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The study on assessment of fish habitat in de-watered river channel due to diversion-type hydropower station

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Abstract

Alteration of hydrological regime due to diversion-type hydropower station has significant impacts on the fish habitat in the de-watered river channel. This paper evaluates the alteration of hydrological regime by using the Indicators of Hydrologic Alteration (IHA) and the Range of Variability Analysis (RVA), analysis the impact on the fish habitat. The IHA&RVA analysis suggests that the construction of diversion-type hydropower hydrological seriously effects hydrological alterations of downstream and damages the fish habitat. Instream flow and hydrograph study should be developed urgently.

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Keywords: Fish habitat, de-water river, diversion-type hydropower station, IHA&RVA;

1. Introduction

Water Resources and Hydropower Engineering, as an indispensable measure, plays an important role in energy source, flood protection, irrigate, shipping and so on. At the same time, it influences the river ecosystem with long-term, accumulated and potential harms. Diversion-type hydropower station, which is one way of hydroelectric development, usually apply to medium or small rivers with small flux and large slope. In these engineering in our world, the energy head of Austrian lysergic keshan hydropower station, has the highest energy head, is 1767m; the longest length of water diversion of Norway Kaoboerfu hydropower station is about 39km; while, In China, the energy head of Yanshuigou hydropower station is 629m in Yunnan, and the length of Jinping-II station is 16629m in

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Yalong river. Compared with dam-type power plant, diversion-type power plant takes more change in hydrological regime and make longer de-water reach, get more researchers' attention.

Fu(2008)[1]argued that the construction of the small diversion-type hydropower plants (SDHPs) had no significant impact on water chemistry, but physical variables. Chen(2013)[2]developed an optimization model to explore trade-offs between hydropower generation and ecological flow requirement and applied to two cascaded diversion-type reservoirs (Jinping-I and Jinping-II) in the Yalong River.

This paper discusses the influences of de-water reach, caused by the construction of Jinping-II diversion-type hydropower station, to fish habitat based on the Indicators of Hydrologic Alteration (IHA) and the Range of Variability Analysis (RVA).

2. Study region and data

Two cascaded reservoirs, Jinping-I and Jinping-II are in the middle downstream area of the Yalong River, southwestern of China. Jinping-II is designed as a daily regulating and diversion-type hydropower station which is used to counter regulate. The dam of Jinping-II is located downstream of Jinping-I and the diversion-type power plant of Jinping-II is arranged at the end of the diversion tunnels, therefore, a 119km long loop of the river is short cut by four diversion tunnel(Figure 1),which provided a 288m energy head.

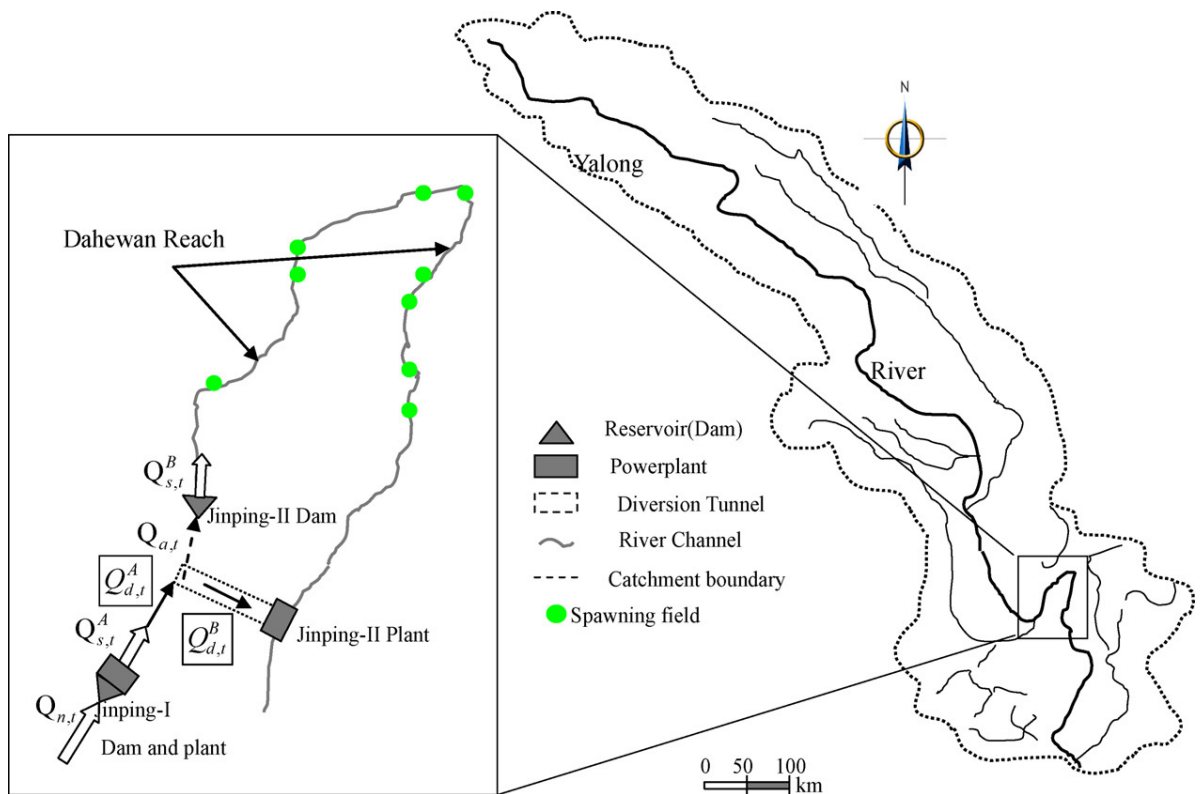


Fig. 1. Locations of Jinping-I and Jinping-II and the positions of spawning grounds[2]

Daily streamflow data(1985-2014) from Santan hydrologic station in the upstream of the Dahewan loop is provided by the environmental protection centre of Yalong River Hydropower Development Company,LTD. This paper elects the year of 2013, when the trial operation of Jinping-II was carried out, as the beginning of hydrological changes, therefore, the data of 1984 to 2012 is on behalf of the nature water regime while the data of 2013 to 2014 represent artificial.

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