



Evaluation of the ornithological importance of the Alyki Kitrous wetland, Macedonia, Greece: a priority for conservation

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The ornithological importance of the Alyki Kitrous wetland (Macedonia, Greece) is evaluated for five groups of birds of special conservation interest by comparison with existing criteria. Ten raptor species (six protected in the EC) occurred but in small numbers. Herons also occurred in small numbers, but wintering great white egrets *Egretta alba* and wintering and summering spoon-bills *Platalea leucorodia* occurred in numbers of international importance. Waterfowl were especially abundant in winter, but Alyki was of international importance only for shelduck *Tadorna tadorna*, although in the past it had also been important for Eurasian wigeons *Anas penelope*. Alyki was also nationally important for the most abundant wintering anatid species, and for overall numbers, and has been occasionally important for coots. Waders were most abundant in spring migration: avocets *Recurvirostra avosetta* (during most of the year) and collared-pratincoles *Glareola pratincola* (in summer) occurred in internationally important numbers. Of breeding waders the same species were important in numbers both internationally and nationally. The latter category also included black-winged stilts *Himantopus himantopus*. Larids formed one of the most abundant groups, and Alyki was internationally important for particular breeding species such as Mediterranean gulls *Larus melanocephalus* and gull-billed terns *Gelochelidon nilotica*. It was also nationally important for breeding common *Sterna hirundo* and little *S. albifrons* terns and wintering and breeding slender-billed gulls *Larus genei*. The Alyki Kitrous wetland is threatened by illegal building and unscheduled development of the salines in the area. Priority conservation measures are proposed.

INTRODUCTION

Greece has more than 124 wetlands (Heliotis, 1988), but only a small number of these have been adequately described. Basic data for the evaluation of their ornithological importance are available only for those protected under the Ramsar Convention. However, a number of other smaller wetlands seems to be very important, holding good populations (breeding, on passage or wintering) of a variety of bird species which are considered to be threatened in the countries of the European Community (Joensen & Jerrentrup, 1988). Such

wetlands are under imminent threat due to rapid development activity in Greece, and some may even be lost before their potential importance can be assessed (Goutner & Handrinos, 1990).

This study aims to evaluate the ornithological importance of a Macedonian wetland which has also been proved to be of outstanding herpetological importance (Stubbs, 1981a,b; Stubbs *et al.*, 1981a, 1985; Hailey, 1988), and also to stimulate conservation action for this site.

STUDY AREA

Alyki, which means 'salt works' (Fig. 1), is situated at the west mouth of the Gulf of Thessaloniki

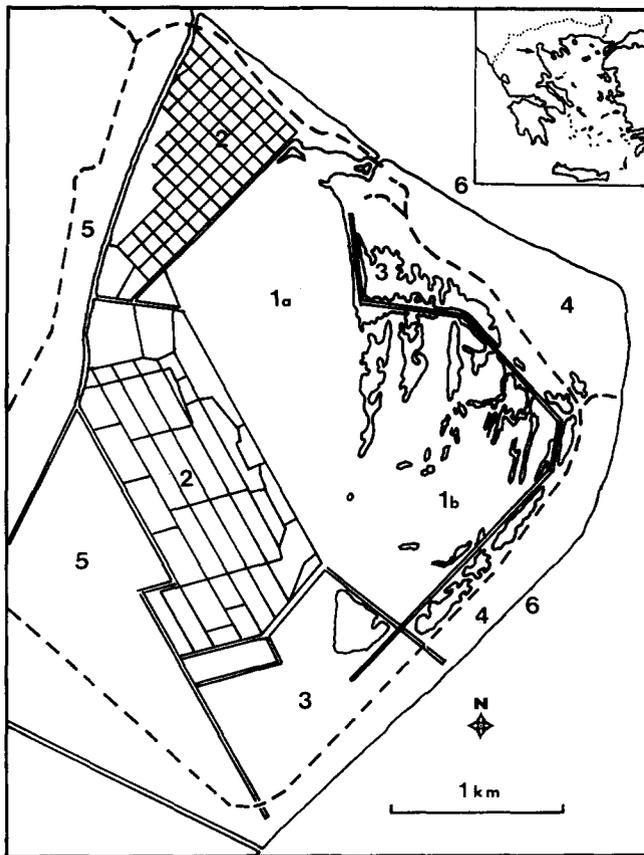


Fig. 1. Map of the study area indicating the habitats described in the text, 1a, lagoon, open water area; 1b, lagoon, shallow area with islets; 2, salines; 3, saltmarshes; 4, coastal heath; 5, west terrestrial zone; 6, coastal region. The arrow in the inset location map indicates the area within Greece.

