INTERNATIONAL WATERBIRD CENSUS

MOROCCO · 2019-2023

المعهد العلمي
Institut Scientifique

Vogelbescherming
NEDERLAND

GREPOM

ANEF
الوكالة الوطنية للمياه والغابات
AGENCE NATIONALE DES EAUX ET FORETS

Mediterranean Waterbirds
Oiseaux d'eau Méditerranée
الطيور المائية بمنطقة البحر المتوسط

ACKNOWLEDGEMENTS AND LIST OF PARTICIPANTS

COUNTERS:

E. Abba, Hd. Achiban, Hn. Achiban, A. Ait Baamrane, A. Al Harrass, M. Amezian, H. Amrij, M. Aourir, S. Azaouaghe, H. Banan, A. Benhamza, E. Benka, I. Bentayaa, M. Bouamama, H. Bouchri, O. Boukarai, M. Boumaaza, B. Bourouah, A. Caballero, A. Chahir, N. Chekrouni, A. Chendoud, I. Cherkaoui, N. Cherkrouni, L. Chillasse, M. Chlaida, M. Dakki, M.J. De Lope, I. Douini, S. El Abbassi, M.A. El Agbani, A. El Ajy, N. El Allouli, A. El Aouki, H. El Bouzidi, R. El Hamoumi, M.K. El Haoua, R. El Khamlichi, A. El Khattabi, S. El Malki, E. El Mouden, A. El Mounssi, A. Essabbani, K. Essalai, A. Essalek, K. Esshasah, A. Fahmi, B. Farouqi, M.J. Fernández, R. Garcia, Y. Goutou, Z. Haddou, H. Hammouradia, H. Hassani, M. Hilmi, H. Ismaili Alaoui, I. Jabar, L. Joulami, N. Kaddouri, H. Kasbaji, Y. Khachtib, M. Khaffou, L. Kimdil, M. Laarbi Jebari, E. Laghzaoui, S. Lahrouz, K. Laidi, V. Lieron, B. Maire, A. Mansouri, I. Mansouri, N. Mars, M. Moukhliss, A. Mounir, M. Mounir, E. Nabil, A. Nahli, M. Noaman, J. Notario, A. Onrubia, A.K. Oudghiri, L. Oukannou, R. Oulaarif, B.Y. Oulahrir, D. Ousaaid, A. Qninba, M. Radi, O. Rguibi, A. Rihane, F. Salhi, W. Squalli, Y. Tamraoui, Y. Teyar, C. Torralvo, O. Zekhnini, H. Zidane, and A. Zinessabah.

ORGANISATIONS:

GREPOM/BirdLife Maroc (Salé); Emirates Center for Wildlife Propagation (Missour); Fundación Migres (Spain); Groupe Ornithologique du Maroc (Meknès).

DEPARTMENT IN CHARGE OF WETLAND MANAGEMENT:

Agence Nationale des Eaux et Forêts (Biodiversity Service, Rabat); Régional Directions of Water and Forests (Services of Wild Fauna monitoring) of Fes, Kenitra, Beni Mellal, Oriental, and Dakhla; Ifrane National Park.

HIGHER EDUCATION AND SCIENTIFIC RESEARCH INSTITUTIONS:

Scientific Institute of Rabat; High School of Technology of Khenifra; Faculties of Sciences of Agadir, Fes, Meknes, Casablanca (Ben Msik), and Marrakech (Semlalia).

AUTHORS:

M. Dakki, R. El Hamoumi, Z., M. Radi & K. Bourass.

General report (2009-2018)

Morocco report (2009-2018)

Bibliographic reference: M. Dakki, R. El Hamoumi, Z., M. Radi & K. Bourass. 2025.
International waterbird census. Morocco report (2019-2023). Medwaterbirds Network, Tour du Valat, 12 p.

Cover image: Khnifiss Lagoon (South of Morocco) © M. Dakki
Photo p.2: Caspian Terns (*Hydroprogne caspia*) - Dakhla bay (Morocco) © M. Dakki / **Cartography:** Marta Lago, Khalil Baddour
With the contribution of Marta Lago, Khalil Baddour, Laura Dami / **Graphic design and layout:** Atelier Guillaume Baldini

MOBILIZED **NATIONAL OBSERVERS**

The 2023 winter census marked 40 years of waterbird monitoring in Morocco. Efforts led to 292 wetlands surveyed and nearly 100 observers involved. This success is due to GREPOM's strong engagement, involvement and strong logistical and economic support from the National Agency of Water and Forests, as well as the Agence Française du Developpement (AFD) (via the MedWaterBirds network at Tour du Valat) and VBN (Vogelbescherming Nederland).

NUMBER OF VOLUNTEERS

MORE THAN **100** VOLUNTEERS

NUMBER OF WETLANDS VISITED

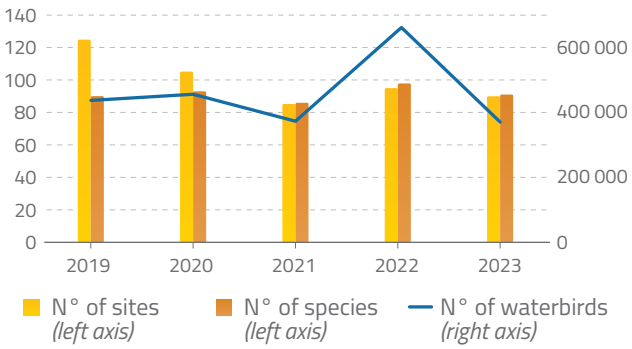
175 WETLANDS MONITORED AT LEAST ONCE (2019-2023)

