Elsevier Science Ltd*

**Keywords:** imperial parrot *Amazona imperialis*, red-necked parrot *A. arausiaca*, St Lucia parrot *A. versicolor*, St Vincent parrot *A. guildingii*, environmental education, captive breeding.

Correspondence to: C. S. Christian; Tel.: (809) 44-82731 ext. 3415.

## INTRODUCTION

Although similar in many respects, the islands of the West Indies (Fig. 1) exhibit a variety of edaphic, climatic and topographic conditions which together influence and determine local species composition. The high level of endemism which is characteristic of most tropical island environments, particularly in terms of plants and invertebrates present in the rain forest zones, holds true for the Lesser Antilles. The avifauna constitutes the largest group of terrestrial vertebrates, and many species, particularly the parrots, are endemic to the region (Blume, 1968). Unfortunately, all the extant parrot species of the region are threatened with extinction (Snyder *et al.*, 1987; Evans, 1988).

This paper presents a brief overview of the status of Lesser Antillean *Amazona* species, highlights the factors responsible for their decline over the years, and examines parrot conservation efforts in the Lesser Antilles. Brief comparisons are made with the parrot conservation strategies used in Puerto Rico, and measures likely to enhance parrot conservation efforts in the Lesser Antilles are proposed.

## HISTORICAL AND PRESENT STATUS OF LESSER ANTILLEAN *AMAZONA* SPECIES

Four genera of the family Psittacidae have been known to occur in the West Indies. These are *Ara*, which is

