Application of rainfall runoff model to rivers in Himi city toward habitat evaluation of Itasenpara

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1. Introduction

Acheilognathus longipinnis is called Itasenpara in Japan. Itasenpara is a typical plankton feeding cyprinid and one of endemic species in Japan. It can be found at Yodogawa River water system in Osaka Prefecture, the Nobi Plain in Gifu Prefecture and the Himi city in Toyama Prefecture.

The impacts of climate change will increase temperature, precipitation intencity, flood risk and snow melt, and it would affect to Itasenpara habitat. The main purpose of this study is to assess the climate change impacts in the past and in the future on Itasenpara.

2. Study area

Target areas in this study are Himi and Oyabe city including Moo River water system, Bushoji River water system and Oyabe river as shown in **Figure 1.** Itasenpara can be found in only Moo River water system.

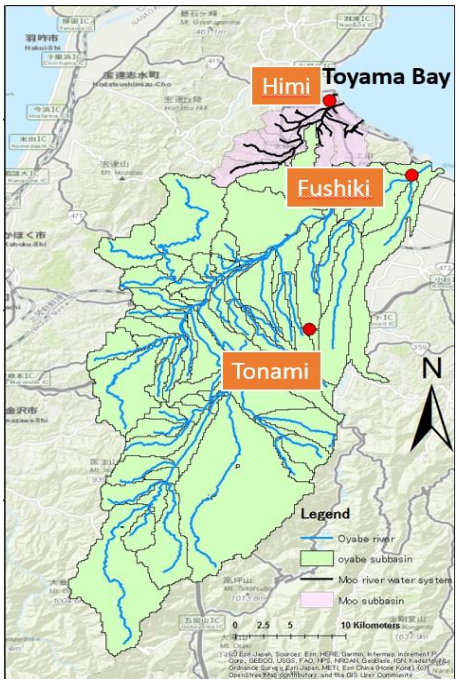

Fig.1 Study area

3. Methods

(1) Data Collection

Observed daily precipitation, air temperature, snow depth and satellite image of the snow cover are collected. These data will be used to understand the historical snow and climate trend. Also, the dataset will be used as the input and validation data of the model.

(2) Rainfall Runoff Simulation

Physically based distributed rainfall-runoff model was employed because this model can simulate the hortonian overland flow in the urban areas, and the subsurface flow and saturation overland flow in mountainous areas depending upon the soil and hillslope. **Figure 2** show the flow chart of our research which rainfall runoff is included. We applied these model to the rivers in the target area.

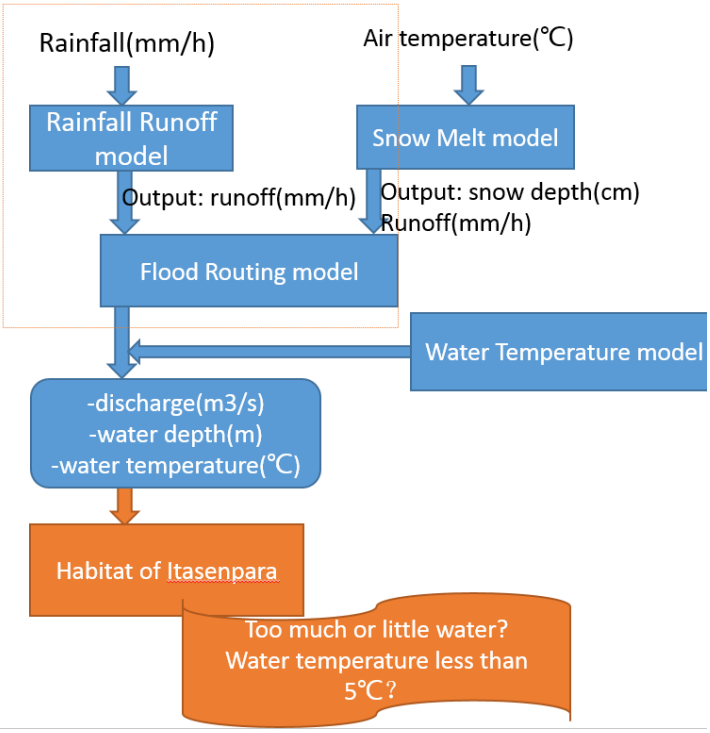

Fig.2 Flow chart

4. Results

Snow depth in Himi, Fushiki and Tonami since 1993 until 2018 are shown in **Figure 3.** We collected the snow cover the whole year since 2000 until 2018 and **Figure 4** as an example the snow cover in Toyama for January 2010. We will use these figures for the validation of simulation. Finally, we validate the simulation by made comparisons between discharge observed and simulated at Oyabe river as shown in **Figure 5.**

