

Ruddy shelduck (*Tadorna ferruginea*)



Arne List, Wikimedia Commons 2016

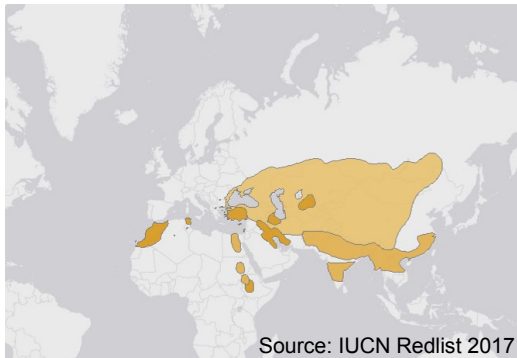
- Ornamental fowl native to Northwest Africa, Greece and Romania, and eastwards into the Himalayas, India and central Asia.
- Commonly kept in private collections in GB and Europe.
- A low number of breeding pairs found in eastern England, particularly in Norfolk.
- May have a moderate environmental impact, particularly on other native birds through competition for nest sites.
- May also have minor economic impacts as an agricultural pest.

History in GB

First recorded in 1776 when an individual, possibly a vagrant from the native range, was shot in Dorset. Further records exist from the late 1900s and it is unclear whether these were vagrants or escaped birds from private collections. In 2005 the UK population was estimated to be between 30 and 40 birds. In 2014/15 this had reduced to an estimated 8 individuals, although this may be an underestimate. Although ruddy shelduck are known to breed regularly in GB, numbers of breeding pairs have always been low and the population does not appear to be increasing. Most breeding has taken place in the southeast of the country, particularly in Norfolk.

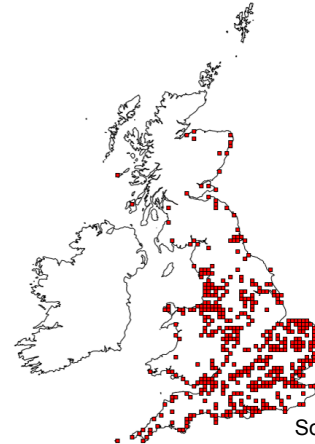
Native distribution

Northwest Africa, and from Greece and Romania eastwards into the Himalayas, India and central Asia.



Source: IUCN Redlist 2017

Distribution in GB (map shows sightings, not established populations)



Source: NBN 2017

Impacts

Environmental (moderate)

- Potential threat to native bird species through competition for nest sites and aggressive behaviour.
- Known to hybridise with the native shelduck although this is rare.

Economic (minor)

- Agricultural pest, known to graze on cereal crops and vegetables.

Social (minimal)

- Potential vector for avian influenza, but unlikely to be a significant risk.

Introduction pathways

Ornamental - ruddy shelduck are commonly kept in captivity. Escapes are common and likely to be the source of most feral birds in western Europe.

Spread from European populations - breeding populations exist in several western European countries and it is possible that birds could spread across the channel to GB from these countries.

Spread pathways

Natural (slow) - if numbers were to increase birds are likely to colonise new potential breeding areas.

Human-aided (intermediate) - commonly kept in private collections in GB. Further escapes are likely, although the number of locations from which birds can escape is unlikely to increase dramatically.

Summary

	Risk	Confidence
Entry	VERY LIKELY	VERY HIGH
Establishment	LIKELY	HIGH
Spread	INTERMEDIATE	MEDIUM
Impacts	MODERATE	MEDIUM
Conclusion	MEDIUM	MEDIUM

Information about GB Non-native Species Risk Assessments

The Convention on Biological Diversity (CBD) emphasises the need for a precautionary approach towards non-native species where there is often a lack of firm scientific evidence. It also strongly promotes the use of good quality risk assessment to help underpin this approach. The GB risk analysis mechanism has been developed to help facilitate such an approach in Great Britain. It complies with the CBD and reflects standards used by other schemes such as the Intergovernmental Panel on Climate Change, European Plant Protection Organisation and European Food Safety Authority to ensure good practice.

Risk assessments, along with other information, are used to help support decision making in Great Britain. They do not in themselves determine government policy.

