Invasive Birds

Global Trends and Impacts

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CABI

28 Egyptian Goose (*Alopochen aegyptiaca* Linnaeus, 1766)

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28.1 Common Names

Egyptian Goose, Nile Goose, Phoenician Goose, African Goose, Egyptian Shelgoose (Avibase, 2018).

28.2 Distribution

The Egyptian Goose (*Alopochen aegyptiaca* Linnaeus, 1766) has a widespread natural distribution across sub-Saharan Africa and the upper Nile Valley, where population levels are estimated to be stable at around 500,000 individuals (Fig. 28.1) (Brown *et al.*, 1982; Madge and Burn, 1988; Maclean, 1997; Banks *et al.*, 2008). The species has established non-native breeding populations in Belgium, the Czech Republic, Denmark, France, Germany, Israel, Luxembourg, Mauritius, the Netherlands, Sweden, Switzerland, United Arab Emirates, the UK and the USA (Banks *et al.*, 2008; Kampe-Persson 2010; Gyimesi and Lensink, 2012; van Daele *et al.*, 2012; Ries *et al.*, 2014; Callaghan and Brooks, 2017; Jaška and Řepa, 2017; CAB International, 2018; DAISIE, 2009).

28.3 Description

The Egyptian Goose is one of two species of African shelgeese, with an overall brownish appearance, including a yellowish-brown head, neck and breast, a whitish belly and dark brown upper parts (Fig. 28.2). A pinkish bill with dark edges and long pink legs give the species, in combination with a chestnut neck ring and chocolate brown eye and breast patches, a distinctive appearance. Egyptian Geese have clear white wing coverts, forming white flank streaks when on the ground. In flight, these coverts are visible as large white patches on broad wings, highly contrasting with the surrounding chestnut tertials, metallic green and purple secondaries, and black primaries. Young birds are dull and darker overall, lacking the distinctive head, neck and breast markings. Greater coverts are grey-brown instead of clear white, and secondaries lack metallic shine. Both sexes are similar in plumage, but male birds on average are larger than females. Wing length, tarsus length and body weight on average are, respectively, 39 cm, 85 mm and 2.45 kg in males, and 37 cm, 80 mm and 1.94 kg in females. Within a pair, males are almost always larger than females (Madge and Burn 1988; Baker 1993).

28.4 Diet

The Egyptian Goose is a predominantly herbivorous species, with grass, seeds, leaves, grain, crop seedlings, aquatic rhizomes, tubers and plant detritus making up the main part of the

