

Project Update: February 2022

Fieldwork was conducted between December 2020 and January 2021. A total of 43 wetlands were visited over the entire territory of Tunisia, including coastal and continental wetlands under different levels of protection (Table 1).

Table 1. List of wetlands selected for waterbird surveys and habitat assessments

Site	X	Y	Region
Lac Ichkeul	37,160546	9,662118	Bizerte
Garaet Mabtough	37,022629	9,943546	Bizerte
Sebkhet Ariana	36,912228	10,243256	Tunis, Ariana
Lac of Tunis	36,817719	10,244488	Tunis, Ben Arous
Sebkhet Séjoumi	36,765512	10,149841	Tunis
Dam of Mornaguia	36,779186	10,032244	Tunis, Ariana
Lagoon Soliman	36,728352	10,49466	Nabeul
Lagoon Tazarka	36,529293	10,840788	Nabeul
Lagoon of Korba	36,607066	10,886889	Nabeul
Dam of Lebna	36,739682	10,915893	Nabeul
Dam of Sidi Abdelmonem	36,857544	10,9287	Nabeul
Dam of Mlaâbi	36,828843	10,985507	Nabeul
Dam of El khatéf/Oued El Haajar	36,847843	11,030572	Nabeul
Dam of Al Masri	36,531086	10,486827	Nabeul
Dam Hmira/ Khairat	36,15254	10,212848	Sousse
Dam Takrouna/ Moussa	36,146492	10,309437	Sousse
Hill lake Boulabousse	36,242532	10,180937	Zaghouan
Dam of Oued Rmal	36,349398	10,345004	Zaghouan
Sebkhet sidi khelifa	36,236051	10,456328	Sousse
Sebkhet Halk el Menzel	35,985736	10,510978	Sousse
Saltwork Monastir	35,758997	10,778425	Monastir
Sebkhet El Moknine	35,584649	10,95463	Monastir
Sebkhet kelbia	35,852345	10,289306	Kairouan
Dam of El Houareb	35,568073	9,74002	Kairouan
Metbassta	35,807942	10,153246	Kairouan
Sebkhet Sidi El Hani	35,551947	10,418195	Kairouan
Kerkennah Islands	34,743786	11,220314	Sfax
Saltwork Thyna	34,647891	10,705058	Sfax
Kneiss Islands	34,376756	10,308441	Sfax
Sebkhet Ennoual	34,394173	9,836801	Sidi Bouzid
Sebkhet Dreiaâ	34,173905	10,024107	Sfax-Gabès
El Grine	33,639707	10,490233	Medenine
Ras Rmal	33,881509	10,887697	Medenine
Borj kastile	33,66584	10,952827	Medenine
Gallela	33,737314	10,826847	Medenine
Lagoon of Boughrara	33,534659	10,682242	Medenine

Lagoon El Bibane	33,234447	11,230549	Medenine
Douz Laâla	33,473179	8,982673	Kébili
Snam	33,469688	8,954093	Kébili
Ghidma	33,431699	8,795167	Kébili
Sebkhet Nouaïel	33,536186	8,778982	Kébili
Blidatte	33,5593	8,8609	Kébili
Blidatte chott ejrid	33,582468	8,807527	Kébili

Data collection

Waterbird data

Each wetland was visited twice on different dates (December 2020-January 2021). Observations were made from 08:00 – 11:30 and 15:30 – 17:30 and only under favourable meteorological conditions to ensure good visibility and hence bird detectability. In particular, no observation was conducted during strong wind or rain. During each visit, the observers recorded all birds detected using binoculars and a spotting scope (20–60*).

A total of 344440 birds and 333586 birds were recorded during the first and second visit respectively (Table 2).

Table 2: Number of waterbirds recorded in each wetland during the two visits.

