

Sacred Ibis (*Threskiornis aethiopicus*)

Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, November 2016
Revised, July 2019, August 2019
Web Version, 9/23/2021

Organism Type: Bird
Overall Risk Assessment Category: High



Photo: Steve Garvie. Licensed under Creative Commons Attribution-Share Alike 2.0 Generic. Available: https://commons.wikimedia.org/wiki/File:Threskiornis_aethiopicus_-_Mida_Creek_mud_flats,_Kenya-8.jpg. (August 2019).

1 Native Range and Status in the United States

Native Range

From Johnson and McGarrity (2009):

“Sacred Ibises are native to sub-Saharan Africa, the Middle East, and Madagascar; historically, they were also found in Egypt, where they are now extinct.”

CABI (2019), lists *Threskiornis aethiopicus* as native in the following countries: Iraq, Kuwait, Aldabra, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Congo, Congo Democratic Republic, Côte d’Ivoire, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho,

Liberia, Madagascar, Malawi, Mozambique, Nigeria, Rwanda, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, and Zimbabwe.

From Yésou and Clergeau (2005):

“The nominate form of Sacred Ibis (*T. a. aethiopicus*) is widespread in sub-Saharan Africa, [...]. The species is common to very common within its main African range, where its population is considered to be stable at an estimated 200,000 to 450,000 individuals (Delany & Scott 2002). North of its present range, the species was common in Egypt until the beginning of the 19th century, when it died out for unknown reasons (del Hoyo et al. 1992). Also, a very small and declining population occurs in the marshes of southern Iraq (Delany & Scott 2002).”

From Clergeau and Yésou (2006):

“Africa south of Sahara, also populations in Southern Iraq, Madagascar and Aldabra Island.”

From EOL (2019):

“By 1850, however, the species had disappeared from Egypt both as a breeding and migrant population, with the last, albeit questionable, sighting in 1864 [Wasef 2016; Updated Checklist of the Birds of Egypt].”

“The bird is also native to Yemen; in 2003 it bred in large numbers on small islands near Haramous and along the Red Sea coast near Hodeidah and Aden, where it was often found at waste-water treatment plants. It has been recorded nesting on a shipwreck in the Red Sea [Shobark et al 2003]. It is also seen as a vagrant on Socotra [Porter and Aspinall 2016].”

Status in the United States

From Yésou and Clergeau (2005):

“In the USA, two pairs of Sacred Ibises were found nesting in the Everglades, Florida, in 2005. One pair raised two nestlings which were captured just before they fledged and donated to a zoo and the other nest failed at the egg stage. This is the first such nesting in the wild there. It is thought that these birds may have originated from Miami Metro Zoo, where the 1992 Hurricane Andrew is said to have caused the release of some birds, with some 30 to 40 Sacred Ibises now apparently living in the wild in the surroundings, but returning nightly to the zoo to roost (Garth Herring and Bill Pranty pers. comm.).”

Threskiornis aethiopicus is found in trade in the United States. According to Pure Poultry (2019), this species can be purchased as a yearling pair or a breeder pair, starting at \$1,248. This species is currently listed as “Out of Stock.”

From Herring and Gawlik (2008):

“The findings of this study suggest that the sacred ibis has a high probability (73%) of successful establishment in the Florida Everglades. As such, wading bird conservation efforts in the

Everglades should now include the potential for negative impacts from sacred ibis, particularly given the recent exponential population growth rate and aggressive and destructive colonial behavior of nonindigenous sacred ibis in France (Clergeau and Yésou 2006). [...] We recommend that the highest priority be given to wading bird colonies with both sacred ibis and endangered wood storks.”

“In Florida, the close proximity of nesting to urban areas to date, readily available sources of food in both the Everglades and adjacent urban areas, elevated physiological condition even in a poor nesting year, and temperate climate make it likely that that sacred ibis will have larger clutch sizes and increased fledging success, leading to population growth and range expansion.”

From Johnson and McGarrity (2009):

“In the United States, introduced Sacred Ibises have only been found in areas of southern Florida, including Everglades National Park and the Arthur R. Marshall Loxahatchee National Wildlife Refuge.”

“Local governments (e.g., Palm Beach County), Florida Fish and Wildlife Conservation Commission (FWC), and the United States Department of Agriculture Wildlife Services Office (USDA/APHIS/WS) have teamed up to attempt to eradicate invasive Sacred Ibises. At this time [2009], experts believe that all Sacred Ibises living in the wild in south Florida have been removed—approximately 75 birds total.”

According to EDDMapS (2019), *Threskiornis aethiopicus* is still present in southern Florida.

Threskiornis aethiopicus is listed on Hawaii’s Restricted Animal List (Part B) (Hawaii Department of Agriculture 2019).

Means of Introductions in the United States

From Yésou and Clergeau (2005):

“It is thought that these birds may have originated from Miami Metro Zoo, where the 1992 Hurricane Andrew is said to have caused the release of some birds, with some 30 to 40 Sacred Ibises now apparently living in the wild in the surroundings, but returning nightly to the zoo to roost (Garth Herring and Bill Pranty pers. comm.).”

