

## Historical Perspectives

# Feral Parrots in the Continental United States and United Kingdom: Past, Present, and Future

Christopher J. Butler, PhD

### Introduction

In many cities across the United States (USA), from Boston to Los Angeles and Seattle to Miami, free-flying parrots and parakeets can now be seen. Likewise, feral parakeets are now present in England in the Greater London area, on the Isle of Thanet in Kent, and in select cities along the south coast. In some areas, these feral parrots have been present for decades, whereas in others, parrots have only been present for a few years. This paper summarizes the historical changes in number and composition of psittacine birds in the USA and United Kingdom (UK).

### Native parrot species

The USA was formerly home to 2 native parrot species—the Carolina parakeet (*Conuropsis carolinensis*) and the thick-billed parrot (*Rhynchopsitta pachyrhyncha*)—both of which disappeared from the USA during the 20th century.

Carolina parakeets were formerly found throughout the southeastern USA, north to New York and west to North Dakota, Colorado, and Texas.<sup>1,2</sup> Carolina parakeets fed on a variety of fruits, buds, and seeds and were not averse to sampling crops, a fact that did not endear them to farmers.<sup>2</sup> In addition, flocks tended not to flee when fired upon, particularly if an individual in the flock called in distress.<sup>2</sup> Consequently, hunting or persecution probably had a substantial impact on the population. Individuals also were collected for the pet trade, which may have hastened their decline.<sup>2</sup> By the mid-19th century, Carolina parakeets were scarce throughout much of their range and were considered to be abundant only in Florida.<sup>2</sup>

By the early 20th century, Carolina parakeets were nearly extinct, but reliable sightings were reported

from Florida in 1904 and Missouri in 1905. A specimen also was taken in Kansas in 1904.<sup>1</sup> The last known Carolina parakeets were kept at the Cincinnati Zoo (where they had been kept for 32 years), with “Lady Jane” dying during the summer of 1917 and her mate “Incas” on February 21, 1918,<sup>1</sup> although unconfirmed sightings of Carolina parakeets were reported in South Carolina until 1936,<sup>1</sup> and at least 1 author suggests that they may have survived until the late 1930s in Florida.<sup>2</sup> Thereafter, there have been no credible reports of this species, and it is believed to be extinct. The disappearance of the Carolina parakeet is presumed to be due to a combination of overhunting, habitat destruction, and disease.<sup>2</sup>

Thick-billed parrots were formerly present in southeastern Arizona and southwestern New Mexico, extending south through the Sierra Madre Occidental of Mexico to northwestern Durango.<sup>1,3</sup> Unlike the Carolina parakeet, the thick-billed parrot fed primarily on pine seeds, although it also ate acorns.<sup>4</sup> Heavy hunting pressure is blamed for the decline of this species in the USA by the end of the 19th century. During the early 20th century, thick-billed parrots were still present in reasonable numbers in southern Arizona and New Mexico. However, hunting pressure on these birds continued to be intense.<sup>4</sup> Of 300 parrots seen in Pinery Canyon, Arizona, during 1917–18, fully one third were shot.<sup>4</sup>

By the 1930s, the population(s) of thick-billed parrots in the USA had declined considerably. The last credible sighting of thick-billed parrots in Arizona was in 1938 at the Chiricahua National Monument.<sup>4</sup> A number of other species vanished from the Chiricahua region of southeastern Arizona at approximately the same time, including elk (*Cervus elaphus*), pronghorn (*Antilocapra americana*), bighorn sheep (*Ovis canadensis*), and wild turkey (*Meleagris gallopavo*).<sup>4</sup> The last reliable sighting of thick-billed parrots in New Mexico was in 1964.<sup>4</sup>

A program to reestablish thick-billed parrots in the USA began in 1986. A total of 88 individuals (most

---

From University of the South, SPO, 735 University Avenue, Seawane, TN 37383, USA.

of whom were recovered from bird smugglers) were released into the Chiricahua Mountains of southern Arizona between 1986 and 1993.<sup>5</sup> During the summer of 1988, a pair successfully fledged 2 offspring.<sup>5</sup> Although 3 pairs attempted to breed the following year and another nest was attempted during the summer of 1993, all of these attempts were unsuccessful.<sup>5</sup> The lack of consistent reproduction, coupled with a relatively high rate of raptor predation, prohibited the formation of a self-sustaining wild population of thick-billed parrots in the USA. It is unknown if an individual bird seen in the mountains of Sierra County, New Mexico, during 2003 was a wild bird (thick-billed parrots still breed within 80 km of the US border), a survivor from the experimental release in Arizona, or an escapee.<sup>6</sup>

