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Monitoring Dataset on Waterbirds in Qinghai Lake Basin (2021–2022)

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Abstract: The Qinghai Lake basin is located in the northeastern part of the Qinghai-Tibet Plateau, which is a gene pool of bird species in the Tibetan Plateau, as well as one of the typical areas of the plateau ecosystem. The authors conducted post-breeding monitoring of waterbirds at 26 sample sites in the basin in August 2021 and August 2022. The dataset includes: (1) location data of 26 monitoring sample sites; (2) basic information of waterbird monitoring areas; (3) late breeding monitoring data of waterbirds in Qinghai Lake basin; (4) dominant species assessment of waterbirds; (5) photos of waterbirds. The dataset is archived in .xlsx, .shp, .jpg and .docx formats, and consists of 16 data files with 19.4 MB (Compressed into 1 file with 19.3 MB).

Keywords: Qinghai Lake basin; Qinghai-Tibet Plateau; waterfowl breeding; 2021; 2022

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Dataset Availability Statement:

The dataset supporting this paper was published and is accessible through the *Digital Journal of Global Change Data Repository* at: https://doi.org/10.3974/geodb.2023.06.04.V1 or https://cstr.escience.org.cn/CSTR:20146.11.2023.06.04.V1.

1 Introduction

Birds are the largest group of terrestrial vertebrates, which are sensitive to environmental changes and become an important indicator species of environmental pollution levels[1]. Biodiversity monitoring is to provide information on the spatial and temporal changes of the monitored objects as the main objective, mainly reflecting the changes of biodiversity in a certain time and space scale, so biodiversity becomes one of the important indicators to assess the effectiveness of ecological conservation[2] . The strong spatial and temporal scale dependence and multi-level nature of biodiversity determine that the analysis of biodiversity

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[2] Li, X. Y., Sun, J. Q., Chen, Y. R., *et al*. Monitoring dataset on waterbirds in Qinghai Lake basin (2021–2022) [J/DB/OL]. *Digital Journal of Global Change Data Repository*, 2023. https://doi.org/10.3974/geodb.2023.06.04.V1. https://cstr.escience.org.cn/CSTR:20146.11.2023.06.04.V1.

status and variables requires comprehensive and continuous monitoring at multiple spatial scales in different ecosystems, thus building a biodiversity research and monitoring network are the foundation of biodiversity conservation and research[3] .

Qinghai Lake is located in the northeastern part of Qinghai province and the edge of the first step in China and is the largest inland saltwater lake on the Qinghai-Tibet plateau in China; it is also located at the junction of the eastern monsoon region, the western arid and semi-arid region and the alpine region of Qinghai-Tibet, and its precipitation is concentrated in summer, with thin cloud cover, sufficient sunshine, strong solar radiation and large daily difference in temperature. In this case, waterfowl monitoring and observation sample sites in Qinghai Lake basin were monitored and surveyed in accordance with the spatial and geographical distribution characteristics of waterfowl in Qinghai Lake, referred to the waterfowl monitoring sample sites of Qinghai Lake National Nature Reserve Management Machine with the monitoring time of August of 2021 and 2022, so as to form the waterfowl monitoring dataset for the late breeding period of 2021–2022 in Qinghai Lake basin finally.

2 Metadata of the Dataset

The metadata of the Qinghai Lake basin waterbird monitoring dataset (2021–2022)[4] is summarized in Table 1. It includes the dataset full name, short name, authors, year of the dataset, data format, data size, data files, data publisher, and data sharing policy, etc.

Table 1 Metadata summary of Qinghai Lake basin waterbird monitoring dataset (2021–2022)