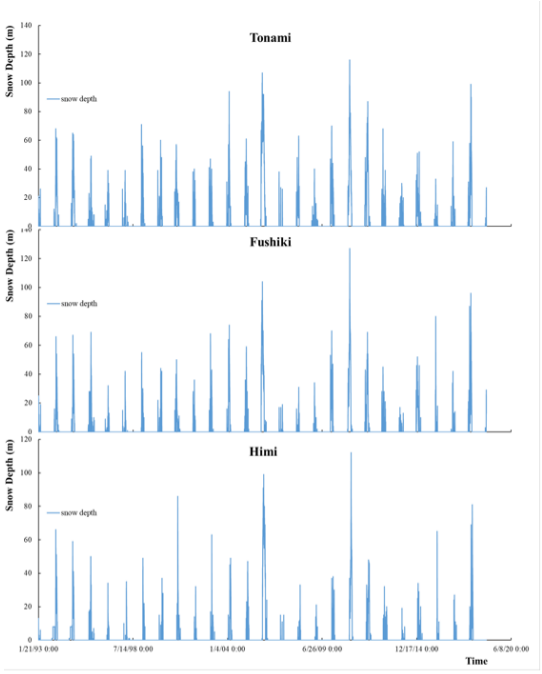

Fig.3 Time series of the snow depth in 3 stations

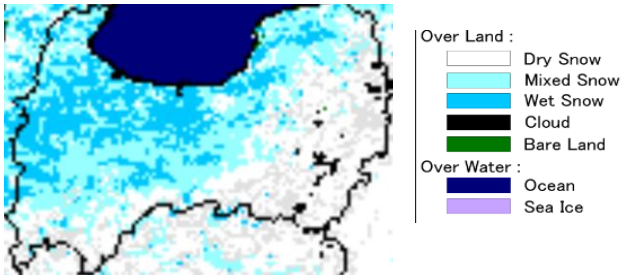

Fig.4 snow cover around Toyama in January 2010

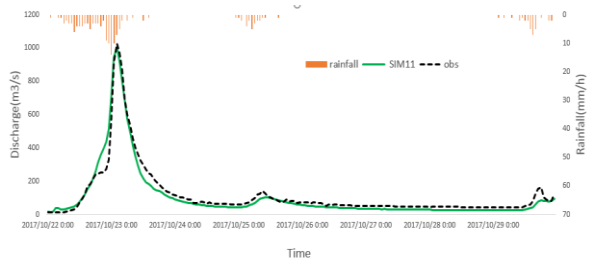

Fig.5 hydrograph comparison between observed and simulated at Oyabe river

5. Conclusions

The hydrologic data (snow and rainfall) were collected, and these datasets will be used for the model input and model validation of the snow model.

The period of data collection is since 1993 until 2018 (26 years), the snow cover data within 26 years are insufficient to analyze climate change impact. Another word, we need to collect the snow depth data more than 26 years (e.g 50 years, 100 years), so that we need a climate change impact study.

Rainfall runoff model was applied to Oyabe river basin for the period (October) without snow as the first step of the hydrologic modeling.

6. Future tasks

Snow melt model (Degree Day method) will be applied to simulate the hydrologic situations in Winter and Spring. Also, future assessment of climate change of Oyabe river by considering future rainfall and air temperature data, and the impact on Itasenpara's life will be evaluated.

7. Reference

1) Nishio, Edo, Yamazaki.: Paddy management for potential conservation of endangered Itasenpara bittering via zooplankton abundance. *Agriculture Ecosystems & Environment*, Elsevier B.V, 2017.

2) Hen, Kure: Hydrological and water quality characteristics of rivers in Acheilognathus longipinnis life during irrigation and non-irrigation, 2018.

3) Giang et al: Impact of climate change on environments are increase temperature, precipitation, flood risk and snow melt, 2014.