(40° 22' N, 22° 38' E) and administratively belongs to Pieria province, Macedonia, and has been described by Stubbs *et al.* (1981a, 1985). The total study area was 1170 ha, the extent of the habitats mentioned below being measured from aerial photographs.

(1) Lagoon (308 ha), connected to the sea by a narrow (4 m) opening controlled by sluices, and used by the salt works for the storage of seawater. The water level depends on pumping, tidal amplitude, rainwater inflow and evaporation but details of the hydrology of the area have never been studied. Two different habitats can be distinguished: (a) an open water area of 159 ha in the northwest part of the lagoon, with water up to 50 cm deep, and islets less than 1 ha in extent in the northern part; (b) a shallow (maximum 25 cm deep) area of 149 ha at the southeastern part, of which 33 ha are islets covered by halophytic vegetation (Fig. 1). Changes in water level greatly affect the size of the area covered by water.

(2) Salines, occupying 254 ha, of which 171 ha, in the southern part, are pans used for gradual concentration of the salty water. There are some small islets within some of the pans in this area. The remaining 83 ha, in the northern part, are used for salt crystallisation. The saline pans are separated by dykes which are covered by vegetation to various degrees.

(3) Saltmarshes (214 ha), mainly around the southeastern part of the lagoon and the southern saline pans. An area of 170 ha is covered by halophytic vegetation dominated by *Arthrocnemum fruticosum*, *A. glaucum*, *Halocnemum strobilaceum*, *Salicornia europaea*, *Halimione portulacoides* and *Limonium* spp. An area of 44 ha consists of unvegetated pans periodically covered by water, which may not be connected with the lagoon.

(4) Coastal heath (150 ha), with mainly sandy substrate and characterised as 'heath'—due to its physiography rather than taxonomic composition—and described in detail by Stubbs *et al.* (1981a, 1985). Both vegetative composition and physiography of this zone are changing rapidly due to human pressure through fires and construction (Hailey & Goutner, 1991).

(5) West terrestrial zone (90 ha), the west boundary of the study area and including cultivations, grazing fields, reedbeds and groups of trees.

(6) Coastal region, including an area of 154 ha of sea surrounding the terrestrial part of the study area up to a distance of 200 m from the coastline. Within this area, water depth is no more than 6 m and, according to the Ramsar Convention definition, can be considered as a wetland.

METHODS

The evaluation of the ornithological importance of the Alyki wetland was based on the criteria proposed by Scott (1980) for wetlands of international importance. For waterfowl we used the more recently proposed criteria of Rüger *et al.* (1986). We also used Fuller's (1980) 1% criterion to evaluate the importance of the study area on a national level. These methods were possible for species for which the relevant criteria and qualifying levels have been put forward (Scott, 1980; Rüger *et al.*, 1986), and for which there is an evaluation of the discrete populations in the biogeographical units which include Greece. A safe evaluation of a wetland based on these criteria presupposes availability of data for a series of

years. Apart from IWRB, mid-winter counts, which were available for some years, and censuses of particular breeding species (Goutner, 1986; Goutner & Isenmann, in press), published data for the site were lacking. To obtain quantitative data and a better picture of the ornithological importance of the area, field observations took place weekly from 19 October 1988 to 18 October 1989. The area was censused from 0830 h to 1700 h along a standard route using binoculars and telescopes. Additional observations were made monthly from January to May 1990. Numbers and distribution of all bird species present were noted on 1:10 000 and 1:20 000 maps. The numbers of breeding pairs were counted in June 1989 by visits to the nesting areas. During field work special attention was paid to the species included in Annex I of the Bird Directive 79/409-85/411/EC.