The Non-native Species Secretariat (NNSS) manages the risk analysis process on behalf of the GB Programme Board for Non-native Species. Risk assessments are carried out by independent experts from a range of organisations. As part of the risk analysis process risk assessments are:

- Completed using a consistent risk assessment template to ensure that the full range of issues recognised in international standards are addressed.
- Drafted by an independent expert on the species and peer reviewed by a different expert.
- Approved by an independent risk analysis panel (known as the Non-native Species Risk Analysis Panel or NNRAP) only when they are satisfied the assessment is fit-for-purpose.
- Approved for publication by the GB Programme Board for Non-native Species.
- Placed on the GB Non-native Species Secretariat (NNSS) website for a three month period of public comment.
- Finalised by the risk assessor to the satisfaction of the NNRAP.

To find out more about the risk analysis mechanism go to: www.nonnativespecies.org

Common misconceptions about risk assessments

To address a number of common misconceptions about non-native species risk assessments, the following points should be noted:

- Risk assessments consider only the risks posed by a species. They do not consider the practicalities, impacts or other issues relating to the management of the species. They therefore cannot on their own be used to determine what, if any, management response should be undertaken.
- Risk assessments are about negative impacts and are not meant to consider positive impacts that may also occur. The positive impacts would be considered as part of an overall policy decision.
- Risk assessments are advisory and therefore part of the suite of information on which policy decisions are based.
- Completed risk assessments are not final and absolute. Substantive new scientific evidence may prompt a re-evaluation of the risks and/or a change of policy.

Period for comment

Draft risk assessments are available for a period of three months from the date of posting on the NNSS website*. During this time stakeholders are invited to comment on the scientific evidence which underpins the assessments or provide information on other relevant evidence or research that may be available. Relevant comments are collated by the NNSS and sent to the risk assessor. The assessor reviews the comments and, if necessary, amends the risk assessment. The final risk assessment is then checked and approved by the NNRAP.

*risk assessments are posted online at: <http://www.nonnativespecies.org/index.cfm?pageid=143>
comments should be emailed to nnss@apha.gov.uk

Non-native Species Rapid Risk Assessment (NRRAP)

Rapid Risk Assessment of: *Tadorna ferruginea* (Ruddy shelduck)

Author: Rebecca Jones and Lee Johnson, Animal and Plant Health Agency (APHA)

Version: Draft 1 (*March 2012*), Peer Review (*March 2013*), NNRAP 1st review (*June 2012*), Draft 2 (*Nov 2016*), NNRAP 2nd review (*Nov 2016*)

Signed off by NNRAP: November 2016

Approved by Programme Board: June 2019

Placed on NNS website: TBC

Introduction:

The rapid risk assessment is used to assess invasive non-native species more rapidly than the larger GB Non-native Risk Assessment. The principles remain the same, relying on scientific knowledge of the species, expert judgement and peer review. For some species the rapid assessment alone will be sufficient, others may go on to be assessed under the larger scheme if requested by the Non-native Species Programme Board.

Guidance notes:

- We recommend that you read all of the questions in this document before starting to complete the assessment.
- Short answers, including one word answers, are acceptable for the first 10 questions. More detail should be provided under the subsequent questions on entry, establishment, spread, impacts and climate change.
- References to scientific literature, grey literature and personal observations are required where possible throughout.

1 - What is the principal reason for performing the Risk Assessment? (Include any other reasons as comments)

Response: To rapidly assess the risk associated with this species in Great Britain. The Ruddy shelduck was identified by a GB horizon scanning exercise as a 'medium risk species either present, enclosed, or absent in Great Britain' (Parrot et al., 2009)

2 - What is the Risk Assessment Area?

Response: Great Britain

3 - What is the name of the organism (scientific and accepted common; include common synonyms and notes on taxonomic complexity if relevant)?

Response: *Tadorna ferruginea* (Ruddy shelduck). Monotypic species, slight sexual dimorphism (Reeber, 2015).

4 - Is the organism known to be invasive anywhere in the world?

Response: Yes. The species established a self-sustaining population in Switzerland, which increased rapidly in numbers and distribution in the early 2000s and has spread to Germany (Reeber, 2015; Bauer et al., 2011; Kumschick & Nentwig, 2010; Kestenholz et al., 2005; Wittenberg, 2005). The species has also established a self-sustaining and increasing breeding population in Denmark, has established breeding populations in France,

the Netherlands, the Ukraine, Austria, and Belgium and has the potential to become established in many countries in western Europe (Fox et al., 2015; Holling et al., 2014; Parkin & Knox, 2010; Parrott et al., 2009; Banks et al., 2008; Dubois, 2007; Kestenholz et al., 2005).

5 - What is the current distribution status of the organism with respect to the Risk Assessment Area?

