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論文審査の要旨及び審査員

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論文審査の要旨（2000 字程度）

This thesis is entitled "**Distributed Modeling of Flow Regime for Fish Conservation on a River Network**（河川網における魚類保全 に向けた分布型流況モデルの構築）" and it contains 6 chapters.

The main objective was to propose a feasible approach for conservation of fish in rivers based on a spatio-temporal distributed modeling of flow regime. The analysis of flow and fish was conducted in the Sagami River, Japan. After evaluating the applicability of the hydrological model, spatio-temporal patterns of flow regimes were simulated. Important environmental factors influencing on fish population variability were detected.

Chapter 1 "Introduction" states the state-of-the art in modeling approaches for fish conservation and the specific objectives of the PhD work.

Chapter 2 "Review of diversity and life history of fish on the rhythm of flow regimes" reviews extensively various relationships between flow regimes and fish ecology with a special attention to the "*rhythm.*" For example, a high flow pulse at a proper timing stimulates primal behavioral components of fish. Representation of timing should be expressed in more proper way as a 'circular-variable'. It was also found that the interannual instability of streamflow characteristics may be of particular influence for fish biodiversity.

Chapter 3 "Evaluating simulation accuracy of stream flow characteristics estimated with a distributed hydrological model" evaluates the accuracy of a distributed hydrological model (DHM) based on hydrologic indices on Sagami River basin. The accuracy of the hydrologic indices calculated from the simulated discharge depended on the approach for model calibration. Our objective function was to maximize Nash–Sutcliffe model efficiency coefficient as the first priority, allowing the magnitude and timing of maximum flows to be effectively simulated.

Chapter 4 "Spatial pattern of flow regimes estimated with a distributed hydrological model" applies the DHM to evaluate spatial patterns of altered flow regimes on Sagami River basin. The spatial patterns of flow regimes identify proper locations where flow aspects have been strongly altered. The strongest alterations in different aspects of flow regimes did not occur at the same location, implying that evaluation only at discharge gauges is insufficient to capture alteration in the flow characteristics over the river network. In addition, it was found that the streamflow on the Nakatsu tributary partly mitigated the alteration of flow regimes on the main Sagami River.

Chapter 5 "Spatial-temporally distributed modeling of fish population based on flow regimes in a River" shows spatio-temporal variability of populations of 30 freshwater fish species in the lowland section of the Sagami River basin. Hydrologic indices including antecedent conditions were selected as important predictor variables especially for swimming and land-rocked fish species in comparison to benthic and diadromous fish species. The median flow in August and maximum flow (August–October) in a previous year of fish sampling were commonly selected, indicating that temporal population variability can be influenced by flow conditions during rearing period of many fish species.

Chapter 6 "Conclusions" summarized the main conclusions, implications and the potential future works.

In short, this study comes up with a feasible approach to conserve fishes, and its contents are enough as a PhD thesis in engineering.