Bird species were grouped into five categories considered most important for conservation (see also Burger *et al.*, 1982; Goutner & Kazantzidis, 1989):

(1) raptors: *Circaetus*, *Circus*, *Accipiter*, *Buteo*, *Falco*;

(2) herons (including flamingos): *Ixobrychus*, *Ardeola*, *Egretta*, *Ardea*, *Platalea*, *Phoenicopterus*;

(3) waterfowl: *Gavia*, *Tachybaptus*, *Podiceps*, *Phalacrocorax*, *Anser*, *Branta*, *Tadorna*, *Anas*, *Aythya*, *Bucephala*, *Mergus*, *Rallus*, *Gallinula*, *Fulica*;

(4) waders: *Haematopus*, *Himantopus*, *Recurvirostra*, *Burhinus*, *Glareola*, *Charadrius*, *Pluvialis*, *Vanellus*, *Calidris*, *Philomachus*, *Scolopax*, *Limosa*, *Numenius*, *Tringa*, *Actitis*, *Phalaropus*;

(5) larids: *Stercorarius*, *Larus*, *Gelochelidon*, *Sterna*, *Chlidonias*.

Passerines were excluded from the final analysis because their numbers were unimportant and also because they mainly utilised the terrestrial part of the study area and not the wetland itself. Birds simply flying over the study area were not included in the analysis. Counts done in the 'coastal region' (see above) were excluded from the final evaluation of the ornithological importance of Alyki because the limits of this zone were arbitrary.

Sources for the Greek populations of breeding species were Hallman (1982), Goutner (1986), Grimmet and Jones (1989), Goutner and Isenmann (in press), the *Red Data Book of Greece* (in press) and our unpublished data; the IWRB mid-winter

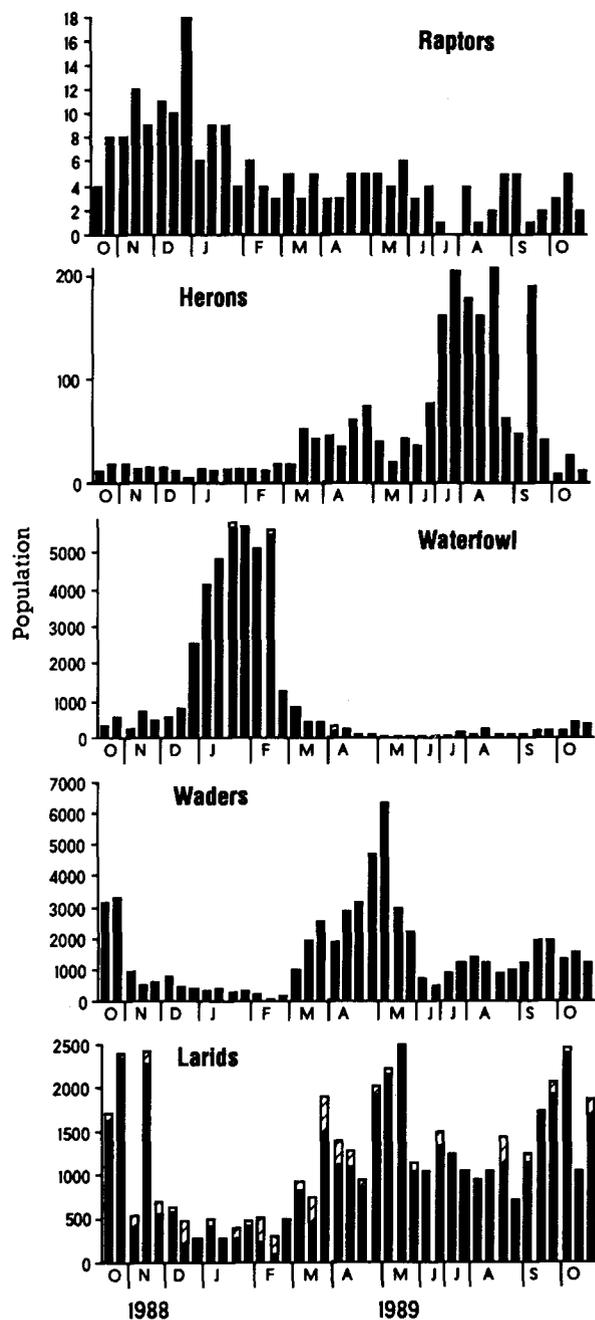


Fig. 2. Numbers of birds of the five groups considered at Alyki during the study. The open parts of bars are numbers observed in the coastal region.

waterfowl counts were used for the populations of the wintering species.