MAXIMUM NUMBER OF SPECIES OBSERVED

115 SPECIES OBSERVED IN MOROCCO (2019-2023)

EVOLUTION OF THE NUMBER OF WATERBIRDS,

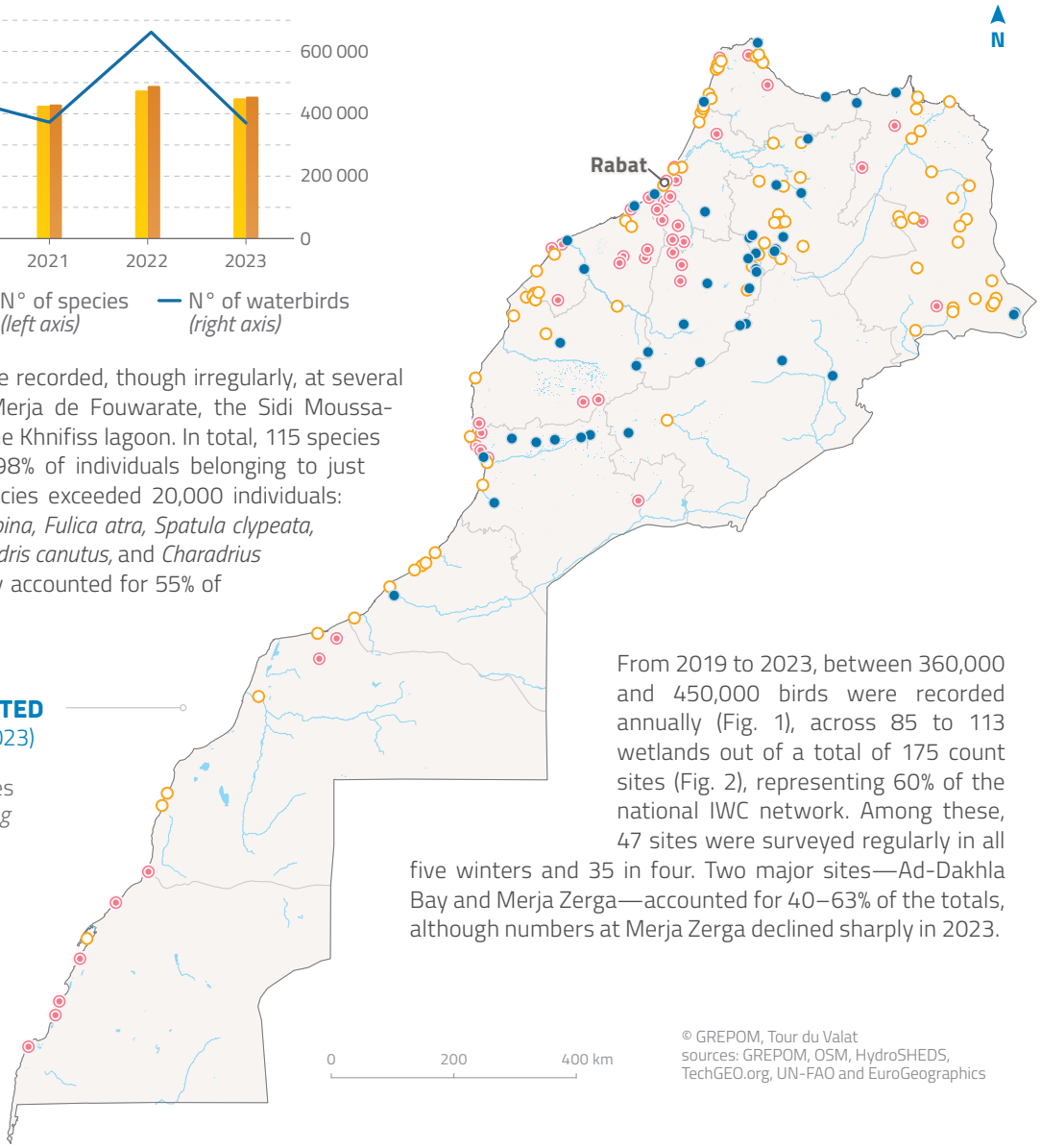
species, and sites visited (2019-2023) - *Fig. 1*



Over 20,000 birds were recorded, though irregularly, at several large sites, such as Merja de Fouwarate, the Sidi Moussa-Walidia lagoons, and the Khnifiss lagoon. In total, 115 species were observed, with 98% of individuals belonging to just 53 species. Seven species exceeded 20,000 individuals: *Larus fuscus, Calidris alpina, Fulica atra, Spatula clypeata, Anas platyrhynchos, Calidris canutus,* and *Charadrius hiaticula*. Together, they accounted for 55% of all birds counted.

WETLANDS COUNTED

in Morocco (2009-2023)



- Regularly visited sites *(at least 7 times during 2009-2023)*
- Newly visited sites *(visited only during 2019-2023)*
- Earlier sites *(visited only during 2009-2018)*
- Bodies of water
- Rivers

From 2019 to 2023, between 360,000 and 450,000 birds were recorded annually (Fig. 1), across 85 to 113 wetlands out of a total of 175 count sites (Fig. 2), representing 60% of the national IWC network. Among these, 47 sites were surveyed regularly in all five winters and 35 in four. Two major sites—Ad-Dakhla Bay and Merja Zerga—accounted for 40–63% of the totals, although numbers at Merja Zerga declined sharply in 2023.

MAIN TRENDS (2019-2023) IN WATERBIRD POPULATIONS

Recent regular counts using Generalized Linear Models (GLM) revealed a clear decline in 13 wintering species (Table 1), while only eight showed an increase (Table 2). Several hypotheses are proposed, though counting effort may explain trends in a few cases.

