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Evaluate Climate Change Impacts on Habitat of Formosan Landlocked Salmon

Shu-Han Wu, Wan-Yu Lien, and Ching-Pin Tung
National Taiwan University, Taiwan (r99622005@ntu.edu.tw)

In recent years, the impacts of climate change have been the focus of world attention. Climate change will cause more climate variability and more frequent extreme hydrological events. Streamflow and water temperature play important roles in river ecosystem, which influences not only aquatic biodiversity but also the area of habitat. As the only Oncorhynchus masu living in subtropical zone, the Formosan Landlocked Salmon is a unique species in Taiwan and the ChiChiaWan creek is its important habitat. Formosan Landlocked Salmon may be significantly influenced by greater variation of streamflow and higher water temperature due to climate change. Although some local studies have identified that the Formosan Landlocked Salmon's habitat will be reduced due to higher daily water temperature, no study has been done on evaluating the impacts of variation of streamflow under climate change conditions for the habitat. In addition, some studies indicated that consecutive 7-day water temperature may be more important for the salmon than daily water temperature. Thus, this study will focus on evaluating the impacts of climate change on extreme streamflow and consecutive 7-day high water temperature. A set of ecohydrological indicators will be used to estimate the vulnerability of Formosan Landlocked Salmon habitats under climate change. The future climate scenarios are derived from several GCMs. Then, a hydrological model is used to simulate the extreme consecutive 7-day streamflow under different climatic conditions and a water temperature model is used to further simulate the extreme water temperature. On the other hand, Indicators of Hydrologic Alteration (IHA) are applied to quantify the impacts of streamflow variation due to climate change on the ChiChiaWan creek. The consecutive 7-day streamflow is analyzed because it is not only an indicator of IHA but also important for water temperature simulation. According to this study results, streamflows will become much more extremalization with the increasing consecutive 7-day high flow and decreasing consecutive 7-day low flow under different climate scenarios. The results also show water temperature may exceed the threshold temperature of survival under some GCMs' scenarios. Because the Formosan Landlocked Salmon is the critically endangered species, how to estimate the impacts of climate change on its habitats becomes a crucial issue. In the meantime, the simulations of future streamflow and water temperature greatly depend on climate scenarios which are derived from GCMs' projects. Thus, how to select proper GCMs' projections to reasonably estimate the impacts on habitat desires more attention.

Keywords: Ecohydrological Indicators, Water Temperature, Streamflow, Global Warming, Simulation