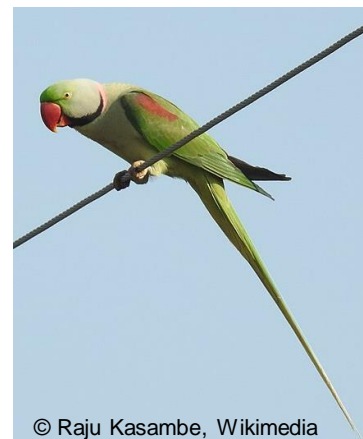


Alexandrine Parakeet (*Psittacula eupatria*)



© Raju Kasambe, Wikimedia

- A large green parrot with red bill and shoulder patches, c. 60cm in length.
- Non-native populations are established in Europe and elsewhere where it can be a pest of crops and a noise nuisance.
- Commonly kept in captivity in GB, from which escapes occur.
- Not yet established in GB, but future establishment is likely.
- May cause minor impacts on crops, native species and as a noise nuisance.

History in GB

Wild-living birds have been reported in England for several decades, including occasional successful breeding records since the 1990s. Reports have been recorded from Greater London and Merseyside / Lancashire, although the latter were culled. Established and rapidly increasing in Belgium, the Netherlands and Germany.

Native Distribution

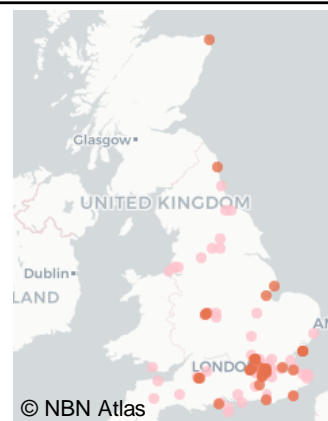
Native to southern Asia, from eastern Afghanistan to the Himalayan ridge and through most of lowland forests of South Asia to Indochina.



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GB Distribution

The NBN atlas holds 151 records since the early 1990s, but this includes duplicate records of the same bird. The number in the wild was closer to 2-3 during 2010-2020, with none reported in some years.



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Impacts

Environmental (minor, medium confidence)

- May displace native birds through competition for hole nesting, in a similar manner to ring-necked parakeet.
- Evidence is limited and its impact elsewhere appears to be localised.

Economic (minor, medium confidence)

- A serious pest of crops and druit in its native range.
- If it became widespread in GB it could have minor impacts on agricultural interests.

Social (minor, low confidence)

- Extremely noisy, as has been demonstrated by ring necked parakeets.
- Could become a nuisance in urban and sub-urban areas.

Introduction pathway

Escapes of pets or birds kept by aviculturists or from zoological collections (more rarely).

Spread pathway

Natural (moderate, medium confidence): populations in Europe have grown slowly, from a few individuals to small populations of ~ 200 in less than two decades.

Human (moderate, high confidence): humans moving pets while in captivity.

Summary

	Response	Confidence
Entry	V LIKELY	HIGH
Establishment	LIKELY	HIGH
Spread	SLOWLY	MEDIUM
Impact	MINOR	MEDIUM
Overall risk	LOW	MEDIUM

GB NON-NATIVE ORGANISM RISK ASSESSMENT SCHEME

Name of organism: *Psittacula eupatria*, Alexandrine Parakeet

Author: David Noble, British Trust for Ornithology

Risk Assessment Area: Great Britain

Version: Draft 1 (Dec 2022), Peer review (Jan 2023), NNRAF 1 (Mar 2023), Draft 2 (Jun 2023), NNRAF 2 (Jun 2023), Draft 3 (Nov 2023), NNRAF 3 (Dec 2023), Draft 4 (Jan 2024)

Signed off by NNRAF: December 2023

Approved by GB Committee: April 2024

Placed on NNS website: *to be completed*

What is the principal reason for performing the Risk Assessment?

The GB Committee for non-native species is considering whether to add this species to the list of species of special concern. This assessment will form part of the evidence used to inform the Committee’s decision. This species was selected for consideration following horizon scanning¹, in which it was ranked in the top 30 overall threats because it is known to be present as a pet in GB, could potentially establish and there is evidence to suggest it could be an agricultural pest and could compete with other birds.

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¹ Roy et al 2019. Horizon-scanning for invasive alien species with the potential to threaten biodiversity and ecosystems, human health and economies in Britain. https://www.nonnativespecies.org/assets/Document-repository/Horizon_scanning_short_report_2019-2.pdf

SECTION A – Organism Information																				
Stage 1. Organism Information	RESPONSE				COMMENT															
1. Identify the organism. Is it clearly a single taxonomic entity and can it be adequately distinguished from other entities of the same rank?	<p><i>Psittacula eupatria</i></p> <p>Four subspecies occur across the species' native range but the genetics of introduced populations have not been studied.</p>																			
2. If not a single taxonomic entity, can it be redefined? (if necessary use the response box to re-define the organism and carry on)	N/A																			
3. Does a relevant earlier risk assessment exist? (give details of any previous risk assessment)	No. However, this species was considered by horizon scanning (Roy et al 2019)																			
4. If there is an earlier risk assessment is it still entirely valid, or only partly valid?	<p>The full entry from horizon scanning (Roy et al 2019) is reproduced below:</p> <table border="1"> <thead> <tr> <th>Arrival</th> <th>Establishment</th> <th>Bd Impact</th> <th>Ec Impact</th> <th>HH impact</th> <th>Overall rank</th> <th>Bd rank</th> </tr> </thead> <tbody> <tr> <td>5</td> <td>4</td> <td>3</td> <td>3</td> <td>2</td> <td>16-30</td> <td>41-50</td> </tr> </tbody> </table> <p>Bd = biodiversity. Ec = economic. HH = human health.</p> <p>This invasive bird is known to compete for nest sites in tree holes with other birds but there is also evidence of economic damage because <i>P. eupatria</i> can be an agricultural pest. There are also concerns that this parakeet could potentially be infected with influenza A viruses and transmit these to humans. Alexandrine Parakeets are similar to Ring-necked Parakeets and are widely available as aviary or cagebirds that can escape from captivity, providing a ready source of arrivals. Wild-living birds have been reported in England for several decades, including occasional successful breeding records since the 1990s, such as in Greater London and Merseyside/Lancashire (although the latter two pairs and their young were culled) (Arnold et al. 2018, Butler 2021). The species can apparently also hybridise with the Ring-necked Parakeet in wild feral populations, and this has been reported in Britain, in</p>						Arrival	Establishment	Bd Impact	Ec Impact	HH impact	Overall rank	Bd rank	5	4	3	3	2	16-30	41-50
Arrival	Establishment	Bd Impact	Ec Impact	HH impact	Overall rank	Bd rank														
5	4	3	3	2	16-30	41-50														