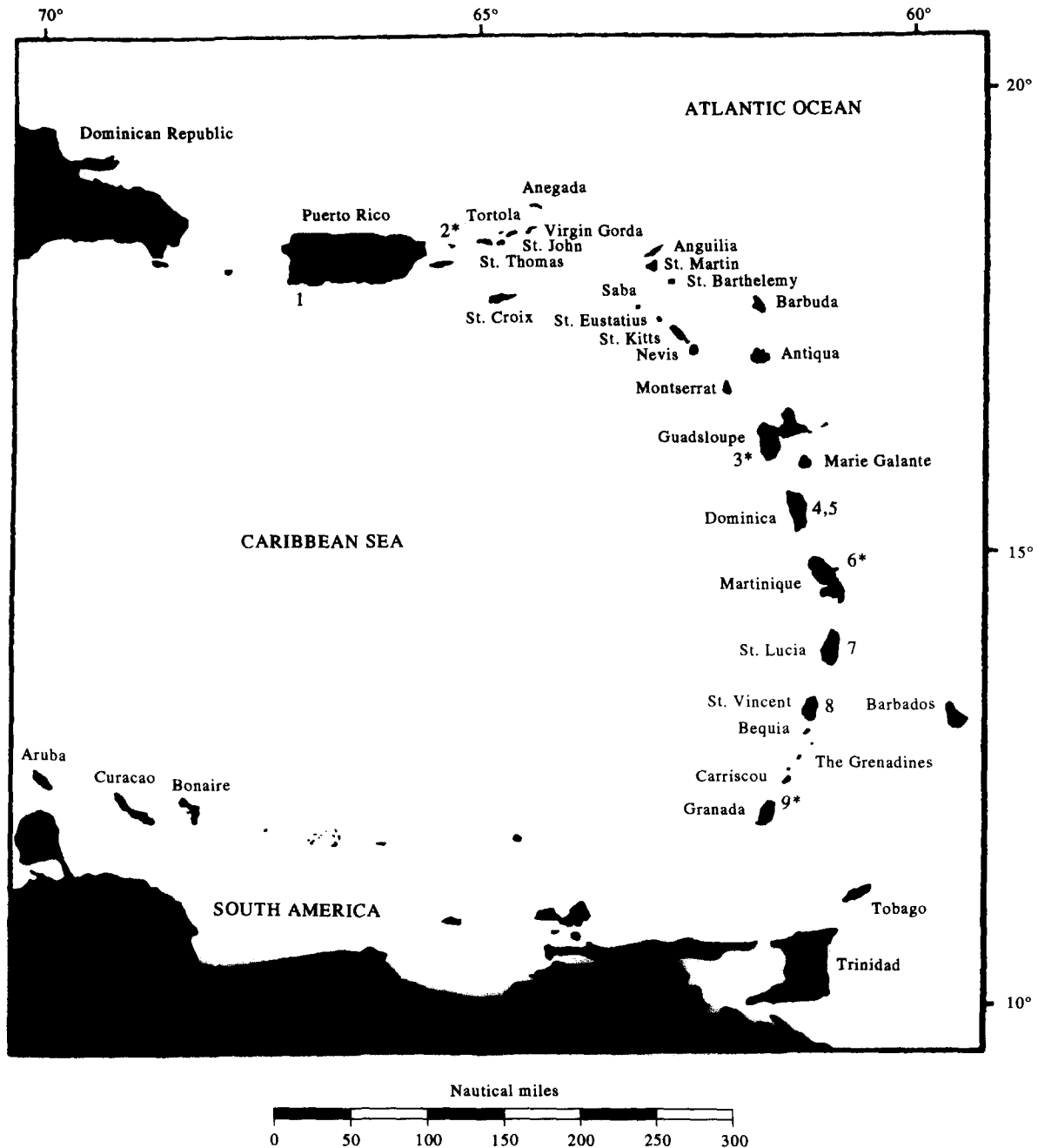


Fig. 1. Distribution of extinct and extant *Amazona* spp. in the study area. 1, Puerto Rican parrot *A.v. vittata*; 2, Culebra parrot *A.v. gracilipes*\*; 3, Guadeloupe parrot *A. violacea*\*; 4, imperial parrot *A. imperialis*; 5, red-necked parrot *A. arausiaca*; 6, Martinique parrot *A. martinica*\*; 7, St Lucia parrot *A. versicolor*; 8, St Vincent parrot *A. guildingii*; 9, unnamed\*; \*, Species extinct (adapted from ECNAMP, 1980; Evans, 1991; Wiley, 1991).

now extinct, *Aratinga*, and *Amazona* (Bond, 1971; Forshaw, 1973). Another genus, *Anodorhynchus*, which is also extinct, is reported to have possibly occurred on the island of Guadeloupe (Snyder *et al.*, 1987). Reports indicate that parrots were seen in most of the Caribbean islands by Columbus during his voyages to the region in the 15th and 16th centuries (Snyder *et al.*, 1987). About 14 species have become extinct since his first visit (Wiley, 1980, 1991).

The genus *Amazona* comprises 26 species and 52 subspecies (Kolar, 1972). Nine of the extant neotropical *Amazona* species are endemic to the West Indies

(Snyder *et al.*, 1987; Gnam, 1990), and extant species are confined to individual islands. The islands of Puerto Rico, Dominica, St Vincent (including the Grenadines) and St Lucia all have extant endemic parrots. The last three are oceanic islands in the Lesser Antilles, and are of similar size and economic status. Puerto Rico, situated in the Greater Antilles, is larger and has a stronger economic base.

The four Lesser Antillean parrot species are the imperial or Sisserou parrot *Amazona imperialis* and the red-necked or Jaco parrot *A. arausiaca* of Dominica, the St Lucia parrot *A. versicolor* of St Lucia, and the St

Vincent parrot *A. guildingii* of St Vincent. They are all over 40 cm long and are about 10 times as heavy as the Puerto Rican parrot *A. vittata*, which measures 26–33 cm long (Snyder *et al.*, 1987). The imperial parrot is reported to be the largest extant *Amazona* (Snyder *et al.*, 1987; Evans, 1988; Wille, 1991). Seven other endemic species of the parrot family are known to have occurred in the Lesser Antilles but they are now extinct. A subspecies of *A. vittata* is also extinct (Snyder *et al.*, 1987).

Evans (1991) estimated that there were only about 80 imperial parrots and 300 red-necked parrots in the wild, but Dominican resource managers are convinced that the present populations are closer to 300 and 1000 birds respectively (Christian *et al.*, 1994; Forestry & Wildlife Division (FWD), pers. comm.). The St Lucia parrot population is currently estimated at 325 birds (Donald Anthony, pers. comm.), up from 300 in 1990 (Wille, 1991). The St Vincent parrot population is estimated at 450 individuals (Calvin Nichols, pers. comm.), reflecting an increase of 29 over 1982 estimates (Lambert, 1983). The wild population of the Puerto Rican parrot has been <60 over the last two decades, and reached a precariously small number of about 13 birds in 1975 (Snyder *et al.*, 1987). It was again reduced from 47 to 23 after Hurricane Hugo of 1989, but current estimates put the wild and captive populations at 41 and 56 respectively (Vilella & Arnizaut, 1994; James Wiley, pers. comm.).