RESULTS

Raptors

The numbers of birds of prey observed at Alyki were low, and were mostly found in winter (Fig. 2).

Table 1. Evaluation of the importance of Alyki for waterbird species on a national level

Species	Maximum numbers ^a	% of national population ^b	Status ^c
<i>Egretta garzetta</i>	198	?	P
<i>Egretta alba</i>	40	?	W
<i>Ardea cinerea</i>	141	?	P
<i>Platalea leucorodia</i>	59	?	W
	80	?	S ^d
<i>Tadorna tadorna</i>	1 142	19.0	W
<i>Anas penelope</i>	2 500	2.5	W
<i>Anas crecca</i>	700	2.0	W
<i>Anas acuta</i>	1 156	7.0	W
<i>Aythya ferina</i>	616	2.2	W
Total Anatidae ^e	6 201	1.9	W
<i>Himantopus himantopus</i>	11*	1.0	B
	72	?	S
<i>Recurvirostra avosetta</i>	128*	18.0	B
	1 240	?	P
<i>Burhinus oedicephalus</i>	3*	1.5	B
<i>Glareola pratincola</i>	80*	4.0	B
<i>Charadrius alexandrinus</i>	150	?	P
<i>Gelochelidon nilotica</i>	46*	23.0	B
<i>Sterna hirundo</i>	155*	14.0	B
<i>Sterna albifrons</i>	78*	>5.6	B
<i>Larus melanocephalus</i>	7 300*	98.8	B ^f
<i>Larus genei</i>	36*	100	B

^a*, Number of breeding pairs.

^b?, Data on national populations lacking.

^cW, Wintering; B, breeding; S, summer visitor; P, on passage.

^dSummer 1979 (Stubbs *et al.*, pers. comm.).

^eAlso includes species not evaluated here.

^f1988.

This was to be expected as Greek wetlands are wintering areas for many species of this group (Handrinos, 1987). Raptors were the least abundant group during the course of the study, ten species being observed at Alyki, none of them breeding in the area (Stubbs *et al.*, 1981a;

Grimmet & Jones, 1989; B. Hallmann, pers. comm.; personal observations). Although six of these species are included in the EC Bird Directive their relative numbers were too low for Alyki to be considered especially important for this group.

Hérons

The numbers of herons were generally low during the study, being greatest during the summer (Fig. 2), mainly due to post-breeding dispersion (observations of marked individuals, S. Kazantzidis, pers. comm.). Their relative abundance ranged from 0.4% (winter 1988–89) to 5.3% (summer 1989). A total of seven species of this group were observed (all protected in the EC), and for some of these Alyki seemed to be important. Numbers of wintering great white egret *Egretta alba* (Table 1) were 2.7 times higher than the relevant international criterion and those of wintering and summering spoonbills *Platalea leucorodia* were close to or exceeded the proposed criterion (0.98 and 1.3 times, respectively). Numbers of summering little egrets *Egretta garzetta* and autumn migrating grey herons *Ardea cinerea* might be important at the national level but this cannot be confirmed due to the lack of adequate data about the Greek populations of the species.

Waterfowl

The numbers of waterfowl were highest in the winter months (Fig. 2). Their proportions followed a similar trend and ranged from 3.1% (summer 1989) to 79.8% (winter 1988–89). Fourteen

Table 2. Mid-winter waterfowl counts available for Alyki

	1973	1983	1984	1985	1986	1987	1989	1990
<i>Anser anser</i>	—	—	—	—	—	—	7	—
<i>Anser albifrons</i>	—	—	—	—	—	—	1	—
<i>Tadorna tadorna</i>	—	1	17	6	26	—	1 142	849
<i>Anas penelope</i>	7 000	310	1 010	40	220	—	2 500	960
<i>Anas crecca</i>	—	510	—	—	—	—	700	438
<i>Anas platyrhynchos</i>	40	200	10	10	12	—	62	24
<i>Anas acuta</i>	50	110	78	—	18	—	1 156	560
<i>Anas clypeata</i>	—	40	60	60	37	—	6	13
<i>Anas strepera</i>	—	—	—	—	—	—	5	—
Other Anatidae ^a	—	—	63	72	219	—	622	992
<i>Fulica atra</i>	—	3 400	3 500	45	240	—	206	—
Total Anatidae	7 090	1 171	1 238	188	532	—	6 201	3 836
Total Anatidae and Rallidae	7 090	4 571	4 738	233	772	—	6 407	3 836

^a *Aythya* sp., *Bucephala* sp., *Mergus* sp. and unidentified.