Remarks

From Yésou and Clergeau (2005):

“Sacred Ibis *Threskiornis aethiopicus* is closely related to both Black-headed Ibis *T. melanocephalus* (from the Indian subcontinent) and Australian White Ibis *T. molucca* (which breeds in Australia, New Guinea and some nearby islands) – to the point that they are sometimes treated as one species, *T. aethiopicus*. However, they are generally regarded as three distinct species forming a superspecies (eg del Hoyo et al. 1992).”

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2019):

Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Deuterostomia
Phylum Chordata
Subphylum Vertebrata
Infraphylum Gnathostomata
Superclass Tetrapoda
Class Aves
Order Pelecaniformes
Family Threskiornithidae
Subfamily Threskiornithinae
Genus *Threskiornis*
Species *Threskiornis aethiopicus* (Latham, 1790)

“Taxonomic Status:

Current Standing: valid”

Size, Weight, and Age Range

From CABI (2019):

“*T. aethiopicus* has a length of 65-89 cm and a wingspan of 112-124 cm; the weight is about 1500g (Urban, 1974). The female adults are smaller, especially the bill.”

Environment

From CABI (2019):

“In Africa, *T. aethiopicus* forages in a diversity of open habitats, both wet and dry, including natural grassland but also artificial sites such as dams, sewage works, sites used for washing pigs, dung heaps, refuse dumps and cultivated land, as well as coastal lagoons, intertidal areas and coastal islets (Clark 1979, A. J. Williams, University of Cape Town, Western Cape Nature Conservation Board, Rondebosch, South Africa, personal communication, 2005). Their nest and roost sites also show a high diversity in Africa, from wetlands and coastal islands to urban parks (review in Brown et al., 1982, Hancock et al., 1992).”

“In areas where the species has been introduced, the same opportunism is found. Ibises forage in meadows (usually but not only wet meadows, with or without cattle) and rubbish dumps (all year round), and marshes and reedbeds (particularly used in spring and summer). They can also feed in ploughed fields, farmyards and open-air poultry farms. Occasionally small populations can settle in suburban and even urban landscapes. The roost is commonly in trees of different species and nesting colony sites can be in trees, in shrubs or on the ground. *T. aethiopicus* shows a large

tolerance to various landscapes but the presence of water appears essential (Clergeau and Yésou, 2006).”

Climate

From CABI (2019):

“Tropical monsoon climate (< 60mm precipitation driest month but > (100 - [total annual precipitation (mm)/25]))”

“Warm average temp. > 10°C, Cold average temp. > 0°C, wet all year”

Distribution Outside the United States

Native

From Johnson and McGarrity (2009):

“Sacred Ibises are native to sub-Saharan Africa, the Middle East, and Madagascar; historically, they were also found in Egypt, where they are now extinct.”

CABI (2019), lists *Threskiornis aethiopicus* as native in the following countries: Iraq, Kuwait, Aldabra, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Congo, Congo Democratic Republic, Côte d’Ivoire, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mozambique, Nigeria, Rwanda, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, and Zimbabwe.

From Yésou and Clergeau (2005):

“The nominate form of Sacred Ibis (*T. a. aethiopicus*) is widespread in sub-Saharan Africa, [...]. The species is common to very common within its main African range, where its population is considered to be stable at an estimated 200,000 to 450,000 individuals (Delany & Scott 2002). North of its present range, the species was common in Egypt until the beginning of the 19th century, when it died out for unknown reasons (del Hoyo et al. 1992). Also, a very small and declining population occurs in the marshes of southern Iraq (Delany & Scott 2002).”

From Clergeau and Yésou (2006):

“Africa south of Sahara, also populations in Southern Iraq, Madagascar and Aldabra Island.”

From EOL (2019):

“By 1850, however, the species had disappeared from Egypt both as a breeding and migrant population, with the last, albeit questionable, sighting in 1864 [Wasef 2016; Updated Checklist of the Birds of Egypt].”

“The bird is also native to Yemen; in 2003 it bred in large numbers on small islands near Haramous and along the Red Sea coast near Hodeidah and Aden, where it was often found at waste-water treatment plants. It has been recorded nesting on a shipwreck in the Red Sea [Shobark et al 2003]. It is also seen as a vagrant on Socotra [Porter and Aspinall 2016].”

Introduced

CABI (2019) reports introduced populations in the United Arab Emirates, Canary Islands, Belgium, France, Germany, Italy, Luxembourg, Netherlands, Portugal, Spain, and United Kingdom. The population in Belgium is listed as no longer present. Populations in Germany and Luxembourg are listed as only present in captivity/cultivation.

From Clergeau and Yésou (2006):

“Several spots around the world, in West and South Europe, Arabian Peninsula, Taiwan, [...]. In Italy and Netherlands only some pairs and in Canary Islands about 30 pairs.”

“In most cases, no action has been undertaken against ibises. However, the feral population in Barcelona, Spain, has been culled in 2001.”

From CABI (2019):

“In Italy, *T. aethiopicus* has bred in the upper Po valley (Piedmont) since 1989, having escaped from a zoo near Turin. There were 26 pairs and about 100 individuals in 2000. In 2003, breeding was observed at another site in the same area, with possibly up to 25-30 pairs, and a few more pairs were found at a third colony in 2004. Since these dates there has been neither a coordinated count of the breeding sites nor an updated estimate of the population size.