Greater London (Arnold et al. 2018). Feral populations of Alexandrine Parakeets are established and showing rapid increases in Belgium, The Netherlands and Germany (Ancillotto et al. 2016). These feral populations, along with a source of captive birds in Britain, successful breeding already recorded in the wild, and widespread establishment of the related Ring-necked Parakeet, all suggest that establishment of Alexandrine Parakeets in Britain is very realistic. The 2015 EU horizon scanning for invasive non-native species identified similar economic and biodiversity threats of Ring-necked and Alexandrine Parakeets, especially potential crop and damage and competition for tree cavities (Roy et al. 2015). As such, the same impacts of Alexandrine Parakeets could be expected in Britain if widespread establishment were to occur.

This risk assessment has resulted in a lower risk category for *P. eupatria* than implied by its inclusion as a top threat to GB in the horizon scanning exercise. Firstly, although they are taxonomically and ecologically similar, *P. eupatria* is less widespread and less common than *P. krameri* suggesting a narrower ecological niche. It is less commonly kept as a pet and hence fewer individuals escape into the wild. It has established non-native populations in fewer countries elsewhere in Europe and total numbers are much smaller (100s rather than 10,000s of individuals). There is also less published evidence of impact for *P. eupatria* within its native or introduced range. Although the type of impacts are similar (e.g. potential competition with cavity nesters, and crop damage), the magnitude is likely to differ considerably between the two species. The tightening of trade laws for *P. eupatria* in India, greater biosecurity generally in the UK, and increasing awareness of the impact of non-native parrots in the UK may also mitigate against a similar pattern of spread as seen in *P. krameri*.

The other important point is that assessments elsewhere of the threats posed by *P. eupatria* may have been too high, given the lack of strong evidence for anything other than localised biodiversity effects, temporary behavioural effects (e.g. dominating bird tables) and the speculative nature of some risks, for example related to disease transmission. *P. eupatria* are very unlikely to be key drivers in the population trajectories of any of the species they are hypothesized to compete with for cavities, including Nuthatch which are increasing rapidly in the UK and elsewhere in Western Europe. The risks of hybridisation relate only to effects on another non-native species, the congeneric *P. krameri*.

Although carried out independently, this assessment is in general accordance with the statement in the review by Brightsmith and Kiacz (2021) and supported by Turbe et al. (2017) and by White et al. (2019) that despite being well established in many areas outside their native range, nearly all naturalised parrot populations have no or low-level impacts, at least based on the evidence available to date.

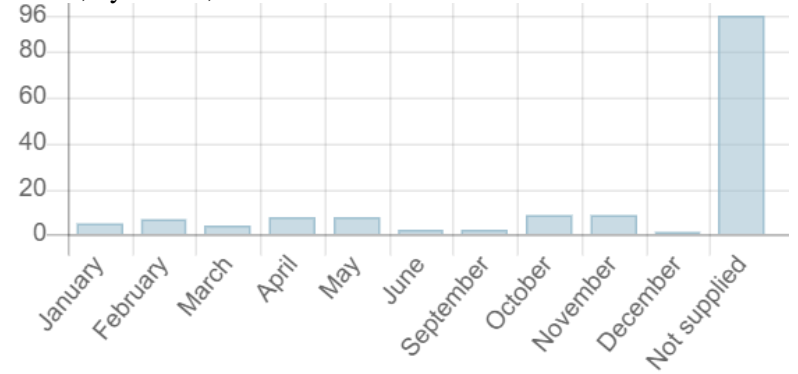
5. Where is the organism native?	The native range is most of southern Asia, from eastern Afghanistan to the Himalayan ridge and through most of the lowland forests of South Asia to Indochina.
6. What is the global distribution of the organism (excluding the risk assessment area)?	The global distribution includes all of the native range, as well as being established as breeding species in Japan, Hong Kong, parts of the Middle East and parts of Europe (Germany, Belgium, Netherlands, Italy and Turkey)
7. What is the distribution of the organism in the risk assessment area?	<p>Alexandrine Parakeets are reported as a scarce alien in most years in Great Britain and it has been known to breed or attempt to breed (in Merseyside 1997-1999 and London in 2000-2001) but is not established and there are no breeding records since 2001 according to the non-native species collated records reported periodically by the UK's Rare Breeding Bird Panel, there were no Alexandrine Parakeet breeding attempts during 2005-2014 according to Holling & RBBP (2017) or over the subsequent five years (RBBP, personal communication).</p> <p>At least 2-3 pet birds escape and are reported on pet lost & found sites every year and the National Biodiversity Network (NBN) holds 151 records since the early 1990s, spread across a very scattered range of towns, not just cities, in England as well as in Cardiff in Wales and in Scotland. However, these include duplicate records of the same bird at the same site in adjacent days, and the number of individuals recorded in the wild is therefore closer to 2-3 individuals during the decade 2010-2020, with none reported in some years. There are no records of breeding since 2001 and these seem to be largely recent escapes seen close to where they were held in captivity.</p>
8. Is the organism known to be invasive (i.e. to threaten organisms, habitats or ecosystems) anywhere in the world?	Yes. There are established introduced populations in a wide range of countries from Europe and the Middle East to eastern Asia.
9. Describe any known socio-economic benefits of the organism in the risk assessment area.	Possible cultural / aesthetic benefit of a parakeet living in urban areas Ribeiro et al. (2021). <i>P. eupatria</i> are one of many parrots kept commonly as pets (total numbers of this species in captivity are not available) and are also kept in zoological collections, at least two in the UK (registered on zootierliste).