Items	Description
Dataset full name	Qinghai Lake basin waterbird monitoring dataset (2021–2022)
Dataset short name	QinghaiLakeWaterBirds2021-2022
Authors	Li, X. Y., Qinghai Normal University, lixingyue0102@163.com
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	Chen, K. L., Qinghai Normal University, ckl7813@163.com
Geographical area	Qinghai Lake basin
Year	2021, 2022
Data Format	.xlsx, .shp, .jpg,.docx
Data size	19.4 MB
Data files	Waterfowl monitoring species, number, distribution location;Basic information on waterfowl monitoring areas; assessment of dominant species of waterfowl
Foundations	Science and Technology Department of Qinghai Province (2022-QY-204); Ministry of Science and Technology of P. R. China (2019QZKK0405)
Data publisher	Global Change Research Data Publishing & Repository, http://www.geodoi.ac.cn
Address	No. 11A, Datun Road, Chaoyang District, Beijing 100101, China
Data sharing policy	***Data*** from the Global Change Research Data Publishing & Repository includes metadata, datasets (in the *Digital Journal of Global Change Data Repository*), and publications (in the *Journal of Global Change Data & Discovery*). ***Data*** sharing policy includes: (1) ***Data*** are openly available and can be free downloaded via the Internet; (2) End users are encouraged to use ***Data*** subject to citation; (3) Users, who are by definition also value-added service providers, are welcome to redistribute ***Data*** subject to written permission from the GCdataPR Editorial Office and the issuance of a ***Data*** redistribution license; and (4) If ***Data*** are used to compile new datasets, the 'ten per cent principal' should be followed such that ***Data*** records utilized should not surpass 10% of the new dataset contents, while sources should be clearly noted in suitable places in the new dataset[5]
Communication and searchable system	DOI, CSTR, Crossref, DCI, CSCD, CNKI, SciEngine, WDS/ISC, GEOSS

3 Data Monitoring Methods and Results

Waterbirds are groups of birds whose life histories are more or less ecologically linked to bodies of water[6]. As a higher taxon unique to wetlands, waterbird is one of the important components of wetland ecosystems and an indicator species characterizing changes in wetland quality[7, 8]. According to the distribution characteristics of waterbirds breeding and roosting in Qinghai Lake basin, the direct counting method was used to investigate the population size of birds at the waterbirds monitoring sample sites in the basin, and the types of waterbirds in the observation area were clearly identified and counted by monocular and double-pass binoculars and telephoto cameras, and photographs of birds and their habitats were taken..According to the habitat type, the monitoring area is mainly divided into: estuary wetland, swamp meadow, farmland, freshwater lake, river wetland, river manzanita, peninsula, island, etc.

Qinghai Lake is the largest inland saltwater lake in China and is a breeding and stopover site for many waterfowl along the Central Asia-India migration route[9]. The specific monitoring sample sites are Heima River wetland, Jiangxigou, Xiaohong Lake, Erhai Lake, Daotang River wetland, Xiaobohu wetland, Naren wetland, Haergai estuary, Dalian Lake, Ganzihe wetland, Ganzihe estuary, Sha Dao, Shaliuhe estuary, Xiannvwan wetland, Quanji estuary, Wu Shi Da Lai, Ha Da Tan, Cormorant island, Buha River, Sheng River estuary, Tie Bu Jia wetland, Quanwan wetland, Ga Ri La, Egg island, Haixin Mountain and San Kuai Shi (Figure 1). Egg island monitoring has been added compared to 2021.