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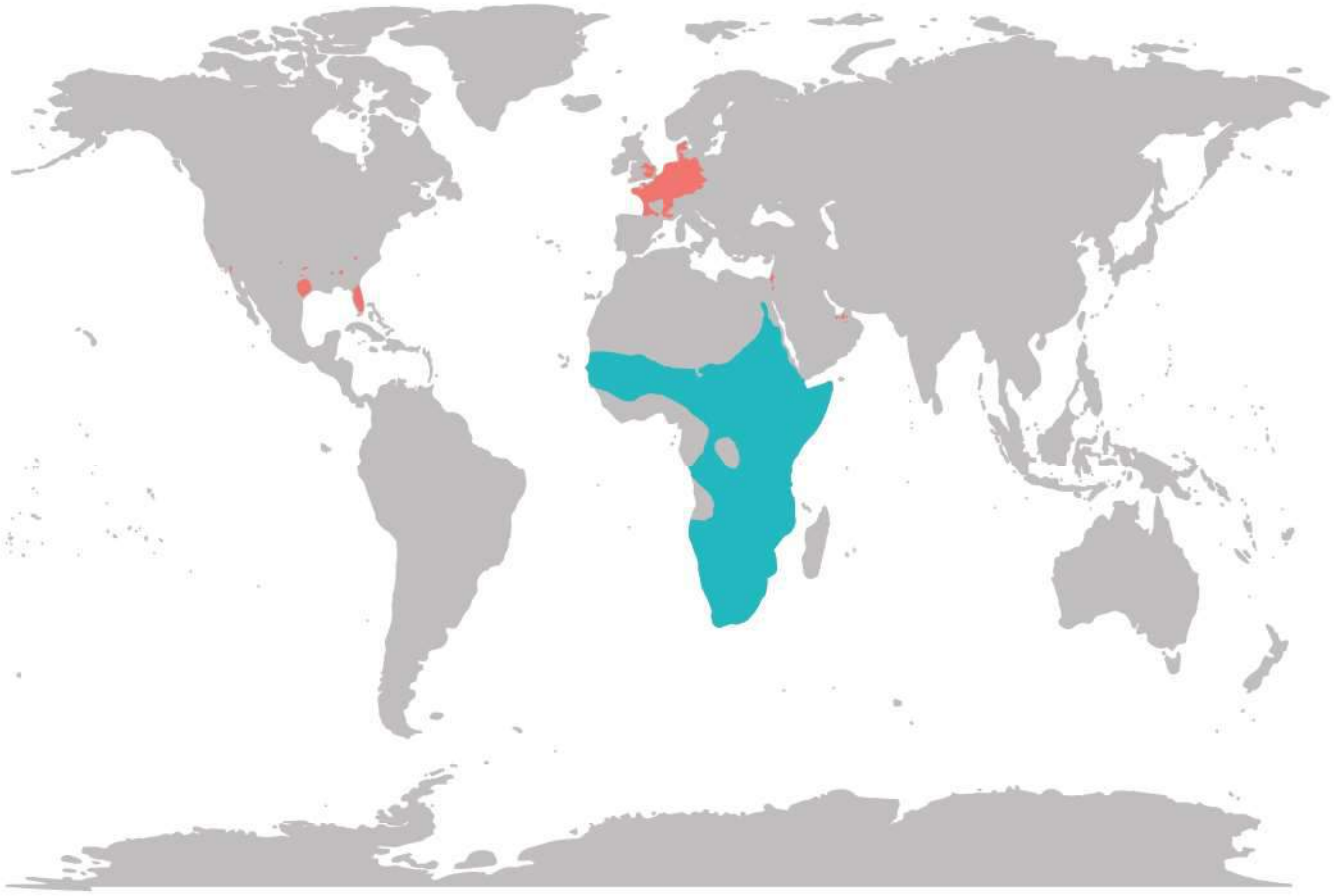

Fig. 28.1. Global distribution of the Egyptian Goose (*Alopochen aegyptiaca*) showing the native (blue) and invasive (red) ranges.

Fig. 28.2. Egyptian Goose adults. (© Photograph: Yves Adams, Vildaphoto.)

diet. Occasionally, they also feed on small insects, terrestrial worms and frogs (Halse, 1984; Maclean, 1997; Mangnall and Crowe, 2002). In Texas, 12% of reports documented some type of anthropogenic feeding, including bread, maize, bird seed and cat food (Callaghan and Brooks, 2016). The comprehensive diet of Egyptian Geese allows seasonal variation in the actual diet composition (Halse, 1984). For example, during the flightless moulting period and brood rearing, when geese seek protection on and alongside various types of water bodies, the diet largely shifts to aquatic and waterside vegetation. Egyptian Geese also rely heavily on body reserves during this period, and potentially lose up to 25% of their body mass (Halse, 1984; Gyimesi and Lensink, 2010).