In Western France, after 20 birds were imported from Kenya, a breeding colony soon became established at Branféré zoological garden in southern Brittany. There were 150 pairs in the zoo in 1990. The young were left free to fly and rapidly moved beyond the zoo, mostly visiting the nearby wetlands but also wandering hundreds of kilometres away along the Atlantic coast. Breeding in the wild was first noted in 1993 at both the Golfe du Morbihan, 25 km from the introduction site, and the Lac de Grand-Lieu, 70 km away. Breeding has not occurred at Branféré zoo since 1997. Colonies later occurred at various sites along the French Atlantic seaboard: in Brière marshes (up to about 100 nests), in the Golfe du Morbihan and on a marine island nearby (up to about 100 nests), with a few more nests up to 350 km south of Branféré at Brouage marshes and near Arcachon. The largest colony was discovered in 2004 on an artificial island in the estuary of the Loire River; in 2005 this attracted at least 820 pairs. The French Atlantic population was a little over 1000 breeding pairs and about 3000 individuals in 2004-2005 (based on a roost census). There were about 1400 to 1800 pairs in 2007 with more than 5000 individuals. Culling was tested in 2007 and has been carried out at a large scale from 2008; 3000 birds were shot that year, leading to a remaining total of 2500 individuals in February 2009 and a breeding population of about 900 pairs that year.

In Southern France, *T. aethiopicus* was acclimatized in 1982 within the “African Reserve” at Sigean. They were left free to fly by 1989 and a pair bred in 1991. Observations in natural

surroundings became regular from 1995, and in 2000 the species bred in a colony of 8 nests in the wild at Etang de Bages. This colony held 75 pairs in 2004 and about 300 individuals in 2007. Population limitation began in 2007 and fewer than 30 birds remained in the wild in February 2009.”

“Eradication programmes have been conducted by the ONCFS (Office National de la Chasse et de la Faune Sauvage), mandated by the French government. Nature wardens shoot birds with guns in some monospecific colonies or on rubbish dumps. Eradication has nearly been achieved on the Mediterranean coast (13 individuals remaining in spring 2009) and is in progress in western France (about half of the population was culled in 2008).

Decisions about management of *T. aethiopicus* have been especially hard. It is a large, easily recognizable, white, and nice-looking species, and benefits from a relatively positive appreciation from tourists and some naturalists. The duration of its presence in Western France (over 20 years) has favoured this, and lack of consensus meant that it took several years for the decision to be made to eradicate it.

In Spain, the authorities rapidly gave authorisation to shoot the ten (tagged) ibises that arrived in Coto Doñana (Andalucia) from France.”

Means of Introduction Outside the United States

From CABI (2019):

“The risk of introduction is completely linked to zoos. Sometimes individuals escape from captivity, but in general, the birds are allowed to fly freely and can move out of the zoo limits and form feral populations.”

From Yésou and Clergeau (2005):

“Sacred Ibises have, however, escaped from captivity and been seen in the wild in Europe since the 19th century, eg in Italy (Andreotti et al. 2001), but this remained a rare event until about the 1970s when it became fashionable to breed free-flying groups of ibises in zoological gardens. This led to a regular flow of escapes, which in turn led to the establishment of breeding pairs in the wild, and breeding populations have now become established in Spain, Italy and France, as well as on the Canary Islands.”

Short Description

From CABI (2019):

“The plumage is white with primaries and secondaries tipped black. The bill is curved and thick. The head and the neck are bare and black. Immature birds have blackish-brown tertials and the head and neck are feathered (Hoyo et al. 1992, Reeber 2005).”

From Johnson and McGarrity (2009):

“Sacred Ibises [...] have mostly white bodies and wings; the trailing edges of their wings (tips of the feathers) are gray-black. They have very distinctive long, black feathers or plumes on their rumps [...]. During the breeding season the feathers on the sides of their chests and on the outer wings (near the edge when folded) may have a yellowish (or reddish) tinge, and their lower legs may be tinged with reddish-copper; bare patches of scarlet-red skin may also be visible under their wings. The heads and necks of young Sacred Ibises are covered with black and white feathers, giving the head and neck a mottled appearance [...]; these feathers are lost as the birds mature. The heads and necks of adults are bare of feathers and are gray-black, as are their long, curved bills, legs, and feet. Sacred Ibises are quiet birds and lack distinctive calls.”

Biology

From Clergeau and Yésou (2006):

“It is mostly found in wet areas in meadows and inland wetlands to coastal areas, and is gregarious, often forming large groups. It is carnivorous with a tendency to omnivory. The diet is based on terrestrial and aquatic insects, fishes, batrachians, molluscs and crustaceans. It can also feed upon small mammals and bird eggs and on animal and vegetable refuse.”

“Nomadic species able to change its breeding sites to suit environmental conditions. In the introduced range, there is regular exchange between colonies, with nomadic individuals moving up to several hundred kilometres from colonies.”

“Colonies up to several thousand pairs (one colony of over 1,000 in France), sometimes with other ciconiiformes and herons. Nests often closely aggregated in trees, bushes and on the ground near water. 2-4 eggs give 1-2 chicks. Breeding success in France appears to be higher than in Africa.”

“Large tolerance to various landscapes but presence of water essential.”