SECTION B – Detailed assessment			
PROBABILITY OF ENTRY			
<p>Important instructions:</p> <ul style="list-style-type: none"> • Entry is the introduction of an organism into the risk assessment area. Not to be confused with spread, the movement of an organism within the risk assessment area. • For organisms which are already present in the risk assessment area, only complete the entry section for current active pathways of entry or if relevant potential future pathways. The entry section need not be completed for organisms which have entered in the past and have no current pathways of entry. 			
QUESTION	RESPONSE	CONFIDENCE	COMMENT
<p>1.1. How many active pathways are relevant to the potential entry of this organism?</p> <p>(If there are no active pathways or potential future pathways respond N/A and move to the Establishment section)</p>	<p>very few</p>	<p>high</p>	
<p>1.2. List relevant pathways through which the organism could enter. Where possible give detail about the specific origins and end points of the pathways.</p> <p>For each pathway answer questions 1.3 to 1.10 (copy and paste additional rows at the end of this section as necessary).</p>	<p>pet trade – escapes</p> <p>zoological collections - escapes</p>	<p>high</p>	<p>The major pathway is escapes of pets or birds kept by aviculturists. Escapes from zoological collections occur but more rarely</p>
<p>Pathway name:</p>	<p>pet trade - escapes</p>		

GB NON-NATIVE SPECIES RISK ANALYSIS

<p>1.3. Is entry along this pathway intentional (e.g. the organism is imported for trade) or accidental (the organism is a contaminant of imported goods)?</p> <p>(If intentional, only answer questions 1.4, 1.9, 1.10, 1.11)</p>	<p>accidental</p>	<p>high</p>	
<p>1.4. How likely is it that large numbers of the organism will travel along this pathway from the point(s) of origin over the course of one year?</p> <p>Subnote: In your comment discuss how likely the organism is to get onto the pathway in the first place.</p>	<p>unlikely that large numbers enter pathway every year</p> <p>very likely that small numbers (3 to 6) enter the pathway every year</p>	<p>high</p>	<p>Alexandrine parakeets are fairly widely kept as cagebirds in GB but numbers are not huge. A total of 4,260 alexandrine parakeets were imported into GB between 1975 and 2005 (NNSIP 2019) but many more (number unavailable) will have been bred and sold in captivity. Due to their value, owners are motivated to ensure they do not escape although there is some interest in having free-flying birds. Nevertheless, <i>P. eupatria</i> have powerful beaks that can chew through many structures, cages and aviaries can be damaged by storms or deliberately and birds do escape and enter the wild every year.</p> <p>Examination of the 151 records, some duplicates of same individual, in National Biodiversity Network suggests that on average 2-3 unique individuals are reported every year, with a range of none to 6 per year over the decade 2010-2020. A popular lost and found pets site suggests that approximately three are reported lost every year. So, while it is clearly very likely that some birds (3-6) enter the wild through this pathway every year, it seems unlikely that 'large numbers' enter the pathway every year.</p>
<p>1.5. How likely is the organism to survive during passage along the pathway (excluding management practices that would kill the organism)?</p>	<p>very likely</p>	<p>high</p>	<p>The passage along this pet escape pathway is immediate, i.e. escaped birds will immediately be in the local, likely urban environment, so logically survivorship will be high.</p> <p>Most escapes will be of single birds, and given their relatively long period to reproductive maturity and the time required to find a mate and</p>

GB NON-NATIVE SPECIES RISK ANALYSIS

<p>Subnote: In your comment consider whether the organism could multiply along the pathway.</p>			<p>form a pair bond, there is little chance to multiply along the pathway, although that could occur subsequently</p>																								
<p>1.6. How likely is the organism to survive existing management practices during passage along the pathway?</p>	<p>very likely</p>	<p>high</p>	<p>No management practices are envisaged during passage along pathway</p>																								
<p>1.7. How likely is the organism to enter the risk assessment area undetected?</p>	<p>moderately likely</p>	<p>high</p>	<p><i>P. eupatria</i> is similar in appearance to <i>P. krameri</i> so its presence may not be immediately detected, but the large numbers of skilled birders in GB means it should not remain undetected for long</p>																								
<p>1.8. How likely is the organism to arrive during the months of the year most appropriate for establishment?</p>	<p>likely</p>	<p>high</p>	<p>Escapes can occur during any season and the evidence from sightings (see NBN records below, and reports of birds lost) support this. Any greater tendency to put birds or cages outside in warmer weather may be balanced by greater risk of damage to aviaries from storms during the winter. The natural breeding period starts early and is long so most months are appropriate for establishment, especially in a long-lived species so overall this is likely</p> <p>Fig 1. National Biodiversity Network records of <i>P. eupatria</i> in Great Britain, by month,</p>  <table border="1"> <caption>Data for Fig 1: National Biodiversity Network records of <i>P. eupatria</i> in Great Britain, by month</caption> <thead> <tr> <th>Month</th> <th>Number of Records</th> </tr> </thead> <tbody> <tr> <td>January</td> <td>~5</td> </tr> <tr> <td>February</td> <td>~8</td> </tr> <tr> <td>March</td> <td>~5</td> </tr> <tr> <td>April</td> <td>~8</td> </tr> <tr> <td>May</td> <td>~8</td> </tr> <tr> <td>June</td> <td>~2</td> </tr> <tr> <td>September</td> <td>~2</td> </tr> <tr> <td>October</td> <td>~8</td> </tr> <tr> <td>November</td> <td>~8</td> </tr> <tr> <td>December</td> <td>~2</td> </tr> <tr> <td>Not supplied</td> <td>~96</td> </tr> </tbody> </table>	Month	Number of Records	January	~5	February	~8	March	~5	April	~8	May	~8	June	~2	September	~2	October	~8	November	~8	December	~2	Not supplied	~96
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GB NON-NATIVE SPECIES RISK ANALYSIS

