

# Review of the alien bird species recorded on the Balkan Peninsula

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## Abstract

The paper presents a review of the status of 16 alien species of birds recorded in five Balkan countries (Bulgaria, Croatia, Greece, Montenegro, and FYR Macedonia). Most of the alien birds were recorded after the beginning of the 20<sup>th</sup> century, at least two of them have been kept as domestic birds for centuries. Half of the alien species of birds found so far on the Balkan Peninsula originates from the tropics (eight species), and the other half comes from the temperate zone. Most alien birds originate from the Americas (five species), three species originate from Africa, two species originate from both Africa and Asia, two species originate from East Asia, and two from Australia. Two species of *Alectoris* spp. originate from Europe (southwestern and southeastern parts, respectively). The main pathways of introduction of the alien bird species to the Balkan region include: (1) escapees (from zoos, parks, or similar collections, and pets), (2) secondary spread from European breeding populations introduced elsewhere, and (3) intentional introductions. The need of profound scientific studies before any introduction attempts is discussed.

The Rose-ringed Parakeet is considered invasive and potentially the worst one. As for most of the other alien species, in general, a large increase in their numbers on the Balkan Peninsula in the near future is not expected. There are no any passerine alien species recorded so far but the occurrence of some passerine species from neighbouring regions is possible. The potential negative impact of translocated species as Chukar is also discussed.

## Key words

Alien bird species, Balkan Peninsula, review

## Introduction

Invasive alien species are considered nowadays among the main threats to biological diversity (EEA 2012). Therefore, for management purposes, it is always important to have up to date information about the alien species in a specific area. Although the Balkan Peninsula has a crossroad location in South-eastern Europe and within the Mediterranean region, it is still poor when it comes to exotic species of birds, established and spread by natural and human-related factors (Chiron et al. 2009). However, data on the status of the alien bird species within the region under study is not always readily available. The aim of this review is to compile the existing most current data on the alien species of birds recorded on the Balkan Peninsula until the end of 2013.

## Methods

Data were compiled from five Balkan countries – Bulgaria, Croatia, Greece, Montenegro, and FYR Macedonia. In the review, we followed the definitions of “alien species” and “introduction” adopted by CBD (2002): alien species is a species introduced outside its natural past or present distribution range by human agency, either directly or indirectly. The present review included those bird species, which were introduced through human-assisted or natural (secondary introduction) pathways to the Balkan Peninsula, from the list of the European alien bird species provided by Nankinov (2006). The Chukar (*Alectoris chukar*) was added as well – although being native to two of the Balkan countries under study (Bulgaria and Greece) – because of the potential negative effect on other birds (in particular, hybridisation with the Rock Partridge *Alectoris graeca*) as a result of artificial introduction to other, non-native regions on the Balkans. On achieving completeness, following Nankinov (2006), the Muscovy Duck (*Cairina moschata*) was also listed here, although it is found on the Balkan Peninsula only in captivity as a domesticated bird, without any records in the wild.

The data on each species in each country were

organised under standard subheadings (DAISIE 2009, slightly modified), completed according to the available information:

- Temporal trends
- Habitats
- Main pathways to the Balkan region
- Most invaded ecosystems
- Impact on ecology, ecosystems and economy
- Management options and their feasibility (including measures already in place)
- Future expected trends.

The short “species accounts” are followed by summarised data, where the most important issues of alien species colonisation on the Balkans are discussed.

## Results

The list of the alien bird species in five Balkan countries (Bulgaria, Croatia, Greece, Montenegro, and FYR Macedonia) is presented in Table 1.

### Black Swan (*Cygnus atratus*)

The species is recorded in Bulgaria and Croatia.

- *Temporal trends*

**BG:** Incidental. Three records to date (Nankinov 1992, 2006): Atanasovsko Lake (19 October 1988), the Kamchiya River mouth into the Black Sea (13 February 1994), and fishponds near the town of Blagoevgrad (03 January 1998).

**HR:** Incidental. First time recorded in 1991 (Stipčević 1996). A total of seven records of 12 birds reported between 1991 and 2011. Mostly individual birds were recorded, in one occasion a flock of 6 birds (on 31 May 2007 in Jelas Polje, Posavina) (Kralj and Barišić 2013.)