### Feral parrot populations in the 20th century

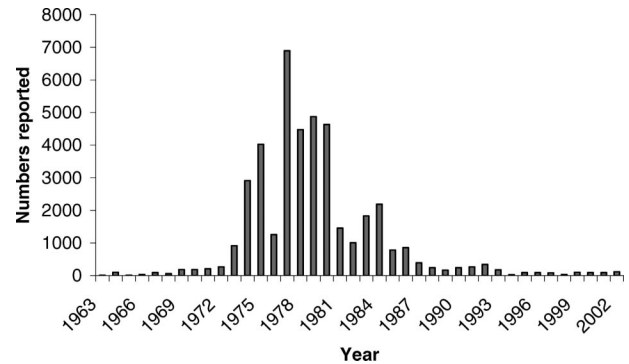
Although Carolina parakeets had declined (and perhaps vanished altogether) by the early 1920s, there were rumors of a “flock” of parakeets present around the edge of the Everglades.<sup>7</sup> A specimen collected in 1924 was identified as a green conure (*Aratinga holochlora*).<sup>7</sup> Although this bird was believed to be part of a flock living in the wild for several years, it was later reported that the bird was a local escapee from 5 miles away.<sup>8</sup> Rumors of a “flock” of parakeets near the Everglades were never substantiated.

During the 1920s and 1930s, feral populations of parakeets were reported in southern Florida and southern Texas, although breeding was not confirmed. In Texas, a population of green-cheeked Amazon parrots (*Amazona viridigenalis*) persisted in La Feria (Cameron County) from the 1920s into the early 1930s.<sup>9</sup> Rose-ringed parakeets (*Psittacula krameri*) were reported in Florida during the 1930s.<sup>10</sup> Feral populations of breeding parrots were established in southern California, southern Texas, and Florida in the 1950s.

### Florida

Budgerigars (*Melopsittacus undulatus*) were released along the Gulf Coast of west-central Florida sometime after 1956. Breeding was reported in 1963,<sup>10</sup> and by 1977, budgerigars were widespread along Florida’s Gulf Coast, ranging from Fort Myers (Lee County) in the south to Hudson (Pasco County) in the north.<sup>11</sup> The population continued to increase rapidly, and in 1978 a single roost contained an estimated 6000–8000 birds.<sup>11</sup> Thereafter, the population underwent a rapid decline, as illustrated by Christmas Bird Count data (Fig 1).

During the 1960s and 1970s, breeding popula-



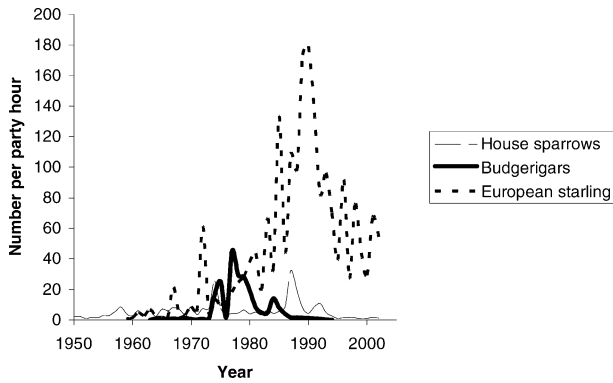
**Figure 1.** Christmas Bird Counts of budgerigars in Florida from 1963 to 2002.

tions of rose-ringed parakeets, nanday conures (*Nandayus nenday*), and green-cheeked Amazon parrots also were reported in Florida.<sup>11,12</sup> “Canary-winged parakeets” were first noted in southern Florida in the late 1960s.<sup>13</sup> Their numbers continued to increase during the 1970s and a 1972 count of a roost at Coconut Grove recorded nearly 700 individuals.<sup>13</sup> “Canary-winged parakeets” are now recognized as 2 separate species; the white-winged parakeet (*Brotogeris versicolurus*) and the yellow-chevrons parakeet (*Brotogeris chiriri*).<sup>14</sup>

From 1986 to 1991, a concerted effort was made to record the distributions of all birds breeding in Florida for the Breeding Bird Atlas (BBA).<sup>15</sup> A total of 17 species of breeding parrots was found, including the red-masked conure (*Aratinga erythrogenys*) and blue-fronted Amazon (*Amazona aestiva*). First reported in Florida in 1985,<sup>10</sup> breeding mitred conures (*Aratinga mitrata*) were confirmed in Miami (Dade County) during the BBA.<sup>14</sup> The first published report of feral chestnut-fronted macaws (*Ara severa*) in Florida was during 1981.<sup>10</sup> During the 1986–91 BBA, breeding was confirmed in chestnut-fronted macaws in Dade County, where they used old pileated woodpecker (*Dryocopus pileatus*) cavities.<sup>15</sup>

Only 9 parrot species were found breeding in more than 1 atlas block (an atlas block was 7.5' × 7.5') during the BBA.<sup>15</sup> Breeding rose-ringed parakeets were confirmed in multiple counties in Florida including Citrus, Pinellas, Collier, and Dade counties.<sup>15</sup> Likewise, the breeding range of nanday conures had expanded to include Bay, St John’s, Pinellas, and Dade counties.<sup>15</sup> By 1994, 1 author considered the Pinellas County population of nanday conures to be sufficiently large enough to be an established (ie, self-sustaining) population.<sup>10</sup>

In contrast, several parrot species continued to have restricted breeding ranges in Florida. For instance, it was estimated that there were 50–75 green-cheeked Amazon parrots in southeastern



**Figure 2.** The numbers of budgerigars, house sparrows, and common starlings recorded per party hour during the Christmas Bird Counts in St. Petersburg, FL, USA. Note that numbers of both house sparrows and common starlings initially peak in the early 1970s, whereas budgerigar numbers peak in the late 1970s before a decline begins.

