In Situ Vegetation Dataset in Qinghai Lake Basin (2021–2022)

Chen, Y. R.[1,2,3]   Sun, J. Q.[4]   Li, X. Y.[1,2,3]   Chen, K. l.[1,2,3*]

1. College of Geography, Qinghai Normal University, Xining 810008, China;
2. Key Laboratory of Physical Geography and Environmental Process of Qinghai Province, Qinghai Normal University, Xining 810008, China;
3. Qinghai Lake Wetland Ecosystem National Positioning Observation Station, Haibei 812200, China;
4. Qinghai Lake National Nature Reserve Administration, Xining 810008, China

Abstract: Qinghai Lake basin is an important natural geographical area in the northeast of the Qinghai-Tibet Plateau and a crucial component of ecological security pattern in Qinghai province. In August 2021 and August 2022, the authors conducted vegetation survey on 29 sample sites in the Basin. The dataset includes: (1) The geographical location and overview of vegetation surveying sites; (2) The vegetation type structure of temperate grassland, temperate desert grassland, alpine grassland, temperate desert, mountain meadow and lowland meadow; (3) Statistics on the number of plant families, genera and species; (4) Vegetation biomass statistics of Qinghai Lake Nature Reserve and Przewalski's gazelle activity area; (5) Annual vegetation structure and biomass. The dataset is archived in .shp and .xlsx data formats, and consists of 8 data files with data size of 124 KB (Compressed into one file with 102 KB).

1 Introduction

Biodiversity monitoring is a vital task in biodiversity conservation in China. It is to quantitatively monitor and study biological changes within a certain time and space range, providing scientific basis for regional ecological protection[1]. Monitoring of vegetation diversity is the basis of the driving factor of the loss of vegetation diversity and the intrinsic survival mechanism, as well as the basis of the services of terrestrial ecosystems[2].

Vegetation change in alpine regions has always been a hot issue in the field of climate and ecology[3]. The research and monitoring of biodiversity in the Qinghai Lake basin is the basic work of biodiversity conservation and research in the Qinghai Lake basin. Grasslands are an important part of terrestrial ecosystems, accounting for 40% of the world's total land area and are the crucial carbon reservoir in terrestrial vegetation[2]. As the hub of soil, atmosphere and water, vegetation plays a vital role in biological sustainability, climate regulation and maintaining the stability of terrestrial ecosystems[4–6]. Qinghai Lake basin is located in the northeast of the Qinghai-Tibet Plateau, with a total area of about 29,600 km^2 and an altitude of 3,194–5,174 m. It has diverse vegetation types, mainly meadow and grassland[3]. Qinghai Lake is the largest inland saltwater lake in China, and as a significant water body of the Qinghai-Tibet Plateau, it is also an essential barrier to prevent desertification in western China and maintain the ecological security of the northeast of the Qinghai-Tibet Plateau[7, 8].

This dataset was monitored from August 10 to 17, 2021 and August 1 to 11, 2022 with reference to the vegetation monitoring samples of Qinghai Lake National Nature Reserve[9]. The vegetation monitoring working group of Qinghai Lake National Nature Reserve carried out the monitoring of localized vegetation. Finally, the vegetation ground measurement dataset in Qinghai Lake basin (2021–2022) was formed.

2 Metadata of the Dataset

Table 1 summarizes the metadata of the *In situ* vegetation dataset in Qinghai Lake basin (2021–2022)[10]. It includes the dataset full name, short name, authors, year of the dataset, dataset files, data publishing and sharing service platform, and data sharing policy, etc.

3 Monitoring Methods

Vegetation monitoring plots were deployed in the area around Qinghai Lake with 28 plots in 2021 and 29 plots in 2022, including the geographical location, vegetation type, plant species, and plant biomass of the monitoring plots.

The sample plots were set up in the monitoring plot, and one sample orientation was 1 m^2 in the vegetation monitoring area of Qinghai Lake over the years, including 1 vegetation structure square, 10 vegetation frequency squares, a 25 m^2 vegetation structure sample in shrub or tall herbs. The vegetation ground biomass in the activity area of Przewalski's gazelle was also determined, and the biomass sample was 4.

The vegetation cover and biomass of scrub or tall herb sample plots were calculated as follows:

Vegetation cover of sample plot = Herbaceous sample cover × (1−total cover of various shrubs or tall herbs) + total cover of various shrubs or tall herbs. Where, total shrub or tall herb cover = Σ(standard bush length × standard bush width × π ÷ 4 × standard bush number) ÷ sample area.

Total biomass of vegetation in the sample site = total biomass of various shrubs or tall herbs ÷ area of shrub or tall herb sample + average biomass of herb sample × (1−total cover of various shrubs or tall herbs).

4 Data Results

4.1 Dataset Composition

(1) Geographical location and overview of vegetation surveying sites; (2) vegetation type structure of temperate grassland, temperate desert grassland, alpine grassland, temperate

desert, mountain meadow and lowland meadow; (3) statistics on the number of plant families, genera and species; (4) vegetation biomass statistics of Qinghai Lake Nature Reserve and Przewalski's gazelle activity area; (5) annual vegetation structure and biomass. The dataset is archived in .shp and .xlsx data formats, and consists of 8 data files with data size of 124 KB (Compressed into one file with 102 KB).

Table 1 Metadata summary of the *In situ* vegetation monitoring dataset of Qinghai Lake basin (2021–2022)

Items	Description
Dataset full name	*In situ* vegetation monitoring dataset of Qinghai Lake basin (2021–2022)
Dataset short name	VegetationQinghaiLakeBasin2021-22
Authors	Chen, Y. R., Qinghai Normal University, 2776246502@qq.com
	Sun, J. Q., Qinghai Lake National Nature Reserve Administration, sunjq@163.com
	Li, X. Y., Qinghai Normal University, lixingyue0102@163.com
	Chen, K. L., Qinghai Normal University, ckl7813@163.com
Geographical region	Qinghai Lake basin
Year	2021, 2022
Data format	.shp, .xlsx
Data size	124 KB
Data files	8 data files (compressed to 1 files)
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[10]
Communication and searchable system	DOI, CSTR, Crossref, DCI, CSCD, CNKI, SciEngine, WDS/ISC, GEOSS

4.2 Data Results

The grassland vegetation survey of Qinghai Lake National Nature Reserve was completed from August 10 to 17, 2021, lasting 8 days, and from August 1 to August 11, 2022, lasting 11 days, and basic data such as vegetation nutrient height, reproductive height, plant cluster, cover, biomass and species number were obtained.

In 2021, 7 grassland classes and 17 grassland types were investigated, with a total of 118 species in 90 genera in 39 families. The average height of vegetative branches and reproductive branches was 6.85 cm and 14.3 cm. Among them, the average height of vegetative branches of dominant species was 12.5 cm, and the average height of reproductive branches was 27.9 cm. The total vegetation cover and dominant species coverage were 54.4% and 16%, respectively. The average total biomass was 2,210.15 kg/ha. The average edible forage biomass in the active area of Przewalski's gazelle was 2,228.6 kg/ha. The available biomass is 1,760 kg/ha. In the past 12 years, the aboveground biomass of the *Stipa sareptana var. a*nd *Krylovii* temperate grassland showed a slight trend of decrease, that is, the Haixin mountain-like land may be mainly disturbed by the long-term lack of grazing activities, and there is more litters on the surface, which reduces the

promotion effect of light on grassland plant growth. The temperate grassland of *Achnatherum splendens*, *Stipa spp.* showed a significant increase trend, while the aboveground biomass of the *Stipa spp.* temperate desert, the *Agropyron cristatum* temperate grassland and the *Stipa breviflora* temperate desert also showed a significant increase trend. The aboveground biomass of *Stipa purpurea* alpine grasslands and *Elymus nutans* mountain meadows increased slightly.

In 2022, 7 grassland classes, 17 grassland types, a total of 29 plots, 29 vegetation plots, 290 vegetation frequency plots, 56 aboveground biomass samples, 7 shrubs and tall herbaceous samples were investigated, and a total of 222 species of vascular plants in 125 genera in 47 families were recorded. The average height of vegetative branches of vegetation community was 9.97 cm, the average height of reproductive branches was 16.8 cm, the number of plant clusters was 266 clusters/m^2, and the total vegetation coverage was 53.82%, among which the average height of vegetative branches was 29.13 cm, and that of reproductive branches of vegetation-dominant plants was 14.13 cm. The number of plants was 99/m^2, and the community coverage was 27.88%. The average aboveground biomass of 14 plots was 1,917.27 kg/ha, and the average edible forage biomass in the Przewalski's gazelle activity area was 2,228.6 kg/ha, of which the available biomass was 1,760 kg/ha. In 2022, affected by comprehensive factors such as long-term drought and grazing intensity in the early part of the growing season, except for No. 047 plots (temperate deserts raised by fences), the community height, cover and number of plants in most plots were lower than the average values from 2010 to 2021. The height and cover of the temperate grassland of the *Stipa Sareptana var. Krylovii* and the *Carex stenophylloides* decreased compared with the average of previous years, but the biomass reached a historical peak. The vegetation height, vegetation cover and biomass of the *Achnatherum splendens*, *Stipa spp.* and *Agropyron cristatum* temperate grassland and the alpine grassland of the *Stipa purpurea* decreased significantly. Compared with the average value of the previous years, the height, cover and biomass of the temperate desert vegetation such as *Stipa spp.* increased except for a slight decrease in vegetation height. Aboveground biomass in mountain meadow of *Elymus nutans* is at an all-time low, which may be due to continued overgrazing, in addition to climatic factors.
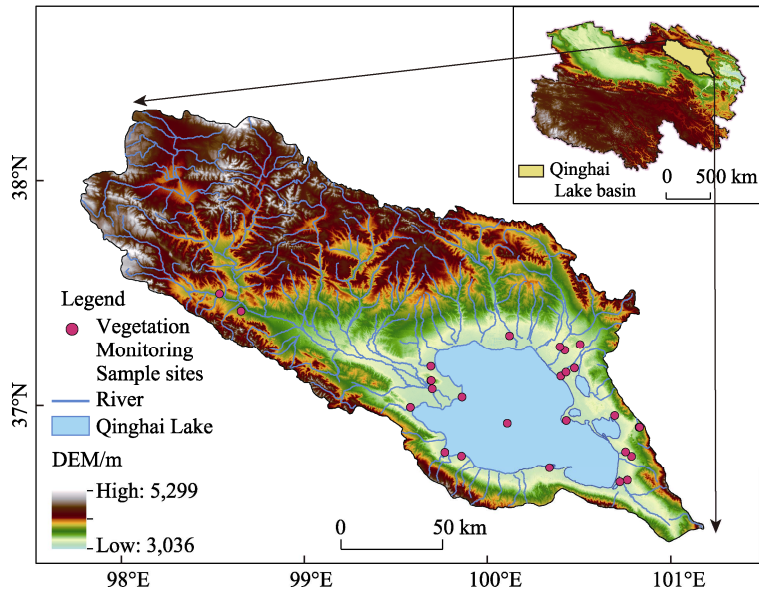

Figure 1   Map of monitoring sites for vegetation in the Qinghai Lake basin

5 Summary

In August 2021 and August 2022, vegetation monitoring was carried out in the Qinghai Lake basin, and the monitoring of vegetation structure, plant frequency, and habitat biomass of Przewalsk's gazelle was completed for 7 grassland classes and 17 grassland types.

The Qinghai-Tibet Plateau is the most unique geo-geographic-ecological unit on the earth today, with unique biological resources, and occupies an irreplaceable position in the map of world biodiversity[11]. Qinghai Lake basin is a crucial natural geographical area of the Qinghai-Tibet Plateau[6], and the monitoring of vegetation diversity in the Qinghai Lake basin aims to clearly understand the status of vegetation resources in the basin, obtain the temporal and spatial variation characteristics of vegetation resources, provide scientific data support for the protection and rational utilization of vegetation resources in the basin, provide a significant basis for the construction of Qinghai Lake National Park and the Qinghai-Tibet Plateau ecological civilization highland, and also provide data support for the protection and restoration of the ecosystem of the Qinghai-Tibet Plateau[13].

Author Contributions
Chen, Y. R. and Chen, K. L. designed the algorithms for the dataset. Sun, J. Q., Li, X. Y. and Chen, Y. R. contributed to data processing and analysis and Chen, Y. R. wrote the paper.

Conflicts of Interest
The authors declare no conflicts of interest.

References

[1] Zhi, Y. J., Yi, J. F., Liu, W., *et al.* Monitoring of wintering waterbirds in the Nanji Wetland National Nature Reserve of Poyang Lake [J]. *Chinese Journal of Ecology*, 2020, 39(7): 2400–2407.

[2] Wu, H., Xu, X. H., Feng, X. J., *et al*. Progress and prospects of biodiversity monitoring in China from a global perspective [J]. *Biodiversity*, 2022, 30(10): 196–210.

[3] Sun, H. Y., Li, B. Surface vegetation cover changes in China and their relationship with climate factors [J]. *Journal of Remote Sensing*, 1998, 2(3): 204–210.

[4] Li, X. G., Zhu, L. Q., Chen, C. N. Analysis of spatial and temporal variation characteristics of NDVI of vegetation in Henan province from 2000–2015 [J]. *Journal of Henan University* (*Natural Science Edition*), 2018, 48(5): 554–564.

[5] Hou, Y., Chen, W. L., Zhong, C. Remote sensing monitoring of spatial and temporal changes of vegetation cover in Inner Mongolia [J]. *Journal of Northeast Forestry University*, 2018, 46(11): 35–40.

[6] Gao, L. M., Zhang, L. L. Study on the spatial and temporal variation of vegetation cover in Qinghai Lake Watershed [J]. *Journal of Geoinformation Science*, 2019, 21(9): 1318–1329.

[7] Gao, L. M., Zhang, L. L., Chen, K. L. Microclimate characteristics analysis of wetlands in Qinghai LakeWatershed [J]. *Arid Zone Research*, 2019, 36(1): 186–192.

[8] Zhang, L. L., Gao, L. M., Chen, K. L. Variation characteristics of radiation balance and surface albedo in the Wayan Mountain wetland of the Qinghai Lake watershed [J]. *Journal of Glaciology and Geocryology*, 2018, 40(6): 1216–1222.

[9] Hou, Y. S., He, Y. B., Xing, Z., *et al*. Diversity and distribution of waterbirds in Qinghai Lake National Nature Reserve [J]. *Zoological Systematics*, 2009, 34(1): 184–187.

[10] Cheng, Y. R., Sun, J. Q., Li, X. Y., *et al*. *In situ* vegetation dataset in Qinghai Lake basin (2021–2022) [J/DB/OL]. *Digital Journal of Global Change Data Repository*, 2023. https://doi.org/10.3974/geodb.2023.06.05.V1. https://cstr.escience.org.cn/CSTR:20146.11.2023.06.05.V1.

[11] GCdataPR Editorial Office. GCdataPR data sharing policy [OL]. https://doi.org/10.3974/dp.policy.2014.05 (Updated 2017).

[12] Deng, T., Wu, F. X., Su, T., *et al*. Qinghai-Tibet Plateau-an evolutionary hub for modern biodiversity formation [J]. *China Science*: *Earth Science*, 2020, 50(2): 177–193.

[13] Chen, Z. R., Hou, Y. S., Chen, K. L., *et al*. Vegetation monitoring dataset from 31 plots in Qinghai Lake watershed (2018) [J]. *Journal of Global Change Data & Discovery*, 2022, 6(1): 73–77. https://doi.org/10.3974/geodp.2022.01.10. https://cstr.escience.org.cn/CSTR:20146.14.2022.01.10.