Response: A small population is already present in GB. Records of the species date back to the late 1900s, and it remains unclear whether these records represent natural vagrants or escaped birds (Harrop, 2002). Banks et al. (2008) estimated the UK population to have been between 30 and 40 birds in 2005. The BTO WEBS data for the winter of 2014/2015 gives a maximum count of 8 individuals (BTO, 2016), but this is potentially an underestimate. Holling et al. (2014) list the species as an occasional breeder in the UK, with breeding occurring in 6 out of 10 years previous to 2011, with a mean of 1 breeding pair annually in the 5 years previous to 2011. Although the species breeds regularly in the UK, numbers of breeding pairs have always been low and the population does not appear to be increasing (Holling et al., 2014; Holling et al., 2011). Most breeding has occurred in the south east of the country, particularly in Norfolk (see maps below) (wildlife.co.uk, 2016; Balmer et al., 2013; Parrott et al., 2009). Birds in GB and other western European countries are generally considered to be of captive origin, although natural vagrancy from its native range in south eastern Europe, North Africa, and Asia has been shown to occur, so some of the birds in GB and other countries in western Europe may be of wild origin (Fox, 2015; Reeber, 2015; Dubois, 2007; Harrop, 2002; Vinicombe, 2002).

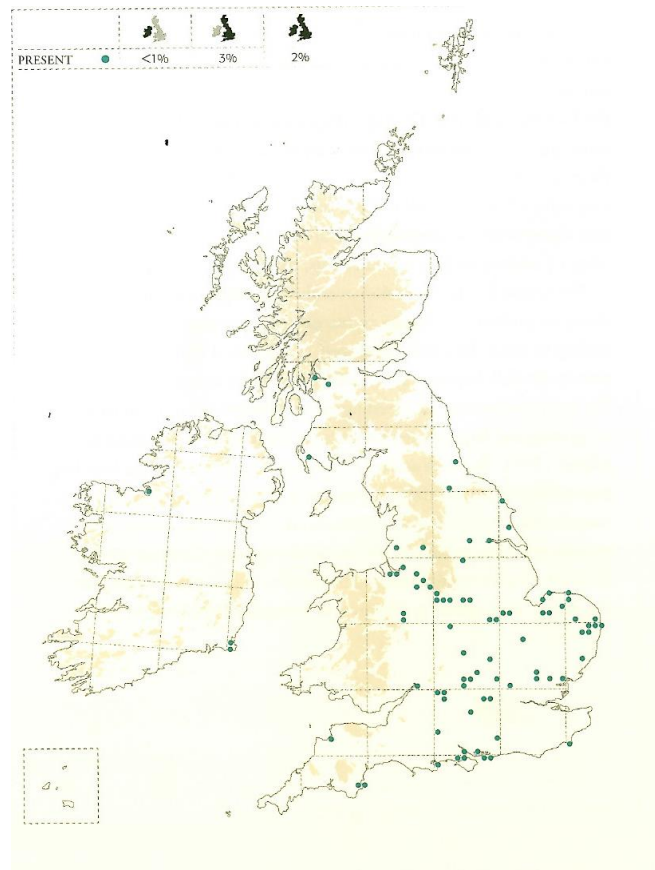
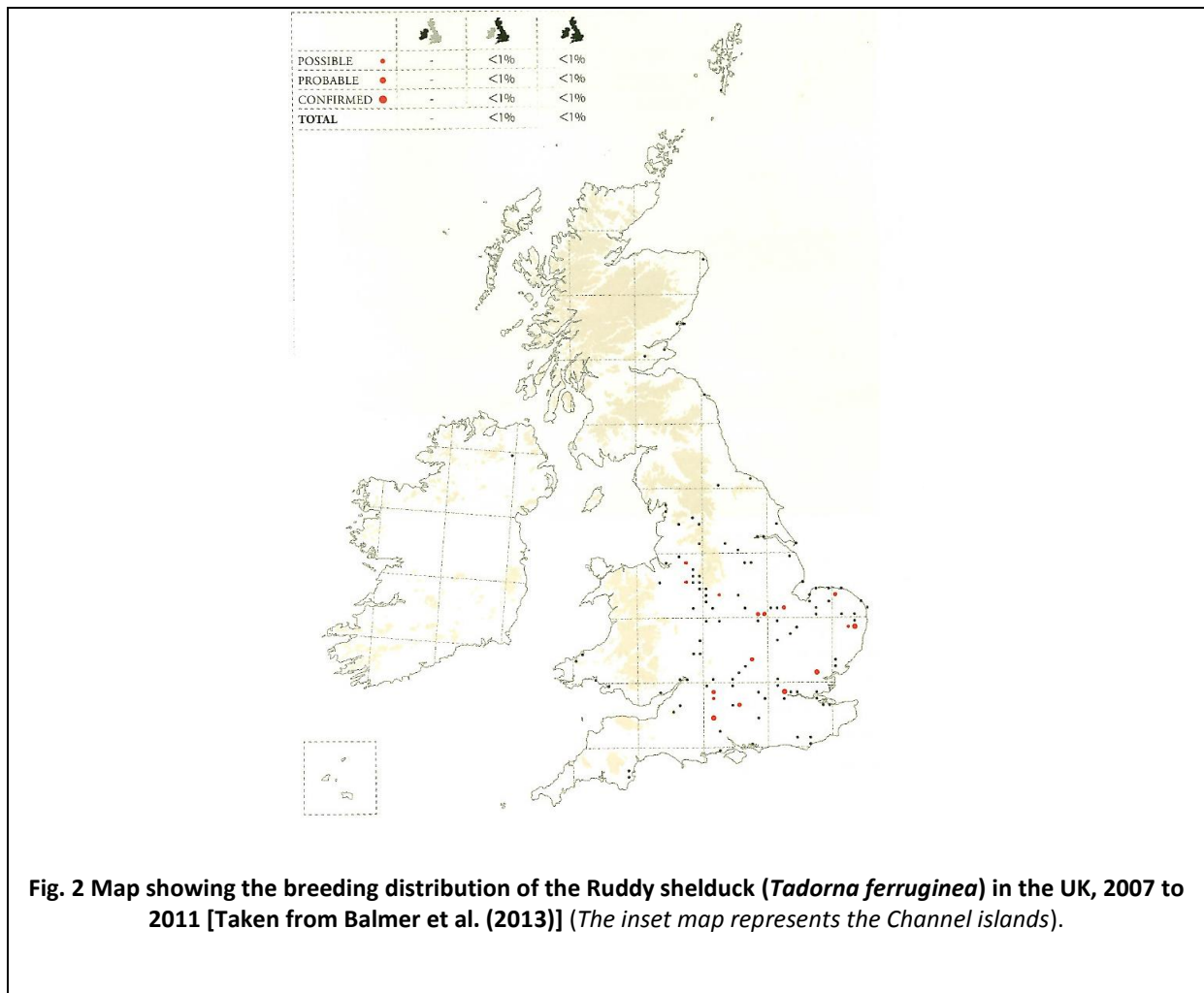