1.9. How likely is the organism to be able to transfer from the pathway to a suitable habitat or host?	very likely	high	<i>P. eupatria</i> kept as cagebirds are most likely to escape into urban and suburban habitats, which is the habitat where this species has established itself in other countries. Where populations have been established in western Europe, these have all been in cities or towns (Mori et al. 2016, Kleunen et al. 2014, Ancillotto et al. 2021) and this is also true where they have become established in the Middle East (Mori et al. 2016). <i>P. eupatria</i> is a large and hardy species so it is judged very likely to adapt to live in the habitats surrounding human habitations in the UK
1.10. Estimate the overall likelihood of entry into the risk assessment area based on this pathway?	very likely	high	This is very likely because evidence from annual sightings and reports of escapes shows that <i>P. eupatria</i> enters into the risk assessment area along this pathway every year
<i>End of pathway assessment, repeat as necessary.</i>			
Pathway name:	zoological collections - escapes		
1.3. Is entry along this pathway intentional (e.g. the organism is imported for trade) or accidental (the organism is a contaminant of imported goods)? (If intentional, only answer questions 1.4, 1.9, 1.10, 1.11)	accidental	high	
1.4. How likely is it that large numbers of the organism will travel along this pathway from the point(s) of origin over the course of one year? Subnote: In your comment discuss how likely the organism is to get onto the pathway in the first place.	unlikely	high	It is unlikely that many <i>P. eupatria</i> will enter via this pathway because zoological collections will have security measures, but escapes may occur occasionally due to storms or faulty enclosures. The number of <i>P. eupatria</i> kept in UK zoological collections is unknown, and only two collections are registered on <i>zootierliste</i>

GB NON-NATIVE SPECIES RISK ANALYSIS

1.5. How likely is the organism to survive during passage along the pathway (excluding management practices that would kill the organism)? Subnote: In your comment consider whether the organism could multiply along the pathway.	very likely	high	The transition across this pathway is almost immediately into potentially suitable habitat but this pathway provides little opportunity to multiply because breeding in parakeets requires achieving good condition, finding a suitable mate, and a suitable nesting area
1.6. How likely is the organism to survive existing management practices during passage along the pathway?	very likely	high	No management practices are envisaged during passage of this rapid transition pathway
1.7. How likely is the organism to enter the risk assessment area undetected?	moderately likely	high	<i>P. eupatria</i> is similar in appearance to <i>P. krameri</i> so its presence may not be immediately detected, but the large numbers of skilled birders in GB means it should not remain undetected
1.8. How likely is the organism to arrive during the months of the year most appropriate for establishment?	likely	medium	Escapes could occur during any season as <i>P. eupatria</i> are hardy birds likely to be kept in outdoor enclosures. The breeding season is long, the species is adaptable and hence it seems likely to survive during most of the year whenever escapes occur.
1.9. How likely is the organism to be able to transfer from the pathway to a suitable habitat or host?	very likely	high	<i>P. eupatria</i> kept in zoological collections are most likely to escape into urban and suburban habitats, which is the habitat where this species has established itself in other countries, particularly in Western Europe including Germany, Belgium, Italy and The Netherlands (Ancillotti et al. 2016, Mori et al. 2021, Kleunen et al. 2014).
1.10. Estimate the overall likelihood of entry into the risk assessment area based on this pathway?	likely	medium	Escapes will occur and hence entry via this pathway is likely but less than for pets due to better security measures in zoos and the smaller number of individuals kept

GB NON-NATIVE SPECIES RISK ANALYSIS

1.11. Estimate the overall likelihood of entry into the risk assessment area based on all pathways (comment on the key issues that lead to this conclusion).	very likely	high	Periodic sightings of escaped birds in GB (up to 6 per year and first reported in 1980) demonstrates that this does happen in most years. It is very likely via the pet escape pathway and likely via the zoo escape pathway so in combination very likely
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PROBABILITY OF ESTABLISHMENT			
<p>Important instructions:</p> <ul style="list-style-type: none"> For organisms which are already well established in the risk assessment area, only complete questions 1.15, 1.21 and 1.28 then move onto the spread section. If uncertain, check with the Non-native Species Secretariat. 			
QUESTION	RESPONSE	CONFIDENCE	COMMENT
1.12. How likely is it that the organism will be able to establish in the risk assessment area based on the similarity between climatic conditions in the risk assessment area and the organism's current distribution?	very likely	high	The species is already known to occupy a wide range of climatic conditions in its native and non-native range. <i>P. eupatria</i> have established themselves in a number of cities in northern Europe with similar climates to that in the UK. These include Frankfurt, Bonn & Cologne in Germany, in Brussels in Belgium, Amsterdam & Groningen in the Netherlands. (Mori et al. 2016, Kleunen et al. 2014, Ancillotto et al. 2016)
1.13. How likely is it that the organism will be able to establish in the risk assessment area based on the similarity between other abiotic conditions in the risk assessment area and the organism's current distribution?	likely	high	The species is already known to occupy a wide range of conditions in its native and non-native range. <i>P. eupatria</i> have established themselves in a number of cities in northern Europe with similar landscapes and seasonality to that in the UK. These include Frankfurt, Bonn & Cologne in Germany, in Brussels in Belgium, Amsterdam & Groningen in the Netherlands. (Mori et al. 2016, Kleunen et al. 2014, Ancillotto et al. 2016)
1.14. How likely is it that the organism will become established in protected conditions (in which the environment is artificially maintained, such as wildlife parks, glasshouses, aquaculture facilities, terraria, zoological gardens) in the risk assessment area? Subnote: gardens are not considered protected conditions	likely	medium	This parakeet's tendency to associate with humans to gain benefits such as food resources could lead to establishment in such artificial environments