- *Habitats*

Inland and coastal wetlands, mostly freshwater. Only one observation from a hyperhaline lagoon. Still not recorded in marine habitats.

- *Main pathways to the Balkan region*

Probable escapees (pet trade) or birds from introduced European breeding population.

**Table 1.** List of alien bird species recorded in Bulgaria, Croatia, Greece, Montenegro, and FYR Macedonia – incidental (I), not established (N), established (E) – and their native range. The situation for the Chukar (*Alectoris chukar*) in Montenegro and FYR Macedonia is not clear, the species is not native to both countries (marked with “?” in the table).

\* The Muscovy Duck (*Cairina moschata*) is found only in captivity, without any records in the wild so far.

Species	Native range	Bulgaria (BG)	Croatia (HR)	Greece (GR)	Montenegro (ME)	FYR Macedonia (MK)	Total # of countries
<b>ANSERIFORMES</b>							
<i>Cygnus atratus</i>	Australia	I	I				2
<i>Branta canadensis</i>	North America	I	I				2
<i>Alopochen aegyptiacus</i>	Africa	N	I	N			3
<i>Cairina moschata</i> *	Central and South America	N	N	N	N	N	5
<i>Aix sponsa</i>	North America	I	I				2
<i>Aix galericulata</i>	East Asia	I	I				2
<b>GALLIFORMES</b>							
<i>Meleagris gallopavo</i>	North America	N	N	N	N	N	5
<i>Colinus virginianus</i>	North America		E				1
<i>Coturnix japonica</i>	East Asia	N					1
<i>Alectoris chukar</i>	SE Balkans and Asia	native	E	native	?	?	3
<i>Alectoris rufa</i>	SW Europe	N		E			2
<i>Numida meleagris</i>	Africa	N	N	N	N	N	5
<b>COLUMBIFORMES</b>							
<i>Streptopelia roseogrisea</i>	Africa	N	I				2
<i>Streptopelia senegalensis</i>	Africa and Asia	I		I			2
<b>PSITTACIFORMES</b>							
<i>Melopsittacus undulatus</i>	Australia	N		E		N	2
<i>Psittacula krameri</i>	Africa and Asia	N	I	E			3
<b>Total # of species</b>		<b>14</b>	<b>12</b>	<b>8</b>	<b>3(4)</b>	<b>3(4)</b>	

- *Most invaded ecosystems*

Inland water bodies: wetlands, fishponds, gravel pits, lakes, rivers.

- *Impact on ecology, ecosystems and economy*

No impact reported or presumed.

- *Management options and their feasibility (including measures already in place)*

Prevention of escapes through the strict application of rules governing aviculture (Owen et al. 2006), regulated by national laws.

- *Future expected trends*

Increase in numbers, as well as possible breeding

attempts, as breeding occurred in some other European countries (Banks et al. 2008).

### Canada Goose (*Branta canadensis*)

The species is recorded in Bulgaria and Croatia.

- *Temporal trends*

**BG:** Incidental. Three records to date (Michev and Simeonov 1985; Simeonov and Mooij 1997; Nikolov et al. 2006): Atanasovsko Lake (27 October 1980), Shabla Tuzla Lake (05 May 1997), and near Tsanko Tserkovski Reservoir (14 February 2006).

**HR:** Incidental. Only one record, probable escapee. One bird observed on 1 February 2013 in Jelas Polje fishponds, Posavina (Kralj and Barišić 2013.).

- *Habitats*

Coastal and inland water bodies, as well as open fields in their vicinity.

- *Main pathways to the Balkan region*

Probable escapees (pet trade) or birds from introduced European breeding population.

- *Most invaded ecosystems*

Freshwater and haline water bodies (natural lakes and reservoirs, fishponds) and open fields of (mostly) arable land around them.

- *Impact on ecology, ecosystems and economy*

No impact reported or presumed.

- *Management options and their feasibility (including measures already in place)*

Prevention of escapes through the strict application of rules governing aviculture (Owen et al. 2006), regulated by national laws.

- *Future expected trends*

Increase in numbers as a result of the increasing population established in Europe (Banks et al. 2008).

### **Egyptian Goose (*Alopochen aegyptiacus*)**

The species is recorded in Bulgaria, Croatia and Greece.