Fig 1. Map showing the winter distribution of the Ruddy shelduck (*Tadorna ferruginea*) in the UK, 2007/08 to 2010/11 [Taken from Balmer et al. (2013)] (The inset map represents the Channel islands).



6 - Are there conditions present in the Risk Assessment Area that would enable the organism to survive and reproduce? Comment on any special conditions required by the species?

Response: Yes. The species requires inland wetland areas, but may also breed relatively far from water. It also feeds in grassland and agricultural land (BirdLife, 2016; Reeber, 2015; Parrott et al. 2009). There are many such areas in GB. The species is highly mobile, being both migratory and dispersive in its native range, so it is able to move to find suitable feeding and breeding sites when necessary (BirdLife, 2016; Reeber, 2015). It is also a fairly generalist feeder, eating grasses, grains, and other aquatic and terrestrial plants, invertebrates, and occasionally small vertebrate prey (BirdLife, 2016; Zu-Kuil et al., 2013). This relative omnivory means it may be more adaptable to new surroundings. The species requires cavities to nest in, using burrows, holes in trees, nest boxes, and old buildings (BirdLife, 2016; Reeber, 2015; Parrott et al. 2009). Such sites are plentiful in the UK, although there is likely to be competition with other species for such nest sites, but the Ruddy shelduck is known to be an aggressive bird that may out-compete other species (Bauer et al., 2011; Dubois, 2007). The number of available nest sites may be a limiting factor for potential population growth (Gymes & Lensink, 2012). The species is also known to be relatively tolerant to disturbance and has been known to nest close to human residences (Namgail et al., 2011).

7 - Does the known geographical distribution of the organism include ecoclimatic zones comparable with those of the Risk Assessment Area or sufficiently similar for the organism to survive and thrive?