Site	Visit 1	Visit 2
1	1506	1519
2	394	342
3	1921	1183
4	2068	2391
5	12530	21905
6	2535	2669
7	22882	23277
8	175	133
9	1002	1095
10	410	950
11	36247	33494
12	11900	11666
13	3406	3345
14	21	16

15	2387	2294
16	566	441
17	1335	1670
18	1366	1328
19	8	2
20	21082	16690
21	14995	15287
22	59	6
23	151	138
24	130	126
25	1236	1356
26	17265	17738
27	11458	10910
28	4439	7002
29	141	146
30	1637	1663
31	27095	21557
32	41776	42226
33	31229	28879
34	119	109
35	4581	2279
36	1381	1107
37	3406	3309
38	3304	2915
39	16118	17586
40	31433	22307
41	80	75
42	4555	3854
43	4111	6640
Total	344440	333589

A total of 78 species (30 shorebirds, 25 waterfowl, 12 open-water birds and 11 wading bird) belonging to 17 families were recorded (Table 3). The families with the highest numbers of species were Scolopacidae (26% of species), Anatidae (21%), Laridae (8%) and Charadriidae (8%).

Concerning migratory status, 20 species were recognised as resident, 53 were regular wintering species and five were irregular wintering species that accounted for negligible numbers. With regard to conservation status, the avifauna was mainly composed of species of Least Concern (66 of the 78 recorded species). There were eight Near Threatened species: lesser flamingo (*Phoeniconaias minor*), ferruginous duck (*Aythya nyroca*), Eurasian oystercatcher (*Haematopus ostralegus*), northern lapwing (*Vanellus vanellus*), curlew sandpiper (*Calidris ferruginea*), Eurasian curlew (*Numenius arquata*), black-tailed godwit (*Limosa limosa*) and bar-tailed godwit (*Limosa lapponica*). We also recorded three Vulnerable species and one Endangered species respectively: marbled duck (*Marmaronetta angustirostris*), common pochard (*Aythya ferina*), Audouin's gull (*Ichthyaetus audouinii*) and white-headed duck (*Oxyura leucocephala*).

Moreover, for 19 species, the 1% level criterion of the Ramsar Convention was exceeded for relevant populations: great cormorant (*Phalacrocorax carbo*), little egret (*Egretta garzetta*), Eurasian spoonbill (*Platalea leucordia*), greater flamingo (*Phoenicopterus ruber*), greylag goose (*Anser anser*), common shelduck (*Tadorna tadorna*), ruddy shelduck (*Tadorna ferruginea*), northern shoveler (*Anas clypeata*), Eurasian wigeon (*Anas penelope*), marbled duck, white-headed duck, pied avocet (*Recurvirostra avocetta*), ferruginous duck, Kentish plover (*Charadrius alexandrinus*), grey plover (*Pluvialis squatarola*), dunlin (*Calidris alpina*), slender-billed gull (*Larus genei*), Mediterranean gull (*Ichthyaetus melanocephalus*) and Caspian tern (*Sterna caspia*). (Table 3)

Table 3: List of recorded species classified by foraging guild and family, with information on their migratory status and conservation status. Migratory status: IW = irregular wintering, R = resident, W = wintering; conservation status: LC = Least Concern, NT = Near Threatened, VU = Vulnerable, EN = Endangered