- *Temporal trends*

**BG:** Some data suggest that this species has been kept in captivity in Bulgaria since the 18<sup>th</sup> century (Nankinov 2006). During the last decade single free-flying pairs from the Sofia Zoo bred on several occasions in the wild in one of the city parks, not far away from the Zoo, but no viable population has been established so far.

**HR:** Incidental. Only one record, probable escapee. One bird observed on 19 February 2005 near Slavon-ski Brod.

**GR:** Three birds – possibly escapees – stayed about a year long at the Kerkini Lake in 2013 (Kerkini Lake Management Body – *pers. comm.*; BirdWING).

- *Habitats*

All observations so far come from inland water bodies.

- *Main pathways to the Balkan region*

Probable escapees (pet trade) or birds from introduced European breeding population.

- *Most invaded ecosystems*

Various freshwater water bodies.

- *Impact on ecology, ecosystems and economy*

No impact reported or presumed.

- *Management options and their feasibility (including measures already in place)*

Prevention of escapes through the strict application of rules governing aviculture (Owen et al. 2006), regulated by national laws.

- *Future expected trends*

Increase in numbers as a result of pet escapes, as well as possible breeding attempts.

### **Muscovy Duck (*Cairina moschata*)**

Frequently kept in captivity (mainly for meat) but there are not any records in the wild so far.

- *Temporal trends*

**BG:** Frequently kept in captivity but there are not any records in the wild so far.

**HR:** The first record for Croatia was an observation of domesticated birds at the end of the 19<sup>th</sup> century in Kopački Rit wetlands (Mojsisovics 1883). Domesticated birds have been kept in Croatia and can be observed in or around human settlements; such data are not processed by the Croatian Rarity Committee. No observations of this species in the wild have been reported.

**GR, ME, MK:** Common captive bird.

- *Habitats*

No data available.

- *Main pathways to the Balkan region*

No data available.

- *Most invaded ecosystems*

No data available.

- *Impact on ecology, ecosystems and economy*

Traditionally kept as a food source.

- *Management options and their feasibility (including measures already in place)*

Prevention of escapes through the strict application of rules governing aviculture (Owen et al. 2006), regulated by national laws.

- *Future expected trends*

This species is frequently kept in the open with other domesticated birds, therefore, the probability of escapes are higher than in species kept in aviaries as pets only.

### Wood Duck (*Aix sponsa*)

The species is recorded in Bulgaria and Croatia.

- *Temporal trends*

**BG:** Two confirmed records from Bulgaria, most probably, of the same individual - in March and April 1933, around Sofia. The bird was ringed by the Zoo in Leipzig, Germany (Nankinov 2006). An unconfirmed record from the Southern Black Sea Coast (Primorsko; data from a web-based hunting forum), in February 2007.

**HR:** First time recorded in Croatia (near Kutjevo) in 1890. That winter a number of birds, presumed to be escapees, was shot in Austria (Tschusi zu Schmiddhoffen 1891). Several observations from Croatia, four records of 11 birds during last 50 years (Kralj and Barišić 2013). A flock of seven birds, all without rings, observed near Zagreb from October to December 2010. All reports out of the breeding season (October to December, one in April).

- *Habitats*

Both inland and coastal wetlands.

- *Main pathways to the Balkan region*

Probable escapees (pet trade) or birds from introduced European breeding population.

- *Most invaded ecosystems*

Freshwater and marine coastal habitats.

- *Impact on ecology, ecosystems and economy*

None reported.

- *Management options and their feasibility (including measures already in place)*

Prevention of escapes through the strict application of rules governing aviculture (Owen et al. 2006), regulated by national laws.

- *Future expected trends*

Increase in numbers and possible breeding attempts (most likely first in Croatia, among the studied countries), as breeding occurred in some other European countries (Banks et al. 2008).

### Mandarin Duck (*Aix galericulata*)

The species is recorded in Bulgaria and Croatia.

- *Temporal trends*

**BG:** One record from Bulgaria – on 24 December 1969, three birds (male and two females) at Durankulak Lake, along the Northern Black Sea Coast (Peshev 1971).

**HR:** First time recorded in Croatia in 1903 at three localities in central Dalmatia (Kralj 1997). Seven records of eight birds in the last 50 years (Kralj and Barišić 2013). All reports from the winter period: November to January, in recent times, mostly January.