DECLINING SPECIES, DURING THE ASSESSMENT PERIOD (2019-2023)

SPECIES		VALUES			
English name	Scientific name	Average nb. of birds	Nb. sites	Magn.*	±ES**
Common Pochard	*Aythya ferina*	4354	66	-0.23	0.09
Tufted Duck	*Aythya fuligula*	188	18	-0.50	0.18
Ferruginous Duck	*Aythya nyroca*	1589	49	-0.37	0.16
Cattle Egret	*Bubulcus ibis*	4952	66	-0.54	0.17
White Stork	*Ciconia ciconia*	2696	62	-0.29	0.13
Little Egret	*Egretta garzetta*	1463	107	-0.18	0.07
Red-knobbed Coot	*Fulica cristata*	4217	54	-0.64	0.15

SPECIES		VALUES			
English name	Scientific name	Average nb. of birds	Nb. sites	Magn.*	±ES**
Red-crested Pochard	*Netta rufina*	2029	23	-0.38	0.12
Moroccan Great Cormorant	*Phalacrocorax carbo maroccanus*	1735	33	-2.69	0.43
Great Crested Grebe	*Podiceps cristatus*	1100	62	-0.28	0.11
Black-necked Grebe	*Podiceps nigricollis*	1097	47	-0.74	0.17
Purple Swamphen	*Porphyrio porphyrio*	143	21	-0.52	0.17
Western Water Rail	*Rallus aquaticus*	11	9	-0.90	0.42

* **Magn.:** Magnitude / ** **±SE:** Standard error. The trends shown in the tables are at least significant at an alpha risk of 5%.

The decline mainly affects species tied to inland wetlands, which dry out due to reduced winter rainfall. In marshes, *Rallus* and *Porphyrio* species are hit hardest by the loss of shallow, vegetated habitats. Artificial reservoirs, though regularly surveyed, do not offset the decline of diving waterbirds, likely linked to breeding areas. For storks and herons, whose populations are rising regionally, winter declines in Morocco may reflect food scarcity due to improved waste treatment and wetland drying. The drop in *Fulica cristata, Porphyrio porphyrio*, and *Rallus aquaticus* reflects the impact of winter droughts and climate change. These droughts shrink marshland vegetation and expose land to human use. This hypothesis is confirmed by an exception of high number of Fulica cristata in marshes like Merja de Fouwarate, where rising water levels boosted vegetation. The species seems to expand, but new sites host only few birds, giving a false impression of growth.

HIGHLIGHTS

The significant efforts invested in monitoring wintering waterbirds in Morocco revealed a clear decrease in the number of species. Natural droughts, worsened by human actions—water diversion, wetland occupation, dam expansion—are key causes. Great efforts have been made to identify wetlands important for waterbirds and the issues they face, well known to managers and scientists, but less so to policymakers. Raising their awareness is essential to improve legal and financial tools for conservation. Additionally, waterbird census, as a sentinel tool, should also be improved and the results shared more widely with wetland stakeholders.

Wad Assaka, an inland stream hosting threatened birds such as the Marbled Duck, yet poorly represented in the IWC network. © M. Dakki

Aguelmam Abekhane, an Atlas lake once rich in birdlife, now drying out because of agriculture pressure. © M. Dakki

INCREASING SPECIES,
DURING THE ASSESSMENT PERIOD (2019-2023)

SPECIES		VALUES			
English name	Scientific name	Average nb. of birds	Nb. sites	Magn.*	±ES**
Ruddy Turnstone	*Arenaria interpres*	3065	25	0.75	0.26
Little Stint	*Calidris minuta*	7891	20	0.46	0.15
Great Skua	*Catharacta skua*	18	7	1.78	0.84
Little Ringed Plover	*Charadrius dubius*	407	47	0.17	0.08

SPECIES		VALUES			
English name	Scientific name	Average nb. of birds	Nb. sites	Magn.*	±ES**
Mediterranean Gull	*Larus melanocephalus*	440	24	0.64	0.20
Eurasian Curlew	*Numenius arquata*	683	20	0.34	0.09
Common Tern	*Sterna hirundo*	48	6	3.19	1.04
Eurasian thick-knee	*Burhinus oedicnemus*	326	19	1.65	0.46

* **Magn.:** Magnitude / ** **±SE:** Standard error. The trends shown in the tables are at least significant at an alpha risk of 5%.

The significant increase of some wintering species in Morocco mainly concerns estuarine and marine birds (Table 2), less impacted by droughts and human activities. However, most of these species have stable or decreasing global populations, so the rise in wintering counts in Morocco should be interpreted carefully. Improved coastal monitoring in order to obtain an exhaustive count of waders and larids has probably affected the counts for species like *Arenaria interpres* and *Numenius arquata*. However, inland waterbirds (e.g. *Charadrius dubius* and *Burhinus oedicnemus*), may shift coastward when these wetlands dry up, as an alternative refuge.

FOCUS ON LITTLE RINGED PLOVER (*CHARADRIUS DUBIUS*)

The Little Ringed Plover is a small wading bird that is often found near inland wetlands, including riverbanks, and is rarely counted. The increase in its numbers during winter counts coincides with droughts in inland waters, which drive this species to coastal wetlands where it is more visible to counters, sometimes in large numbers. This example illustrates the **role of coastal wetlands as an alternative winter habitat for birds that would usually inhabit inland areas,** when those areas are exposed to drought. **Reservoirs play the same role for several other waterbird species and should also be considered when interpreting such positive trends,** given that their number and global area are increasing.

HIGHLIGHTS

These simplified hypotheses highlight the many local and European factors influencing wintering waterbirds. While key drivers are often studied separately, integrated models using hydrological and meteorological data are still lacking. Since 2013, the Medwaterbirds network has supported Maghreb monitoring, but ongoing efforts need stronger support—especially for logistics, training, and funding. **More financial contributions** are needed from international cooperation and national institutions and organisations to ensure the counts. Interpreting trends is also limited by gaps in ecological studies meaning that research conducted or initiated over the past four decades must continue.

Estuary of Wad Tamri, closed by a sediment dam and used by thousands of birds, including the Audouin's Gull (*Ichthyaetus audouinii*).

