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## Review

## Vegetation, fauna, and biodiversity of the Ile Delta and southern Lake Balkhash – A review

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## ABSTRACT

Following the desiccation of the Aral Sea, Lake Balkhash has become the largest lake of Central Asia with an area of 17,000 km<sup>2</sup>. 70%–80% of the annual inflow into Lake Balkhash is delivered by the Ile River. The Ile Delta, 8000 km<sup>2</sup> large, is the largest natural delta and wetland complex of Central Asia and therefore is of crucial significance for the biodiversity of that region. In this paper, we reviewed the literature available with regard to vegetation, fauna, and biodiversity of the *Ile River Delta and South Lake Balkhash Ramsar Site*, in order to identify threats and research gaps. Threats are reduced runoff of the Ile River due to increasing water consumption upstream, overfishing, fires ignited by local people, logging for fuel wood collection, over-grazing, and water pollution from upstream. Major research gaps to be addressed are: 1) impact of reduced discharges of the Ile River on the wetland ecosystems and associated changes in livestock grazing, 2) impact of reduced discharges on spawning grounds for fish, 3) upper harvest limits for the fishery, and 4) regrowth of riparian woodlands.

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## Introduction

Central Asia is a region largely covered by drylands (MEA, 2005). Under such conditions water is the major driver for the persistence of the current natural ecosystems and their associated biodiversity and

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possible land use activities. The most productive and diverse ecosystems in the drylands of Central Asia are located along the rivers (Ogar, 2003), e.g. reed beds (Thevs et al., 2007) and riparian forests (Thevs et al., 2012). Following the desiccation of the Aral Sea (EC-IFAS, 2012; UNEP, 2014), Lake Balkhash has become the largest lake of Central Asia with an area of about 17,000 km<sup>2</sup>. 70%–80% of the annual inflow into Lake Balkhash is delivered by the Ile River (Ili River in Russian, Ile River in Kazakh), while the remaining 20%–30% stem from the four rivers Karatal, Aksu, Lapsi, and Ayaköz (Fig. 1). At its mouth, the Ile River has formed a delta with an area of about 8000 km<sup>2</sup>. The Ile Delta is the largest natural delta and wetland complex at an inland lake, which still receives water permanently, in the whole region of Central Asia, since the Amu Darya Delta shrunk considerably in the course of the Aral Sea desiccation (Ramsar Convention, 2012). Accordingly, the Ile Delta and the southern part of Lake Balkhash have been designated the *Ile River Delta and South Lake Balkhash Ramsar Site* (Ramsar Convention, 2012).

While much research work has been devoted to the Aral Sea (e.g. Breckle et al., 2012; Kostianoy and Kosarev, 2010) and to its tributaries (e.g. Martius et al., 2012), the Ile River Basin and Lake Balkhash have received much less attention from scientists and development agencies. There are concerns that Lake Balkhash may shrink or even desiccate like the Aral Sea and that the Ile Delta may degrade severely due to water abstraction along the rivers of the Ile-Balkhash Basin (Propastin, 2013; UNEP, 2004). He et al. (2014) state that the whole Ile-Balkhash Basin is at risk, due to increased water use mainly by agriculture along the Ile River upstream in China and Kazakhstan. Being an endorheic river basin with a relatively non-degraded terminal lake and wetland ecosystems representative for Central Asia, the Ile River Basin offers opportunities to study such wetlands and adjacent natural ecosystems with their vegetation and fauna in a relatively non-degraded setting, and to protect such a wetland complex.