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1.15. How widespread are habitats or species necessary for the survival, development and multiplication of the organism in the risk assessment area?	widespread	very high	A wide range of urban, suburban and also some farmland habitats
1.16. If the organism requires another species for critical stages in its life cycle then how likely is the organism to become associated with such species in the risk assessment area?	na	very high	It does not require another species for its life-cycle, but Ancillotto et al (2016) noted that the presence of Ring-necked Parakeets (<i>P. krameri</i>) already established in a number of cities in the UK is likely to facilitate adaptation of escaped birds to local conditions, feeding and breeding sites due to their propensity to join large groups
1.17. How likely is it that establishment will occur despite competition from existing species in the risk assessment area?	likely	high	Competition might be expected from its widespread congener (<i>P. krameri</i>) but the two species commonly associate with no evidence of competition
1.18. How likely is it that establishment will occur despite predators, parasites or pathogens already present in the risk assessment area?	likely	high	There are few natural predators, and none likely to target this species given the prevalence already of <i>P. krameri</i> .
1.19. How likely is the organism to establish despite existing management practices in the risk assessment area?	likely	high	No management is currently underway so there is no change to the score in the previous questions. But it could be controlled (see 1.21) quite rapidly if desired.
1.20. How likely are management practices in the risk assessment area to facilitate establishment?	unlikely	medium	
1.21. How likely is it that biological properties of the organism would allow it to survive eradication campaigns in the risk assessment area?	unlikely	high	<i>P. eupatria</i> is a large and highly detectable parrot and demonstrably able to be shot, as in the Merseyside population (Butler 2005) so surviving eradication programmes is unlikely while numbers are small. This becomes increasingly difficult as the population grows and becomes more widespread as birds will rapidly move from areas where they are being killed or disturbed.

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1.22. How likely are the biological characteristics of the organism to facilitate its establishment?	likely	high	The species is mobile, adaptable, found in many habitats, benefits from association with humans, and naturally aggregates with others of its species as well as congeners (Sourav et al. 2018, Mori et al. 2016). This includes aggregating in foraging flocks and in communal roosts.
1.23. How likely is the capacity to spread of the organism to facilitate its establishment?	very likely	medium	<i>P. eupatria</i> are capable of long flights allowing them to quickly reach new areas and join with other conspecifics, as well as with other parakeets (e.g. <i>P. krameri</i>) where they may benefit from the group's foraging expertise
1.24. How likely is the adaptability of the organism to facilitate its establishment?	very likely	high	This species has a wide native (and established) range that encompasses many habitats. The established range includes climatic niches that differ from those in its native range (Ancillotto et al. 2016).
1.25. How likely is it that the organism could establish despite low genetic diversity in the founder population?	likely	medium	Captive <i>P. eupatria</i> are likely to have a reasonably diverse genetic history anyway, through a long history of capture from the wild
1.26. Based on the history of invasion by this organism elsewhere in the world, how likely is to establish in the risk assessment area? (If possible, specify the instances in the comments box.)	likely	high	This species has established itself in the urban environments of 5-10 other countries (including Netherlands, Belgium, Italy, Germany and Japan) with similar environmental conditions (Ancillotto et al. 2016).
1.27. If the organism does not establish, then how likely is it that transient populations will continue to occur? Subnote: Red-eared Terrapin, a species which cannot re-produce in the risk	very likely	high	This species is reported almost every year in different parts of GB, at least partly due to pet escapes, and is likely to continue to do so. Most records are of non-breeding and likely transient individuals but there have been scattered breeding attempts albeit with no evidence of an established population lasting more than a few years.

GB NON-NATIVE SPECIES RISK ANALYSIS

assessment area but is established because of continual release, is an example of a transient species.			
1.28. Estimate the overall likelihood of establishment	likely	high	Assuming no rapid response to new breeding populations

PROBABILITY OF SPREAD			
Important notes: <ul style="list-style-type: none"> Spread is defined as the expansion of the geographical distribution of a pest within an area. 			
QUESTION	RESPONSE	CONFIDENCE	COMMENT
2.1. How important is the expected spread of this organism in the risk assessment area by natural means? (Please list and comment on the mechanisms for natural spread.)	moderate	medium	<p>Populations of <i>P. eupatria</i> have grown from a few individuals to small populations of ca 200 individuals in less than two decades a number of cities in the Middle East and in Germany, Belgium and the Netherlands (e.g Viviano and Mori 2021, Ancillotto et al. 2016). However, this pattern of rapid increase does not occur everywhere. Although also first reported between 1990 and 2000 in France, mainland Spain and the UK, populations in those countries have remained very small or did not become established (Mori et al. 2016).</p> <p>There is no published information on natal dispersal distances but <i>P. eupatria</i> are strong fliers and it is known that birds from a ‘considerable area may gather at communal roosts in a single large tree’ (Juniper and Parr 1998) so substantial movements are plausible.</p>
2.2. How important is the expected spread of this organism in the risk assessment area by human assistance? (Please list and comment on the mechanisms for human-assisted spread.)	moderate (in the context of humans moving pets while in captivity)	high	<p><i>P. eupatria</i>, like many other parrots are traded and moved around frequently within Britain but this is while in captivity and before entry into the natural risk assessment area. If this type of human assistance is in scope because it reflects propagule pressure (frequent entries by different individuals from an assumed large gene pool in multiple locations), because pets will travel with their owners, then this would be moderate.</p> <p>Minimal (in the context of human assistance once free-living)</p>
2.3. Within the risk assessment area, how difficult would it be to contain the organism?	difficult	high	<i>P. eupatria</i> is highly mobile and capable of rapidly travelling considerable distances