Response: Yes. The species occupies a wide climatic range in its native state. Although the species prefers warmer regions than those prevalent in GB, suggesting that winters here might be too cold for it, the species is adapted well to cooler climates (Zu-Kuil, 2013). It has been successfully kept year-round and bred in collections in GB and other countries in western Europe, demonstrating its adaptability to local conditions (Reeber, 2015; Vyas, 2005). Feral individuals overwinter successfully in GB without needing to migrate (see maps in response to Question 5). The most successful invasive non-native population established itself in Switzerland, where winters are on average much cooler than in GB.

8 - Has the organism established viable (reproducing) populations anywhere outside of its native range (answer N/A if you have answered 'yes' to question 4)?

Response: N/A

9 - Can the organism spread rapidly by natural means or by human assistance?

Response: This species is likely to spread slowly by natural means, although a more rapid spread may be possible if escapes from captive collections occur. This is a highly mobile species, capable of travelling great distances naturally. In its native state it is both migratory and dispersive. It is thus capable of moving to find new suitable feeding and breeding areas. Birds already present in GB may therefore spread by natural means, and it is also possible that birds may spread to GB from other countries in western Europe, such as the Netherlands (Parrott et al., 2009; Banks et al., 2008).

This species may also be spread by humans, as it is commonly kept in waterfowl collections, bought and sold by waterfowl breeders, and bred in captivity throughout Europe. Escapes are common and are likely the source of most of the non-native birds in GB and other countries in western Europe (Bauer et al., 2011; Dubois, 2007; Wittenberg, 2005; Kestenholz et al., 2005).

10 - Could the organism itself, or acting as a vector, cause economic, environmental or social harm in the Risk Assessment Area?

Response: Yes. The species is potentially an agricultural pest, known to graze on cereal crops and on vegetables such as cabbages and radish in its native range (Zu-Kuil, 2013; Wittenberg, 2005), although reports of such damage are few and large flocks likely to cause severe damage are rare. The species is potentially a threat to native species through competition for nest sites and aggression. It nests in cavities and nest boxes and may out-compete native species such as Barn owls (*Tyto alba*), Kestrels (*Falco tinnunculus*), and Tawny owls (*Strix aluco*) for such sites (Kumschick & Nentwig, 2010; Banks et al., 2008; Dubois, 2007; Callaghan et al., 2006; Kestenholz et al., 2005). It may impact negatively on native waterbirds through its aggressive behaviour (Reeber, 2015; Bauer et al., 2011; Wittenberg, 2005). It has also been known to hybridise with the native Shelduck (*Tadorna tadorna*), although it would appear that this is rare (Kumschick & Nentwig, 2010; Parrott et al., 2009). Because it is known to eat small fish, amphibians and fish and amphibian spawn, it could potentially have a negative effect on these species (Reeber, 2015). Callaghan et al. (2006) list the biodiversity risk of this species as low. The species is known to be affected by avian influenza and therefore is potentially a carrier for this disease (Takekawa et al., 2010), although this species is unlikely to have a significant effect on the epidemiology of avian influenza in the UK.

Entry Summary

Estimate the overall likelihood of entry into the Risk Assessment Area for this organism (comment on key issues that lead to this conclusion).

Response: *very likely*
Confidence: *very high*

Comments (include list of entry pathways in your comments): Ruddy shelduck are already present in GB, with small numbers breeding regularly (Holling et al., 2014; Balmer et al., 2013). There are also breeding populations of non-native birds in several western European countries, including the Netherlands, Belgium, Denmark, Germany, Switzerland, and France, and it is possible that birds could spread across the channel to GB from these countries (Fox et al., 2015; Holling et al., 2014; Parkin & Knox, 2010; Parrott et al., 2009; Banks et al., 2008; Dubois, 2007; Kestenholz et al., 2005). Natural vagrancy to GB from its native range is also a possibility (Harrop, 2002; Vinicombe, 2002).

In addition, Ruddy shelduck are commonly kept in captivity in GB and the rest of Europe, where they breed readily. Escapes are common and are likely the source of most feral birds in western Europe (Fox, 2015; Reeber, 2015; Dubois, 2007; Parrott et al., 2009; Banks et al., 2008). It is very difficult to quantify the risk due to this pathway, as there is no legal requirement to register ownership of this or any waterfowl species, so records of the numbers kept in captivity are difficult to come by (Callaghan et al., 2006). A search of an online zoo database (www.zootierliste.de) returned 12 institutions currently holding Ruddy shelduck in the UK (zootierliste, 2016). This is likely to be a vast under-estimate, as recording is voluntary, and the database is a German one, so institutions outside of Germany, although included, are likely to be under-represented. In addition, waterfowl are kept by many private collectors, which will not be represented. Google searches for Ruddy shelduck for sale in the UK (conducted on 3/11/2016) returned multiple results. Waterfowl keeping is not strictly controlled and regulations have changed little in recent decades (Callaghan et al., 2006). It is therefore likely that escapes from captivity will continue to occur.