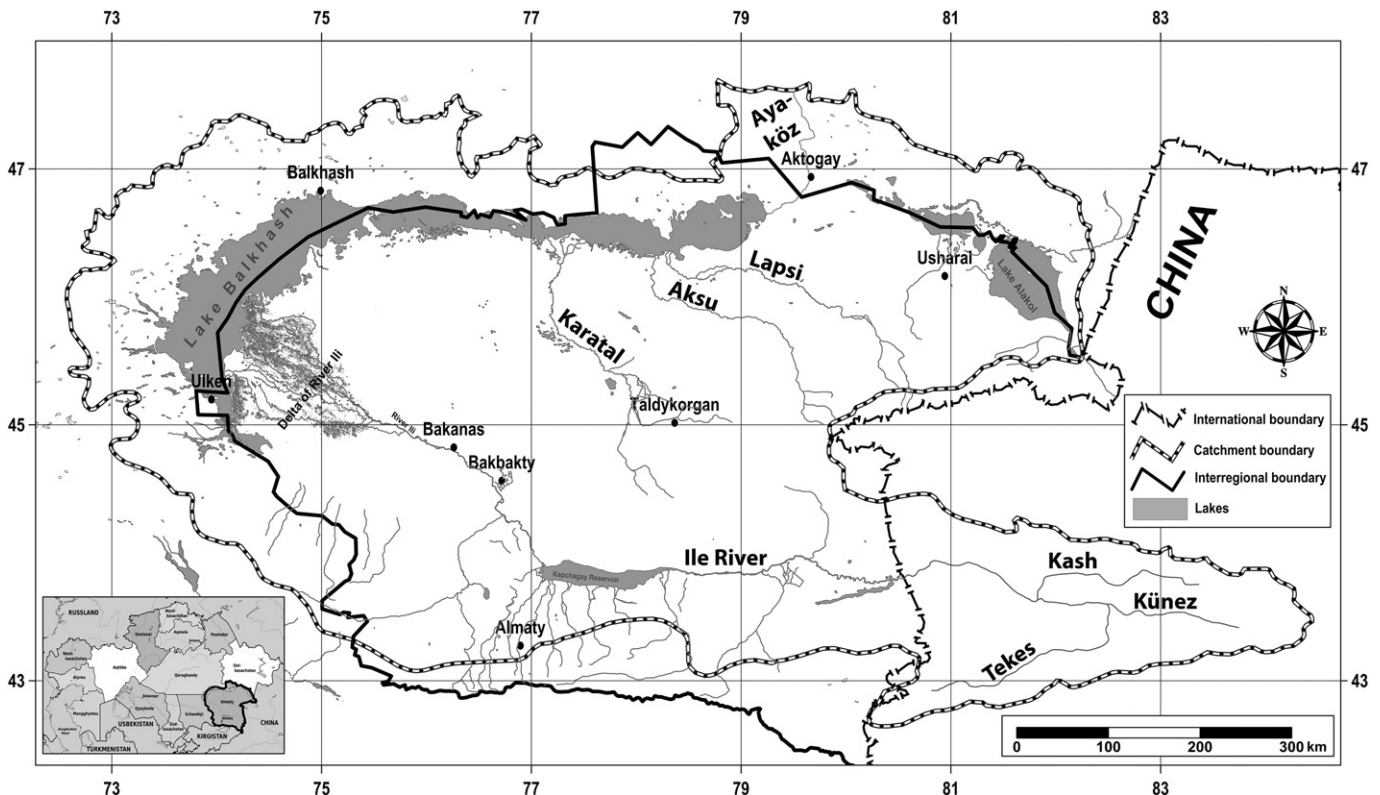
The objective of this review is to describe the status of the biodiversity, including threats for biodiversity, and identify research gaps

through a review of the available information with respect to vegetation and fauna of the Ile Delta and southern Lake Balkhash (i.e. the *Ile River Delta and South Lake Balkhash Ramsar Site*). This review additionally makes these sources available to an international readership. As the delta with its natural ecosystems and Lake Balkhash depend mainly on the inflow from the Ile River, information with respect to the water resources of the Ile River Basin and the whole Ile-Balkhash Basin will also be presented.

**Water resources and land use in the Ile-Balkhash Basin**

The Ile River's two source rivers, i.e. Künez and Tekes, have their headwaters in the Tian Shan Mountains in Xinjiang, China (Fig. 1) as does the largest tributary of the Ile, the Kash River. Thus, about two thirds of the Ile runoff are generated in Xinjiang, China, as shown in Table 1 (Christiansen and Schöner, 2004). Melt water from glaciers and snow as well as rainfall form the discharge of the Ile River (Unger-Shayesteh et al., 2013). For Kazakhstan the Ile-Balkhash Basin is of high significance, as 22% of the water resources of the country are concentrated here (Yerzhanova and Huszti, 2013).

During the 1960s, an average of 15 km<sup>3</sup>/yr water were drained into Lake Balkhash, with 12 km<sup>3</sup>/yr coming from the Ile River and three km<sup>3</sup>/yr from the four minor rivers Karatal, Aksu, Lapsi, and Ayaköz (Fig. 1). Additionally, three km<sup>3</sup> of precipitation fell on average over the lake surface per year so that Lake Balkhash gained 18 km<sup>3</sup>/yr. The lake area was 18,000 km<sup>2</sup> in area during the 1960s. The annual evaporation was 1000 mm/yr on average, thus amounting to 18 km<sup>3</sup>/yr over the lake surface area and being equal to the water gained (Dostaj et al., 2006, 2012). In 1970, the dam of the Kapchagay Reservoir on the Ile River (Fig. 1) in today's Kazakhstan was constructed and the reservoir was filled during the 1970s. During that time the area under irrigation was increased also. Thus, after 1970 the runoff of the Ile River into Lake Balkhash shrunk so that the total inflow into the lake decreased from 15 km<sup>3</sup>/yr to about 12.2 km<sup>3</sup>/yr–12.9 km<sup>3</sup>/yr (Abdrasilov and



**Fig. 1.** Map of the Ile-Balkhash Basin with its boundary (referred to as catchment boundary) and with the major rivers and irrigated areas. After Christiansen and Schöner, 2004, modified after Dostaj, 1999.

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