28.5 Introduction and Invasion Pathways

The establishment of local populations of Egyptian Geese outside the native range generally occurs through escaped individuals from ornamental birds kept in captivity. The species' presence in Western Europe dates to the 17th century, when it was introduced into parks in the UK (Sutherland and Allport, 1991; Rehfisch *et al.*, 2010). Similar introductions in the second half of the 20th century made the species a widespread ornamental bird introduced at various locations across Europe (Banks *et al.*, 2008). Documented escape events in The Hague and Brussels led to birds breeding in the wild from 1967 in the Netherlands and from 1982 in Belgium (Segers, 1989; Vangeluwe and Roggeman, 2002; Anselin, 2004; Anselin and Vermeersch, 2005; Gyimesi and Lensink, 2012). In contrast to

the UK population, populations on mainland Europe showed rapid growth immediately after first breeding in the wild (Gyimesi and Lensink, 2012). The initial spread of these populations was slow, however, leading to additional breeding populations in France and Germany from the mid-1980s and in Luxembourg, Denmark, Switzerland and the Czech Republic in the first decade of the 21st century (Kampe-Persson, 2010; Gyimesi and Lensink, 2012, Ries *et al*., 2014; Jaška and Řepa, 2017). More recent occasional observations of individual birds, small flocks and isolated breeding events in countries such as Sweden, Poland, Austria and Spain indicate a dispersive potential for further future establishment of breeding populations (Kampe-Persson, 2010; CAB International, 2018). Thus, whereas the first Egyptian Geese populations in Europe originated from introductions for ornamental reasons, current range expansion and new populations most likely stem from natural dispersal from previously established populations.

In the USA, the earliest known records were from the late 1800s, probably from captive birds (Akhurst, 1877; Kirkwood, 1900). Egyptian Geese remained common in avicultural collections throughout the 20th century (Wilbur and Yocom, 1971). Breeding in nature was first documented in 1967 in California, and in the mid-1980s in Florida (Callaghan *et al*., 2017). There are now currently significant populations in the states of Florida, Texas and California, among other regions. Similar to European birds, some Egyptian Geese appear to disperse either long or short distances, accounting for records in south-eastern states (Callaghan and Brooks, 2016, 2017).

Egyptian Goose dispersal in non-native ranges, once established, corroborates the knowledge on the dispersive abilities of this species in their native range. Within the native range, the species is thought to be a partial migrant, able to disperse over large distances of up to 1000 km (Toms, 2002). In Europe, the population in the UK shows little movement, and remains confined to eastern England, without reported exchanges with the continent (van Dijk and Majoor, 2011). In mainland Europe, more movement is observed, with individuals regularly dispersing more than 100 km from the ringing site, with occasional maxima of over 350 km (van Dijk and Majoor, 2011; BeBirds: http://odnature.naturalsciences.be/bebirds, accessed 1 November 2019). Higher dispersion is suggested to occur during severe winters (Gyimesi and Lensink, 2012).

28.6 Breeding Behaviour

In their native range, Egyptian Geese usually rear a single brood within a breeding season in which most eggs are laid in March and April although laying can occur throughout the year (Cramp *et al*., 1984; Maclean, 1997; Callaghan and Brooks, 2016). In Florida, broods have been observed in every month (Pranty and Ponzo, 2014). In the European invasive range, year-round breeding events have also been observed, but the main part of the breeding season in Western Europe, comprising nest-building, egg-laying and breeding, is from March to June (Lensink, 1996, 1999; van Daele *et al*., 2012). This seems to differ somewhat with the breeding season on the eastern front of the invasive range, where, for example, in the Czech Republic, breeding only starts in mid-April and lasts until August, which probably relates to differences in local climate (Jaška and Řepa, 2017). Nest site selection is highly variable, and nests can be located on the ground (Fig. 28.3), in holes or on cliff edges but often in trees (Cramp *et al*., 1984; Callaghan and Brooks, 2016). Ground nests are usually confined to islands, whereas tree nests can be found in old trees with holes or epicormic shoots, such as various *Salix* spp. (Sutherland and Allport, 1991). Occasionally, nests are constructed on buildings, and various cases of Egyptian Goose nests in highly elevated nest boxes for Peregrine Falcons (*Falco peregrinus*) and Kestrels (*Falco tinnunculus*) have been reported (Beck *et al*., 2002). Although the rearing habitat for the young consists of waterside grazing pastures, nest sites can be located at larger distances from water, as birds have been shown to walk their broods over distances of more than 1 km from a nest site to suitable rearing locations (Sutherland and Allport, 1991). Sexual maturity is reached after 1 year, at which point sustained, monogamous pair-bonds are formed, which will actively defend a relatively large territory of variable size throughout the breeding and rearing season (Cramp *et al*., 1984; Lensink, 1999; Beck *et al*., 2002).