From Herring and Gawlik (2008):

“[...], in their native range sacred ibis were responsible for the predation of 65% of all cape cormorant (*Phalacrocorax capensis*) chick predation mortalities on Penguin Island, Lambert Bay, South Africa (Williams and Ward 2006). Williams and Ward (2006) calculated that the total cape cormorant losses at the Penguin Island colony due to sacred ibis predation were between 10% and 15% of the total annual production. When the same predation rates were applied to a secondary peak for cape cormorant breeding on Penguin Island, total predation by sacred ibis accounted for 43–64% of all nesting efforts during that period (Williams and Ward 2006).”

From Johnson and McGarrity (2009):

“They breed near their foraging and roosting grounds, and may nest individually or build large, communal platforms of sticks that hold as many as 30 nests. Each pair builds a nest of twigs, in

which the female lays 2–3 eggs. The eggs hatch in 28–29 days, and the young remain in the colony for an additional 44–48 days; both the male and female care for the eggs and young birds. In the Everglades, Sacred Ibises roost and nest on tree islands, often among native species.”

Human Uses

From CABI (2019):

“*T. aethiopicus* is commonly presented in zoological parks around the world; [...]”

Threskiornis aethiopicus is found in trade. According to Pure Poultry (2019), this species can be purchased as a yearling pair or a breeder pair, starting at \$1,248. This species is currently listed as “Out of Stock.”

From EOL (2019):

“It was formerly found in Egypt, where it was commonly venerated and mummified as a votive offering to the god Thoth. For many centuries until the Roman period the main temples buried a few dozen of thousands of birds a year, and to sustain sufficient numbers for the demand for sacrifices by pilgrims from all over Egypt, dozens of ibis breeding farms (called ibiotropheia by Herodotus) were established, initially throughout Egypt, but later centralised around the main temples, each producing around a thousand mummies annually [Wasef 2016].”

Diseases

No records of OIE-reportable diseases (OIE 2019) were found for *Threskiornis aethiopicus*.

Threskiornis aethiopicus can be infected with *Chlamydia ibidis* (see Vorimore et al. 2013, below) which is related to the pathogen that causes avian chlamydiosis (*C. psittaci*), an OIE-reportable disease (OIE 2019). No records were found indicating that *T. aethiopicus* can be infected with *C. psittaci*.

From Vorimore et al. (2013):

“Avian chlamydiosis due to *C. psittaci* is a major concern in the French duck industry where human cases of psittacosis are regularly reported. [...] Although the dataset presented in this study is small, our results suggest a low prevalence of *C. psittaci* in the Ibis population, such that it probably does not represent a significant reservoir of the pathogen, nor a high risk for the contact duck flocks.”

“*Chlamydia ibidis* (ibidis. L. fem. gen. pl. *ibidis*, of the Ibis, because this bird is the only host currently known). The strains of this species occur in the Ibis and possibly also in other birds. The agent can be recovered from cloacal swabs and faeces. So far, no evidence of a pathogenic potential has emerged.”

From CABI (2019):

“*T. aethiopicus* is suspected of spreading disease since it frequently forages in rubbish dumps and slurry pits. Studies of different pathogens are in progress at the Veterinary School of Nantes, France.”

According to Poelen et al (2014), *T. aethiopicus* is a host of Newcastle disease virus, Patagifer, and tapeworms. It is also reported to have the following ectoparasites: *Plegadiphilus threskiornis*, *Ibidoecus threskiornis*, *Ardeicola freemani*, *Ardeicola intermedia*, *Ibidoecus insularis*, *Colpocephalum pygidiale*, and *Ardeicola clayae*.

Threat to Humans

From Johnson and McGarrity (2009):

“The impacts of invasive Sacred Ibises on humans would likely be minimal. Like all birds, ibises can carry a variety of disease-causing agents (bacteria, viruses, etc.) that can spread to humans, so their feces could pose a health risk. Sacred Ibises often forage in human garbage for scraps, and could become a nuisance if populations were allowed to become established.”

From CABI (2019):

“Suspensions of tourism impact could exist in a case where a pine wood has been destroyed by droppings under nest colonies (Island of Morbihan, France). Destruction of the structure of salt pans has been observed in Brittany, involving an increase in human work (Clergeau et al. 2005).”

3 Impacts of Introductions

From Yésou and Clergeau (2005):

“In some areas, it is proving to be a serious predator of other bird species of conservation concern.”

“In western France, predation has been observed in a Sandwich Tern colony, with the ibises flushing the terns off their nests and then taking their eggs. Also, colonies of some tens of incubating Black Terns and Whiskered Terns have been destroyed by Sacred Ibises in France on at least three occasions. Predation has also been reported in western France on nests of both Common Tern and Mallard, and on Black-winged Stilts, Black Terns and Lapwings (Vaslin 2005, Didier Montfort, Jacques Hédin, Patrick Philippon and Sébastien Reeber pers. comm.). In southern France, Sacred Ibises have been observed preying on the nests of Cattle Egrets. Also, as their breeding numbers have increased in southern France, they have been seen competing for nest sites with Cattle Egrets and Little Egrets and have forced many pairs of both species to leave their colonies (Kayser et al. 2005).”

“Although the cases outlined above are believed to have had no serious impact on the populations of the species preyed upon, nature conservation societies are concerned that such predation may increase. As an example of the potential risk, in April 2005 a pair of Sacred Ibises

visited the only colony of the endangered Roseate Tern in France; fortunately, they left the area before the terns had laid (Arnaud Le Névé pers. comm.). Apart from birds, there is concern that the observed predation of Sacred Ibises on newts may have detrimental effects on discrete populations of these endangered amphibians.”

