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## Assessment of the current distribution of free-living parrots and parakeets (Aves: Psittaciformes) in Italy: a synthesis of published data and new records

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### Abstract

Parrot species are often introduced outside of their native distribution range, as they are among the most popular pets worldwide. Releases, and particularly unplanned escapes, have resulted in the establishment of many naturalised populations in Europe, including Italy. Many parrot species present wide ecological tolerance and high synanthropy, but the knowledge of their distribution in the areas of introduction is limited. The introduction of these species may have a negative impact on local biodiversity, particularly in terms of competition with hole-nesting birds and bats, crop damage and epidemiology, so that it has become crucial to provide accurate and up-to-date research on the distribution of these taxa. This work aimed at reporting the occurrence points of the various Psittaciformes species in Italy. Records for 21 species (72.41% of those reported for all of Europe) were collected, with five of them breeding, always close to urban centres.

**Keywords:** *Pet trade, Psittaciformes, invasion detection, distribution range*

### Introduction

It is common knowledge that alien species currently represent a major threat to biodiversity, second only to habitat loss and fragmentation (IUCN 2000; Mack et al. 2000; Genovesi & Shine 2004; Wonham 2006). Therefore, careful trend monitoring (Elzinga et al. 2001) of an exotic population settled in a territory and the early detection of new arrivals are necessary to preserve native species and to minimise the impacts of alien taxa. Species have been unintentionally or deliberately introduced, mostly for hunting (Chapman & Chapman 1980; Hill & Robertson 1988; Dubray & Roux 1989; Silvano et al. 2000), biocontrol (Simberloff 1992; Malecki et al. 1993; Civeyrel & Simberloff 1996; Elliot et al. 1996; Simberloff & Stiling 1996) and aesthetic reasons. However, many animals kept as pets (exotic

birds, squirrels and reptiles), as attractions in urban parks (peafowls, swans and ducks) and for fur farms (coypus and minks) have escaped from captivity, occasionally establishing self-sustainable populations (Spanò & Truffi 1986; Amori & Gippoliti 1995; Reino & Silva 1996; Hughes et al. 2000; Nordström et al. 2002; Duncan et al. 2003; Panzacchi et al. 2007; Bertolino 2009). Birds are remarkably recurrent among all introduced animals (Duncan et al. 2003): worldwide, more than 1400 attempts to introduce at least 400 species belonging to this animal class have been recorded (Lever 1987; Lockwood 1999; Duncan et al. 2003). In particular, parrots are the most popular group due to their colourful and bright plumage and for collecting purposes. It has been estimated that approximately two-thirds of all parrot species are commonly transported

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outside their natural range (Cassey et al. 2004), corresponding to approximately 4,000,000 parrots per year taken from the wild to sustain the pet market, with an annual industry of 1.4 billion dollars. Moreover, many species are decreasing even inside their natural range as a consequence of the continuous capture and nest robbing (Caparroz et al. 2001; Drews 2001; Cassey et al. 2004). Approximately 10% of Psittaciformes have established exotic populations (Cassey et al. 2004). The DAISIE database (Delivering Alien

Invasive Species in Europe, DAISIE 2008) reports that 22 species (nine of which are recorded in Italy) of Psittaciformes are recorded in Europe (Table I).

The Rose-ringed Parakeet and the Monk Parakeet represent the most widely introduced parrot species in Europe (Butler 2003) and are also abundant in their wide natural range (Cassey et al. 2004); in contrast, such species as the Tepui Parrotlet, Grey-cheeked Parakeet and Plain Parakeet, introduced into Germany, are extinct in their introduced range. Most

TABLE I. Parrot species in Europe.