#### CAUSES OF DECLINE IN PARROT POPULATIONS

Land-use practices in small island-settings in the Caribbean, coupled with man's attitude towards wildlife, are two important factors which affect wildlife resources. The decline in population and the current plight of the region's parrots can be attributed to five main factors: deforestation, predation, hunting, nest robbing, and natural disasters.

Clearing of forests for agriculture, charcoal, and lumber has contributed to the loss of parrot habitat throughout the West Indies (Johnson, 1988). Lesser Antillean amazons nest high above ground level in cavities in mature trees. Gommier *Dacryodes excelsa*, bois diable *Licania ternatensis*, and chataignier *Sloanea* spp. are the parrots' favorite nesting and feeding trees, but are among those species most frequently destroyed by humans. Thus, impacts on the parrots resulting from habitat alteration include loss of nesting cavities, food, and shelter (Wiley, 1991; personal observations). The tendency to use exotic tree species for reforestation programs, in the case of St Lucia for example, has further reduced the amount of suitable habitat areas (King, 1981; Jeggo, 1986). Some islands have experienced less natural vegetation loss than others. In Dominica for example, Shanks and Putney (1979) estimated that about 69% of the island was then under some type of natural vegetation. The percentage of

land still under natural vegetation on St Lucia and St Vincent is less.

Field observations suggest that predation is most probably one of the factors responsible for limiting the population growth of the region's parrots. Nest predators of both Dominican parrots include the opossum *Didelphis marsupialis insularis*, boa constrictor *Constrictor constrictor*, broad-winged hawk *Buteo platypterus*, pearly-eyed and scaly-breasted thrashers *Margarops fuscatus* and *M. fuscus* (Evans, 1988; Zamore, no date). The opossum and the black rat *Rattus rattus* have been known to prey on St Vincent parrot eggs and chicks (Nichols, 1980a), whereas the broad-winged hawk preys on chicks (Laidler, 1977).

Hunting has also negatively affected the region's parrot population, though this is no longer a major threat (Lambert, 1983; Butler, 1988, Cuthbert Julien, pers. comm.). However, the practices of 'nest robbing' and 'wing shooting' to supply the local and international bird trade have not been totally eliminated (King, 1981; Lambert, 1983). Nest robbing often involves either cutting into the nest cavity or cutting down the nest tree or tree limb in order to get at chicks. This has had devastating effects on the parrots through the loss of potential new members and wild breeding stock, as well as the destruction of nesting cavities (Snyder *et al.*, 1987).

Wing shooting has probably had even more of a negative impact on the region's parrots during the last 20 years. The practice involves an attempt to injure the wings of adult birds, but often results in the accidental death of several parrots for every live one captured. It has a very detrimental effect on the overall productivity and stability of the population, especially for such long-lived species.

The availability of nest sites and food supply have been further negatively affected by natural disasters such as hurricanes and volcanic eruptions (Wiley & Wunderle, 1993). A few days after the passage of Hurricane David of 1979, Dominica's FWD received reports indicating that an imperial parrot had been caught by villagers without too much difficulty, largely because the bird was weak and helpless through starvation. Parrots normally feed in the canopy of rain and montane forest trees. However, some were seen feeding on shoots of small trees only 3–4 m above ground level in the aftermath of the hurricane. On St Lucia, the after-effects of Hurricane Allen of 1980 were thought responsible for the lack of population increase in 1982 (Jeggo, 1986). The volcanic eruption on St Vincent in 1979, as well as previous eruptions, similarly affected the endemic parrots, both directly and indirectly (Nichols, 1980a; Lambert, 1983).

#### PARROT CONSERVATION EFFORTS

Overall, there are few differences between the parrot conservation activities of St Lucia, St Vincent, and

Dominica. The FWD in each island is responsible for wildlife management. These Divisions are all constrained by a lack of resources, inadequate supporting legislation, and, in some cases, the political support necessary for effective wildlife management (Christian, 1991). Basically, parrot conservation in the Lesser Antilles primarily consists of habitat protection, law enforcement, and a high level of environmental education.

### Environmental education

During the last 15 years St Lucia, St Vincent, and Dominica have embarked on an intensive island-wide environmental education program. All three islands have adopted a similar approach, utilizing the same media, trying similar techniques, and concentrating mainly on elementary and secondary schools, but also on hunters, community groups, and farmers (Butler, 1988, 1989; Christian, 1991; Christian *et al.*, 1994).