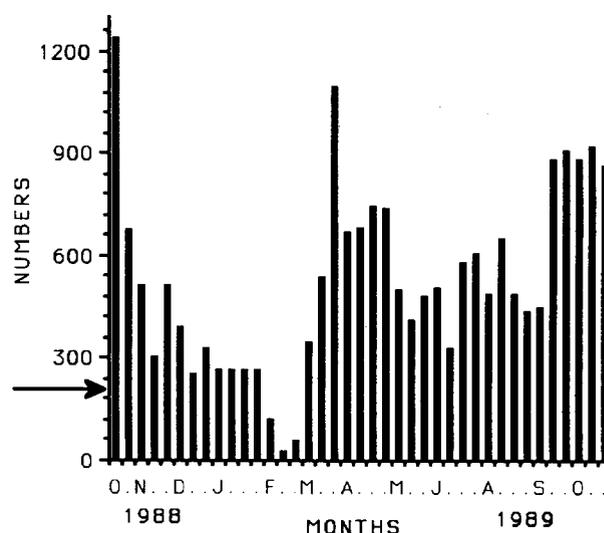
species were observed, of which one, the red-breasted goose *Branta ruficollis*, is threatened in the EC. The available mid-winter counts for the area show that, with some exceptions, waterfowl numbers during the winter of 1989 were the highest ever observed at Alyki (Table 2). This can be attributed to the prohibition of hunting starting in the winter of 1988–89. We mainly used these numbers to evaluate the relative importance of the area for this bird group. Of the most abundant species wintering in Greece, Alyki seemed to be internationally important only for shelduck *Tadorna tadorna*, exceeding 1.5 times in 1989, and 1.1 times in 1990, the criterion proposed by R ger *et al.* (1986). During the 1973 mid-winter count Eurasian wigeon *Anas penelope* (7000) exceeded the criterion 1.15 times.

To evaluate the relative importance of Alyki for waterfowl at the national level, we compared the 1989 mid-winter numbers for the most abundant species (and also total numbers) with those counted during the same period in the rest of the Greek wetlands. These comparisons suggested that during this period Alyki was important for most species and for total numbers. Although the 1989 and 1990 data do not suggest that it was important for coot *Fulica atra*, in 1983 their population exceeded 4.25 times 1% of the national population and in 1984 3.5 times. Thus, Alyki may occasionally be nationally important for coot. Similarly for Eurasian wigeon, in 1973 numbers in Alyki were 12.7 times above 1% of the national population, suggesting that it may at least occasionally be more important than it was during the main study period.

Waders

Waders were one of the most important bird groups of Alyki: in terms of population proportions, this was the most important group in spring (62.7% of the total) and second in the other seasons (ranging from 42.0 to 43.6% of the total)—except winter (7.9%). Numbers were highest during migration periods, especially spring (Fig. 2). A total of twenty-seven species were observed, of which eight are threatened in the EC.

Maximum numbers of the species for which there are available criteria applicable to the Greek biogeographical area are shown in Table 1. Alyki seemed to be internationally important for avocets *Recurvirostra avosetta* and collared pratincoles *Glareola pratincola* (5 times and 1.6 times above



and 48.8% in 1989) and summer (48.5%) although differences in the case of shorebirds were not great. Fifteen species occurred at Alyki, of which eight are threatened in the EC. Data available for breeding larids, both from the study period and previous studies, suggest that Alyki is of outstanding importance. Two gull and three tern species breed at Alyki, all protected by the EC Bird Directive (Table 1). For Mediterranean gulls *Larus melanocephalus*, it is the most important breeding area outside Russia. Thus, although there are no criteria in the wetland classification based on numbers of this species, Alyki is the most important area in the EC, attracting 70–100% of the Greek breeding population. The decline of the breeding population in 1989 (654 pairs) is attributed to temporary changes in the hydrological regime of the lagoon, where these birds breed on islets in the southern part. That year Mediterranean gulls were forced onto saline dykes where, due to lack of isolation and consequent heavy predation by terrestrial predators, their reproduction failed entirely.