Florida in 1980.<sup>10</sup> However, during the 1986–91 BBA, it was apparent that this species was doing poorly in the Miami area and breeding was not confirmed in Dade County. Breeding green-cheeked Amazon parrots were confirmed in Broward County, Florida.<sup>15</sup> Likewise, “canary-winged parakeets” were confirmed breeders only in the Miami area during the 1986–91 BBA.<sup>15</sup> During the 1986–91 BBA, breeding was not confirmed for blue-crowned conures (*Aratinga acuticaudata*) in Florida,<sup>15</sup> although the area where they are suspected of breeding (Key Largo in Monroe County) was not surveyed.<sup>10</sup>

During the 1990s, the once-prolific budgerigar population in Florida leveled off to approximately 100–200 birds (Fig 1).<sup>16</sup> Their range contracted as well, and by 1995–96, budgerigars were limited to southwestern Hernando and northwestern Pasco counties.<sup>15</sup> It has been suggested that this population decline may have been due to competition with house sparrows (*Passer domesticus*) or common starlings (*Sturnus vulgaris*),<sup>10,16</sup> but examination of Christmas Bird Count data indicates that budgerigars declined before either house sparrows or common starlings were particularly numerous (Fig 2).

### California

In California, breeding nanday conures were recorded from 1969 until 1976 in San Bernardino County, although the population during this time did not exceed 6 birds.<sup>12</sup> “Canary-winged parakeets” (white-winged parakeets and yellow-chevrons parakeets) were first observed in Los Angeles County in 1971. By 1974, 60–70 “canary-winged parakeets” were estimated in Los Angeles County

and 200–250 individuals in the state of California.<sup>12</sup> White-winged parakeets dominated in coastal Los Angeles County during the 1970s and 1980s.<sup>17</sup> However, by the late 1980s and into the 1990s, yellow-chevrons parakeets began to predominate in southern California.<sup>17</sup> Mitred conures have also increased in the Los Angeles basin since the 1980s, and in the 1990s it was estimated that there were several hundred to more than a 1000 individuals.<sup>17,18</sup>

During the 1990s, numbers of green-cheeked Amazon parrots also increased in southern California.<sup>9</sup> Between 1995 and 1997, a mixed roost of green-cheeked and lilac-crowned Amazon parrots (*Amazona finschi*) containing up to 750 individuals was observed in Temple City.<sup>19</sup> By 1997, approximately 1080 individuals were estimated in the greater Los Angeles area.<sup>18</sup> That same year, estimates for a variety of parrots in the Greater Los Angeles area were published, including white-winged parakeets (approximately 380 individuals), yellow-chevrons parakeets (approximately 20 individuals), nanday conures (approximately 180 birds), rose-ringed parakeets (60 birds), red-masked conures (70 birds), and blue-crowned conures (50 birds).<sup>18</sup>

### Texas

Feral green-cheeked Amazon parrots have been present in southern Texas since the 1950s.<sup>9</sup> Green conures became established in southern Texas during the 1990s.<sup>1,3</sup> During fieldwork for the 1987–92 Texas BBA, breeding was confirmed in green conures and green-cheeked Amazon parrots in the Lower Rio Grande Valley.<sup>20</sup> The number of green conures and green-cheeked Amazon parrots in the Lower Rio Grande Valley was estimated to be at least 400 individuals each in 1995.<sup>21</sup>

### North America

During the late 1960s and the early 1970s, more than 60 000 monk parakeets (*Myiopsitta monachus*) were imported into the USA, and escapes were reported from New York to Puerto Rico.<sup>22</sup> The first free-flying monk parakeets were observed during 1967 in New York City, and 8 nests were found in that city by 1970.<sup>23</sup> By 1973 it was estimated that 4000–5000 free-flying monk parakeets were present in the USA.<sup>23</sup> In response to this increase in feral monk parakeet numbers, the US Fish and Wildlife Service began overseeing an eradication program in 1973, particularly in the states of New York, California, Virginia, and New Jersey.<sup>23</sup> It seems unlikely, however, that the numbers estimated by the popular press were actually correct, because only 367 monk parakeets were confirmed.<sup>23</sup>

### Parrots in the United Kingdom

The UK does not have any native parrot species, although small parrots apparently were present during the Eocene.<sup>24</sup> The first report of feral psittacine birds in the UK was of rose-ringed parakeets in 1855 in Norfolk; however, this population soon disappeared.<sup>25</sup>

Rose-ringed parakeets were again reported in England, this time in Epping Forest (Essex) in the 1930s but again this population did not persist.<sup>25,26</sup>

Breeding populations of rose-ringed parakeets were established in the 1960s. A family group of parakeets was observed in Southfleet (Kent) in 1969.<sup>25,26</sup> During the 1970s, rose-ringed parakeets expanded their range and nests were found at Stockport in Greater Manchester, Esher (Surrey), Woodford Green-Highams Park (Essex), Margate (Kent), as well as near Croydon (Middlesex) and Old Windsor and Wraybury (Berkshire).<sup>25,27</sup>

The British Ornithologists' Union accepted the rose-ringed parakeet as an established exotic species (Category C) in 1983 and estimated that the population consisted of 500 birds.<sup>28</sup> The birds appear to be a mixture of *Psittacula krameri borealis* and *P. k. manillensis*.<sup>26</sup> Three years later in 1986, the population was estimated to consist of 500–1000 birds.<sup>29</sup> In 1996, a simultaneous count of the known roosts revealed an increase in the rose-ringed parakeet population to 1508 individuals.<sup>30</sup> Since that time, however, there has been a dramatic increase in the numbers of rose-ringed parakeets. By 1999, there were approximately 2500 parakeets at one roost alone.<sup>31</sup>

Similar to the rose-ringed parakeet, breeding budgerigar populations were established in the 1960s. In 1969, 4 pairs of budgerigars were deliberately released on Tresco, in the Isles of Scilly, off England's west coast.<sup>32</sup> Six more pairs of budgerigars were deliberately released on Tresco in 1970.<sup>32</sup> Food and nest boxes were provided for the birds, and within 5 years the population consisted of 100 birds, including 35 breeding pairs.<sup>32,33</sup> However, the resident at Tresco who had provided food for the birds moved from the island in 1975 and thereafter the population crashed.<sup>32</sup> One year later, only a single individual was left and by 1977 the population had completely vanished.<sup>31</sup>

### Parrots in the 21st Century

The American Ornithologists' Union currently recognizes 7 established feral parrot species in the USA. These self-sustaining feral parrot populations include the budgerigar, the rose-ringed parakeet, the white-winged parakeet, the yellow-chevrons par-

akeet, the green-cheeked Amazon parrot, and the monk parakeet.<sup>3</sup> In contrast, the American Birding Association does not consider the rose-ringed parakeet established in the USA.<sup>1</sup>

Currently, there is little official monitoring of numbers of feral psittacine birds in the USA. Consequently, data from Christmas Bird Counts were used to evaluate trends in population size of established parrot species in the USA. Christmas Bird Counts have been conducted annually in North America since 1900.<sup>34</sup> Participants count the number of individual birds encountered within a count circle, which measures 24.1 km in diameter.<sup>34</sup> Many counts have been conducted for decades. Therefore, Christmas Bird Counts provide not only a long-term data set, but the information provided is also wide in scope. During the 103rd Christmas Bird Count performed in 2002, there were 1981 count circles and more than 55 000 observers.<sup>35</sup> There is also standardization of reporting methodology and reporting of observer effort.<sup>16</sup> Nonetheless, data from Christmas Bird Counts should be used with caution. Although observers are supposed to report all individuals of each bird species recorded, in practice Christmas Bird Counts have somewhat erratic coverage of exotic species.<sup>17</sup> In addition, the ranges of some introduced species may not overlap with Christmas Bird Count circles.<sup>16</sup> Because the number of people involved and the amount of effort expended in a count circle may vary from year to year, Christmas Bird Counts analyses are typically performed on the number of birds per party-hour.<sup>16</sup>

Based on Christmas Bird Counts, none of the established feral parrots are declining, although budgerigars and "canary-winged parakeets" do not show a significant increase (Table 1). Rose-ringed parakeets, green conures, green-cheeked Amazons, and monk parakeets all exhibit significant linear increases in population (Table 1).

Rose-ringed parakeets are officially established only in southern Florida; however, this species may also be self-sustaining in southern California. Budgerigars are established in southwestern Florida. White-winged parakeets and yellow-chevrons parakeets are established in southern Florida and California, whereas green conure numbers are self-sustaining only in southern Texas. Green-cheeked Amazon parrots are officially established in southern Texas and southern Florida. In addition, it seems likely that green-cheeked Amazon parrots may be established in southern California as well, with a total of 619 individuals recorded in California during the 2003 Christmas Bird Count, and an estimated 2003 population of 2800 individuals.<sup>36</sup>

Monk parakeets are most widely established with

**Table 1.** Populations of feral psittacine birds in the United States that are considered established or self-sustaining by the American Ornithologists' Union based on data from Christmas Bird Counts.

Species	Year first detected	Number detected in 2002
Budgerigar	1963	117 (count circles)
Rose-ringed parakeet	1972	241 (3 count circles)
Monk parakeet	1970	4155 (45 count circles)
Green conure	1978	336 (6 count circles)
“Canary-winged” parakeet	1971	562 (324 yellow-chevroned in 7 count circles, 238 white-winged in 3 count circles)
Green-cheeked Amazon parrot	1971	468 (9 count circles)

self-sustaining, breeding populations in southern Quebec, Illinois, Michigan, Connecticut, Rhode Island, southern New York, New Jersey, Texas, and Florida.<sup>3</sup> Since the US Fish and Wildlife Service's eradication program was halted, monk parakeet numbers have more than recovered (Table 2). In fact, during the 2002 Christmas Bird Count, 4155 birds were detected (Table 1). Currently, monk parakeet populations are doubling in size every 4.8 years.<sup>37</sup> However, it should be noted that populations are not increasing in every state. For instance, in Oregon, monk parakeet numbers peaked in the late 1980s and early 1990s and thereafter began to decline.<sup>38</sup>

In addition to the species recognized as established by the American Ornithologists' Union, 5 species show significant increases and may be in the process of becoming established in the USA (Table 3). Of those 5 species, nanday conures are most numerous, being recorded in Christmas Bird Counts from both California and Florida. During the 2003 Christmas Bird Count, 500 individuals were recorded in a single count circle in St Petersburg (Pinellas County), FL, USA.<sup>35</sup>

Of nonestablished species, the second most commonly encountered during Christmas Bird Counts

is the mitred conure, which also is also reported in Florida and California. The largest numbers found ( $n = 85$ ) were in the Kendall area of Dade County, Florida.<sup>35</sup> Examination of Christmas Bird Count data indicates that although their numbers are increasing significantly, blue-fronted Amazon parrots are currently limited to southeastern Florida, as are chestnut-fronted macaws and blue-crowned conures. (Small numbers of blue-crowned conures also have been reported from St Petersburg, FL, USA).<sup>35</sup>

Two species (red-masked conures and peach-faced lovebirds [*Agapornis roseicollis*]) also may be in the process of becoming established, but their populations are not being adequately monitored by Christmas Bird Counts. Red-masked conures in San Francisco, CA, USA, are believed to be both reproducing and increasing.<sup>39</sup> The population increased from 26 individuals in 1993 to 130 individuals by 2003.<sup>40</sup> Peach-faced lovebirds were first reported breeding in Phoenix, AZ, USA, in 1998, when a breeding pair was found at a saguaro cavity in Scottsdale (G. Clark, written communication, November 2004). A Web site was set up to track sightings of this species and it soon became clear that the population size was considerable.<sup>41</sup> Currently, it is estimated this population consists of hundreds of individuals in the greater Phoenix area, and it is possible that the total population may number in the low thousands (G. Clark, written communication, November 2004).

In the UK, rose-ringed parakeets are the only officially established feral parrot and their numbers have increased dramatically since 1996. By 2003, a single roost contained 6918 rose-ringed parakeets (J. Wheatley, written communication, November 2004). It is estimated that the 2004 population of rose-ringed parakeets in the UK is approximately 10 000 individuals.<sup>42</sup> Their range is continuing to spread and breeding parakeets can now be found in Surrey, Berkshire, Buckinghamshire, Middlesex, Hertfordshire, Sussex, Hampshire, and Kent.<sup>42</sup>

**Table 2.** A summary of monk parakeets recorded during the 2003 Christmas Bird Count.

State	Number <sup>a</sup>
Florida	2834 (19)
Connecticut	1091 (5)
Illinois	175 (4)
Texas	266 (6)
New Jersey	42 (2)
New York	32 (3)
Louisiana	12 (1)
Total	4452

<sup>a</sup> Number of count circles is given in parentheses.

**Table 3.** A summary of populations of feral psittacine birds not currently recognized as established in the United States that are increasing significantly based on data from Christmas Bird Counts.

Species	Year first detected	Number detected in 2002
Nanday conure	1973	546 (9 count circles)
Blue-crowned conure	1982	80 (1 count circle)
Blue-fronted Amazon parrot	1982	103 (1 count circle)
Chestnut-fronted macaw	1982	44 (2 count circles)
Mitred conure	1984	347 (9 count circles)

In addition to rose-ringed parakeets, 3 other parrot species breeding in England may become established or self-sustaining in the near future: monk parakeets, alexandrine parakeets (*Psittacula eupatria*), and blue-crowned conures.<sup>31</sup> Monk parakeets were found breeding in Borehamwood (Hertfordshire) in 2001.<sup>31</sup> These birds have been present since at least 1993, and by 2002 the population consisted of 32 birds.<sup>31</sup> Most nests are on private property where birds regularly visit bird feeders, and it seems likely that the population will continue to grow.<sup>31</sup>

Since 1997, alexandrine parakeets have bred at Fazackerley (Merseyside) and the population consisted of 12 birds by 1998.<sup>31</sup> However, in 1998, many of the birds were shot, although 1 pair survived to breed again in 1999.<sup>31</sup> In addition, a nest of hybrid alexandrine parakeets (apparently crossed with rose-ringed parakeets) was discovered in 2001 in Kent, and 2 nests of hybrid birds were discovered in 2002.<sup>31</sup> These 3 hybrid birds (1 male and 2 females) as well as 3 apparently pure alexandrine parakeets can routinely be seen roosting with rose-ringed parakeets at the nearby Lewisham Crematorium.<sup>31</sup>

In 1997, a pair of blue-crowned conures was observed coming to a feeder in Bromley (Kent).<sup>43</sup> By 1999, the number of birds coming to the feeder had increased to 8, and a flock of 15 birds was seen nearby.<sup>43</sup> The first nest of this species was discovered in 2001,<sup>43</sup> and the population is believed to be increasing (G. Hazlehurst, written communication, July 2004).

### What the future may hold

Introduced species may have a detrimental effect on native species through predation, habitat alteration, introduction of diseases such as psittacosis or Newcastle's disease, hybridization, competition for nest cavities, or a combination of these. There is also concern that introduced species may cause economic loss due to crop damage.<sup>44</sup>

To date, however, few of these potential negative effects have materialized, although rose-ringed parakeets in England have been observed feeding upon

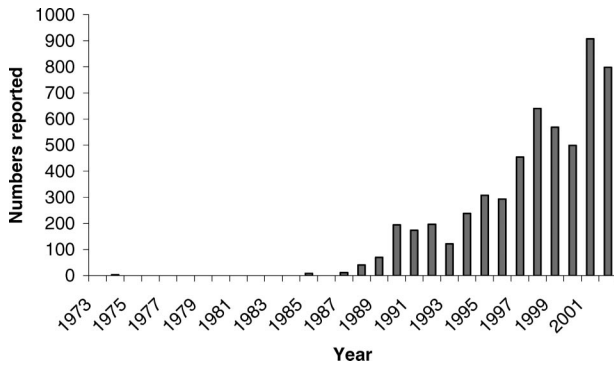
grapes in a vineyard.<sup>45</sup> Interestingly, despite the potential for crop losses, naturalized rose-ringed parakeets in the UK are protected under the Wildlife and Countryside Act of 1981.<sup>46</sup>

It also appears that many people enjoy seeing parakeets.<sup>22</sup> For instance, a PhD study on feral rose-ringed parakeets in the UK found that most people enjoyed seeing parakeets at bird feeders or in the park.<sup>42</sup>

Because introduced parrots and parakeets frequently visit feeders, it has been suggested that feral parrots may rely on human intervention survival. Budgerigars in Florida were apparently heavily dependent upon both bird feeders and nest boxes to survive.<sup>11</sup> Likewise, feral budgerigars in England disappeared after the woman providing food moved.<sup>32</sup> Monk parakeets in Illinois were observed feeding heavily upon sunflower seeds during the winter months.<sup>47</sup> However, at least 1 author has suggested that rose-ringed parakeets in the UK do not need feeders to survive, because a population in Brighton apparently did not learn how to use feeders for 8 years.<sup>48</sup>

Feral parrots are typically found in urban and suburban areas, which also may suggest a reliance upon humans. However, it is also possible that the presence of parrots in urban and suburban areas may be due to a relatively larger pool of potential escapees in these locations. There are probably more pet parrots per unit area in an urban or suburban setting than in a rural setting. Rose-ringed parakeets in the UK are now breeding in rural areas of Berkshire, Buckinghamshire, and Surrey,<sup>42</sup> whereas monk parakeets have a small population in rural Scio (Linn County), OR, USA.<sup>38</sup> This observation suggests that feral parrots are not necessarily restricted to urban and suburban areas as long as adequate food is available and temperatures do not drop too low.

Most feral psittacine birds roost in the open and may not be able to survive prolonged exposure to cold temperatures. Rose-ringed parakeets introduced into New York City suffered from frostbite during the winter.<sup>49</sup> Likewise, a naturalized popu-



**Figure 3.** Monk parakeets detected on Christmas Bird Counts in Connecticut from 1972 to 2002.

lation of rose-ringed parakeets in Belgium has suffered mortality during winter months.<sup>50</sup>

However, it appears that there are few places too cold for monk parakeets to survive in the USA and UK. This species is increasing in numbers not only in southern cities but also in northern states such as Connecticut and Illinois. Monk parakeets were first reported in Connecticut in 1972. By 2002, a total of 799 birds were recorded in Connecticut (Fig 3). Monk parakeets are apparently able to survive colder winters because they do not roost in the open, but rather sleep in their nests. These nests may be up to 4.6°C warmer than the ambient air temperature during the winter.<sup>51</sup>

Although the populations of several established parrot species are increasing rapidly, most of these species have relatively restricted ranges. In part this may be because of restrictions imposed by climate and food supplies; however, this also may be due to limited dispersion from the natal site. Monk parakeets in Argentina, for example, traveled only 1230 m on average from their natal site to their first breeding site.<sup>22</sup> More than 95% of green-rumped parrotlets (*Forpus passerinus*) dispersed less than 500 m from their fledging site.<sup>52</sup> The short dispersal distance leads to a relatively slow rate of expansion. In England, it was discovered that although rose-ringed parakeets in the Greater London area were increasing at approximately 30% per year, the range was only increasing at a rate of 0.4 km/y.<sup>38</sup>