Common name	Species	Original range	European distribution	IUCN category
Fischer Lovebird	<i>Agapornis fischeri</i>	Africa	Spain, France, Austria	NT
Masked Lovebird	<i>Agapornis personatus</i>	Africa	Spain*, France*	LC
Rose-faced Lovebird	<i>Agapornis roseicollis</i>	Africa	Italy, Great Britain	LC
Blue-fronted Amazon	<i>Amazona aestiva</i>	South America	Italy*, Spain, Germany, Switzerland <sup>§</sup>	LC
Orange-winged Amazon	<i>Amazona amazonica</i>	South America	Germany	LC
Cuban Amazon	<i>Amazona leucocephala</i>	Cuba and Central America Isles	Spain	NT
Yellow-crowned Amazon	<i>Amazona ochrocephala</i>	South America	Italy, Spain, Germany	LC
Yellow-headed Amazon	<i>Amazona oratrix</i>	Central America	Germany	EN
Blue-crowned Conure	<i>Aratinga acuticaudata</i>	South America	Great Britain*, Spain*	LC
Red-masked Conure	<i>Aratinga erythrogenis</i>	South America	Spain*	NT
Mitred Conure	<i>Aratinga mitrata</i>	South America	Spain*	LC
Grey-cheeked Parakeet	<i>Brotogeris pyrrhopterus</i>	South America	Germany <sup>§</sup>	EN
Plain Parakeet	<i>Brotogeris tirica</i>	South America	Germany <sup>§</sup>	LC
Patagonian Conure	<i>Cyanoliseus patagonus</i>	South America	Spain	LC
Budgerigar	<i>Melopsittacus undulatus</i>	Australia	Italy, Spain, Germany, Greece*, Austria <sup>§</sup> , Belgium <sup>§</sup> , Great Britain <sup>§</sup>	LC
Monk Parakeet	<i>Myiopsitta monachus</i>	South America	Italy*, Portugal, Spain*, France*, Austria <sup>§</sup> , Great Britain, Germany <sup>§</sup> , Belgium*, Czech Republic*, Slovakia*, Denmark*, Netherland	LC
Nanday Conure	<i>Nandayus nenday</i>	South America	Spain*	LC
Tepui Parrotlet	<i>Nannopsittaca panychlora</i>	South America	Germany <sup>§</sup>	LC
Cockatiel	<i>Nymphicus hollandicus</i>	Australia	Italy, Spain, France	LC
Youyou Senegal Parrot	<i>Poicephalus senegalus</i>	Africa	Spain*, France*, Germany	LC
Alexandrine Parakeet	<i>Psitacula eupatria</i>	Asia	Italy, Belgium*, Germany*, Great Britain	LC
Rose-ringed Parakeet	<i>Pittacula krameri</i>	Saharian Africa and Asia from Pakistan to Bangladesh	Italy*, Portugal*, Spain*, France*, Great Britain*, Belgium*, Netherlands*, Germany*, Slovenia*, Croatia, Greece*, Austria, Switzerland	LC

\* Country with at least one documented breeding attempt. <sup>§</sup> Extinct or eradicated. Sardinia and Sicily are included as part of Italy. Canary Islands and Balears Island are included as part of Spain. IUCN (International Union for Conservation of Nature) categories are listed. NT = Near Threatened; LC = Least Concern; EN = Endangered.

of the naturalised populations of parrots in Europe are concentrated around the locations from which they escaped or where they were released (Snow & Perrins 1998). Identifying those species that have a higher predisposition to establish themselves in a territory and become invasive (Daehler & Strong 1993; Duncan et al. 2003) is a challenging task. However, parrots present all of the features that increase bird establishment success (Duncan et al. 2003; Shwartz et al. 2008) and often have a high probability of developing self-maintaining populations, even when starting from only a few released individuals (Cassey et al. 2004). The general impact of these species on the native biodiversity is poorly described, but it is known that they can compete with hole-nesting birds and bat species (Andreotti et al. 2001; Strubbe et al. 2010; Czajka et al. 2011; Newson et al. 2011), be vectors of human psittacosis, and cause crop damage (Shivanarayan 1981; Lever 1987; Juniper & Parr 1998; Andreotti et al. 2001; Butler 2003).

Although representing merely a first step, knowledge of the distribution of an alien species would help to elaborate targeted and coordinated European management plans to minimise the threats to the indigenous biodiversity (Bertolino et al. 2008; Martinoli et al. 2010). For this reason, we aimed to summarise and map all of the available and currently known incidences of the different species of parrots in Italy, distinguishing between breeding and non-breeding sites. We present a synthesis of published data and new records, which include nine species not present in the DAISIE database.