From Herring and Gawlik (2008):

“Sacred ibis have also been documented destroying sandwich tern (*Sterna sandvicensis*), black tern (*Chlidonias niger*), and whiskered tern (*C. hybridus*) nests in large numbers in areas where they have recently become established (Vaslin 2005; Clergeau and Yésou 2006). We recommend that the highest priority be given to wading bird colonies with both sacred ibis and endangered wood storks.”

“The extent to which nonindigenous populations of sacred ibis will depredate eggs and chicks of native colonial nesting species has not been determined.”

“The ability to exploit a year-round supply of food in human dominated areas may explain why even in a poor wading bird breeding season in the Everglades (Herring and Gawlik, unpublished data), Sacred ibis chicks were in better physiological condition than their nearest sympatric species, the white ibis.”

From CABI (2019):

“The trampling of hundreds of ibises in marshes where they feed or on the soil of islands where they breed can affect the aquatic functioning or the development of vegetation. However, the more important effect is that of the layer of droppings under colony sites, which destroys trees, shrubs and grasses. After the breeding season, some islands show no vegetation for several months.”

“Predation on large numbers of some aquatic insects such as dragonfly larvae and amphibians such as frogs is sometimes noted (Clergeau et al., 2010b) and could impact prey populations. The main concern involves the predation on eggs and young of several protected colonies of terns and herons in France (see Yésou and Clergeau, 2005) as has been observed in the native range (Williams and Ward, 2006). In western France, predation has been observed on Sandwich Terns *Sterna sandvicensis*, the ibises pushing the adults out of their nests and then taking the eggs. Colonies of some tens of incubating pairs of Black Terns *Chlidonias niger* and Whiskered Terns *C. hybrida* (also known as *C. hybridus*) have been destroyed on at least four occasions. Predation has also been reported on single nests of both the Common Tern *S. hirundo* and the Mallard *Anas platyrhynchos*, and occasionally on young Black Terns and Lapwings *Vanellus vanellus* (Clergeau et al., 2005). Reeber (2010) reports predation on *V. vanellus* and the Herring Gull, *Larus argentatus*.”

The following information pertains to *potential* impacts in Florida.

From Johnson and McGarrity (2009):

“We know very little about the impacts of Sacred Ibises in Florida. In Europe, Sacred Ibis populations have been known to grow exponentially, increasing their numbers from hundreds to thousands within five to ten years. Without aggressive, concentrated eradication efforts by wildlife professionals [...], these large birds could proliferate and might eventually have negative impacts on our native species. Most importantly, Sacred Ibises in Florida nest in the same areas (and even in the same colonies) as endangered Wood Storks, and could prey on their eggs and young. Although Sacred Ibises in Florida have not been reported nesting with seabirds or preying on their eggs or young, Florida is also home to several threatened seabird species. If Sacred Ibises were allowed to become established and proliferate, they could cause harm to these species as well.”

4 History of Invasiveness

Threskiornis aethiopicus is native to sub-Saharan Africa, the Middle East, and Madagascar; historically, they were also found in Egypt, where they are now extinct. In the United States, introduced Sacred Ibises have only been found in areas of southern Florida, thought to be escapees and a small colony was established. They are also established outside of their native range in United Arab Emirates, Canary Islands, Belgium, France, Germany, Italy, Luxembourg, Netherlands, Oceania, Australia, Portugal, Spain, and United Kingdom. Their escape is thought to be strictly associated with zoos. Impacts are generally localized and minimal but well documented. *T. aethiopicus* prey on the eggs of other wading birds. The predation has led to seasonal abandonment of breeding colonies of native wading birds in Europe. Large colonies alter vegetation and water flows in marshes and the droppings reduce vegetation under colonies. The history of invasiveness is classified as high.