Foraging guild	Family	Scientific name	Common name	Migratory status	Conservation status
Waterfowl	Podicipedidae	<i>Podiceps cristatus</i>	Great Crested Grebe	W	LC
	Podicipedidae	<i>Podiceps nigricollis</i>	Black-necked Grebe	W	LC
	Podicipedidae	<i>Tachybptus ruficollis</i>	Little Grebe	R	LC
	Phalacrocoracidae	<i>Phalacrocorax carbo</i>	Great Cormorant *	W	LC
Wading birds	Ardeidae	<i>Egretta garzetta</i>	Little Egret *	R	LC
	Ardeidae	<i>Ardea alba</i>	Great Egret	W	LC
	Ardeidae	<i>Ardea cineria</i>	Grey Heron	W	LC
	Ardeidae	<i>Bubulcus ibis</i>	Western Cattle Egret	R	LC
	Ardeidae	<i>Botaurus stellaris</i>	Eurasian Bittern	IW	LC
	Threskiornithidae	<i>Plegadis falcinellus</i>	Glossy Ibis	R	LC
	Threskiornithidae	<i>Platalea leucordia</i>	Eurasian Spoonbill *	W	LC
	Phoenicopteridae	<i>Phoenicopterus ruber</i>	Greater Flamingo *	R	LC
	Phoenicopteridae	<i>Phoeniconaias minor</i>	Lesser Flamingo	IW	NT
	Gruidae	<i>Grus grus</i>	Common Crane	W	LC
	Ciconiidae	<i>Ciconia ciconia</i>	White Stork	R	LC
Waterfowl	Anatidae	<i>Mergus serrator</i>	Red-breasted Merganser	W	LC
	Anatidae	<i>Anser anser</i>	Greylag Goose *	W	LC
	Anatidae	<i>Tadorna tadorna</i>	Common Shelduck *	R	LC
	Anatidae	<i>Tadorna ferruginea</i>	Ruddy Shelduck *	R	LC
	Anatidae	<i>Anas platyrhynchos</i>	Mallard	W	LC
	Anatidae	<i>Anas acuta</i>	Northern Pintail	W	LC

	Anatidae	<i>Anas clypeata</i>	Northern Shoveler *	W	LC
	Anatidae	<i>Anas penelope</i>	Eurasian Wigeon *	W	LC
	Anatidae	<i>Anas crecca</i>	Eurasian Teal	W	LC
	Anatidae	<i>Marmaronetta angustirostris</i>	Marbled Duck *	R	VU
	Anatidae	<i>Mareca strepera</i>	Gadwall	W	LC
	Anatidae	<i>Oxyura leucocephala</i>	White-headed Duck *	R	EN
	Anatidae	<i>Aythya nyroca</i>	Ferruginous Duck *	R	NT
	Anatidae	<i>Aythya ferina</i>	Common Pochard	W	VU
	Anatidae	<i>Aythya fuligula</i>	Tufted Duck	W	LC
	Anatidae	<i>Netta rufina</i>	Red-crested Pochard	W	LC
	Rallidae	<i>Porphyrio porphyrio</i>	Western Swamphen	R	LC
	Rallidae	<i>Rallus aquaticus</i>	Water Rail	W	LC
	Rallidae	<i>Gallinula chloropus</i>	Common Moorhen	R	LC
	Rallidae	<i>Porphyrio porphyrio</i>	Western Swamphen	R	LC
	Rallidae	<i>Fulica atra</i>	Eurasian Coot	R	LC
Shorebirds	Haematopodidae	<i>Haematopus ostralegus</i>	Eurasian Oystercatcher	W	NT
	Recurvirostridae	<i>Himantopus himantopus</i>	Black-winged Stilt	R	LC
	Recurvirostridae	<i>Recurvirostra avocetta</i>	Pied Avocet *	R	LC
	Charadriidae	<i>Charadrius dubius</i>	Little Ringed Plover	W	LC
	Charadriidae	<i>Charadrius hiaticula</i>	Common Ringed Plover	W	LC
	Charadriidae	<i>Charadrius alexandrinus</i>	Kentish Plover *	R	LC
	Charadriidae	<i>Pluvialis squatarola</i>	Grey Plover *	W	LC
	Charadriidae	<i>Pluvialis apricaria</i>	European Golden Plover	W	LC
	Charadriidae	<i>Vanellus vanellus</i>	Northern Lapwing	W	NT
	Burhinidae	<i>Burhinus oedicnemus</i>	Eurasian Stone-curlew	W	LC
	Scolopacidae	<i>Lymnocyrtus minimus</i>	Jack Snipe	W	LC
	Scolopacidae	<i>Gallinago gallinago</i>	Common Snipe	W	LC
	Scolopacidae	<i>Arenaria interpres</i>	Ruddy Turnstone	W	LC
	Scolopacidae	<i>Calidris alba</i>	Sanderling	W	LC
	Scolopacidae	<i>Calidris ferruginea</i>	Curlew Sandpiper	W	NT

	Scolopacidae	<i>Calidris alpina</i>	Dunlin *	W	LC
	Scolopacidae	<i>Calidris minuta</i>	Little Stint	W	LC
	Scolopacidae	<i>Calidris temminckii</i>	Temminck's Stint	W	LC
	Scolopacidae	<i>Philomachus pugnax</i>	Ruff	W	LC
	Scolopacidae	<i>Numenius arquata</i>	Eurasian Curlew	W	NT
	Scolopacidae	<i>Numenius phaeopus</i>	Eurasian Whimbrel	W	LC
	Scolopacidae	<i>Limosa limosa</i>	Black-tailed Godwit	W	NT
	Scolopacidae	<i>Limosa lapponica</i>	Bar-tailed Godwit	W	NT
	Scolopacidae	<i>Tringa totanus</i>	Common Redshank	W	LC
	Scolopacidae	<i>Tringa erythropus</i>	Spotted Redshank	W	LC
	Scolopacidae	<i>Tringa nebularia</i>	Common Greenshank	W	LC
	Scolopacidae	<i>Actitis hypoleucos</i>	Common Sandpiper	W	LC
	Scolopacidae	<i>Tringa ochropus</i>	Green Sandpiper	W	LC
	Scolopacidae	<i>Tringa glareola</i>	Wood Sandpiper	W	LC
	Scolopacidae	<i>Tringa stagnatilis</i>	Marsh Sandpiper	W	LC
Open-water birds	Laridae	<i>Larus genei</i>	Slender-billed Gull *	R	LC
	Laridae	<i>Larus ridibundus</i>	Black-headed Gull	W	LC
	Laridae	<i>Ichthyaetus melanocephalus</i>	Mediterranean Gull *	W	LC
	Laridae	<i>Ichthyaetus audouinii</i>	Audouin's Gull	W	VU
	Laridae	<i>Larus michahellis</i>	Yellow-legged Gull	R	LC
	Laridae	<i>Larus fuscus</i>	Lesser Black-backed Gull	W	LC
	Sternidae	<i>Gelochelidon nilotica</i>	Gull-billed Tern	W	LC
	Sternidae	<i>Sterna sandvicensus</i>	Sandwich Tern	W	LC
	Sternidae	<i>Sterna caspia</i>	Caspian Tern *	W	LC
	Sternidae	<i>Chlidonias niger</i>	Black Tern	IW	LC
	Sternidae	<i>Chlidonias hybrida</i>	Whiskered Tern	IW	LC
	Alcedinidae	<i>Alcedo atthis</i>	Common Kingfisher	W	LC

* Species exceeding the 1% level criterion of the Ramsar Convention

Habitat variables

Samples of water was collected from each wetland (during the winter period). These samples were used to determine the level of nitrate NO_3^- (mg/l), nitrite NO_2^- (mg/l), phosphates PO_4^{3-} (mg/l), water pH, water salinity (g /l) and conductivity (ms/cm) (Table 4).

Water salinity, conductivity and pH were measured using a multiparameter regularly calibrated. The level of NO_3^- , NO_2^- and PO_4^{3-} were measured using ion chromatography analysis (IC850, Metrohm).

Table 4: Descriptive data of water quality parameters recorded in the 43 selected wetlands.