- *Habitats*

Both inland and coastal wetlands.

- *Main pathways to the Balkan region*

Probable escapees (pet trade) or birds from introduced European breeding population.

- *Most invaded ecosystems*

Freshwater and marine coastal habitats.

- *Impact on ecology, ecosystems and economy*

None reported.

- *Management options and their feasibility (including measures already in place)*

Prevention of escapes through the strict application of rules governing aviculture (Owen et al. 2006), regulated by national laws.

- *Future expected trends*

Increase in numbers and possible breeding attempts (most likely first in Croatia, among the studied countries), as breeding occurred in some other European countries (Banks et al. 2008).

### Wild Turkey (*Meleagris gallopavo*)

Frequently kept in captivity (mainly for meat) but there are not any records in the wild so far.

- *Temporal trends*

**BG:** The species has been kept in captivity in Bul-

garia since the 16<sup>th</sup> century. During the second half of the 20<sup>th</sup> century it was introduced into several hunting ranches (semiwild conditions) within the country (Nankinov 2006), in which the populations were artificially sustained by man; currently some birds are kept in the Mazalat Hunting Ranch (S. Stoyanov – *pers. comm.*). There are not any records in the wild.

**HR:** An unsuccessful introduction attempt of wild birds by hunters in the Tikves area (eastern Croatia) mentioned by Mikuska (1979), but without details about year, number of birds, etc. No records about that or other attempts found in the Croatian hunting magazine.

**ME:** One bird, possibly a domesticated individual, was recorded at Ulcinj Salina in 2012. Common captive bird.

**GR, MK:** Common captive bird.

- *Habitats*

No data available.

- *Main pathways to the Balkan region*

Domestic bird.

- *Most invaded ecosystems*

No data available.

- *Impact on ecology, ecosystems and economy*

Traditionally kept as a food source.

- *Management options and their feasibility (including measures already in place)*

No data available.

- *Future expected trends*

Although a low number of birds have been kept in semiwild conditions in the hunting ranches, there are no current plans for the introduction of that species into the wild. Therefore, it will most probably remain in the region as a domestic bird only.

### **Northern Bobwhite (*Colinus virginianus*)**

There are data on this species for Croatia only.

- *Temporal trends*

**HR:** Introduced to the Istria Peninsula by hunters from 1959/1960 onwards (Kralj 1997). A self-sustaining population established (confirmed to breed in the wild), but the dynamics of restocking is not known.

No data about introductions in other areas, but one adult bird was observed on 22 March 2003 in Turopolje (central Croatia).

- *Habitats*

Coastal areas of Istria (North Adriatic) and NW Croatia.

- *Main pathways to the Balkan region*

Intentional introduction as a game bird.

- *Most invaded ecosystems*

Mosaic habitats with vineyards.

- *Impact on ecology, ecosystems and economy*

Game bird. Possible competition with native Rock Partidges (*Alectoris graeca*).

- *Management options and their feasibility (including measures already in place)*

No measures have been taken. The species is included in the list of game birds in Croatia by the Hunting Law (OG 140/05, 75/09, 153/09). From the nature protection standpoint, it would be advisable to cease the introduction and restocking by hunters.

- *Future expected trends*

If introduction and restocking will not be stopped, the species may establish self-sustaining populations in other parts of coastal Croatia. The expansion into the continental part is not likely, as the species is vulnerable to cold winters and snow cover.

### **Japanese Quail (*Coturnix japonica*)**

There are data for this species for Bulgaria only.

- *Temporal trends*

**BG:** Unsuccessful introduction attempts took place in the 1960-1970s when a total of 1860 birds were released in the Sofia, Pazardzhik and Yambol regions (Nankinov 2009).

- *Habitats*

No data available.

- *Main pathways to the Balkan region*

Intentional introduction as a game bird.

- *Most invaded ecosystems*

No data available.

- *Impact on ecology, ecosystems and economy*

No data available.

- *Management options and their feasibility (including measures already in place)*

*ing measures already in place)*

No data available. From the nature protection standpoint, it would be advisable no further introduction attempts to be undertaken by hunters.

- *Future expected trends*

No data available.

## **Chukar (*Alectoris chukar*)**

The species is known for all countries under study, though its status is different.