## Methods

We collected published (Benussi 1984; Maranini & Galuppo 1993; Cignini & Zapparoli 1996; Maranini & Galuppo 1998; Bertolino 1999; AFV 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011; Fraticelli & Molajoli 2002; Giacchini 2003; Noferini & Scaffidi 2003; Bricchetti & Gargione 2005; Pitzalis et al. 2005; Fraissinet 2006; Aimassi & Reteuna 2007; GPSO 2007, 2008; Ruggieri & Sighele 2007; Mascia & Grussu 2008; Dinetti 2009) and unpublished data to delineate the distribution range of Psittaciformes in Italy. To make our survey as complete as possible, we gathered information from published documents that address alien birds' distributions in Italy (Andreotti et al. 2001; Arcamone & Puglisi 2006, 2008; Puglisi et al. 2009), online databases ([www.ornitho.it](http://www.ornitho.it) and [www.europealiens.org](http://www.europealiens.org). Accessed on January 2012), unpublished

data from referenced experts and personal observations. Data not from the literature or other official sources were discarded to avoid unreliable or unconfirmed records. Subsequently, we compared the number of localities reported in the three main assessments for invasive parrots in Italy (Spanò & Truffi 1986; Andreotti et al. 2001; Bricchetti & Fracasso 2006) to evaluate the historical trend of the invasion process of the most widespread species. In a similar way, we also took into account the number of confirmed breeding sites.

## Results

A total of 236 occurrences for 21 parrot species, representing 72.41% of all Psittaciformes species detected in Europe, are recorded in Italy, with at least one record from each region (for detailed data, see Appendix I). Evidence of breeding has been reported for five species in 12 regions. Nine species were observed just once or for a short period of time (less than one month) in the same place and might, therefore, be the result of a sporadic escape from captivity; as a consequence, they could be currently extinct in that locality. Twelve species represent new reports for Italy, with nine of them not yet being included in the DAISIE database; the four remaining of this group, however, are listed in DAISIE for other European countries (Figure 1; Table II).

The Rose-ringed Parakeet and the Monk Parakeet are the most widespread species, occurring in 17 and 13 regions, respectively. Figure 2 shows the increase in both the number of occurrences and confirmed breeding sites for these two species during the last 30 years, based on data gathered from published assessments. Rose-ringed Parakeet occurrences increased from 27 in 1986 to 31 in 2006 and reached 101 in our assessment. Similarly, the confirmed breeding sites for these species display a tenfold rise, increasing from five in 1986 to 51 in the present study. The Monk Parakeet presents an even larger increase in occurrence, from 5 in 1986 to 61 in our assessment; breeding events for this species also show a tenfold increase, from 3 in 1986 to 35 in 2012 (Figure 2).

## Discussion

Although the impact of parrot species in Italy has not yet been studied in detail, our results provide some preliminary evidence about their current status and invasion risk. The 21 Psittaciformes species in our screening could represent an underestimation: a lack of knowledge may be due to the likely large