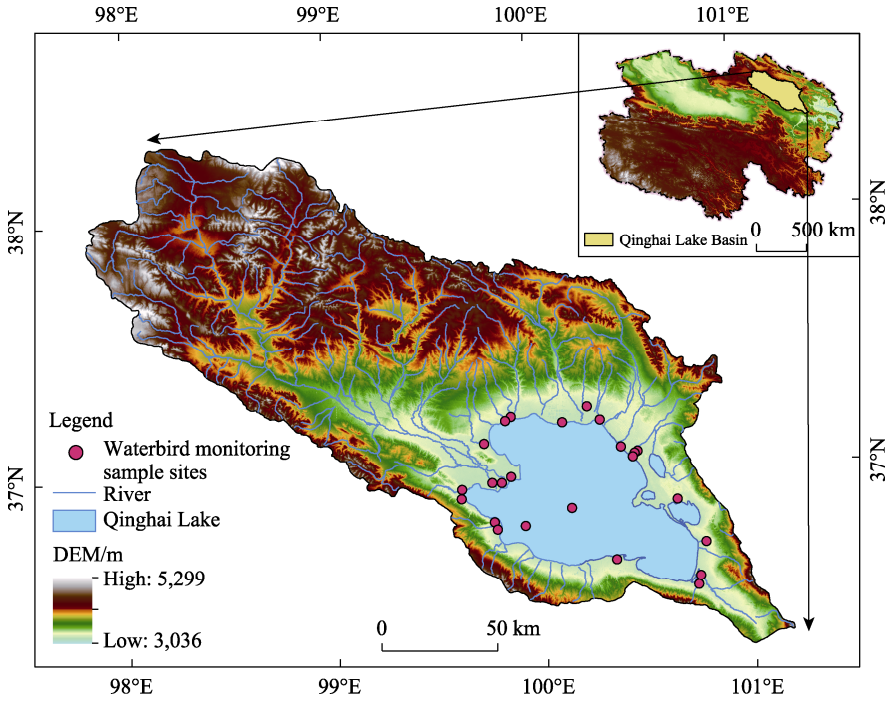


Figure 1 Distribution of waterbird monitoring sample sites in Qinghai Lake basin (2022)

In the late stage of water bird breeding monitoring in 2021, 46 species of birds were recorded, with a total of 40,018 birds; among them, 9,138 *Phalacrocorax carbo* ranked first among all birds, accounting for 22.84% of the total number of birds. The habitat type of Sha Dao is freshwater lakes, where *Phalacrocorax carbo* accounted for 40.32% of the total number of *Phalacrocorax carbo*; 8,974 *Netta rufina* ranked second among all birds,

accounting for 22.42% of the total number of *Netta rufina*. The habitat type of Shaliuhe estuary is estuarine wetlands, where *Netta rufina* accounted for 55.72% of the total; *Anser indicus*, 7,627 birds, ranked third among all birds, accounting for 19.06% of the total. The habit type of Ha Da Tan is river manzanita, where *Anser indicus* accounted for 47.65% of the total number of *Anser indicus*; eight bird species containing *Phalacrocorax carbo*, *Netta rufina*, *Anser indicus*, *Tadorna ferruginea*, *Aythya ferina*, *Larus ichthyaetus*, *Podiceps cristatus,* and *Fulica atra* are all over 1,000. The habitat types are mostly estuarine wetlands, river manzanita, freshwater lakes, accounting for 90.66% of the total. *Vanellus vanellus*, *Tringa glareola*, *Anas clypeata*, *Calidris temminckii*, *Tringa nebularia*, *Tringa guttifer*, *Bucephala clangula*, and *Nycticorax nycticorax* were all found only once.

In 2022, 44 species of waterbirds were recorded in the late stage of waterbird breeding monitoring, with a total of 148,697 birds, with an increase of 108,679 compared with last year; the 44 species of waterbirds included one national-level waterbird and four national-level two waterbirds, as well as one species of vulnerable waterbirds and six species of near-threatened waterbirds. The total number of waterbirds in Naren wetland, Shaliuhe estuary, Quanwan wetland, Tie Bu Jia wetland and Buha River all exceeded 10,000; among them, 61,265 *Netta rufina* ranked first in waterbirds, 20,034 *Tadorna ferruginea* ranked second in waterbirds, and 12,664 *Anser indicus* ranked third in waterbirds.

Netta rufina are mostly found in swamp meadow, herbaceous swamp and estuarine wetlands such as Naren wetland, Shaliuhe estuary, Ga Ri La, Quanwan wetland, Tie Bu Jia wetland, Sheng River estuary, Buha River, etc. *Tadorna ferruginea* are mostly found in swamp meadow, estuarine wetlands and lakeshore peninsula, such as Xiaohong Lake, Naren wetland, Shaliuhe estuary, Quanji estuary, Tie Bu Jia wetland, Cormorant island and Buha River, etc. *Anser indicus* are mostly found in herbaceous swamp and estuarine wetlands such as Shaliuhe estuary, Ha Da Tan, Heima River wetland, Quanwan wetland, Sheng River estuary.