10 WETLANDS MEET THE CRITERIA FOR INTERNATIONAL IMPORTANCE

The main aim of the winter waterbird counts is to monitor global waterbird populations and provide data to the Ramsar Convention to identify wetlands of international importance, commonly known as Ramsar Sites. The Ramsar criteria 5 and 6, based on waterbirds criteria, are among the most widely used criteria for identifying protected wetlands in Morocco, which has registered 38 wetlands on the Ramsar List to date. From 2019–23, 32 wetlands met criterion 6, three of which also met criterion 5 (see Table 3). 69% of these sites (22 wetlands) are already on the Ramsar List.

This potential reflects the Morocco's key role along the East Atlantic flyway and the presence of many vulnerable wintering species. This means Moroccan wetlands make a significant contribution to maintaining global bird populations during migration. Coastal wetlands (bays, lagoons, estuaries, rocky/muddy shores) and inland sites, including small ones hosting sensitive species (*Marmaronetta angustirostris, Oxyura leucocephala*), are especially important. Artificial reservoirs have also become vital refuges for species that have lost natural habitats.

INTERNATIONAL IMPORTANCE SITE	***Designated Ramsar site***	> 20 000 waterbirds	Red knobbed Coot	Audouin's Gull	Ferruginous Duck	Marbled Duck	White headed Duck	Ruddy Shelduck	Sanderling	Kentish Plover	Northern Bald Ibis	Western Cattle Egret	Grey Plover	Eurasian Teal	Red Knot	Little Stint	White Stork	Bar tailed Godwit	Black tailed Godwit	Common Scoter	Red crested Pochard	Greater Flamingo	Glossy Ibis	Northern Shoveler	Common Shelduck
Number of sites		3	14	9	6	6	5	4	3	3	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1
Merja Zerga	R	o	o							o			o	o		o			o					o	o
Baie d'Ad-Dakhla	R	o		o					o	o			o		o			o							
Merja de Fouwarate	R	o	o		o	o	o					o									o				
Embouchure de Wad Dr'a	R			o		o					o														
Lagunes de Sidi Moussa-Walidia	R		o	o		o																			
Aguelmam Afennourir	R		o		o			o																	
Aguelmams Sidi Ali-Ta'nzoult	R		o		o			o																	
Khnifiss	R			o																		o			
Merja de Sidi Bou Ghaba	R		o		o		o																		
Plage Blanche	R			o		o			o																
Wad As-Saqia Al Hamra à La'youn	R			o		o		o																	
Barrage Al Massira	R									o															
Barrage Mohammed V	R		o				o																		
Dayet Ifrah	R		o				o																		
Barrage Ahmed El Hansali					o																				
Barrage Arabat							o																		
Barrage El Ga'da												o													
Barrage Enjil								o																	
Barrage Sidi Echahed			o																						
Embouchure de Wad Martil			o																						
Embouchure de Wad Massa	R										o														
Embouchure de Wad Tamri	R										o														
Embouchures des oueds Chbeyka-Al Wa'er	R			o		o														o					
Marais de Smir	R		o																						
Marais du bas Loukkos	R																						o		
Merja Bargha	R		o																						
Plage Ras Takoumba-Bou Issafine									o																
Plan d'eau de l'wad Fès			o																						
Plan d'eau de Zerrouqa			o																						
Plans d'eau d'Amghass					o																				
Pointe d'Awfist	R			o																					
Sebkha Bou Areg	R			o																					

WETLANDS OF INTERNATIONAL IMPORTANCE FOR WATERBIRDS
Identification based on mid-January (2019-2023) count data for Ramsar Criteria 5 and 6*.
Empty cells in the "Ramsar site" column identify sites not included in the Ramsar network.

- **Criterion 5:** A wetland should be considered internationally important if it regularly* supports 20,000 or more waterbirds.
- **Criterion 6:** A wetland should be considered internationally important if it regularly* supports 1% of the individuals in a population of one species or subspecies of waterbirds.

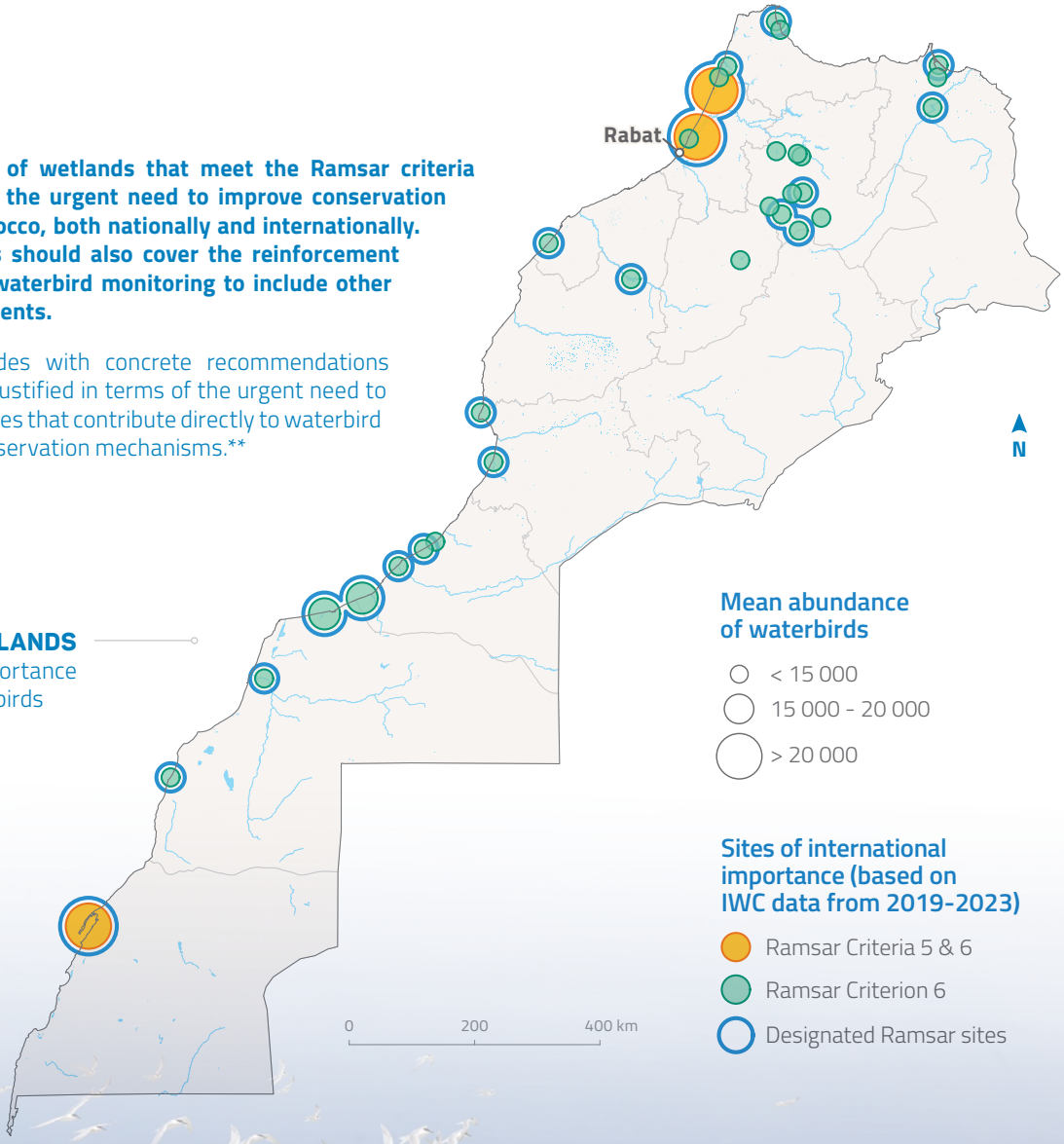
** **To define the notion of "regularly,"** we have applied the following rule (currently under review by COP15 RAMSAR, 2025): A wetland is considered to regularly support a population of waterbirds of a given size if either of the following conditions is met:

1. The average of the annual maxima recorded over a period of at least five years reaches or exceeds the required threshold; or
2. The required number of birds is recorded in at least two-thirds of the years for which adequate data are available, provided that data are available for at least three years in total.

The large number of wetlands that meet the Ramsar criteria for birds indicates the urgent need to improve conservation investment in Morocco, both nationally and internationally. These investments should also cover the reinforcement and expansion of waterbird monitoring to include other ecosystem components.

This paper concludes with concrete recommendations that are succinctly justified in terms of the urgent need to reinforce all processes that contribute directly to waterbird monitoring and conservation mechanisms.**

MOROCCAN WETLANDS
of International Importance
for wintering waterbirds



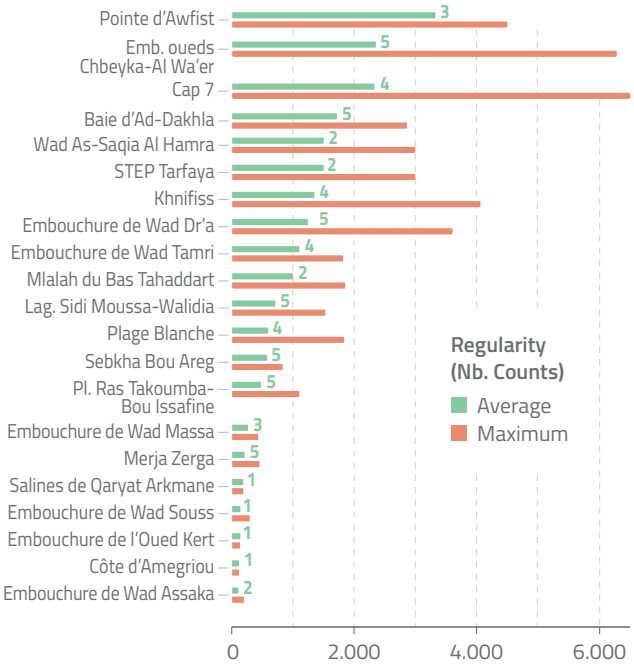
After a long stay in Ad-Dakhla Bay, terns head back to their Moroccan nesting grounds. © M. Mounir

FOCUS
ON COUNTRY'S FLAGSHIP SPECIES

The results and analyses presented above focus on key species whose declines, along with their spatial and temporal patterns, help highlight their importance in identifying Ramsar sites. Most of these species show declining trends, and the following analyses aim to inform recommendations and considerations for their conservation and the enhancement of winter monitoring efforts.

LARUS AUDOUINII

A strictly coastal gull, winters in large numbers on Atlantic beaches, with populations often exceeding 50% of the global species total. Most concentrations are recorded in the southern half of the country, in variable numbers (e.g. 8,380–23,157 birds in 2019–23). This high variability is demonstrated by peaks of over 6,000 individuals that are sporadically observed at various sites. This could be due to the species' high mobility, or because the census coincides with the gulls' resting period.



FULICA CRISTATA

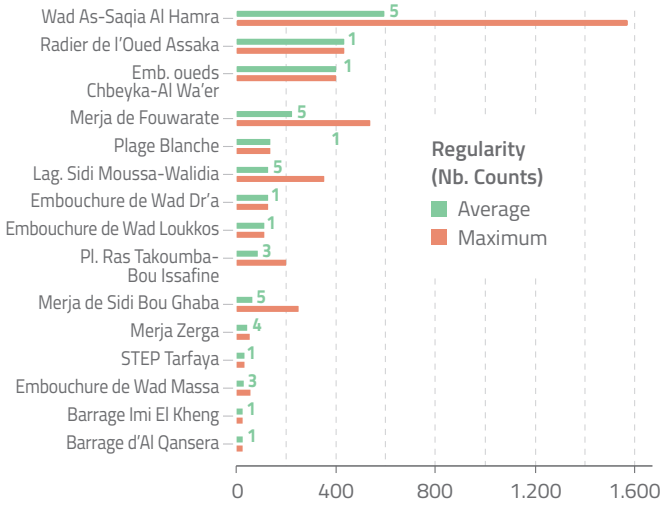
A Rallidae that is clearly dependent on shallow marshlands and is restricted to the northwest of Morocco, including the Middle Atlas, where it has a resident population. This species appears to be highly sensitive to droughts, as the number of birds present in winter depends greatly on the submersion of its habitats during this period. The extensive drainage programme of the Gharb marshlands has significantly reduced the North African population of this species. Its frequent attempts to colonise other regions of Morocco have been unsuccessful.