Forestry and wildlife officials on St Vincent and Dominica presently consider environmental education and protection of habitat to be the most important activity for sound parrot conservation (Calvin Nichols, pers. comm.; Adolphus Christian, pers. comm.). From St Lucia's perspective the protection of parrot habitat is more critical than environmental education at this time (Donald Anthony, pers. comm.). Natural resource managers on St Vincent view the low level of environmental awareness among nationals as being the factor which has contributed most towards the decline of the parrots over the last 10 years. However, their counterparts on St Lucia and Dominica think that the loss of critical habitat has had the greatest negative impact (Donald Anthony, pers. comm.; Adolphus Christian, pers. comm.; Calvin Nichols, pers. comm.).

Indications are that a large percentage of the population on all three islands has been reached through environmental education programs. Generally, the public has been extremely receptive to the information presented (Paul Butler, pers. comm.). In Dominica for example, a total of 94.2% ( $n = 797$ ) of respondents to a questionnaire survey believed that it was either 'important' (26.2%) or 'very important' (67.9%) for government to spend time and money on parrot conservation

efforts (Butler, 1989). A similar survey on St Vincent revealed that 93.5% ( $n = 743$ ) of respondents supported such government efforts, 80.2% considered the issue to be 'very important' and 13.3% indicated that it was 'important' (Butler, 1988).

To a large extent, these islands depend on the same extra-regional sources for assistance in support of their conservation programs: BirdLife International (formerly International Council for Bird Preservation (ICBP)), the RARE Center for Tropical Bird Conservation (RARE), and the World Wide Fund for Nature (WWF). Some local business establishments and individuals have also contributed financially to the programs.

### Habitat protection

St Lucia has set aside c.15,521 ha as protected watersheds, reserves, and parks (Johnson, 1988). This area constitutes about 25% of the island's land area, and includes c.80% of all known parrot habitat (Donald Anthony, pers. comm.). An estimated 70% of Dominica's known parrot habitat areas are encompassed within the island's existing national parks and forest reserves system (Adolphus Christian, pers. comm.), which covers approximately 21% (16,085 ha) of the island (Shanks & Putney, 1979). St Vincent authorities have been able to give legal protection to about 60% of known parrot habitat areas (Calvin Nichols, pers. comm.) (Table 1). In contrast, Synder *et al.* (1987) citing other sources, reports that by 1912 Puerto Rico had already lost 99% of its original forests, and some level of human disturbance had occurred in the remaining areas.

Dominica is in the process of developing the Morne Diablotin National Park in one of the island's primary parrot habitats, to protect its two endemic species. The park will complement other conservation initiatives and support ecotourism development on the island. All the islands in the Lesser Antilles are trying to demonstrate and promote linkages between parrot conservation and socioeconomic development. Ecotourism is seen as one possible strategy for achieving this goal.

### Legislation

In theory the parrots of the Lesser Antilles have been protected for over half a century. The Dominican

**Table 1. Summary of major parrot conservation activities in the Lesser Antilles**

(Source: based on data supplied by local forestry and wildlife personnel, namely Donald Anthony of St Lucia, Adolphus Christian of Dominica, and Calvin Nichols of St Vincent).

| Country    | % habitat protected <sup>a</sup> | Public awareness <sup>b</sup> | Parks & reserves established | Field research <sup>c</sup> | Captive breeding program |                | Management/or recovery plan | Regular field patrols |
|------------|----------------------------------|-------------------------------|------------------------------|-----------------------------|--------------------------|----------------|-----------------------------|-----------------------|
|            |                                  |                               |                              |                             | <i>In-situ</i>           | <i>Ex-situ</i> |                             |                       |
| Dominica   | 70                               | Yes                           | Yes                          | Yes                         | No                       | Yes            | No                          | Yes                   |
| St Lucia   | 80                               | Yes                           | Yes                          | Yes                         | Yes                      | Yes            | No                          | Yes                   |
| St Vincent | 60                               | Yes                           | Yes                          | Yes                         | Yes                      | Yes            | No                          | Yes                   |

<sup>a</sup>All on public lands. Some prime, unprotected habitat areas are on private lands.

<sup>b</sup>One of the primary activities.