- *Temporal trends*

**BG:** The species is native to Bulgaria, especially to its southeastern parts – the Eastern Rhodopes, Sakar Mountains, etc. (Simeonov et al. 1990). Currently, it has been introduced by the Union of Hunters and Fishermen into various regions within the country, although self-sustaining populations have not been formed (Gruychev 2014).

**HR:** Introductions by hunters started in the 1960s and 1970s at several localities along coastal Croatia, including islands (Kralj 1997). A self-sustaining population established. The total number of localities, restocking activities and the local introduction success are not known. The hunting statistics indicates a total stock of 100–400 birds in the period 2006–2011.

**GR:** The species is native to the country, in particular to Crete, the Aegean islands and Thrace. It has been introduced to the mainland Greece (Handrinos and Akriotis 1997; Mullarney et al. 2007).

**ME:** Situation unclear, some birds are likely to enter from populations introduced in neighbouring Croatia. There are some data on releases of birds as game species from private collections by hunters, as well as ceremonial releases of Chukars during human funerals.

**MK:** Situation unclear, it has allegedly been introduced in several hunting grounds, but no data on their survival are available.

- *Habitats*

Various dry and rocky areas in the inland Bulgaria, coastal Croatia and Greece.

- *Main pathways to the Balkan region*

The Chukar is native species to Bulgaria and Greece, and further introduced into new areas by

hunters. Outside its natural breeding range, in Croatia and FYR Macedonia (and possibly Montenegro), it was introduced as a game bird.

- *Most invaded ecosystems*

Rocky pastures, Mediterranean shrubs and Mediterranean rural mosaics.

- *Impact on ecology, ecosystems and economy*

Game bird in all countries. Competition and interbreeding with the Rock Partridge (*Alectoris graeca*). It is known to interbreed with native partridge species (including the Rock and Red-legged Partridge *A. rufa*) elsewhere in Europe as well (Garcia and Arruga 2006; Barilani et al. 2007; Barbanera et al. 2009). A genetic study about interbreeding with the Rock Partridges started in Croatia, but the results are not available yet.

- *Management options and their feasibility (including measures already in place)*

**HR:** No measures have been taken. The Chukar is included in the list of the game birds in Croatia by the Hunting Law (OG 140/05, 75/09, 153/09). From the nature protection standpoint, it would be advisable to cease the introduction and restocking by hunters. It is necessary to study the current genetic situation of the Rock Partridge and identify potential genetically pure Rock Partridge populations.

- *Future expected trends*

The spread of the Chukar and hybridisation with the Rock Partridges can cause the loss of the genetically pure Rock Partridge populations.

## **Red-legged Partridge (*Alectoris rufa*)**

There are data on this species for Bulgaria and Greece only.

- *Temporal trends*

**BG:** An unsuccessful introduction attempt took place in 1969 when 20 birds were released in the Plovdiv region (Simeonov et al. 1990).

**GR:** The species has been introduced as a game bird in several areas in Greece (Triantafyllidis et al. 2007). It has established populations and there is an evidence of cross-breeding with other partridges (Garcia and Arruga 2006; Barbanera et al. 2009). Its distribution is unknown as most of the releases are

not documented.

- *Habitats*

No data available.

- *Main pathways to the Balkan region*

An intentional introduction as a game bird.

- *Most invaded ecosystems*

No data available.

- *Impact on ecology, ecosystems and economy*

Interbreeding with native partridge species.

- *Management options and their feasibility (including measures already in place)*

No data available. From the nature protection standpoint, it would be advisable no further introduction attempts to be undertaken by hunters.

- *Future expected trends*

No data available.

### **Helmeted Guineafowl (*Numida meleagris*)**

Frequently kept in captivity (mainly for meat) but there are not any records in the wild so far.

- *Temporal trends*

**BG:** It is a common domestic bird species in Bulgaria, sometimes kept in semiwild conditions as hunting ranches (Nankinov 2006). In the 1990s there was a flock of birds breeding regularly near a human settlement in the Rupite area, SW Bulgaria (Boris Nikolov – *unpubl. data*).

**HR, GR, ME, MK:** Common captive bird.

- *Habitats*

No data available.

- *Main pathways to the Balkan region*

Domestic bird.

- *Most invaded ecosystems*

No data available.

- *Impact on ecology, ecosystems and economy*

Traditionally kept as a food source.