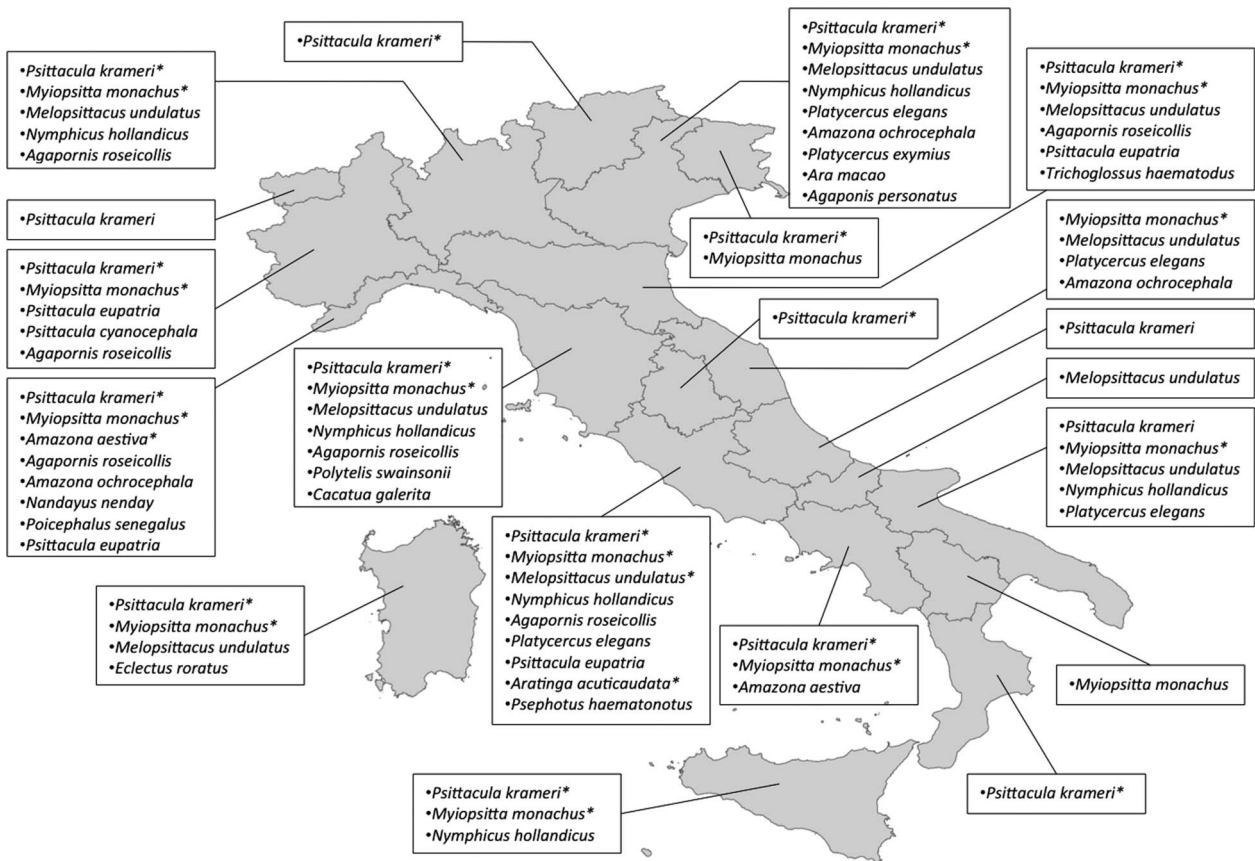


Figure 1. Parrot species records in Italy. \* Known breeding events.

number of unrecorded and/or accidental releases from captivity. Moreover, our analysis did not involve any sampling session in the field and, therefore, could have missed records for some parrot species actually occurring in Italy. As explained above, our screening did not take into account unconfirmed or unpublished records. Conversely, data on the occurrence and nesting of *A. acuticaudata* in Latium (P. Bertagnolio, pers. comm) and occurrence of *N. hollandicus* and *P. elegans* in Tuscany (G. Londi, pers. comm.) were included, as they were provided by qualified experts in the field or corroborated by photographs (J. Langeneck, University of Pisa, pers. comm.). Our results confirmed that Rose-ringed Parakeets and Monk Parakeets are the most distributed, even as nesters, as also noted in previous studies (Spanò & Truffi 1986; Andreotti et al. 2001; Brichetti & Fracasso 2006). The wide distribution of these species correlates with their remarkable invasion and establishment success, also detected in many other countries (Russello et al. 2008; Strubbe 2009; Strubbe & Matthysen 2009). In particular,