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2.4. Based on the answers to questions on the potential for establishment and spread in the risk assessment area, define the area endangered by the organism.	see comment	high	urban and suburban habitats of cities and towns over a wide geographic area covering most of lowland England & Wales and southern Scotland
2.5. What proportion (%) of the area/habitat suitable for establishment (i.e. those parts of the risk assessment area where the species could establish), if any, has already been colonised by the organism?	0-10	very high	The current proportion of suitable habitat with an established population is effectively or very close to zero (it has previously bred sporadically at scattered locations). Our knowledge about establishment is very high given the numbers of birdwatchers in the UK and that the most suitable areas are in urban habitat close to people.
2.6. What proportion (%) of the area/habitat suitable for establishment, if any, do you expect to have been invaded by the organism five years from now (including any current presence)?	0-10	medium	As <i>P. eupatria</i> only occurs sporadically and is not an established breeder in GB, it is likely to be 10-20 years before it establishes and hence the proportion of the area occupied is likely to still be very low in five years. This is in accordance with patterns of increase in other countries in Europe where numbers have increased to 100s in several countries after more than two decades but remain in 10s where it has been less than 10 years since first reported (Mori et al. 2016).
2.7. What other timeframe (in years) would be appropriate to estimate any significant further spread of the organism in the risk assessment area? (Please comment on why this timeframe is chosen.)	20	medium	As the species only occurs sporadically and is not an established breeder in GB, it could be 10-20 years before it establishes, and this is also the time frame since establishments in other parts of Europe
2.8. In this timeframe what proportion (%) of the endangered area/habitat (including any currently occupied areas/habitats) is likely to have been invaded by this organism?	0-10	medium	This species does not reproduce rapidly so it is likely that establishment of the vulnerable area would still be very small
2.9. Estimate the overall potential for future spread for this organism in the risk assessment area (using the comment box to indicate any key issues).	slowly	medium	<i>P. eupatria</i> populations elsewhere in Europe have grown slowly, with no populations greater than a few hundred (Ancillotto et al. 2016). Its much more widespread congener (<i>P. krameri</i>) has also spread relatively slowly. Although numbers have gone up in the occupied

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			<p>areas in Kent and especially London, and there are pairs and small groups in a handful of other cities, it is still not established in most cities even along the south coast or Bristol. The latest UK Bird Atlas (Balmer et al 2013) shows that in the 20-year period between 1990 and 2010, <i>P. krameri</i> increased in distribution by 80%. This is within the range of 10-33% increase every five years defined by this assessment as a slow increase.</p>
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PROBABILITY OF IMPACT			
<p>Important instructions:</p> <ul style="list-style-type: none"> • When assessing potential future impacts, climate change should not be taken into account. This is done in later questions at the end of the assessment. • Where one type of impact may affect another (e.g. disease may also cause economic impact) the assessor should try to separate the effects (e.g. in this case note the economic impact of disease in the response and comments of the disease question, but do not include them in the economic section). • Note questions 2.10-2.14 relate to economic impact and 2.15-2.21 to environmental impact. Each set of questions starts with the impact elsewhere in the world, then considers impacts in the risk assessment area separating known impacts to date (i.e. past and current impacts) from potential future impacts. Key words are in bold for emphasis. 			
QUESTION	RESPONSE	CONFIDENCE	COMMENTS
2.10. How great is the economic loss caused by the organism within its existing geographic range excluding the risk assessment area , including the cost of any current management?	moderate	low	This species is stated to be major pest of crops in agricultural areas of some countries in Asia (Juniper and Parr 1998). The crops associated with this statement are not identified specifically but it is known to eat cultivated maize and sorghum as well as ripening fruits. Its diet also includes guava, almonds, the nectar and petals of many ornamental trees, grains, nuts, fruit, and the young leaves of vegetables.
2.11. How great is the economic cost of the organism currently in the risk assessment area excluding management costs (include any past costs in your response)?	minimal	very high	There are too few individuals in the UK to exert any economic effect
2.12. How great is the economic cost of the organism likely to be in the future in the risk assessment area excluding management costs?	minor	medium	In its native range, <i>P. eupatria</i> feeds on a wide variety of wild and cultivated seeds, nuts, grains, flower buds, nectar, fruit and vegetables, and is considered a crop pest in some areas (Juniper and Parr, 1998). Its diet includes almonds, Chinese apple (<i>Ziziphus mauritiana</i>) and the seeds of plane and pine trees in Pakistan (Sourav et al. 2018) and persimmons in its introduced range in Italy (Viviano and Mori 2021). There are no reports of economic impact from anywhere in its non-native range in Europe, although since no populations exceed a few hundred, effects would in case be localised. If its abundance