5 Global Distribution

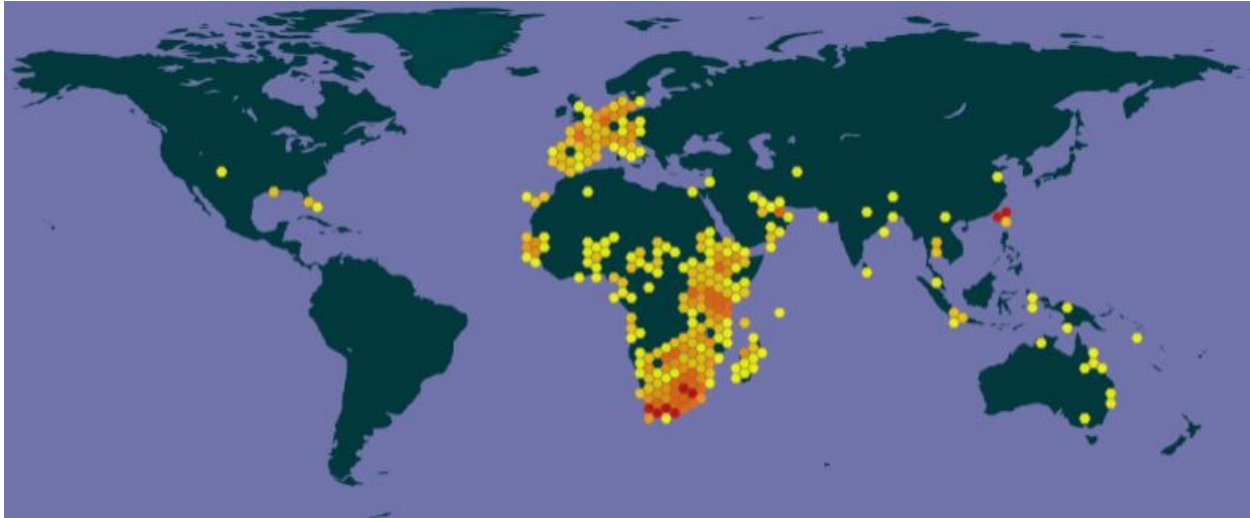


Figure 1. Known global distribution of *Threskiornis aethiopicus*. Map from GBIF Secretariat (2019). Locations in Asia (except Iraq, United Arab Emirates, Yemen and Taiwan) and Australia will be excluded from the climate match because they likely represent sightings of the two closely related species, *Threskiornis molucca* and *Threskiornis melanocephalus*. Locations in Sweden, Austria, Switzerland, Qatar, Oman, and the United States except for those in Florida, will not be used to select source points for the climate match because no information has been found indicating an established populations. Locations in Germany and Luxembourg will not be used in the climate match because they do not represent wild established populations.

6 Distribution Within the United States

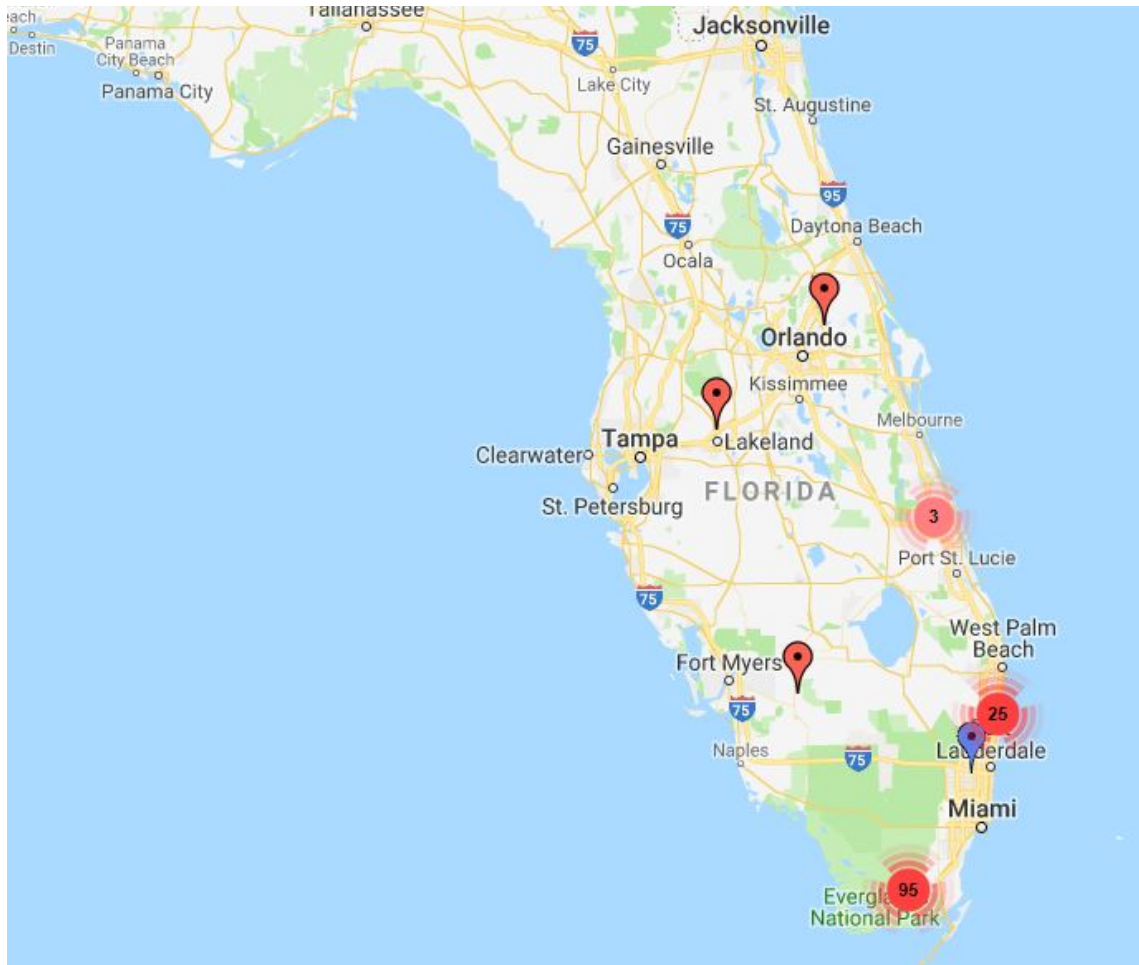


Figure 2. Known distribution of *Threskiornis aethiopicus* in Florida, United States. Map from EDDMapS (2019). Blue pin indicates an invalid sighting.