Strubbe & Matthysen (2009) found that the establishment success of Rose-ringed and Monk Parakeets was positively associated with the human population density. In fact, as in other European countries (Murgui 2001; Domenèch et al. 2003; Cassey et al. 2004), these parakeets established free-living populations in Italy, mostly concentrated around cities and urban parks, locations close to their release sites (Andreotti et al. 2001; Brichetti & Fracasso 2006). Indeed, Rose-ringed Parakeet and Monk Parakeets, being easy to find and capture for trade, have been massively introduced outside their natural range, a phenomenon that in Italy was firstly described in the first half of the twentieth century (Moltoni 1945; Spanò & Truffi 1986). The outstanding establishment success of Rose-ringed and Monk Parakeets was also confirmed in comparison with the number of occurrences and breeding sites collected in the three main national assessments since 1986 (Spanò & Truffi 1986; Andreotti et al. 2001; Brichetti & Fracasso 2006). Despite the shortcomings of our methodological approach, the relevant



TABLE II. Parrot species in Italy.

Species	IUCN	CITES	Region (number of occurrences)	First occurrence (source)	Breeding			
Rose-ringed parakeet ( <i>P. krameri</i> )	LC	III	Valle d'Aosta (1)	1991 (Brichetti & Fracasso 2006)	no			
			Piedmont (9)	1985 (Brichetti & Fracasso 2006)	yes			
			Lombardy (8)	2000 (Dinetti & Fraissinet 2001)	yes			
			Trentino Alto Adige (6)	1990 (Caldonazzi et al. 2003)	yes			
			Veneto (13)	2000 (Dinetti & Fraissinet 2001)	yes			
			Friuli Venezia Giulia (5)	1974 (Brichetti & Fracasso 2006)	yes			
			Liguria (4)	1975 (Andreotti et al. 2001)	yes			
			Emilia Romagna (5)	1992 (Merighi 2003)	yes			
			Tuscany (17)	1997 (Arcamone & Puglisi 2008)	yes			
			Umbria (3)	1985 (Dinetti & Fraissinet 2001)	probable			
			Latium (13)	1980 (Andreotti et al. 2001)	yes			
			Campania (3)	1994 (Fraissinet et al. 2000)	yes			
			Abruzzi (1)	2011 (Ornitho database)	no			
			Apulia (3)	2006 (Brichetti & Fracasso 2006)	no			
			Calabria (2)	2000 (Dinetti & Fraissinet 2001)	probable			
			Sicily (7)	1990 (Lo Valvo et al. 1993)	yes			
			Sardinia (1)	1970 (Grussu 2008)	yes			
Monk Parakeet ( <i>M. monachus</i> )	LC	II	Piedmont (7)	1990 (Hagemeyer & Blair 1997)	yes			
			Lombardy (6)	1934 (Moltoni 1945)	yes			
			Veneto (8)	1985 (AFV 2002)	yes			
			Friuli Venezia Giulia (1)	1980 (Brichetti & Fracasso 2006)	yes			
			Liguria (3)	1970 (Spanò & Truffi 1986)	yes			
			Emilia Romagna (5)	1994 (Ferri & Villani 1995)	yes			
			Tuscany (6)	1989 (Andreotti et al. 2001)	probable			
			Marche (2)	1991 (Pandolfi & Giacchini 1995)	probable			
			Latium (11)	1978 (Mori 2010)	yes			
			Apulia (3)	2008 (De Felice et al. 2011)	yes			
			Basilicata (1)	2002 (Fulco et al. 2008)	no			
			Sicily (1)	1990 (Caruso & Scelsi 1993)	yes			
			Sardinia (6)	1981 (Grussu 2008)	yes			
			Budgerigar ( <i>M. undulatus</i> )	LC	NO	Lombardy (2)	2011 (Ornitho database)	no
Veneto (4)	2003 (AFV 2004)	no						
Emilia Romagna (1)	2011 (Ornitho database)	no						
Tuscany (5)	2005 (Personal observation)	no						
Marche (2)	2011 (Ornitho database)	no						
Latium (2)	2002 (Biondi et al. 2005)	yes						
Molise (1)	2011 (Ornitho database)	no						
Apulia (1)	2011 (Ornitho database)	no						
Sardinia (1)	2008 (Grussu 2008)	no						
Cockatiel ( <i>N. hollandicus</i> )	LC	NO				Lombardy (4)	2011 (Ornitho database)	no
						Veneto (6)	2002 (AFV 2003)	no
			Tuscany (2)	2007 (G. Londi pers. comm. 2011)	no			
			Latium (1)	2011 (Ornitho database)	no			
			Apulia (1)	2011 (Ornitho database)	no			
			Sicily (1)	2007 (Caudullo 2008)	no			
			Rosey-faced Lovebird ( <i>A. roseicollis</i> )	LC	II	Lombardy (1)	2011 (Ornitho database)	no
						Emilia Romagna (4)	2011 (Ornitho database)	no
Tuscany (2)	2006 (Arcamone & Puglisi 2008)	no						
Latium (1)	2011 (Ornitho database)	no						
Blue-fronted Amazon ( <i>A. aestiva</i> )	LC	II	Liguria (1)	1993 (Maranini & Galuppo 1994)	yes			
Crimson Rosella ( <i>P. elegans</i> )+	LC	II	Campania (1)	1994 (Giustino & Nappi 1996)	no			
			Veneto (2)	2004 (AFV 2005)	no			
			Tuscany (1)	2012 (Photo J. Langeneck)	no			
			Marche (1)	2011 (Ornitho database)	no			
			Latium (1)	2011 (Ornitho database)	no			
			Apulia (1)	2011 (Ornitho database)	no			