Compared with last year, a total of 11 species of waterfowl decreased, including *Tringa nebularia*, *Egretta garzetta Linnaeus*, *Chlidonias leucopterus*,*Bubulcus ibis*, *Platalea leucorodia*, *Northern Shoveler*, *Nycticorax nycticorax*, *Bucephala clangula*, *Larus canus and brown-headed duck*, and 10 species of waterbirds, including *Anas strepera*, *Anas penelope*, *Anas crecca crecca Linnaeus*, *Anas acuta, Grus grus*, *Charadrius leschenaultii*, *Calidris canutus*, *Tringa stagnatilis*, *Numenius arquata and Arenaria interpres*, of which the *Grus grus* and *Arenaria interpres* are class 2 waterbirds and Calidris canutus is Near-threatened species. Among the new waterfowl, the Anseriformes and Charadriiformes belong to wetland waterfowl species, and some of the cranes belong to wetland waterfowl species, and are basically wandering birds, which are adapted to swimming and diving for food in the water; most of the wandering birds have migratory behavior, and most of them breed in the north, gathering in the fall to move south to warmer waters, and then returning to the northern breeding grounds in the spring of the following year.

The distribution of birds in Qinghai Lake is closely related to the distribution of food resources, and both the wetlands around the lake and the estuary are areas where birds are concentrated[10]. Table 2 shows the basic information of waterfowl habitat in late breeding season in 2021–2022. Table 3 shows the information of dominant species of waterfowl in 2022, and Figure 2 shows the photograph of waterfowl in field monitoring in 2022.

The dominant species was determined based on the number of individual birds as a percentage of the total number of individuals (P_i)[11] (see Table 4 for details):

$$P_i = \frac{N_i}{N} \times 100\% \quad (1)$$

where, N_i is the number of individuals of the ith species; N is the total number of individuals

Table 2 Information on late breeding habitat for waterfowl around the Qinghai Lake in 2021–2022

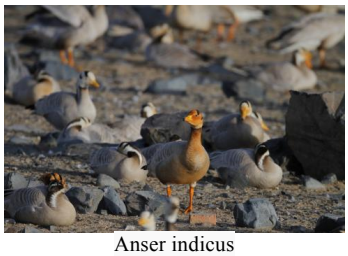
Serial number	Location	Latitude (N)	Longitude (E)	Altitude (m)	Number of species	Total	Habitat type
1	Heima River Wetland	36.44°	99.46°	3,206	12	3,266	Herbaceous Swamp
2	Jiangxigou	36.37°	100.07°	3,215	9	254	Agricultural land
3	Xiaohong Lake	36.65°	100.35°	3,207	23	6,807	Freshwater Lakes
4	Erhai Lake	36.54°	100.74°	3,157	20	3,345	Freshwater Lakes
5	Daotang River Wetland	36.57°	100.75°	3,209	13	794	Freshwater rivers
6	Xiaobohu Wetland	36.70°	100.79°	3,220	6	48	Herbaceous Swamp
7	Naren Wetland	37.20°	100.30°	3,209	21	30,226	Swamp Meadow
8	Haergai Estuary	37.09°	100.39°	3,204	16	882	Estuarine Wetlands
9	Dalian Lake	37.07°	100.47°	3,214	16	375	Freshwater Lakes
10	Ganzihe Wetland	37.06°	100.46°	3,211	14	477	Estuarine Wetlands
11	Ganzihe Estuary	37.05°	100.45°	3,206	9	93	Estuarine Wetlands
12	Sha Dao	36.88°	100.66°	3,222	20	726	Freshwater Lakes
13	Shaliuhe Estuary	37.25°	100.24°	3,208	24	24,688	Estuarine Wetlands
14	Xiannvwan Wetland	37.19°	100.11°	3,205	21	1,223	Estuarine Wetlands
15	Quanji Estuary	37.22°	99.87°	3,201	13	3,514	Estuarine Wetlands
16	Wu Shi Da Lai	37.20°	99.84°	3,211	9	214	Herbaceous Swamp
17	Ha Da Tan	37.12°	99.73°	3,218	17	3,547	River Manzanita
18	Cormorant Island	36.99°	99.86°	3,205	13	6,342	Lakeshore Peninsula
19	Buha River	36.97°	99.81°	3,206	6	1,859	Estuarine Wetlands
20	Sheng River Estuary	36.97°	99.76°	3,198	14	7,241	Estuarine Wetlands
21	Tie Bu Jia Wetland	36.95°	99.62°	3,214	19	13,604	Estuarine Wetlands
22	Quanwan Wetland	36.95°	99.62°	3,214	14	15,275	Herbaceous Swamp
23	Ga Ri La	36.91°	99.61°	3,213	11	6,076	Swamp Meadow
24	Haixin Mountain	36.86°	100.14°	3,200	2	493	Islands in the Lake
25	San Kuai Shi	36.80°	99.91°	3,200	4	918	Islands in the Lake
26	Egg Island	36.99°	99.86°	3,200	6	1,859	Lakeshore Peninsula