7 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Threskiornis aethiopicus* in the contiguous United States was generally medium to high. Low climate match is found in the northern Great Plains, New England, interior of the central Gulf Coast, in patches in the Rocky Mountains, and in western Washington. High and medium match are found throughout the contiguous United States specifically in the West, South and East. The overall Climate 6 score (Sanders et al. 2018; 16 climate variables; Euclidean distance) for the contiguous United States was 0.380, high (scores 0.103 and greater are classified as high). Most States had high individual Climate 6 scores. Alabama, Iowa, Louisiana, Maine, Minnesota, Mississippi, North Dakota, New Hampshire, South Dakota, Vermont, and Wisconsin had low individual scores. Idaho, Montana, Nebraska, and Wyoming had medium scores.

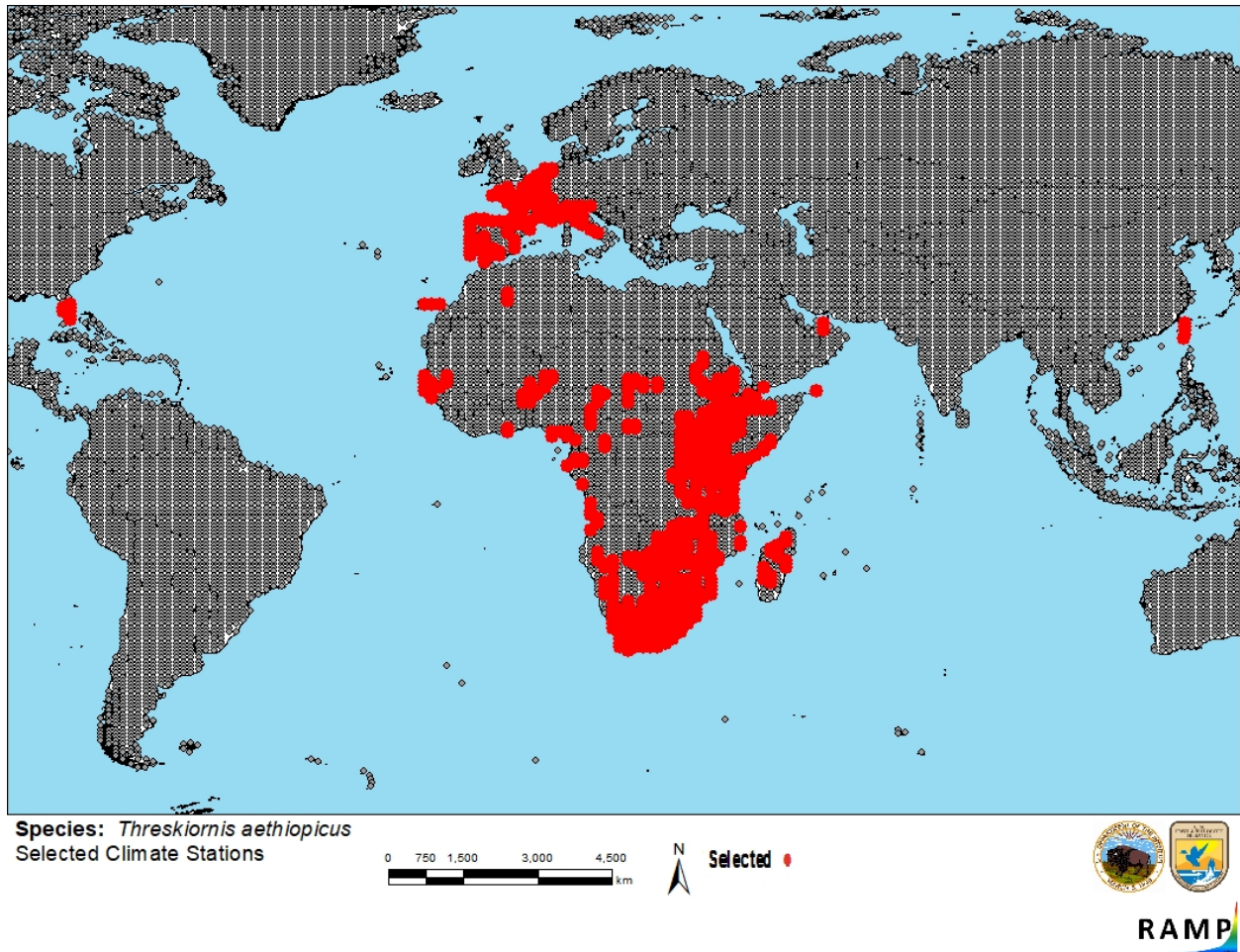


Figure 3. RAMP (Sanders et al. 2018) source map showing weather stations in Africa, Europe, United States, United Arab Emirates, and Taiwan selected as source locations (red) and non-source locations (gray) for *Threskiornis aethiopicus* climate matching. Source locations from GBIF Secretariat (2019). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