The Egyptian Goose clutch size averages eight to nine eggs but can often be as high as 12 (Cramp *et al*., 1984). Brooding is done exclusively by the female and incubation takes 28–30 days (Cramp *et al*., 1984). After the fledging stage, which lasts 70–75 days, the young stay with their parents for several weeks to months (Cramp *et al*., 1984; Callaghan and Brooks, 2016). In the invasive as well as parts of the native range, overall breeding success can be low (1.1 fledglings per pair in England) (Sutherland and Allport, 1991; Gyimesi and Lensink 2012). In other parts of the invasive and natural range, reproductive success can be much higher but variable, with success rates ranging from 1.5 to 5.7 fledglings per pair (Lensink, 1996, 1999; Vangeluwe and Roggeman, 2002; Jaška and Řepa, 2017). The high success in the Netherlands can probably be attributed to low predation pressure and the abundance of outstanding habitats for herbivorous waterfowl with plenty of highly nutritious

Fig. 28.3. An Egyptian Goose nest located on the ground in between brushes on an island in a small freshwater lake in Flanders, Belgium (eggs were marked within the context of a nest success study). (© Photograph: F. Huysentruyt, INBO.)

grasslands situated adjacent to fresh water (Gyimesi and Lensink, 2012).

28.7 Habitat

Egyptian Geese can be found within a wide range of habitats but all within the vicinity of various freshwater systems such as rivers, lakes, reservoirs, pools, sewage ponds and marshes (Cramp *et al.*, 1984; Carboneras, 1992; Callaghan and Brooks, 2016). The species generally avoids coastal regions and densely forested areas, but in mountainous regions within the species' native range, it can occur up to relatively high altitudes (Cramp *et al.*, 1984). The preferred habitat offers sufficient open grassland with a few trees in close proximity to open freshwater bodies (Cramp *et al.*, 1984; Carboneras, 1992; Gyimesi and Lensink, 2012). In the invasive and native range, this prime habitat is often available in urbanized areas including city parks and various green landscape structures that have water bodies such as lakes, golf courses and swimming pools (Gyimesi and Lensink, 2010; Callaghan and Brooks, 2016; C.T. Downs, unpublished data).

28.8 Impacts

The impact of Egyptian Geese on other (waterfowl) species is probably limited to interspecific aggression at certain locations and during specific periods throughout the year. Prior to and during the reproductive season, breeding Egyptian Geese are highly territorial and are spread across the landscape. During breeding, Egyptian Geese will actively and fiercely defend these territories, possibly preventing smaller native species, such as ducks and coots, from establishing territories at these locations (Anselin and Devos, 2007; Callaghan and Brooks, 2016). However, most territorial aggression is targeted towards congeners, and the impact on other native waterfowl could be low, as Egyptian Geese are often observed in association with other waterfowl species (Cramp *et al.*, 1984; Callaghan and Brooks, 2016). Occasional reports of Egyptian Geese drowning other bird species are indeed known, but generally, aspects such as nesting success of native birds is not affected by the presence of breeding Egyptian Geese (Gyimesi and Lensink, 2010, 2012; Callaghan and Brooks, 2016).

Negative effects on native birds during the breeding season are mostly limited to nest site competition with birds of prey. In South Africa, Egyptian Geese have been shown to compete with several raptor species for nest sites (McPherson *et al.*, 2016; Wreford *et al.*, 2017) and negatively influence Black Sparrowhawk (*Accipiter melanoleucus*) nest success (Curtis *et al.*, 2007). In the UK, Egyptian Geese can outcompete Ospreys (*Pandion haliaetus*) and Barn Owls (*Tyto alba*) for artificial nest boxes (Rehfisch *et al.*, 2010). As the use of nest boxes for Peregrine Falcons and Kestrels has been reported in mainland Europe (Beck *et al.*, 2002), possible competition effects can also be expected for these species but have not been reported to date.