<sup>c</sup>To a limited extent. Foreigners are more active in this area than nationals.

parrots, for example, have been legally protected under the Wild Birds Protection Ordinance since 1914 (Government of Dominica, 1963). The two species continued to receive protection under the Forestry and Wildlife Act of 1976, which replaced the Wild Birds Protection Ordinance (Government of Dominica, 1976). The US\$92.59 fine and/or imprisonment for up to 3 months provided for under the Act has since been increased to US\$1850 and three months' imprisonment under the Forestry and Wildlife (Amendment) Act of 1988 (Government of Dominica, 1988). St Lucia's revised wildlife legislation provides for similar maximum fines for offenses related to its endemic parrot (Butler, 1980).

The St Vincent parrot has been protected since 1901 under the Bird and Fish Protection Ordinance, "...but this proved little deterrent, and up to the mid-1970s they continued to be shot..." (Butler, 1988), most likely because of poor law enforcement and minimal penalties. The 1974 amendment of the island's Bird and Fish Protection Act (Cap. 14, 1901) provided for increased maximum fines of US\$92.59 for first offenses and US\$185.19 for subsequent offenses (Lauchsche, 1986). In 1987, when the wildlife sections of that Act were repealed, the Wildlife Protection Act imposed increased penalties of a fine (US\$741) or imprisonment (six months) (Butler, 1988).

We agree with Lauchsche (1986) who wrote "...these penalties are far too low because one bird may bring thousands of dollars (over US\$50,000 to the international trafficker) on the illegal international market".

### Parrots in captivity

Individuals of all four extant Lesser Antillean parrots are known to be held in captivity (Table 2). Some are held illegally and others to aid long-term species conservation. The total number of captive *A. guildingii* is equivalent to 35.1% of the wild St Vincent population. The captive parrot population of Puerto Rico in recent years has actually been larger than the wild population (Fig. 2). Unlike Dominica, both St Vincent and St

Lucia have attempted to develop locally based captive breeding programs (Butler, 1980, 1992; Jeggo, 1980, 1986). An International Breeding Consortium for St Vincent Parrots (IBCSP), a joint effort between Jersey Wildlife Preservation Trust (JWPT) and the Government of St Vincent, has also been established at the United Kingdom-based JWPT facility. With the assistance of RARE, WWF, and the Convention on International Trade in Endangered Species (CITES) secretariat, the Government of St Vincent was able to re-establish sovereignty over several St Vincent parrots which had been held illegally overseas. Birds recovered have been incorporated into the international breeding program (Calvin Nichols, pers. comm.).

Birds kept overseas serve as an 'insurance' against possible total loss of local populations. Furthermore, captive birds help to maintain genetic stock and may be used for restocking island populations. Another consideration is the fact that some of the factors which may limit successful reproduction in the wild can be controlled or eliminated in captivity, thus facilitating successful reproduction.

The first captive breeding success of a Lesser Antillean amazon was with the St Vincent parrot at the Houston Zoological Gardens in Texas in 1972 (Berry, 1980; King, 1981). Since then, similar successes have occurred at a Barbados-based facility in 1976 (Laidler, 1977), at JWPT in 1979 (Jeggo, 1980), and on St Vincent for the first time in 1988 (Butler, 1992). St Lucia parrots which are "...on a Government recognized breeding loan..." at JWPT bred in captivity in 1982 for the first time (Butler, 1992). In 1989 two offspring from the JWPT captive breeding effort were returned to St Lucia and kept in an aviary for environmental education purposes (Wille, 1991). There has been no report of any captive breeding success of Dominican parrots. However, Nichols (1980b) reported a case of interbreeding between a red-necked amazon and a yellow-crowned parrot *A. ochrocephala* in 1970 on Dominica. The offspring of that effort subsequently bred with

**Table 2. Some basic data about Puerto Rico and the Lesser Antilles**

(Sources: based on data from CIA, 1991; Anon., 1991; Wiley, 1991; Adolphus Christian, pers. comm.; Donald Anthony, pers. comm.; Calvin Nichols, pers. comm.).

| Country     | Area (km <sup>2</sup> ) | Human population in 000s (1990) | GDP in US\$M      | Parrot species      | Parrot population (1994) | Govt-approved parrot export (1975-1991) |                | Known parrots in captivity (1991) |                |
|-------------|-------------------------|---------------------------------|-------------------|---------------------|--------------------------|-----------------------------------------|----------------|-----------------------------------|----------------|
|             |                         |                                 |                   |                     |                          | Chicks                                  | Adults         | Locally                           | Other          |
| Dominica    | 790                     | 86                              | 31.5              | Imperial Red-necked | 300<br>1000              | 0 <sup>a</sup>                          | 4 <sup>a</sup> | 9 <sup>a</sup>                    | 5 <sup>a</sup> |
| St Lucia    | 616                     | 151                             | 55.9              | St Lucia            | 325 <sup>c</sup>         | 5 <sup>d</sup>                          | 2 <sup>d</sup> | 3                                 | 21             |
| St Vincent  | 388                     | 114                             | 37.8              | St Vincent          | 450 <sup>e</sup>         | 0                                       | 0              | 78                                | 80             |
| Puerto Rico | 9104                    | 3368                            | 21.1 <sup>b</sup> | Puerto Rican        | 41                       | 0                                       | 0              | 56                                | 0              |

<sup>a</sup> Total for both Dominican species.

<sup>b</sup> Gross National Product (GNP) in US\$billions.

<sup>c</sup> Exported during 1975-1979 to Texas, USA.

<sup>d</sup> Exported during 1975-1979 to Jersey Wildlife Preservation Trust (JWPT) in the UK.

<sup>e</sup> 1991 estimates.

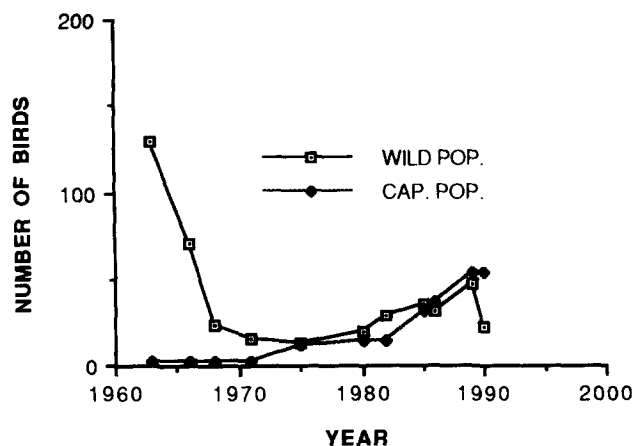


Fig. 2. Trends of captive and wild populations of the Puerto Rican parrot. Note that since the mid-1980s the captive stock has been approximately equal to or slightly greater than the wild population. The most recent estimates (1994) for wild (41) and captive (56) parrots fit this trend (adapted from Christian, 1991).

another red-necked parrot. This type of experimentation should be strongly discouraged.

One might argue that given the vulnerability of islands to the devastating effects of natural disasters, it is unwise to invest in locally based captive breeding projects. There is some merit to this argument. However, while we do not advocate captive breeding, we recognize that such programs could provide opportunities for collaborative and direct involvement of local natural resource managers, as well as help to instill pride in and foster support for parrot conservation efforts at the local level.

#### Artificial nest boxes

For several years researchers on Puerto Rico have facilitated parrot nesting activities through the use of artificial nest boxes in the wild. Thus, based on the assumption that the shortage of suitable nest sites was a limiting factor for parrot populations, and influenced by the successful experiences on Puerto Rico, resource managers in the Lesser Antilles provided artificial nest boxes in suitable local habitats. However, thrashers utilized nest boxes tried on St Vincent (Lambert, 1983), and the idea was abandoned on Dominica in 1980 when competitors and predators such as pearly-eyed thrashers, opossums, and boas began occupying the boxes. On St Lucia, the results were similarly discouraging (Snyder *et al.*, 1987; James Wiley, pers. comm.).

#### DISCUSSION

Island species are especially vulnerable to pressures and extinction (Raffaele, 1989; Wiley, 1991). One reason for this is that island species have limited and restricted ranges and do not have peripheral areas for escape from stressful forces. Also, having developed in isolation in many cases, these species normally do not have

the means to defend themselves from humans and other predators (Raffaele, 1989). Another consideration is the fact that there are no sources of new colonists. Thus, in the case of many avian species in the Lesser Antilles the 'population' is the 'species'. This high level of vulnerability of island species, particularly birds, is evidenced by the fact that *c.*90% of the bird species which have become extinct during the last four centuries have been island inhabitants (Snyder *et al.*, 1987; Johnson, 1988; Raffaele, 1989).

#### Captive breeding

To some, captive breeding is the best guarantee against the possible extinction of some parrot species. Noegel (1980), a strong advocate of this viewpoint, in reference to the Caribbean islands wrote "...it has become increasingly evident that the only sure way to save many species of amazons will be through captive breeding programs. We can no longer permit ourselves to indulge in romantic dreams of large flocks of parrots flying free in their small native habitats". However, others oppose captive breeding (Berry, 1980; Christian, 1991), citing the depletion of wild populations, high costs involved in captive breeding, and the difficulty of producing disease-free, behaviorally well-adapted individuals capable of living in the wild (Derrickson & Snyder, 1992). Another important consideration in the case of the Lesser Antilles is the fact that the islands do not have either the expertise or financial resources to sustain an intensive, long-term *in-situ* captive breeding program. *Ex-situ* breeding programs can address the issues of costs and expertise, but cannot successfully address all other related issues. Furthermore, birds occasionally perish while en route to overseas breeding facilities (Snyder *et al.*, 1987).

We endorse this latter view, especially now, when the population of endemic parrots appears to be stable and local conservation strategies such as environmental education and habitat protection seem to be effective.

#### Trade

The international bird trade poses a serious threat to avifauna everywhere (Snyder *et al.*, 1987; Gnam, 1990). Ruthless traffickers and illegal collectors demonstrate total disregard for national laws and regulations pertaining to wildlife, thus creating additional challenges for parrot conservation in small developing island-nations. For example, although the capture and export of Dominican parrots have been illegal for about 81 years, in 1989 the island's FWD was informed that an imperial parrot was secretly being offered for sale in North America (Christian, 1991). We suspect that other birds have been taken out of the region under similar circumstances.

Given the widespread trade in parrots, some species of which are endangered, the need for international action and cooperation to control this activity seems obvious. In order to cope effectively with the problem,

both importing and exporting countries will have to be more vigilant and impose stricter controls. Many countries have already taken action in this direction, and the ratification of CITES by more than 100 countries to date indicates a willingness to act (Traffic-USA, 1991).

St Lucia and St Vincent are signatories to CITES and have officially declared their endemic parrots as the national bird (Wille, 1991; Butler, 1992). Dominica has neither ratified CITES nor officially declared either of its parrots as the national bird, though the imperial parrot is regarded at all levels in the society as the island's national bird and appears on the island's flag and official seal. Environmental education is one of the important methods being used to reduce this illegal hunting and trading in wildlife in the Lesser Antilles.

Penalties for illegal hunting and trading in wildlife throughout the region will serve as deterrents only when the financial benefits to be derived from the illegal activities are considerably lower than possible penalties (Christian, 1993).

### Research

Few detailed ecological and biological studies of the islands' parrots have been undertaken, and the majority of the studies completed to date were conducted by foreigners. As illustrated by the islands' experiences with artificial nest boxes, research is necessary for a thorough understanding of the ecological and behavioral characteristics of the desired species, and of relevant predators and competitors, before introducing management intervention strategies. Investigations of such characteristics are currently in progress on Dominica and St Lucia. Whenever feasible local resource managers should be invited to participate actively in research activities. Possible areas for future collaborative research in the Lesser Antilles include (a) extent of damage to agricultural crops; (b) estimation of predation and competition levels; and (c) species' reproductive biology (e.g. habitat requirements and nest success).

### Conservation

Although all the Lesser Antillean islands have set aside thousands of hectares of prime parrot habitat as national parks and reserves, and have embarked on island-wide environmental education programs, the region's parrots are not completely out of danger. Continued enforcement of wildlife legislation, within economic constraints, is therefore necessary to complement other conservation measures.

The personal involvement of top government officials in parrot conservation efforts in the region has definitely helped to instill pride among nationals for these unique birds. St Lucia's Prime Minister, the Hon. John Crompton, headed the delegation which brought back the first captive-bred St Lucia parrots from the United Kingdom (Wille, 1991). Sir Clarence Seignoret, President (retired) of Dominica, has also supported

local conservation measures and the FWD's public awareness campaign (Christian, 1991, Christian *et al.*, 1994).

Recent evidence indicates that the strategies adopted by the islands are producing results. The parrot populations in all three islands have either remained stable or have shown signs of increase over the last decade (Wille, 1991; Evans, 1991; Butler, 1992). In fact, red-necked parrots are now being seen at low elevations, and frequently feed on agricultural crops with small farmers very often experiencing substantial losses. Farmers do not receive any compensation for crop losses, and so the possibility of some farmers adopting illegal measures to protect their crops does exist. If the current population trends continue it is likely that major conflicts between the parrots and farmers may develop in the future.