Table 3 New waterfowl in Qinghai Lake in 2022

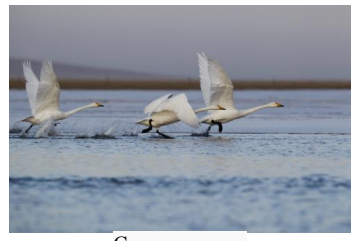
Waterfowl species name	Latin	Phylum	Class	Order	Family
Anas strepera	*Anas strepera*	Chordata	Aves	Anseriformes	Anatidae
Anas penelope	*Anas penelope*	Chordata	Aves	Anseriformes	Anatidae
Anas crecca crecca Linnaeus	*Anas crecca crecca Linnaeus*	Chordata	Aves	Anseriformes	Anatidae
Anas acuta	*Anas acuta*	Chordata	Aves	Anseriformes	Anatidae
Grus grus	*Grus grus*	Chordata	Aves	Gruiformes	Gruidae
Charadrius leschenaultii	*Charadrius leschenaultii*	Chordata	Aves	Charadriiformes	Charadriidae
Calidris canutus	*Calidris canutus*	Chordata	Aves	Charadriiformes	Scolopacidae
Tringa stagnatilis	*Tringa stagnatilis*	Chordata	Aves	Charadriiformes	Scolopacidae
Numenius arquata	*Numenius arquata*	Chordata	Aves	Charadriiformes	Scolopacidae
Arenaria interpres	*Arenaria interpres*	Chordata	Aves	Charadriiformes	Scolopacidae

of all species in the community; $P_i \geqslant 10\%$ was designated as the dominant species; $1\% \leqslant P_i < 10\%$ as the common species; $0.1\% \leqslant P_i < 1\%$ as the rare species; and $P_i < 0.1\%$ as the rare species.

As shown in the table below, there are 3 dominant species, 9 common species, 11 rare species and 22 very rare species in2021 and 2 dominant species, 8 common species, 11 rare species and 23 very rare species in 2022.


Anser indicus


Anser indicus


Cygnus cygnus


Vanellus vanellus


Grus nigricollis


Aythya fuligula

Figure 2 Field monitoring waterfowl photography in 2022 (Photographed in August 2022)

Table 4 Assessment of dominant species of waterbirds around the Qinghai Lake

Serial number	Waterfowl species name	Quantity		Dominant species/common species/rare species/rare species	
		2021	2022	2021	2022
1	*Podiceps nigricollis*	68	107	Rare species	Very rare species
2	*Podiceps cristatus*	1,312	7,339	Common species	Common species
3	*Podiceps auritus*	2	4	Very rare species	Very rare species
4	*Phalacrocorax carbo*	9,138	9,633	Dominant species	Common species
5	*Ardea cinerea*	64	72	Rare species	Very rare species
6	*Egretta garzetta Linnaeus*	8	0	Very rare species	0
7	*Ardea alba*	10	23	Very rare species	Very rare species
8	*Nycticorax nycticorax*	1	0	Very rare species	0
9	*Bubulcus ibis*	2	0	Very rare species	0
10	*Platalea leucorodia*	4	0	Very rare species	0
11	*Cygnus cygnus*	10	15	Very rare species	Very rare species
12	*Anser anser anser*	47	291	Rare species	Rare species
13	*Anser indicus*	7,627	12,664	Dominant species	Common species
14	*Tadorna ferruginea*	3,751	20,034	Common species	Dominant species
15	*Tadorna tadorna*	2	14	Very rare specie	Very rare specie
16	*Anas strepera*	0	46	0	Very rare specie
17	*Anas penelope*	0	717	0	Rare species
18	*Anas crecca crecca Linnaeus*	0	944	0	Rare species
19	*Anas platyrhynchos*	44	17	Rare species	Very rare specie
20	*Anas acuta*	0	677	0	Rare species
21	*Bucephala clangula*	1	0	Very rare specie	0
22	*Anas luzonica*	11	0	Very rare specie	0
23	*Anas clypeata*	1	0	Very rare specie	0
24	*Netta rufina*	8,974	61,265	Dominant species	Dominant species
25	*Aythya ferina*	2,974	12,088	Common species	Common species