(Continued)

TABLE II. (Continued).

Species	IUCN	CITES	Region (number of occurrences)	First occurrence (source)	Breeding
Alexandrine Parakeet ( <i>P. eupatria</i> )	LC	II	Piedmont (1) Emilia Romagna (1) Latium (1)	2011 (Ornitho database) 2011 (Ornitho database) 2011 (Ornitho database)	no no no
Yellow-crowned Amazon ( <i>A. ochrocephala</i> )	LC	II	Veneto (2) Marche (1)	2010 (Associazione Faunisti Veneti 2011) 2011 (Ornitho database)	no no
Barraband Parakeet ( <i>P. swainsonii</i> )+	VU	II	Tuscany (3)	2011 (Personal observation)	no
Eastern Rosella ( <i>P. eximius</i> )+	LC	II	Veneto (2)	2007 (Bon et al. 2007)	no
Youyou Senegal Parrot ( <i>P. senegalus</i> ) §	LC	II	Liguria (2)	1997 (Borgo et al. 2005)	no
Blue-crowned Conure ( <i>A. acuticaudata</i> ) §	LC	II	Latium (1)	2011 (P. Bertagnolio pers. comm. 2011)	yes
Red Macaw ( <i>A. macao</i> )*+	LC	I	Veneto (1)	1990 (Bon et al. 2007)	no
Sulphur-crested Cockatoo ( <i>C. galerita</i> )*+	LC	II	Tuscany (1)	1996 (Personal observation)	no
Rainbow Lorikeet ( <i>T. haematodus</i> )*+	LC	II	Emilia Romagna (1)	2011 (Ornitho database)	no
Red-rumped Parrot ( <i>P. haematonotus</i> )*+	LC	II	Latium (1)	2005 (Biondi et al. 2005)	no
Eclectus Parrot ( <i>E. roratus</i> )*+	LC	II	Sardinia (1)	2005 (Grussu 2008)	no
Nanday Conure ( <i>N. nenday</i> )* §	LC	II	Liguria (1)	2000 (Borgo et al. 2005)	no
Plum-headed Parakeet ( <i>P. cyanocephala</i> )*+	LC	II	Piedmont (1)	2010 (GPSO 2011)	no
Masked Lovebird ( <i>A. personatus</i> )* §	LC	II	Veneto (1)	2009 (AFV 2011)	no

\* Species recorded only once and never re-confirmed. + Not reported in the DAISIE (Delivering Alien Invasive Species in Europe) database. § Listed in DAISIE for other European countries. IUCN = International Union for Conservation of Nature; CITES = Convention on International Trade in Endangered Species of Wild Fauna and Flora; LC = Least Concern; VU = Vulnerable). Date cited as ‘Ornitho database’ refers to the checklist freely downloaded from the online database Ornitho.it ([www.ornitho.it](http://www.ornitho.it)) accessed on January 2012.