The USA has lost 2 native parrot species during the 20th century (the Carolina parakeet and the thick-billed parrot) but gained 7 species of feral parrots during the second half of the century. The UK did not lose any native parrots during the same period (because there were no native parrots) but feral rose-ringed parakeets became established. It seems possible that an additional 7 species in the USA and an additional 2 or 3 species in the UK may become established during the next few decades. The im-

plications of this are unclear, although it has been suggested that further introductions may have detrimental effects on native species due to competition for nest cavities and the introduction of disease. There is also the potential for economic damage. Despite this, the relatively slow rate of range expansion observed in feral parrots suggests that most will still have relatively restricted ranges in the decades to come.

## References

1. Dunn JL, Dittman DL, Garrett KL, et al. *ABA Checklist: Birds of the Continental United States and Canada*. Colorado Springs, CO: American Birding Association; 2002.
2. Snyder NFR, Russell K. Carolina parakeet (*Conuropsis carolinensis*). In: Poole A, Gill F, eds. *The Birds of North America*, No. 667. Philadelphia, PA: The Birds of North America Inc; 2002:1–36.
3. American Ornithologists' Union. *Check-list of North American Birds*. 7th ed. Lawrence, KS: Allen Press; 1998.
4. Snyder NFR, Enkerlin-Hoefflich EC, Cruz-Nieto MA. Thick-billed parrot (*Rhynchopsitta pachyrhyncha*). In: Poole A, Gill F, eds. *The Birds of North America*, No. 406. Philadelphia, PA: The Birds of North America Inc; 1999:1–24.
5. Snyder NFR, Koenig SE, Koschmann J, Snyder HA. Thick-billed parrot releases in Arizona. *Condor*. 1994;96:845–862.
6. Williams SO III. New Mexico. *North Am Birds*. 2003;57:383–385.
7. Barbour T. An ornithological enigma. *Auk*. 1925;42:132.
8. Bailey HH. "An ornithological enigma" explained. *Auk*. 1928;45:216–217.
9. Enkerlin-Hoefflich EC, Hogan KM. Red-crowned parrot (*Amazona viridigenalis*). In: Poole A, Gill F, eds. *The Birds of North America*, No. 292. Philadelphia, PA: The Academy of Natural Sciences; 1997:1–20.
10. Stevenson HM. *The Birdlife of Florida*. Gainesville, FL: University Press of Florida; 1994.
11. Wenner AS, Hirth DH. Status of the feral budgerigar in Florida. *J Field Ornithol*. 1984;55:214–219.
12. Shelgren JH, Thompson RA, Palmer TK, et al. An evaluation of the pest potential of the ring-necked parakeet, nanday conure, and the canary-winged parakeet in California. Sacramento, CA: California Department of Food and Agriculture, Division of Plant Industry Special Services Unit; 1975.
13. Owre OT. A consideration of the exotic avifauna of southeastern Florida. *Wilson Bull*. 1973;85:491–500.
14. Brightsmith D. White-winged parakeet (*Brotogeris versicolurus*) and yellow-chevoned parakeet (*Brotogeris chiriri*). In: Poole A, Gill F, eds. *The Birds of North America*, Nos. 386–387. Philadelphia, PA: The Birds of North America Inc; 1999:1–24.
15. Florida Fish and Wildlife Conservation Commission.