In Greece, slender-billed gulls *Larus genei* breed only in Alyki (Isenmann & Goutner, in press).

Of the breeding tern species, gull-billed terns *Gelochelidon nilotica* bred in internationally important numbers (2.4 times above the criterion). Little tern *Sterna albifrons* numbers were relatively close to the proposed criterion (0.8). For all tern species Alyki was important at the national level (Table 1).

Maximum numbers of some larid species such as Mediterranean gulls (2100), black-headed gulls *Larus ridibundus* (2000), slender-billed gulls (215) and sandwich tern *Sterna sandvicensis* (390) counted during migration may be important on a national level but detailed data for such comparisons are lacking. Mid-winter counts in 1989 indicated that Alyki was nationally important for slender-billed gulls, attracting 7% ($n = 24$) of the Greek wintering population.

DISCUSSION

Much of the information which has been used to evaluate the importance of the Alyki wetland for birds has been collected during a relatively short period. Thus, the evaluation of its relative importance for some species may contain a degree of error. For several species, our study basically indicates the area's potential significance, rather than

determining with certainty its ornithological importance. On the other hand, the already existing published and unpublished information (mainly B. Hallmann, pers. comm., and our observations) and data presented above suggest that Alyki has also in the past been important for at least some of the species of importance in the present study. In comparison with the Evros Delta, a wetland of international importance (for which there are adequate data for comparison), Alyki seems to hold similar or greater numbers of species (e.g. of waders) despite its smaller area and lower habitat diversity (Goutner *et al.*, 1988; G. Papakostas, unpublished data). The importance of Alyki regionally may increase through time because other parts of the wider wetland ecosystem in the region of the Gulf of Thessaloniki are gradually losing their significance for bird life due to heavy human pressure. It will also become more important because it hosts waterfowl species that have decreased in the Black Sea–Mediterranean region (such as pochard *Aythya ferina*, coot and perhaps others, Pirot *et al.*, 1989), and it is probable that this holds true for species of the other groups examined.

Conservation

Like most Greek wetlands, Alyki is threatened. Many problems arise from the fact that the area has not yet achieved protected status under Greek legislation. Its unique herpetological importance has become known thanks to studies and conservation efforts mainly of English scientists. Despite such efforts, which started in 1980, and due to the indifference of the Greek State, a great part of the surrounding heath was burned and ploughed by local people for holiday housing development in 1980 and again in 1989. A more detailed description of the facts and their consequences on the herpetofauna is given in Stubbs (1981a,b), Stubbs *et al.* (1981a,b, 1985) and Hailey and Goutner (1991). The development sought by local people would destroy all the surrounding heath and the south part of the lagoon, which administratively belongs to the Community of Kitros.

Another potential threat to the area is the intended expansion and development of the salines. These are government-owned but are managed by a private organisation. A new pump has been constructed at the opening of the lagoon in order to enrich it with seawater because (according to the saline managers) inadequate

amounts enter during high tides. There is no information on the consequences this would have on the nesting birds in the southern part of the lagoon, where hundreds of nests might be destroyed by flooding. Apart from this, failure of breeding in the lagoon may also be associated with lack of adequate rainfall, which contributes to preserving the water level in the southern part of the lagoon, especially at the beginning of the breeding season. Thus part of the problem for the conservation of the populations breeding in the lagoon islets is associated with the hydrological regime of the area.

Further changes are also intended, especially in the northern part of the lagoon (which is managed by the salines), involving construction of dykes which would divide the area into smaller sections. This region of the lagoon is very important for the occurrence of many species of herons and waterfowl (G. Papakostas, unpublished data). Additionally, unless other management measures are taken, isolation of the southern part of the lagoon by a dyke will probably destroy the most important nesting area for larids and shorebirds.

The following measures should be urgently taken for the conservation of Alyki:

(1) Delineation of the ornithologically and herpetologically important area and inclusion of this and a buffer zone in an area with special protection status.

(2) Provision by the Greek State of an alternative area for the people of Kitros for housing and/or tourist activities, away from the protected area.

(3) Collaboration of conservation bodies with the managers of the salt works to encourage them to organise production activities so that these will not threaten the wildlife of the area. Within this framework a hydrological study is needed, and also appropriate management to increase the importance of the area for particular bird species and groups.

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