(*To be continued on the next page*)

(*Continued*)

Serial number	Waterfowl species name	Quantity		Dominant species/common species/rare species/ very rare species	
		2021	2022	2021	2022
26	*Mergus merganser*	200	11	Rare species	Very rare species
27	*Aythya nyroca*	5	58	Very rare species	Very rare species
28	*Aythya fuligula*	139	6,244	Rare species	Common species
29	*Grus grus*	0	1	0	Very rare species
30	*Grus nigricollis*	89	80	Rare species	Very rare species
31	*Fulica atra*	1,104	6,219	Common species	Common species
32	*Himantopus himantopus*	404	823	Common species	Rare species
33	*Recurvirostra avosetta*	67	95	Rare species	Very rare species
34	*Vanellus vanellus*	1	5	Very rare species	Very rare species
35	*Pluvialis dominica*	3	2	Very rare species	Very rare species
36	*Charadrius alexandrinus*	47	338	Rare species	Rare species
37	*Charadrius mongolus*	6	15	Very rare species	Very rare species
38	*Charadrius leschenaultii*	0	2	0	Very rare species
39	*Limosa limosa*	698	615	Common species	Rare species
40	*Tringa totanus*	256	1,388	Rare species	Rare species
41	*Calidris canutus*	0	12	0	Very rare species
42	*Tringa stagnatilis*	0	5	0	Very rare species
43	*Tringaerythropus*	4	1	Very rare species	Very rare species
44	*Calidris ferruginea*	30	14	Very rare species	Very rare species
45	*Numenius arquata*	0	197	0	Rare species
46	*Tringa glareola*	1	153	Very rare species	Rare species
47	*Arenaria interpres*	0	1	0	Very rare species
48	*Tringa guttifer*	1	0	Very rare species	0
49	*Tringa nebularia*	1	0	Very rare species	0
50	*Calidris temminckii*	1	66	Very rare species	Very rare species
51	*Larus ichthyaetus*	1,399	3,134	Common species	Common species
52	*Brown headed Gull*	910	2,806	Common species	Common species
53	*Sterna hirundo*	111	457	Rare species	Rare species
54	*Chlidonias leucopterus*	32	0	Very rare species	0
55	*Larus canus*	458	0	Common species	0

5 Summary

Birds are better indicator biota[12] , and exogenous factors such as global warming, wetland loss and degradation have adversely affected waterbirds that depend on wetland ecosystems[13]. Through waterbird monitoring, we can further study waterbird breeding in Qinghai Lake basin in depth, comprehensively grasp waterbird species, number and distribution in Qinghai Lake basin, provide data support for the national biodiversity monitoring of waterbirds by the Ministry of Ecology and Environment, and provide significant guidance for Qinghai Lake. It also has a significant guiding role in the ecological protection of the Qinghai Lake basin. At the same time, the observation of waterfowl breeding is also conducive to raising human awareness of the importance of biodiversity conservation, which is a condition for human survival, a strategic resource for sustainable

socio-economic development, and an important guarantee for ecological security and food security[14]. In addition, we should strengthen the protection and conservation of biodiversity in inland waters, incorporate waterfowl habitats and wetlands into the scope of protection, and improve systematic protection. This study also needs to continue the long-term monitoring of waterbirds in the basin to ensure better and more scientific data.

Author Contributions

Li, X. Y., Chen,Y. R. and Chen,K. L. did the overall design of the dataset development; Li, X. Y., Sun, J. Q. and Chen,Y. R. collected and processed all the data; Li, X. Y. wrote the data paper, etc.

Conflicts of Interest

The authors declare no conflicts of interest.

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