In contrast to the breeding season, during the moulting period, when large flocks are formed, interspecific aggression may have a much higher impact on native waterfowl. Aggression towards other species may cause avoidance behaviour, limiting the availability of optimal foraging and moulting areas for these other species, and increasing physiological stress during an already vulnerable stage (Gyimesi and Lensink, 2010). In parts of the USA, these large congregations and flocks of Egyptian Geese can occur at any time of the year (Callaghan *et al.*, 2017), suggesting that these impacts can be persistent throughout the year.

Egyptian Geese are known to hybridize with native species such as Barnacle Geese (*Branta leucopsis*), Greylag Geese (*Anser anser*) and various duck species, and with other introduced anatid species such as Ruddy Shelducks (*Tadorna ferruginea*) and Canada Geese (*Branta canadensis*), but hybrids are usually infertile (Lensink, 1996; Banks *et al.*, 2008; Rehfisch *et al.*, 2010; Gyimesi and Lensink, 2010, 2012; Avibase, 2018).

Different strains of avian influenza virus have been identified in Egyptian Geese in their native range (Cumming *et al.*, 2011). The presence of this virus outside the native range is thus possible, but given the absence of actual long-distance migratory behaviour in these populations, the possibility of Egyptian Geese serving as a vector for avian influenza is expected to be minimal (Gyimesi and Lensink, 2010).

Within the native range, Egyptian Geese are recognized locally as an agricultural pest, both by direct grazing and by trampling of crops (Mangnall and Crowe, 2002; Gyimesi and Lensink, 2010; Callaghan and Brooks, 2017). As far as crops are concerned, the species is known to mainly cause damage to grasslands, cornfields and wheat but occasionally other crops such as lettuce, peas and lucerne are also targeted (Gyimesi and Lensink, 2010; BIJ12: https://monitorfaunaschade.bij12.nl/, accessed 1 November 2019). The high dependency of the species on grassland habitats and its ability to forage on other crop types also raise concern in the region in which the species is introduced (Sutherland and Allport, 1991; Beck *et al.*, 2002; Gyimesi and Lensink, 2010). High local grazing pressure on grasslands can even result in competition with livestock for food, in addition to direct damage and yield loss. However, as in all cases of goose damage on growing crops, moderate grazing pressure can exert positive effects through additional fertilization via goose droppings and plant growth stimulation as a response to short grazing periods (Kear, 1970; Mangnall and Crowe, 2002). As Egyptian Geese are mainly non-migratory or limited to short-distance movements within the invasive range, crop grazing often occurs repeatedly and at high pressure, so that negative effects often outcompete the positive influences.

The presence of large flocks of Egyptian Geese may also cause eutrophication of standing water, which can heavily impact oligotrophic water systems of high biological value (Anselin and Devos, 2007; Callaghan and Brooks, 2016, 2017). Within other areas such as parks or swimming ponds, pollution by defaecation can cause nuisance to the public and interfere with the intended use of these areas (Callaghan and Brooks, 2016, 2017). Nuisance and damage caused by Egyptian Geese on golf courses in both the native and invasive ranges are well documented (Mackay *et al.*, 2014). Finally, the presence of large flocks of Egyptian Geese around airports poses the risk of aircraft collisions (Rehfisch *et al.*, 2010).

28.9 Control

Egyptian Geese experience little impact by predators in their invasive range, although kills by various raptor species are sometimes reported. Red foxes (*Vulpes vulpes*) and brown rats (*Rattus norvegicus*) are the most common predators of nests, but generally nests are fiercely defended, and predation will mostly be limited to ill-attended or deserted nests.