Establishment Summary

Estimate the overall likelihood of establishment (comment on key issues that lead to this conclusion).

Response: *likely*
Confidence: *high*

Comments (state where in GB this species could establish in your comments, include map if possible): The species is already present and regularly breeding in GB, so although numbers are currently too low to be self-sustaining, it has the potential to become established here (Balmer et al., 2013; Parkin & Knox, 2010;)

Instances of breeding have been concentrated in the southeast of the country, especially Norfolk, so this is the most likely place for a breeding population to become established (Balmer et al., 2013; Parrott et al., 2009) From there, the population could be expected, in a worst case scenario, to become established anywhere where there are open inland wetland areas, although breeding is likely to be limited by available breeding sites (BirdLife, 2016; Gyimesi & Lensink, 2012). In Switzerland, numbers increased dramatically in the early 2000s, from where they spread to Germany (Reeber, 2015; Bauer et al., 2011; Kumschick & Nentwig, 2010; Kestenholz et al., 2005; Wittenberg, 2005). The reasons for the success of this species in Switzerland are not clear. By contrast, in the Ukraine, a programme to establish a successful breeding population required considerable efforts, while populations elsewhere in western Europe seem relatively stable (Fox et al., 2015; Holling et al., 2014; Parkin & Knox, 2010; Parrott et al., 2009; Banks et al., 2008; Dubois, 2007; Kestenholz et al., 2005; Zubko & Semenov, 2001). Although an increase of the kind seen in Switzerland has not occurred in GB, with numbers remaining low and the population trend stable, the possibility of such an expansion cannot be

ruled out (Holling et al., 2014; Holling et al., 2011). Heer and Keller (2005) consider that the Ruddy shelduck has the potential to become established in several European countries, and with continued breeding of feral populations already in GB, the likelihood of further escapes, and the possibility of spread from other countries in Europe of both non-native and occasional vagrant birds, it is likely that the species could become established in GB. A substantial number of escapes, especially within a short time-frame, could be enough to lead to an established population. The species has similar requirements to the Egyptian goose (*Alopochen aegyptiacus*) and its current distribution within GB is similar to that of the Egyptian goose in the early stages of invasion. It is therefore possible that the spread of the Ruddy shelduck could follow a similar pattern to that of the Egyptian goose, numbers of which are still increasing in GB (see map below).

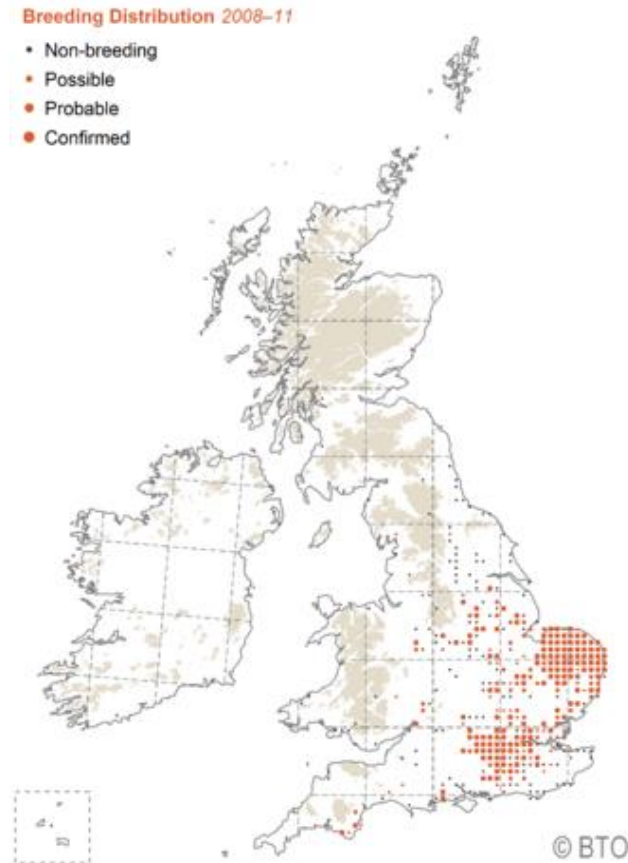


Fig.3. Map showing the current breeding distribution of the Egyptian goose (*Alopochen aegyptiacus*) in the UK (Taken from Balmer et al., 2013). The Ruddy shelduck (*Tadorna ferruginea*) has the potential to become established in the same areas. (The inset map represents the Channel islands).