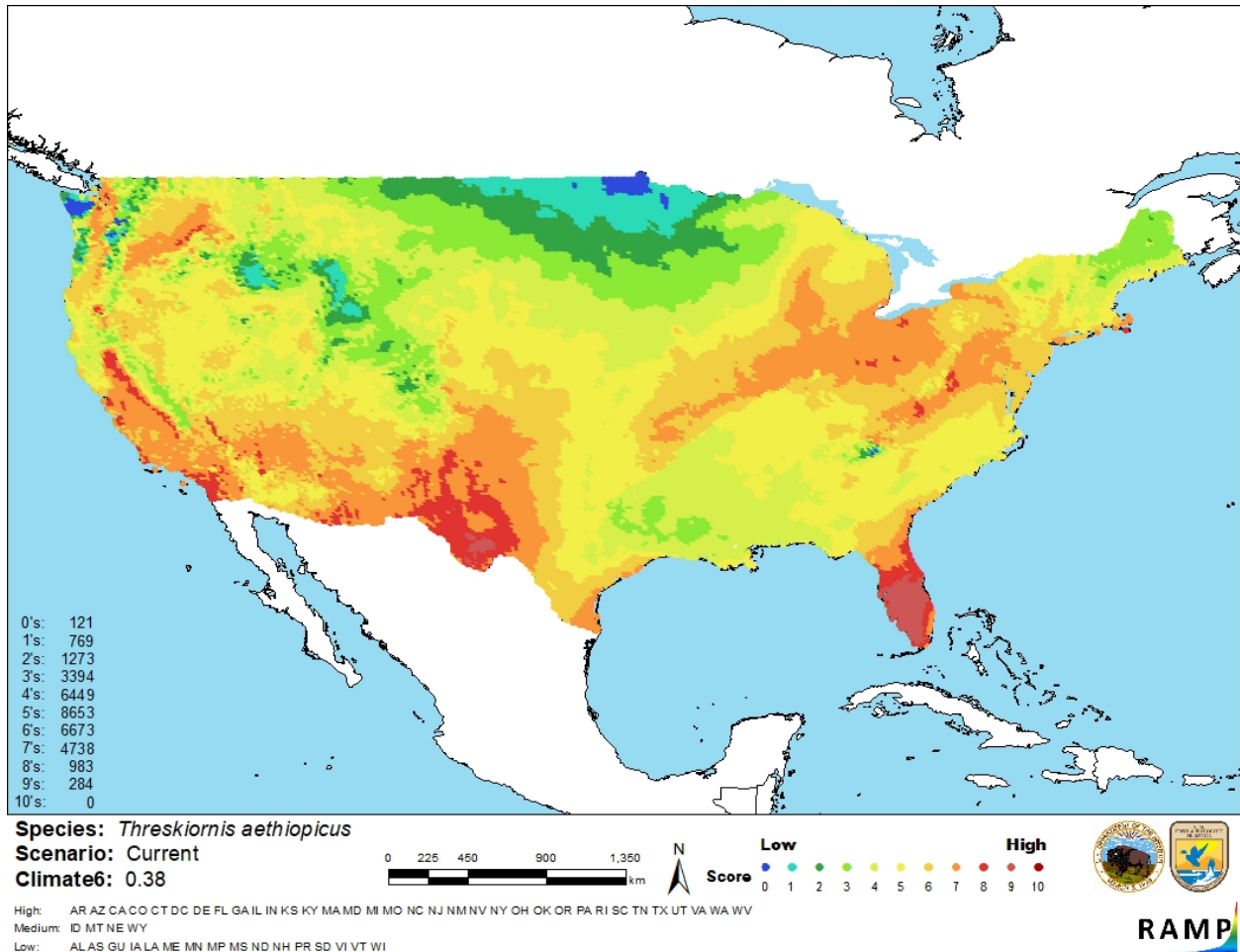


Figure 4. Map of RAMP (Sanders et al. 2018) climate matches for *Threskiornis aethiopicus* in the contiguous United States based on source locations reported by GBIF Secretariat (2019). Counts of climate match scores are tabulated on the left. 0/Blue = Lowest match, 10/Red = Highest match.

The High, Medium, and Low Climate match Categories are based on the following table:

Climate 6: (Count of target points with climate scores 6-10)/ (Count of all target points)	Overall Climate Match Category
$0.000 \leq X \leq 0.005$	Low
$0.005 < X < 0.103$	Medium
≥ 0.103	High

8 Certainty of Assessment

The certainty of assessment for *Threskiornis aethiopicus* is high. The biology and ecology of *Threskiornis aethiopicus* are well-known. Negative impacts from introductions and spread of this species are adequately documented in the scientific literature. No further information is needed to evaluate the negative impacts the species is having where introduced.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Sacred Ibis (*Threskiornis aethiopicus*) is a wading bird native to sub-Saharan Africa. The omnivorous bird can be found within urban areas as well as wetlands and has been shown to easily forage in human waste dumps. *T. aethiopicus* can be found in private collections as well as zoos. It is in trade in the United States. The history of invasiveness is classified as high. *T. aethiopicus* has been introduced to Europe, Taiwan, and the United States and established wild populations. This bird species is known to escape from zoos and other captive collections. *Threskiornis aethiopicus* is a predatory bird that preys on chicks and eggs of other species, forcing abandonment of nests and breeding colonies, possibly impacting the prey's population size. Foraging activity and feces from colonies can negatively affect vegetation. The climate match for the contiguous United States is high. Most of the contiguous United States had a high or medium match. Areas of low match were mainly found in New England, the northern Great Plains, and Rocky Mountains. The certainty of assessment is high. The overall risk assessment category for *Threskiornis aethiopicus* is high.

Assessment Elements

- **History of Invasiveness (Sec. 3): High**
- **Overall Climate Match (Sec. 6): High**
- **Certainty of Assessment (Sec. 7): High**
- **Remarks/Additional Information: No additional information**
- **Overall Risk Assessment Category: High**

10 Literature Cited

Note: The following references were accessed for this ERSS. References cited within quoted text but not accessed are included below in Section 11.

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