PHOENICOPTERUS ROSEUS

Has a broad winter distribution in the country, but its annual pattern varies depending on the hydrological conditions of inland wetlands. Exceptional numbers can be recorded in vast sebkhas when they are submerged, but the highest concentrations are often found in estuarine ecosystems, which support regular wintering. A recent nesting attempt in Sebkha Tazra—an estuarine sebkha connected to the Khnifiss Lagoon—offers hope for the expansion of the species' breeding range in Africa.

MARMARONETTA ANGUSTIROSTRIS

Whose global population was recently classified as Near Threatened, regularly winters in Morocco but is recorded in only a few habitats. The species is widely distributed across the northern half of the country (30 sites were recorded between 2019 and 2023), and its annual numbers range from tens to hundreds, with some exceptional peaks—for example, 3,300 individuals in 2022. This duck appears to be resilient, likely due to its ecological plasticity.



OXYURA LEUCOCEPHALA

A globally endangered duck, is represented in Morocco by a resident population that appears resilient, thanks to a few key wetlands. Remarkable numbers recorded during some cold winters are due to visiting individuals from Spain. However, the breeding population remains highly threatened, despite several attempts by the species to expand into new habitats.

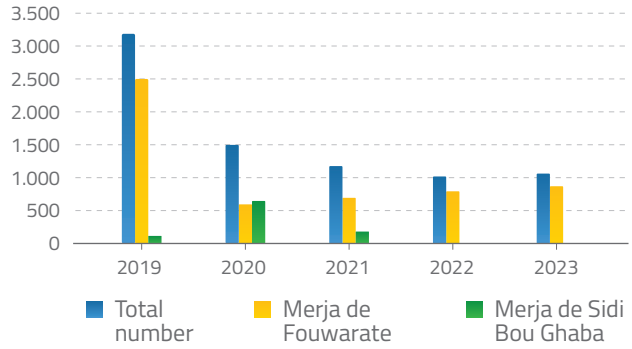
Sites	2019	2020	2021	2022	2023
Total annuel	743	1.186	761	1.177	561
Merja de Sidi Bou Ghaba	743	260	78	460	80
Merja de Fouwarate		500	60	550	430
Dayet Ifrah			33	24	
Barrage Arabat				3	51
Barrage Mohammed V		426	587		
Merja Zerga				77	
Embouchure de Wad Assaka				32	
Barrage Bin Al Widane				22	
Aguelmams Sidi Ali-Ta'nzoult				7	
Aguelmam Afennourir				2	
Barrage Taghdout			3		

GERONTICUS EREMITA

A globally endangered species, appears to be resilient in the Souss-Massa coastal area, which hosts the only remaining wild population in the world. Since this bird rarely feeds or rests in wetlands—such as at Oued Tamri—its wintering numbers are likely underestimated, as population estimates are based primarily on breeding colonies. As a result, winter population trends cannot be reliably assessed.

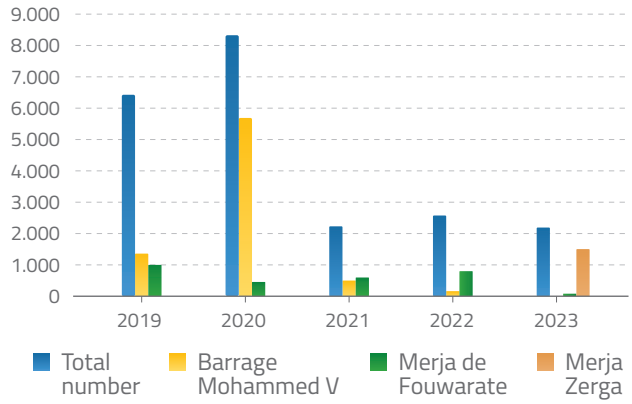
AYTHYA NYROCA

A Near Threatened duck, currently winters in approximately 50 Moroccan wetlands. It has established a local breeding population that appears to be growing, even as the overall wintering numbers are statistically declining. Around 65% of the wintering population is concentrated in two large northwestern marshlands—Merja de Fouwarate and Merja de Sidi Bou Ghaba—with respective averages of 1,095 and 319 individuals. In other wetlands, numbers rarely exceed 100 individuals, including at breeding sites where the species is regularly observed.



AYTHIA FERINA

Is a diving duck undergoing global decline. In Morocco, it is a regular winter visitor, widely distributed across the northern half of the country, with occasional sightings of small groups in some coastal Saharan wetlands. Its decline in Morocco is evident, as numbers have only occasionally exceeded 1,000 individuals at a few key sites: a large reservoir (Mohammed V Dam), a major marshland (Fouwarate Marshland), and a lagoon (Merja Zerga). At other sites, even when regularly recorded, counts rarely exceed 300 individuals.



During the four last decades, irrigated agriculture was intensively developed in the Middle Atlas Mountains, amplifying the effect of recurrent droughts on water availability in wetlands. One of the largest lakes of these mountains (Ifrah lake) is then frequently dry.

CONCLUSIONS AND HIGHLIGHTS

This short analysis provides scientists and conservation organisations with an overview of the key findings of the International Waterbird Census in Morocco during the winters of 2019–23. The results showed significant national trend data and identified several sites that met Ramsar criteria 5 and 6.