- *Management options and their feasibility (including measures already in place)*

No data available.

- *Future expected trends*

No data available.

### **African Collared Dove (*Streptopelia roseogrisea*)**

The species is recorded in Bulgaria and Croatia.

- *Temporal trends*

**BG:** Kept regularly in captivity but on several occasions during the 20<sup>th</sup> century recorded in the wild, including breeding – most of the data come from Sofia city parks (Nankinov 2006).

**HR:** Incidental. Only one record, probable escapee. One specimen caught on 8 May 1947 in Trnovec (NW Croatia) “in a flock of about 12 turtle doves (*Streptopelia turtur*)” is kept in the Croatian Natural History Museum (Grbac and Kralj 2008).

- *Habitats*

Inland Bulgaria and Croatia, close to the settlements.

- *Main pathways to the Balkan region*

Probable escapees (pet trade).

- *Most invaded ecosystems*

No data available.

- *Impact on ecology, ecosystems and economy*

None reported.

- *Management options and their feasibility (including measures already in place)*

No data available.

- *Future expected trends*

No data available.

### **Laughing Dove (*Streptopelia senegalensis*)**

The species is recorded in Bulgaria and Greece.

- *Temporal trends*

**BG:** Incidental. Only one record so far – single bird observed on 06 August 1998 close to Ahtopol along the Southern Black Sea Coast (Nankinov 1998).

**GR:** Rare, less than 50 records (the Hellenic Rarities Committee 2013).

- *Habitats*

No data available.

- *Main pathways to the Balkan region*

No data available. The closest established population is in Istanbul, Turkey (Magnin 1997).



**Laughing Dove (*Streptopelia senegalensis*)**

January 2012, Istanbul, Turkey  
(© Boris Nikolov,  
www.fotobiota.com)

- *Most invaded ecosystems*

Forested areas around arable land.

- *Impact on ecology, ecosystems and economy*

None reported.

- *Management options and their feasibility (including measures already in place)*

No data available.

- *Future expected trends*

Possible increase in numbers as a result of the gradual range expansion in Turkey (most likely first in Bulgaria and Greece, among the studied countries) (Albayrak 2011).

**Budgerigar (*Melopsittacus undulatus*)**

The species is recorded in Bulgaria, Greece and FYR Macedonia.

- *Temporal trends*

**BG:** The species is regularly recorded in the wild or in human settlements – certainly escapees. The birds often join sparrow flocks. To date no successful breeding has been recorded in the wild (Nankinov 2006).

**GR:** The species has been recorded to breed in the Athens area, forming small groups in large parks that are open to the public (Greek Alien Terrestrial Animals Database 2013).

**MK:** Escapees are frequent, especially in the late 20<sup>th</sup> century, but probably surviving for a short time.

- *Habitats*

Inland and coastal areas.

- *Main pathways to the Balkan region*

Escapees (pet trade).

- *Most invaded ecosystems*

It is found mainly in parks, open areas, around

wetlands, and man-made environments of urban and semi-urban areas.

- *Impact on ecology, ecosystems and economy*

No data available.

- *Management options and their feasibility (including measures already in place)*

Prevention of escapes through the strict application of rules governing aviculture (Owen et al. 2006), regulated by national laws.

- *Future expected trends*

A big increase in the number of records in the near future is not expected, although successful breeding has been predicted as possible in South Bulgaria and along the Black Sea Coast owing to the milder climate conditions (Nankinov 2006).

### **Rose-ringed Parakeet (*Psittacula krameri*)**

The species is recorded in Bulgaria, Croatia and Greece.

- *Temporal trends*

**BG:** Recorded for the first time in Burgas in 1996 (Nankinov and Popov 1997). Since then numerous records throughout the country have been collected, most of them coming from the Black Sea Coast and mostly during autumn and winter time. The biggest part of the observations was recorded in 2004. Unsuccessful breeding attempt was observed in 2006 close to Kranevo along the Northern Black Sea Coast (Nankinov 2006).

**HR:** Incidental. Only one record, probable escapee. One bird was present in Petrčane near Zadar (mid-Adriatic) between 20 August 1991 and 4 February 1992 (Stipčević 1996).

**GR:** The species has been recorded from all continental and insular areas of Greece. It has established viable populations (Masseti 2002; Greek Alien Terrestrial Animals Database 2013).

- *Habitats*

Inland and coastal areas.

- *Main pathways to the Balkan region*

At least two possible ways of colonisation from populations established after introductions: (1) from



**Rose-ringed Parakeet (*Psittacula krameri*)**

January 2012, Gir National Park, Gujarat, India (© Boris Nikolov, www.fotobiota.com)

Western and Central Europe to the east-southeast, and (2) from Istanbul and Aegean Thrace to the north-northwest (Nankinov 2006).

- *Most invaded ecosystems*

It is found mainly in parks, gardens and other man-made environments of urban and semi-urban areas.

- *Impact on ecology, ecosystems and economy*

Competition with hole-nesting bird species, such as the House Sparrow (*Passer domesticus*), Stock Dove (*Columba oenas*), Nuthatch (*Sitta europaea*), Common Starling (*Sturnus vulgaris*), etc. (Strubbe et al. 2010; Czajka et al. 2011).

- *Management options and their feasibility (including measures already in place)*

Prevention of escapes through the strict application of rules governing aviculture (Owen et al. 2006), regulated by national laws.

- *Future expected trends*

Expansion of breeding range (including successful breeding attempts in Bulgaria) and increase in numbers in the whole region.

## Discussion

In terms of temporal trends, most of the alien bird species recorded on the Balkan Peninsula to date have been recorded after the beginning of the 20<sup>th</sup> century. Some species, such as the Wild Turkey (*Meleagris gallopavo*) and Helmeted Guineafowl (*Numida meleagris*), have been kept as domestic birds for centuries (Nankinov 2006).

Most of the alien bird species recorded on the Balkans originate (in terms of their native range) from the Americas, mostly North America (four species), rarely Central and South America (one species). Three species originate from Africa, two species from both Africa and Asia, two species originate from Australia, and two from East Asia. Two species of *Alectoris* spp. originate from Europe (southwestern and southeastern part, respectively). Thus, half of the alien species of birds found so far on the Balkan Peninsula originates from the tropics (eight species), while the other half comes from the temperate zone.

The main pathways of introduction to the Balkan

region include (1) escapees (from zoos, parks or similar collections, pets, domesticated birds), (2) birds from introduced European breeding populations, and (3) intentional introduction as game birds.

In most cases of introduction of the alien species, the current knowledge about the negative impact on local avifauna is insufficient or lacking. The impact can be a competition/displacement or hybridisation. A number of cases of introduction attempts by hunting organisations without prior profound scientific studies have been described. The scientific studies should become an essential legislatively determined tool for any intended introduction. The lack of such studies is the reason why many of the introduction attempts subsequently failed. A competition of alien species with native birds and interbreeding of the Chukar with the Rock Partridge were assumed to occur in Bulgaria, Croatia and Greece; similar results have been reported elsewhere as well (Barilani et al. 2007).

Among the alien bird species recorded on the Balkans, potentially the worst one is the Rose-ringed Parakeet, which is considered invasive. It is listed among the top 100 worst alien species in Europe (DAISIE 2009; Brochier et al. 2010), because of competing with native wildlife, causing disturbance to humans and behaving as an agricultural pest.

The higher number of alien bird species recorded in Bulgaria, Croatia and Greece, compared to Montenegro and FYR Macedonia, can be explained mainly with the larger territories of the former and the popularity of birdwatching in those countries. In general, the Balkan Peninsula, being a part of the Eastern European Bloc during the Cold War, benefited from the limited alien bird species introductions and subsequent population establishment as a result of the restrictions on the international trade, compared to Western Europe (Chiron et al. 2009). The lower birdwatching activities compared to Western Europe might be one of the reasons for the lower number of records of incidental species.

Except for the Rose-ringed Parakeet, in general, a large increase in the numbers and /or breeding range expansion of most alien species on the Balkans is not expected in the near future. Possible breed-

ing is predicted mainly for some waterfowl species, with breeding populations in Central and Western Europe. It should be noted that there have not been any passerine alien species of birds recorded so far. It is not unlikely that alien species as the Common Myna (*Acridotheres tristis*) and some of the estrildids and weavers introduced in the Western Mediterranean will continue their range expansion to the east and will reach the Balkan Peninsula (Nankinov 2006).

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