			increased markedly in the UK, there is potential economic impact through depredation of fruit and nut-producing trees, in orchards near built up areas and in gardens.
2.13. How great are the economic costs associated with managing this organism currently in the risk assessment area (include any past costs in your response)?	minimal	very high	This is minimal due to the lack of any breeding birds since 2001 and that individuals can easily be shot, as in Merseyside (Butler 2005). Moreover, many escaped parrots (in general) reported in the wild are subsequently recaptured, usually by members of the public or animal care charities and further management by responsible bodies is often not required. Monk Parakeets are the only parrot actively officially controlled in the UK.
2.14. How great are the economic costs associated with managing this organism likely to be in the future in the risk assessment area?	minor	medium	The shooting of the <i>P. eupatria</i> breeding in Merseyside in the early 2000s demonstrated that control could be easily and cheaply carried out, especially if an early response to breeding attempts was implemented. However, management of a highly mobile and dispersed species that breeds high in hollow trees, and occupies urban areas with high densities of people would become more difficult and more costly once it became very widespread.
2.15. How important is environmental harm caused by the organism within its existing geographic range excluding the risk assessment area ?	minimal	medium	There has been no published evidence of impact of this species in other established populations in Europe but populations of <i>P. eupatria</i> are currently small. Negative impacts of its congener <i>P. krameri</i> have been shown in Belgium on Nuthatches and in Spain on Noctule Bats, both through competition for nest sites (Strubbe et al, 2010; Hernandez et al. 2018) but in Spain also by killing the bats. Viviano and Mori (2021) report that <i>P. krameri</i> has displaced, or sometimes killed, hibernating bats when accessing cavities for nesting in Spain for the greater noctule bat <i>Nyctalus lasiopterus</i> and the meridional serotine <i>Eptesicus isabellinus</i> , the Netherlands for the common noctule bat <i>Nyctalus noctula</i> and in Italy for the lesser noctule bat <i>Nyctalus leisleri</i> .
2.16. How important is the impact of the organism on biodiversity (e.g. decline in native species, changes in native species communities, hybridisation) currently	minimal	very high	There have been currently too few <i>P. eupatria</i> to have anything other than minimal impact; moreover, the impact of its well-established congener (<i>P. krameri</i>) remains to be proven in GB. Tests in GB of the impact of <i>P. krameri</i> on other cavity nesters such as Nuthatches found no evidence (Newson et al.

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<p>in the risk assessment area (include any past impact in your response)?</p>			<p>2011). A later UK study (Pringle and Siriwardena 2022) found both negative and positive correlations between <i>P. krameri</i> and population growth rates in both cavity nesters and open-nesting bird species and concluded that correlative studies of impact are likely to be confounded by background variables such as habitat quality, and hence difficult to interpret.</p>
<p>2.17. How important is the impact of the organism on biodiversity likely to be in the future in the risk assessment area?</p>	<p>minor</p>	<p>medium</p>	<p>Impact of its well-established congener (<i>P. krameri</i>) remains to be proven in GB. Tests of the impact of <i>P. krameri</i> on cavity nesters such as Nuthatches found no evidence of negative effects (Newson et al. 2011) although such effects were found in Belgium (Strubbe et al. 2010) and it was deemed conceivable there could be negative impacts in the future if parakeets increase and spread markedly. There is evidence of killing of other cavity nesters such as Noctule Bats (Giuntini et al. 2022) and Lesser Kestrels (Hernandez et al. 2014) in Spain: and competitive exclusion from cavities of other bird species such as Scops Owl, Hoopoe and Swift elsewhere (Mori & Menchetti 2021) so the potential for negative impacts is there. But this is judged to be Minor because the irreversible effects would be localised and because there is no evidence anywhere of long-term effects on populations of any other species.</p>
<p>2.18. How important is alteration of ecosystem function (e.g. habitat change, nutrient cycling, trophic interactions), including losses to ecosystem services, caused by the organism currently in the risk assessment area (include any past impact in your response)?</p>	<p>minimal</p>	<p>very high</p>	<p>There have been currently too few to have anything other than minimal impact, and none would be anticipated</p>
<p>2.19. How important is alteration of ecosystem function (e.g. habitat change, nutrient cycling, trophic interactions), including losses to ecosystem services, caused by the organism likely to be in the risk assessment area in the future?</p>	<p>minimal</p>	<p>medium</p>	<p>This species is herbivorous, does not alter habitats and is unlikely to have any impact on ecosystem function or ecosystem services</p>

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<p>2.20. How important is decline in conservation status (e.g. sites of nature conservation value, WFD classification) caused by the organism currently in the risk assessment area?</p>	<p>minimal</p>	<p>very high</p>	<p>None given its very scarce periodic occurrence</p>
<p>2.21. How important is decline in conservation status (e.g. sites of nature conservation value, WFD classification) caused by the organism likely to be in the future in the risk assessment area?</p>	<p>minimal</p>	<p>high</p>	<p>Given its lack of expected impact on ecosystem function, the expected impact on conservation status of sites, etc is expected to be minimal.</p>
<p>2.22. How important is it that genetic traits of the organism could be carried to other species, modifying their genetic nature and making their economic, environmental or social effects more serious?</p>	<p>minimal</p>	<p>medium</p>	<p>This species is known to hybridise in captivity (Krause 2004) and in the wild with <i>P. krameri</i> (Postigo 2016), the only other well-established parrot in GB. But that is unlikely to increase the low environmental, economic or social impacts of ring-necked parakeets.</p>
<p>2.23. How important is social, human health or other harm (not directly included in economic and environmental categories) caused by the organism within its existing geographic range?</p>	<p>minor</p>	<p>low</p>	<p>There is little evidence of such impact despite its wide geographic range but <i>P. eupatria</i>, like other parakeets are extremely noisy, have a tendency to congregate with conspecifics and may be irritating to human communities, as shown for <i>P. eupatria</i> in the Netherlands by Kleunen et al. (2010) Moreover, their use of trees in parks and urban areas places them close to, and often directly above humans such that droppings as well as the noise could affect humans negatively. This is assessed as minor due to limited evidence from elsewhere in Europe, as well as limited evidence of this kind of impact in GB for its much more abundant congener <i>P. eupatria</i>, where roosts can number up to 15,000 individuals.</p>
<p>2.24. How important is the impact of the organism as food, a host, a symbiont or a vector for other damaging organisms (e.g. diseases)?</p>	<p>minor</p>	<p>low</p>	<p>By occupying urban habitats, <i>P. eupatria</i> could conceivably and more easily transmit diseases to humans but there has been no evidence of this. Psittaciformes are vulnerable to Newcastle disease and psittacosis (Kaleta et al., 2007) and <i>P. eupatria</i> traded from Asia have been found to have avian flu (Mase et al. 2001).</p>