Moroccan Great Cormorant, an endemic coastal bird expanding thanks to the well-preserved wetlands of southern Morocco. © M. Radi

CONCLUSIONS

The present report confirms the following:

- a significant increase in the number of sites and in the range of variation of the counted bird numbers, without an apparent change in the number of recorded species or observers. The general methodology consisted of direct counts from terrestrial fixed points using binoculars and a telescope.
- the significant contribution of Moroccan wetlands to maintaining the world's waterbird populations, despite the frequent droughts they face;
- a real risk of loss of bird populations, as the census revealed thirteen statistically declining species, some of which provide pertinent illustrations of the impacts of climate change. While we must increase our conservation efforts, the growth of certain populations raises interesting questions.

HIGHLIGHTS

Most interpretations of winter census trends in Morocco acknowledge the wide range of factors influencing waterbird wintering, with climate change remaining the predominant driver. However, these trends are still poorly modelled.

We strongly **recommend greater involvement of both statisticians and ecologists,** especially now that recent censuses present fewer data gaps than in the past.

Waterbird monitoring in Morocco is producing increasingly robust data, but its continuity remains at risk without ongoing evaluation and support. **We recommend securing long-term technical and financial resources,** with particular emphasis on **strengthening the observer network and ensuring regular, comprehensive national counts.**

Although the number of Ramsar sites in Morocco has grown significantly over the past two decades, it remains low relative to the total number of wetlands that meet the Ramsar criteria. We therefore urge continued efforts to register eligible wetlands under the Ramsar Convention. While Ramsar designation provides a baseline level of protection for bird habitats, we also recommend establishing a permanent mechanism to ensure sustained investment in their effective management and monitoring.

Given the rapid transformation of Moroccan wetlands, driven by recurrent drought and major development projects, it is **essential to regularly update Ramsar Information Sheets** as part of an ongoing review and adaptive management process.

BIBLIOGRAPHY

- **Cherkaoui I., Hanane S., Magri N., El Agbani M.A. & Dakki M. (2015).** Factors influencing species-richness of breeding waterbirds in Moroccan IBA and Ramsar wetlands: a macroecological Approach. *Wetlands*, 35, pp. 913–922.
- **Chillasse L. & Dakki M. (2004).** Potentialités et statuts de conservation des zones humides du Moyen-Atlas (Maroc), avec référence aux influences de la sécheresse. *Sécheresse*, 4, 15, pp. 337-345.
- **Dakki M., Qninba A., El Agbani M.A., Benhoussa A. & Beaubrun P.C. (2001).** Waders wintering in Morocco: national population estimates, trends and site-assessments. *Wader Study Group Bull.*, 96, pp. 47-59.
- **Dakki M., Qninba A., El Agbani M.A. & Benhoussa A. (2002).** Recensement hivernal d'oiseaux d'eau au Maroc : 1996-2000. *Trav. Inst. Sci.*, Rabat, Sér. Zool., 45, pp. 1-28.
- **Dakki M. (2022).** Classification écologique des zones humides du Maroc. *Trav. Inst. Sci.*, Rabat, Série Générale, pp. 1-123 (+Annexe : 15 pages).
- **Dakki M., El Agbani M.A. & Qninba A. (Eds) (2011).** Zones humides du Maroc inscrites jusqu'en 2005 sur la Liste de la Convention de Ramsar. *Trav. Inst. Sci.*, Rabat, Sér. Générale, 7, 238 pp.
- **Dakki M., Menioui M. & Amhaouch Z. (2016).** Stratégie Nationale et plan d'action 2015-2024 pour les Zones Humides du Maroc. HCEFLCD/DLG/GIZ, 54 pp.
- **Dakki M., Robin G., Suet M. et al. (2021).** Imputation of large-scale monitoring count data via penalized estimation. *Methods in Ecology and Evolution,* pp. 1-24. https://doi.org/10.1111/2041-210X.13594.
- **El Agbani M.A., Dakki M., Thévenot M. & Beaubrun P.C. (1996).** Statut actuel au Maroc d'une espèce globalement menacée, la Sarcelle marbrée *(Marmaronetta angustirostris). Bull. Inst. Sci.,* Rabat, 20, pp. 163-180.
- **El Agbani M.A., Dakki M., Benhoussa A. et al. (2017).** Recensement hivernal d'oiseaux d'eau au Maroc, 2001-2005. *Travaux de l'Institut Scientifique,* Rabat, série Zool., n°53, pp. 1-40.
- **El Falah S., Dakki M., Mansouri I. & El Agbani M.A. (2021).** Mapping analysis of the wetland loss in the Gharb plain (Morocco) under agricultural managements. *Applied and Environmental Soil Science,* Jan. 2021.
- **El Hamoumi R., El Malki S., Rihane A., Fahmi A. & Dakki M. (2022).** The Sidi Moussa-Oualidia wetland complex: A bird paradise between land and Sea. *Frontiers in Science and Engineering,* 12, 1, pp. 65-75. DOI: 10.34874/IMIST. PRSM/fsejournal-v12i1.31633. https://www.researchgate.net/publication/366513577.