Spread Summary

Estimate overall potential for spread (comment on key issues that lead to this conclusion).

Overall response: *intermediate*
Confidence: *medium*

Sub scores:

Natural spread only:Response: *slow*Confidence: *medium***Human facilitated spread only:**Response: *intermediate*Confidence: *high*

Comments (in your comments list the spread pathways and discuss how much of the total habitat that the species could occupy has already been occupied):

A combination of both spread pathways is likely. This species is highly mobile and if numbers were to increase, birds are likely to colonise new potential breeding areas. The species increased its range in Switzerland and it is likely that birds spread from here to Germany. Numbers are also increasing in Denmark. It is possible that birds could spread across the channel to GB from the continent, and it is also possible that successful breeding in GB could lead to an increase in range within GB.

The likelihood of spread by human-facilitated means is evidenced by the presence of Ruddy shelduck of captive origin throughout Europe. Further escapes are likely, although the number of locations from which birds can escape is unlikely to increase dramatically.

The species currently breeds in <1% of GB, and occupies 3% of GB during the winter months (Balmer et al., 2013; see maps in response to Question 5). Potential habitat for this species includes grasslands, inland wetlands, inland waterbodies, and croplands. It is possible that the species would not spread as far north as Scotland, given its preference for warmer climates. The current potential habitat for this species in GB is therefore roughly 112273 km² (Knoema, 2016). Currently, therefore, this species occupies 6.2% of its potential habitat in GB (outside of the breeding season).

It is difficult to predict population growth. The breeding population has been small and stable for many years, but if the population were to reach a critical limit, either through an increase in breeding success, escapes of captive birds, spread of non-natives from across the channel, or an instance of vagrancy from its native range, it could begin to grow. If this were to happen, the species would almost certainly spread to other grassland and wetland areas in southern GB.

Impact Summary

Estimate overall severity of impact (comment on key issues that lead to this conclusion)

Overall response: *moderate*Confidence: *medium***Sub-scores****Environmental impacts:**Response: *moderate*Confidence: *medium***Economic impacts:**Response: *minor*Confidence: *high***Social impacts:**Response: *minimal*Confidence: *high*

Comments (include list of impacts in your comments):

Environmental impacts: The species is potentially a threat to native species through competition for nest sites and aggression. It nests in cavities and nest boxes and may out-compete native species such as Barn owls (*Tyto alba*), Kestrels (*Falco tinnunculus*), and Tawny owls (*Strix aluco*) for such sites (Kumschick & Nentwig, 2010; Banks et al., 2008; Dubois, 2007; Callaghan et al., 2006; Kestenholz et al., 2005). It may impact negatively on native waterbirds through its aggressive behaviour (Reeber, 2015; Bauer et al., 2011; Wittenberg, 2005). It has also been known to hybridise with the native Shelduck (*Tadorna tadorna*), although it would appear that this is rare (Kumschick & Nentwig, 2010; Parrott et al., 2009). Because it is known to eat small fish, amphibians and fish and amphibian spawn, it could potentially have a negative effect on these species (Reeber, 2015). Bauer et al. (2011) state that negative impacts caused by Ruddy shelduck seem limited. Banks et al. (2008) give the Ruddy shelduck a risk status of 2, based on potential competition with and aggression towards native species, but state that these effects remain unproven, and 3, based on potential hybridisation with native species (*Tadorna tadorna*). Although hybridisation with other Shelduck species in captivity is common, reports of hybrids with Common shelduck, seem to be rare, possibly owing to the slight overlap in the native ranges of these two species. Callaghan et al. (2006) list the biodiversity risk of this species as low.

Economic impacts: The species is potentially an agricultural pest, known to graze on cereal crops and on vegetables such as cabbages and radish in its native range (Zu-Kuil, 2013; Wittenberg, 2005), although reports of such damage are few and large flocks likely to cause severe damage are rare.

Social impacts: The species is known to be affected by avian influenza and therefore is potentially a carrier for this disease (Takekawa et al., 2010).

Climate Change

What is the likelihood that the risk posed by this species will increase as a result of climate change?

Response: *medium*

Confidence: *medium*

Comments (include aspects of species biology likely to be effected by climate change (e.g. ability to establish, key impacts that might change and timescale over which significant change may occur):

Warmer conditions may favour survival and breeding for this species, which prefers warmer climates. Warming of the climate in GB could facilitate the species' spread northwards. However, colder winters might have a negative impact on survival during the winter (breaking of ice on waterbodies was a strategy used in the Ukraine to help increase survival in the species [Zubko et al., 2001]) and could induce migratory behaviour.

Conclusion

Estimate the overall risk (comment on the key issues that lead to this conclusion).

Response: *medium*

Confidence: *medium*

Comments: Small numbers of Ruddy shelduck are already present and breeding regularly in GB. Although numbers are low and stable (~1 breeding pair annually), the species has the potential to become established if numbers were to increase through escapes of captive birds, spread from mainland Europe of non-natives established in other western European countries, or even vagrants from its native range. There is plenty of

suitable habitat available for this species in GB. Negative impacts on native wildlife are possible through out-competing native species for limited cavity breeding sites, aggression towards native species, and possibly a detrimental effect on fish and amphibians, which it occasionally feeds upon. Some hybridisation with the native Common shelduck (*Tadorna tadorna*) is also possible. Damage to cereal and vegetable crops is possible, but there are few reports of this species as an agricultural pest elsewhere. The species is also known to be affected by avian influenza, which could be a problem in the event of an outbreak.

Management options (brief summary):

1 - Has the species been managed elsewhere? If so, how effective has management been?

Response: An eradication programme has been ongoing in Switzerland since 2004, with up to 400 individuals shot between 2004 and 2008. The outcome remains uncertain, but in 2008 it appeared that the rate of population increase at least had been slowed or perhaps stopped (Banks et al., 2008).

2 - List the available control / eradication options for this organism and indicate their efficacy.

Response:

Possible control/eradication methods include destruction of nests and eggs, shooting of adults during the non-breeding (hunting) season, shooting of adults during the breeding season i.e. at nest sites, and rounding up and killing birds during flightless post-breeding moult.

Destruction of nests, egg oiling and/or egg pricking is a possible method of preventing populations from increasing. However, since the species is long-lived and nests are often difficult to find and access, it would need to be done intensively and over a long period of time to make a difference to the population size. It is likely to be labour-intensive and unlikely to achieve results on its own.

Adding the species to the quarry list for shooting during the hunting season may make a small difference to numbers, but given that this type of shooting occurs outside the breeding season in order to allow numbers of quarry species to remain stable, it is unlikely to have much of an effect. The species is not currently listed as quarry by BASC (BASC, 2016).

Shooting of adults during the breeding season could be effective at reducing numbers and preventing future breeding, assuming nests can be found. Given the strong pair bond in this species, killing one of the pair is likely to prevent breeding for that breeding season and may affect the surviving individual's reproductive output for one or more successive breeding seasons. General licenses to kill this species or to destroy nests or eggs are not currently available (www.gov.uk, 2016).

Killing flightless birds during their post-breeding moult has been an effective strategy for reducing numbers of other waterfowl species and could be considered for this species. Ruddy shelduck occasionally form large flocks at this time, and could be rounded up into a corral and humanely killed. Relatively large numbers could therefore be killed at one time. It is unlikely to be a successful strategy on its own, however, as Ruddy shelduck do not always congregate at this time and may be difficult to find. It also has the disadvantage of needing to be times after breeding has already occurred that year.

3 - List the available pathway management options (to reduce spread) for this organism and indicate their efficacy.

Response: Given that most of the non-native Ruddy shelduck living in GB and the rest of western Europe are of captive origin, stricter regulations on the keeping of these species, marking and registering specimens, and preventing and recording escapes would be key to preventing further entry (Callaghan et al., 2006). Control or eradication measures in other European countries where this species exists as a non-native, particularly the Netherlands and Belgium, would reduce the risk of birds spreading across the channel.

4 - How quickly would management need to be implemented in order to work?

Response: It seems that numbers in GB are currently low enough for an eradication programme to be successful if implemented soon. There may be issues to do with the proximity of the native range and the fact that occasional vagrants are reported in GB. It may not be justifiable to kill genuine vagrants, and the origins of an individual are often unclear.

References

Provide here a list of the references cited in the course of completing assessment

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