In most of its invasive range, Egyptian Geese are either a huntable species or can be shot within the context of invasive species or crop damage management. However, the species is not a very popular game species and appears to be difficult to hunt due to its vigilant nature and its large territorial spread during much of the year, as well as the general urban habitats it often resides in. In addition, there typically is no requirement to report the number of birds shot, making it difficult to assess the effectiveness of shooting as a management policy. The best evidence on shooting effectiveness comes from the Netherlands (where reporting on shot birds is mandatory) (Visser *et al.*, 2015). Gyimesi and Lensink (2012) used demographic models to assess the feasibility of population management of shooting to control Egyptian Geese numbers and found that about 28% of the population needs to be culled annually to prevent the populations from growing, and credited culling by shooting as a main reason behind the (near) stabilization of the Dutch Egyptian Goose population. Visser *et al.* (2015) also report a very high shooting effectiveness for Egyptian Geese in the Zuid-Holland region, and data from the native range also shows that large numbers of Egyptian Geese can be shot in organized shoots, directly removing hundreds of birds (Mangnall and Crowe, 2002). In general, although bag data on the species are mostly limited within the invasive range and hunting pressure put on Egyptian Geese can vary locally, overall the effect is expected to be limited in both Europe and the USA.

The Egyptian Goose has also been shown to be largely unaffected by a moult trapping approach as is often used for other goose species such as the Canada Goose and Barnacle Goose. Egyptian Geese, although often present at the same locations as moulting Canada and Barnacle Geese, are more vigilant and will not easily leave the water. Additionally, in contrast to other goose species, Egyptian Geese will also dive easily, and escape being herded from the water into a land-set trap in contrast to other species.

The Egyptian Goose does not generally nest in colonies and regularly uses nesting sites in trees, making the nests less accessible for viability control through egg pricking or oiling with liquid paraffin (Baker *et al.*, 1993). Viability control through nest destruction, pricking or oiling eggs has also been shown to be ineffective at the population level for goose control (Klok *et al.*, 2010). Visser *et al.* (2015) report that in exceptional cases (i.e. when it is impossible to catch or shoot the adult birds), egg oiling can be used to manage Egyptian Geese populations. For example, around Schiphol Airport in the Netherlands, where shooting is difficult for obvious reasons, up to 19% of Egyptian Goose nests could be targeted by oiling eggs in the nest (Visser *et al.*, 2015).

From ringing efforts in their native range, it has long been known that Egyptian Geese can be trapped with the use of baited walk-in traps with live decoy birds (Siegfried, 1967). Therefore, as an alternative to shooting, which may be opposed by parts of the general public or can be unfeasible in certain sites (e.g. strongly urbanized areas, or natural reserves harbouring species vulnerable to disturbance), trapping methods have been trialled. Floating or land-based Larsen traps have been used to reduce Egyptian Geese numbers across Flanders in northern Belgium (van Daele *et al.*, 2012). At low Egyptian Geese densities, trapping can be effective, as a field trial conducted in Belgium showed that a single Larsen trap was able to remove all breeding pairs present in a site (typically only one or two pairs) within a timespan of 1–9 days. Catching success with this method is best achieved with tamer, docile decoy birds, which exhibit no stress behaviour when placed in the trap. In general, the best results are obtained using a calm, frequently calling male as the decoy bird, which seems to trigger territorial behaviour in local birds most effectively. The highest success with these trap types is reached at nesting sites during the breeding season (Adriaens and Huysentruyt, 2014). This implies that traps need to be frequently moved between breeding sites (although pairs are reported usually to be caught within hours at a specific site). Experience with field trials in Flanders have shown that this approach can be successful in trapping territorial birds, leading to approximately 100 birds/year for each trapper. While effective and promising, it remains unclear whether this approach is cost-effective for removing larger populations spread across a larger geographical extent, especially as it requires daily inspection of all cage-traps installed.

28.10 Uses

As is common in waterfowl species, Egyptian Geese are hunted or shot in derogation and the meat is consumed. The species is a popular ornamental bird, often kept in captivity, but with pinioned birds also kept in open park settings.

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