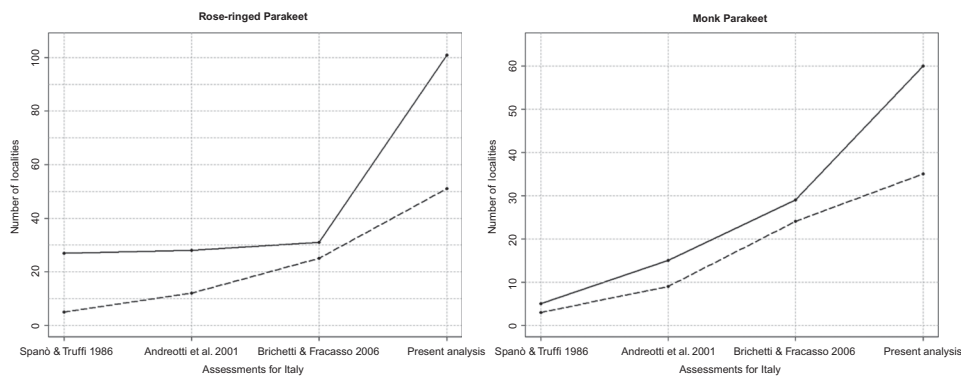


Figure 2. Trends in number of localities of Rose-ringed Parakeet (left) and Monk Parakeet (right) during the last 30 years. Solid lines represent presence sites and dashed lines indicate confirmed breeding sites.

number of records collected in the present study, as compared to the most recent assessment on parakeets in Italy (Brichetti & Fracasso 2006), indicates an increase in both introductions and breeding

events for these species, representing an alternative and effective way of collecting records. In fact, free online expert-checked databases of occurrences, such as DAISIE ([www.europe-aliens.org](http://www.europe-aliens.org)), Ornitho



Figure 3. A Barraband's Parakeet in Populonia Station (photo M. Foresta).

([www.ornitho.it](http://www.ornitho.it)) and Tuscan Regional Atlas ([www.centronitologicotoscano.org](http://www.centronitologicotoscano.org)), allow for a wider availability of such data. Among the species we reported in our assessment, the first Italian breeding of Blue-crowned Conure in 2011 in Maccarese, near Rome (P. Bertagnolio, pers. comm. 2011), deserves a special mention. This species has been reported to breed in the United Kingdom and Spain (Table I), but there was no previous evidence of its presence or breeding in Italy. Moreover, the first European sightings of Barraband's Parakeet represent another remarkable result. A specimen in a group of three individuals was photographed by one of the authors (M. Foresta) in Populonia Station and was recognised as an adult male (Figure 3).

Another two sightings of this species were dated on 11 December 2011 and 7 March 2012 around Accessa Lake (Massa Marittima, Grosseto, Tuscany) and in the pinewood of "Tony's Beach" (Pratoranieri-Follonica, Grosseto, Tuscany), respectively. These individuals may belong to the same group already recorded in Populonia Station. Barraband's Parakeet is the only species detected as free-living in Italy and evaluated as "vulnerable" by the International Union for Conservation of Nature (IUCN 2001). Nevertheless, the small number of individuals currently recorded may represent the only obstacle to the establishment of this species, given the commonality of ecological and ethological habits shared with the other two naturalised parakeet species in Italy.

Our study represents the most comprehensive and up-to-date attempt to assess the current status of parakeet species in Italian territory, and it emphasises the critical role of an appropriate level of knowledge to cope with invasive alien species (Genovesi & Shine 2004). Our approach is also an example of

how, when coupled with more traditional methodologies, online databases are a useful tool to assess the invasion status of species.

Although the status of the parakeet populations in Italy is not yet a conservation emergency, as it could be considered in Spain (Munoz & Real 2006; Real et al. 2008), and no data on the real impacts are available, the collection of information about their distribution is the first step to reduce their future spread and establishment risks and to design action plans to minimise their impacts (DAISIE 2008).

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