Site	PH	conductivity	salinity	PO_4^{3-}	NO_3^-	NO_2^-
1	8.19	25.2	14.535	8.757	14.875	0.377
2	8.21	36.3	21.763	16.457	12.562	0.214
3	8.54	45.5	28.01	14.252	25.933	0.439
4	8.54	66.7	43.229	7.224	8.434	0.112
5	8.09	68.2	44.349	9.058	14.817	0.133
6	8.62	0.384	0.173	16.205	25.851	0.683
7	7.69	50.1	31.215	22.848	17.47	0.653
8	7.35	15.98	8.828	18.305	14.863	0.826
9	8.35	68.9	44.874	8.442	9.463	0.214
10	8.29	1.254	0.584	4.389	6.679	0.133
11	6.63	175.3	140.948	9.975	17.47	0.275
12	8.53	2.47	1.191	3.612	5.137	0.245
13	8.34	1.516	0.712	7.448	9.815	0.316
14	7.49	1.568	0.738	4.354	6.658	0.082
15	7.58	2.14	1.024	14.035	13.37	0.286
16	8.21	0.508	0.23	0.182	1.48	0.092
17	7.84	2.32	1.115	32.375	41.964	2.152
18	8.47	1.195	0.556	0.413	1.752	0.061
19	8.04	95.6	65.837	22.827	29.77	0.622
20	8.34	78.7	52.35	21.434	17.495	0.347
21	7.72	10.41	5.87	8.113	18.521	0.862
22	8.71	71.2	46.606	8.862	14.047	0.153
23	8.39	1.513	0.711	22.848	17.47	0.694
24	7.58	4.53	2.269	11.375	13.37	0.49
25	7.44	175.3	140.948	4.375	9.815	0.418
26	7.93	38.4	23.169	8.323	25.67	1.581
27	7.85	128.5	94.4	14.357	25.933	0.551
28	7.96	69.9	45.625	8.015	39.463	0.663
29	7.33	62.8	40.344	22.827	29.77	0.959

30	7.23	7.68	3.994	6.454	8.84	0.52
31	8.15	68.7	44.724	17.738	20.168	0.479
32	8.19	65.1	42.041	9.296	14.6	0.173
33	8.6	0.904	0.415	11.375	18.946	0.53
34	7.43	20.8	11.775	43.407	33.87	1.265
35	8.32	66.5	43.08	25.557	13.518	0.286
36	8.32	65.7	42.486	7.784	8.286	0.571
37	8.18	43.3	26.496	39.368	12.685	0.959
38	7.78	18.92	10.615	32.375	25.793	0.694
39	8.03	25.9	14.98	16.527	31.263	0.826
40	7.85	55.3	34.904	9.205	25.547	0.632
41	7.8	0.871	0.4	1.876	13.37	0.133
42	7.62	18.12	10.126	36.848	45.354	2.356
43	8.14	30.1	18.6	7.162	22.074	1.28



Flock of Marbled Duck observed in IBA of Snam (region of Kébili)



Mixed Flock of Eurasian Spoonbill and Greater Flamingo in the Saltwork of Monastir



Wetland of Kneiss Islands



Glossy Ibis observed in the Saltwork of Monastir



Flock of Ruddy Shelduck and Common Shelduck observed in Sebket Noudiel



IBA of Douz Laâla



Flock of White-headed Duck observed in the dam of Hmira



IBA of dam El Houareb



IBA of lagoon El Bibane (Region of Medenine)



Flock of Great Cormorant observed in the IBA of lagoon El Bibane.



Flock of Common Pochard observed in the dam Hmira/ Khairat.



Flock of ducks observed in the Saltwork of Monastir.



Flock of ducks observed in Sebket kelbia



Flock of ducks flying over the Sebket of kelbia



Flock of Slender-billed Gull observed in the saltwork of Thynd



IBA of Sebket Noudiel



IBA of lagoon El Bibane



Mixed flock of Ferruginous Duck, Northern Shoveler and Eurasian Coot observed in the IBA of Borj kastile



Ferruginous Duck and Red-crested Pochard observed in the IBA of Borj kastile



Common Crane observed in Kerkennah Islands



IBA dam of Lebna



Flock of Greater Flamingo in the IBA of lagoon Boughrara



Mixed flock of Slender-billed Gull, Caspian Tern and Sandwich Tern in the lagoon of Boughrara



Flock of Greater Flamingo in the IBA of Gallela



Bird counting in the IBA of Ras Rmal





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