Aguelmam Afennourir, a Middle Atlas lake losing its role as a wintering site due to recurring droughts
© A. Mahassini

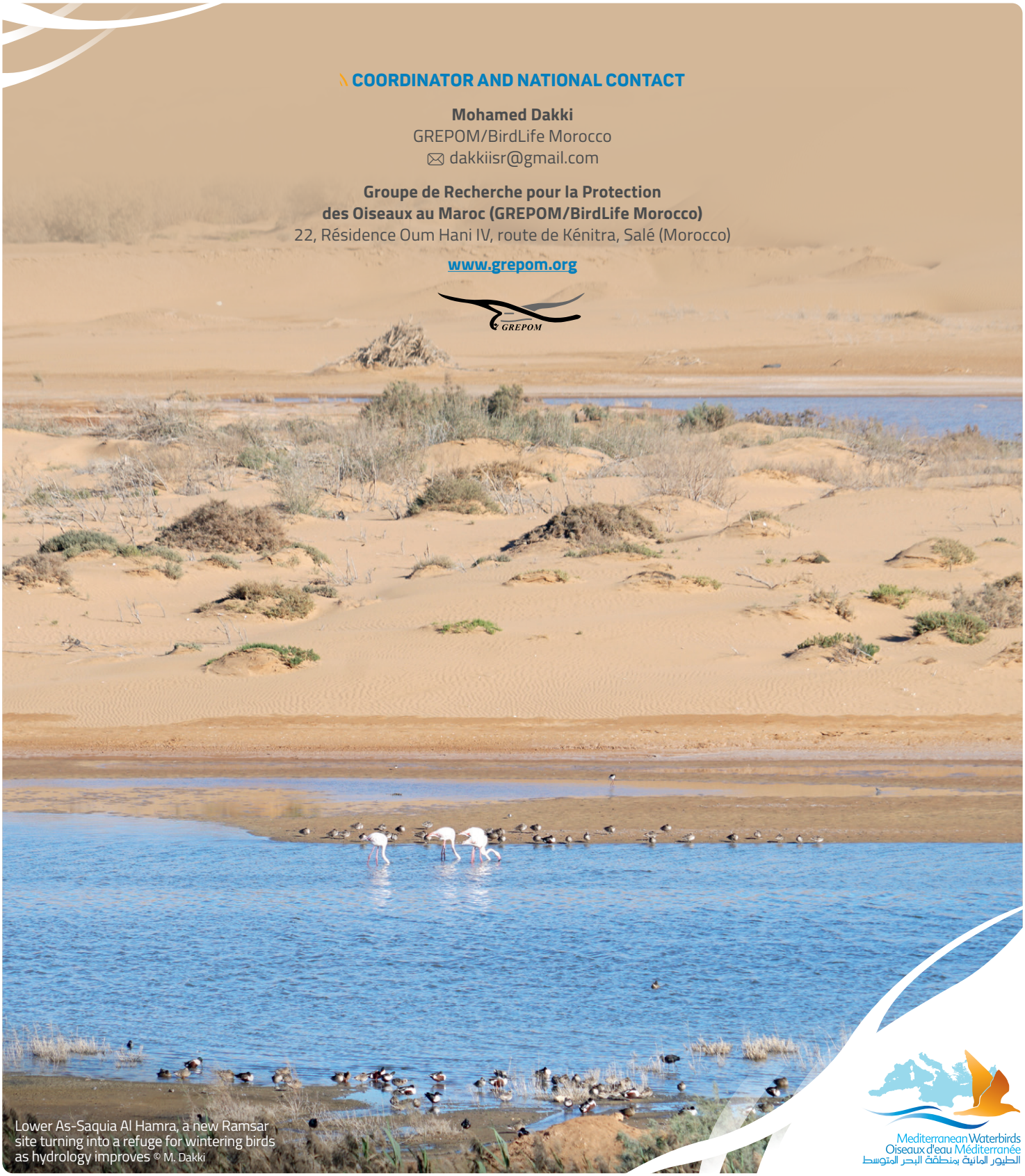
- **Lahrouz S., Dakki M., Mansouri M., El Hamoumi R. (2023).** Discovering the secret lives of White-headed Ducks: Unveiling population trends and phenology at Morocco's two best wintering and nesting sites, Merja Fouwarate and Lake Sidi Boughaba. *Zoology and Ecology,* 33, 1, pp. 16-21.
- **Ouassou A., Dakki M., El Agbani M.A., Radi M. et al. (2017).** Recensement hivernal d'oiseaux d'eau au Maroc, 2010-2015. *Travaux de l'Institut Scientifique,* Rabat, série Zool., n°55, pp. 1-40.
- **Ouassou A., Dakki M., Lahrouz S., El Agbani M.A. & Qninba A. (2018).** Status and trends of the Ferruginous duck's (Aythya nyroca) wintering population in Morocco: analysis of 35 years of winter census data (1983-2017). *Intern. J. Zool.,* Vol. 2018, pp. 1-9. Article ID 5767194, 9 pp. https://doi.org/10.1155/2018/5767194.
- **Qninba A., Ouassou A., Radi M. et al. (2017).** Recensement hivernal d'oiseaux d'eau au Maroc, 2006-2010. *Travaux de l'Institut Scientifique,* Rabat, série Zool., n°54, pp. 1-39.
- **Sayoud M.S., Salhi H., Chalabi B., Dakki M. et al. (2017).**- The first coordinated trans-North African mid-winter waterbird census: The contribution of the International Waterbird Census to the conservation of waterbirds and wetlands at a biogeographical level. *Biological Conservation,* 206, pp. 11-20.
- **Verniest F., Le Viol I., Julliard R., Dami L., Guelmami A., Suet S. et al. (2023).** Anticipating the effects of climate warming and natural habitat conversion on waterbird communities to address protection gaps. *Biological Conservation,* Feb. 2023, pp. 1-38. https://www.researchgate.net/publication/368273438. DOI: 10.1016/j.biocon.2023.109939

COORDINATOR AND NATIONAL CONTACT

Mohamed Dakki
GREPOM/BirdLife Morocco
✉ dakkiisr@gmail.com

Groupe de Recherche pour la Protection
des Oiseaux au Maroc (GREPOM/BirdLife Morocco)
22, Résidence Oum Hani IV, route de Kénitra, Salé (Morocco)

www.grepom.org



Lower As-Saquia Al Hamra, a new Ramsar site turning into a refuge for wintering birds as hydrology improves © M. Dakki

Mediterranean Waterbirds
Oiseaux d'eau Méditerranée
الطيور المائية بمنطقة البحر المتوسط

https://medwaterbirds.net

Mediterranean coordination:

With the financial and technical support of: