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Methods of investigation and assessment of ecological water resources

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ABSTRACT

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methods

1 *Sampling and data collection*

The sampling and field investigation were carried out in the downstream salt marsh area within 50 km of the West Taijinar Lake in April 2019. Random sampling of water was conducted at 5–10 km intervals in the accessible parts of the salt marsh area.

Thirteen surface water samples were collected from the downstream tributary of the West Taijinar River using polyethylene bottles (1000 mL), while seven underground water samples were obtained from existing boreholes using a simple water collector. For water quality analysis, polyethylene bottles were filled with no less than 1000 mL of water per sample. For surface water, the pH was measured using a pH meter (FE20; METTLER TOLEDO, Zurich, Switzerland). Suspended solid (SS) was analyzed by the gravimetric method (GB 11901-89, 1990). The nephelometric turbidity unit (NTU) was determined using a turbidity meter (2100Q; HACA, Loveland, USA). Total iron (Fe) was analyzed by inductively coupled plasma-atomic emission spectrometry (ICAP6300; Thermo Fisher Scientific, Waltham, MA, USA). Chloride (Cl^-) and sulfate (SO_4^{2-}) concentrations were analyzed by silver nitrate titration (D512-12, 2012) and volumetric method (GB/T 13025.8-2012, 2012), respectively. Chemical oxygen demand (COD_{cr}) was analyzed by the dichromate method (HJ 828-2017, 2017), while ammonia nitrogen (NH_3-N) concentration was determined by Nessler's

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reagent spectrophotometry (HJ 535-2009, 2009). For groundwater, the pH, NTU, Fe, Cl^-, and SO_4^{2} levels were determined as described above. Additionally, total dissolved solid (TDS) was analyzed by the weighing method. Sodium ion (Na^+), magnesium ion (Mg^{2+}), calcium ion (Ca^{2+}) and total boron (B) were analyzed by inductively coupled plasma-atomic emission spectrometry.
For plankton community analysis, 13 surface water samples (at least 500 mL) were collected with a simple water collector from the shallow (5–15 cm below the water surface), medium, or deep (5–15 cm above the river bed) depths in the downstream tributary of the West Taijinar River. Samples collected at the same point were mixed equably and concentrated randomly to give 10–20 mL per sample, followed by filtration with 25 # plankton filter and storage in sealed glass bottles with 1 mL of formol . Qualitative and quantitative analyses of plankton communities were performed using an optical microscope (SAGA SG-300; Suzhou Shenying Optical Co., Ltd., Suzhou, China). The morphology of plankton was observed and identified at the genus level according to previous study; then individuals for each genuswas recorded (Siet al, 2019). The diversity of plankton was estimated using Shannon's diversity index.
Only herbs were collected from the salt marsh area without shrubs, trees, or other tall plants. Considering the extremely low density and uneven distribution of plants, the salt marsh area was divided into four units in the east, west, north, and south directions, respectively. Multi-point random sampling was conducted based on field survey to record the number of plant species, plant height, and coverage area. Photographs were taken to identify plants at the genus level with reference to the map.

2 *Assessment methods*

2.1 *Establishment and weight assignment of the assessment indicator system*
The AHP was used to assess the ecological status of water resources in the salt marsh area. Briefly, the assessment indicator system of water resources were divided into the target layer, the criterion layer, and the indicator layer according to their characteristics such as simple water ecosystem, rich mineral resources, and primary industrial use

2.2 *Ecological pressure assessment*
To assess the ecological pressure of water resources in the salt marsh area, the ecological deficit or surplus and ecological pressure index of water resources were obtained by comparing their ecological footprint and ecological carrying capacity following the method described by Wackernagel et al. (2004)

2.3 *Environmental quality assessment*
The single-factor index was used to assess the environmental quality of water resources in the salt marsh area.

2.4 *Socio-economic assessment*
To explore the utilization efficiency of water resources, the socio-economic assessment was based on water consumption per 10,000 yuan GDP of industrial companies in the salt marsh area (Chongxunet al, 2010). Additionally, as one of the large drainage areas in Qaidam Basin, West Taijinar Lake is an important flood storage and detention area, and threatened by the flood, which have certain effects on industrial production.

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