- Florida's Breeding Bird Atlas: a collaborative study of Florida's birdlife. Available at: <http://www.wildflorida.org/bba/default.asp;2003>. Accessed November 27, 2004.
16. Pranty B. The use of Christmas Bird Count data to monitor populations of exotic birds. *Am Birds*. 2002; 56:24–28.
  17. Johnston RF, Garrett KL. Population trends of introduced birds in western North America. In: Jehl JR Jr, Johnson NK, eds. *A Century of Avifaunal Change in Western North America: Proc Int Symp Cent Meet Cooper Ornithol Soc*. Sacramento, CA; 1994:221–231.
  18. Garrett KL. Population status and distribution of naturalized parrots in southern California. *West Birds*. 1997;28:181–195.
  19. Mabb KT. *Naturalized Parrot Roost Flock Characteristics and Habitat Utilization in a Suburban Area of Los Angeles County, California* [master's thesis]. Pomona, CA: California State Polytechnic University; 2003.
  20. Benson KLP, Arnold KA. The Texas Breeding Bird Atlas. Available at: <http://txtbba.tamu.edu/>; 2001. Accessed November 22, 2004.
  21. Lasley GW, Sexton C, Lockwood M, Sekula W. Texas region. *Field Notes*. 1995;49:948–952.
  22. Spreyer MF, Bucher EH. Monk parakeet (*Myiopsitta monachus*). In: Poole A, Gill F, eds. *The Birds of North America*, No. 322. Philadelphia, PA: The Birds of North America Inc; 1998:1–24.
  23. Neidermyer WJ, Hickey JJ. The monk parakeet in the United States, 1970–75. *Am Birds*. 1977;31:273–278.
  24. Harrison CJO. The earliest parrot: a new species from the British Eocene. *Ibis*. 1982;124:203–210.
  25. Lever C. *The Naturalized Animals of the British Isles*. London, UK: Hutchinson; 1977.
  26. Morgan DH. Feral rose-ringed parakeets in Britain. *Br Birds*. 1993;86:561–564.
  27. Hudson R. News and comment. *Br Birds*. 1974;67: 173–175.
  28. British Ornithologists' Union. British Ornithologists' Union Records Committee: 11th report. *Ibis*. 1983; 126:440–445.
  29. Lack P. *The Atlas of Wintering Birds in Britain and Ireland*. Calton, UK: T & AD Poyser; 1986.
  30. Pithon JA, Dytham C. Census of the British ring-necked parakeet *Psittacula krameri* population by simultaneous count of roosts. *Bird Study*. 1999;46: 112–115.
  31. Butler C. Breeding parrots in Britain. *Br Birds*. 2002; 95:345–348.
  32. King B. Free-winged budgerigars in the Isles of Scilly. *Br Birds*. 1978;71:82–83.
  33. Hunt DB, Robinson HPK. Systematic list. *Isles Scilly Bird Rep*. 1976;1975:7–28.
  34. Drennan SR. The Christmas Bird Count: an overlooked and underused sample. In: Ralph CJ, Scott JM, eds. *Estimating Numbers of Terrestrial Birds*. Caldwell, NJ: The Blackburn Press; 1981:24–29.
  35. National Audubon Society. The Christmas Bird Count historical results [online]. Available at <http://www.audubon.org/bird/cbc/>; 2002. Accessed November 22, 2004.
  36. Dale D, Aird J. Parrots once removed: the urban parrots of California. *Calif Wild*. 2003; summer 2003: 23–27.
  37. van Bael S, Pruett-Jones S. Exponential population growth of monk parakeets in the United States. *Wilson Bull*. 1996;108:584–588.
  38. Butler C. Species status review: monk parakeets in Oregon. *Oreg Birds*. 2003;29:97–100.
  39. Bittner M. *The Wild Parrots of Telegraph Hill*. San Francisco, CA: Harmony; 2004.
  40. Bittner M. The wild parrots of Telegraph Hill. Available at: <http://www.pelicanmedia.org/wildparrots.html>; 2004. Accessed December 1, 2004.
  41. Clark, G. Peach-faced lovebird range expansion data. Available at: [http://mirror-pole.com/collpage/pf\\_loveb/pfl1.htm](http://mirror-pole.com/collpage/pf_loveb/pfl1.htm); 1999. Accessed December 1, 2004.
  42. Butler CJ. *Population Biology of the Introduced Rose-ringed Parakeet Psittacula krameri in the UK* [doctoral thesis]. Oxford, UK: University of Oxford; 2003.
  43. Butler C, Hazlehurst G, Butler K. First nesting by blue-crowned parakeet in Britain. *Br Birds*. 2002;95: 17–20.
  44. Fritts TH. Economic costs of electrical system instability and power outages caused by snakes on the Island of Guam. *Int Biodeterior Biodegrad*. 2002;49: 93–100.
  45. Saines K. Parakeets are a pain at Painshill Park. Available at: [http://www.thisiskingston.co.uk/news/elbridge/display.var.643427.index.parakeets\\_are\\_a\\_pain\\_at\\_painshill\\_park.html](http://www.thisiskingston.co.uk/news/elbridge/display.var.643427.index.parakeets_are_a_pain_at_painshill_park.html). Accessed April 5, 2005.
  46. Holmes JS, Simmons J. The Wildlife and Countryside Act 1981 and bird introductions. In: Holmes JS, Simmons J, eds. *The Introduction and Naturalisation of Birds*. London, UK: HMSO; 1996:19–24.
  47. Hyman J, Pruett-Jones S. Natural history of the monk parakeet in Hyde Park, Chicago. *Wilson Bull*. 1995; 107:510–517.
  48. James P, ed. *Birds of Sussex*. Brighton, UK: Sussex Ornithological Society; 1996.
  49. Roscoe DE, Stone WB, Petrie L, Renkavinsky JL. Exotic psittacines in New York State. *N Y Fish Game J*. 1976;23:99–100.
  50. Temara K, Arnhem R. Perruches a collier (*Psittacula krameri*) victimes des conditions climatiques en region Bruxelloise. *Aves*. 1996;33:128–129.
  51. Caccamise DF, Weathers WW. Winter nest microclimate of monk parakeets. *Wilson Bull*. 1977;89:346–349.
  52. Sandercock BK, Beissinger SR, Stoleson SH, et al. Survival rates of a neotropical parrot: implications for latitudinal comparisons of avian demography. *Ecology*. 2000;81:1351–1370.