### Parrot conservation in Puerto Rico

Puerto Rico's experiences in parrot conservation are different from those of her neighbors. A reversal of the declining trend in the population of *A. vittata* has been realized in the last 20 years, largely because of an intensive, collaborative initiative launched in 1968 by the US Fish and Wildlife Service, US Forest Service, and Puerto Rico's Department of Natural Resources (Snyder *et al.*, 1987; Wiley, 1991; Vilella & Arnizaut, 1994). Elements of the present conservation and management efforts include the provision of specially designed nest boxes to prevent and/or reduce predation and competition, the improvement and manipulation of natural nest cavities, expansion of the captive breeding program, control of predation and competition, continued ecological research, monitoring all known parrot nests in the wild particularly during the breeding season, and the eventual reintroduction of parrots to traditional nesting areas (Wiley, 1980, 1991; Johnson, 1988; Vilella & Arnizaut, 1994). Apparently, Puerto Rico has not proportionately allocated as much resources to environmental education as those apportioned in the Lesser Antilles.

Some creative, intensive management approaches have been tried in Puerto Rico. For example, active parrot nests have been protected from rats through the use of rat poison and metal guards placed around the stems of nest trees. The temporary sealing of parrot nests with mesh at the end of each breeding season, to prevent the establishment of honey bee *Apis mellifera* hives, is regularly adopted. A policy of protecting parrot eggs and chicks as much as possible has also been pursued. Unlike the locally based St Lucian captive breeding attempt which has not produced any chicks to date, over 80 birds have been bred in captivity at the Puerto Rican facility (Wiley, 1980; Snyder *et al.*, 1987; James Wiley, pers. comm.).

These conservation efforts have produced encouraging results to date, but such intensive management practices are costly. During the 17-year period prior to

1985 approximately US\$2 million, over \$100,000 a year, were spent trying to save the Puerto Rican parrot (Friedman, 1985).

It should be emphasized that prevailing local circumstances influenced and, to some degree, dictated the parrot conservation strategies adopted. In the case of the Lesser Antilles, limited resources led them to adopt a relatively simple, low budget, but high potential impact approach. On the other hand, whereas the small, rapidly declining population of parrots in the wild was an important consideration, Puerto Rico's approach was no doubt partially influenced by her potential ability to access resources from the USA, some of which was indirectly mandated by Federal law. Thus, expensive species conservation programs such as those adopted in Puerto Rico are "...not feasible for species on other [Caribbean] islands" (Wiley, 1991). Both approaches have, to a large extent, produced the desired results. Each set of strategies has its strengths and weakness, and overall may be complementary for successful long-term parrot conservation programs, particularly in the context of small, island populations. The selected mix of strategies should be influenced by prevailing circumstances.

## CONCLUSIONS

Comprehensive, standardized management or recovery plans for the endemic parrots are needed for each of the Lesser Antillean islands. Immediate measures should be taken to incorporate the remaining parrot habitat areas, currently unprotected, into the islands' parks and protected areas network. Failure to act now will only result in further habitat loss and increased pressures on the parrots.

Given the region's experiences and resources we believe that parrot conservation in the Lesser Antilles will be further enhanced through the implementation of standardized annual survey on all three islands to facilitate comparisons. Continuous monitoring of parrot damage to agricultural crops is recommended and strategies developed for minimizing this problem in the future.

The export of live parrots from the region must be discontinued and breeding research should be done *in-situ*, utilizing birds already in captivity. A survey of the genetic variability of all captive birds in the Lesser Antilles should be undertaken, in order to establish a viable breeding program. This does not preclude the continuation of current *ex-situ* captive research. Additionally, the authorities should insist that local resource personnel must be active collaborators in any research in the region, thus helping to improve the skills and knowledge of nationals. Because most of the poaching which currently occurs in the region is to satisfy the international bird and pet trades, it is recommended that penalties be significantly increased to serve as deterrents.

The strategies used in the Lesser Antilles may provide a model for the management of rare species on other small, developing, tropical island-nations, where similar socioeconomic, educational levels, and landscape characteristics prevail. However, to accomplish the desired results of a stable species population at minimal costs, management intervention measures must be initiated before the population concerned reaches a critically low level.

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