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<p>2.25. How important might other impacts not already covered by previous questions be resulting from introduction of the organism?</p>	<p>na</p>	<p>high</p>	
<p>2.26. How important are the expected impacts of the organism despite any natural control by other organisms, such as predators, parasites or pathogens that may already be present in the risk assessment area?</p>	<p>minimal</p>	<p>medium</p>	<p><i>P. eupatria</i> have few natural predators even in their native range, and apart perhaps from Peregrine Falcons, the situation in GB is likely to be similar.</p>
<p>2.27. Indicate any parts of the risk assessment area where economic, environmental and social impacts are particularly likely to occur (provide as much detail as possible).</p>	<p>orchards and fruit crops within urban or suburban environments</p>	<p>medium</p>	<p>There are potential economic costs of damage to fruit trees and crops</p>
<p>2.28. Estimate the overall impact of this organism in the risk assessment area (using the comment box to indicate any key issues).</p>	<p>minor</p>	<p>medium</p>	<p>The overall risk of impact of <i>P. eupatria</i> in GB is assessed as minor because each of risks assessed (on native biodiversity, genetic issues, disease, economic and social) were assessed as minor at most, or minimal. Much of the assessment relies on the strength of evidence of impact by its closely related and ecologically similar congener <i>P. krameri</i>, as well as studies on non-native <i>P. eupatria</i> populations elsewhere. Overall, the confidence in this assessment is medium.</p>

RISK SUMMARIES			
	RESPONSE	CONFIDENCE	COMMENT
Summarise Entry	very likely	high	This is the result of very likely entry (already annual) via the pet escape pathway and slightly less but still likely entry via the escape from zoos pathway. Numbers are small and some are recaptured or return but survivorship could be high and this is likely to be sustained as parrots, including <i>P. eupatria</i> , remain popular pets and are regularly imported and bred in captivity
Summarise Establishment	likely	high	Breeding by <i>P. eupatria</i> has occurred intermittently although not since the early 2000s but not been sustained, in one instance due to control. Hence establishment is likely , with the caveat that this is without control measures which have and could be applied while numbers are very small and localised. It is not higher because the number of escapes remains small despite the assumption of a large captive population of pets.
Summarise Spread	slowly	medium	This is slow because of the biology of the species (long-lived and late to breed), because there is little evidence of particularly rapid growth of <i>P. eupatria</i> in other established populations in Europe, and because the population growth rate of the much more invasive <i>P. krameri</i> has still been within the range defined as slow for these assessments (10-33% every five years)
Summarise Impact	minor	medium	Although <i>P. eupatria</i> is currently very scarce and only sporadically breeding the impact risk is considered minor because each of risks assessed (on native biodiversity, genetic issues, disease, economic and social) was assessed as minor, or minimal. There is evidence for impact by the much more widespread and abundant <i>P. krameri</i> but it is not strong evidence despite the species' abundance in some parts of its European introduced range. The assessment also takes into account the speculative nature of some hypothesized risks, such as disease transmission.

<p>Conclusion of the risk assessment</p>	<p>low</p>	<p>medium</p>	<p>It seems likely that <i>P. eupatria</i> will eventually establish itself in GB (it already enters the risk area annually) and has resulted in itinerant small populations. But impact is likely to be minor resulting in the low risk assessment (and only medium confidence). This accords broadly with the assessment of White et al. (2019) who failed to find any evidence of impact of this species in its localised and small European populations but highlighted the lack of studies and the likelihood of greater risk if populations increase.</p> <p>The outcome of this assessment has resulted in a lower overall risk than might be expected for <i>P. krameri</i>, which has demonstrated its invasiveness in many more locations, within Europe and elsewhere. This lower risk is due to lack of evidence for some attributes (eg impact) for <i>P. eupatria</i>, and the lower number and size of established populations (it is not known how numbers in captivity compare). There may also be differences in biological attributes reflected by the greater natural range of <i>P. krameri</i>, and slightly smaller size and faster breeding maturity. However, the conclusion of Toft & Wright (2015) was that the length of time over which species such as <i>P. krameri</i> have entered the wild, termed propagule pressure, is probably the main reason for the success of that species. <i>P. eupatria</i> seem to be less commonly kept than <i>P. krameri</i> and the tightening of trade laws for <i>P. eupatria</i> in India, greater biosecurity generally in the UK, the 2005 European wild bird trade ban aimed at mitigating the risk of avian flu, and increasing awareness of the impact of non-native parrots in the UK may also mitigate against a similar phenomenon.</p>
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ADDITIONAL QUESTIONS - CLIMATE CHANGE			
3.1. What aspects of climate change, if any, are most likely to affect the risk assessment for this organism?	Warming, particularly milder winters	medium	Warmer winters are likely to improve survival, as well as facilitate the spread of a wider range of fruit trees and introduced plants that the parakeets are able to exploit.
3.2. What is the likely timeframe for such changes?	20	low	
3.3. What aspects of the risk assessment are most likely to change as a result of climate change?	Establishment and spread	high	
ADDITIONAL QUESTIONS - RESEARCH			
4.1. If there is any research that would significantly strengthen confidence in the risk assessment please summarise this here.	see comment	medium	Studies of the impact of introduced <i>P. eupatria</i> populations elsewhere in Europe Assessment of current trade and especially captive holdings in GB.

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