Atelier
Atelier AARMS-CRM « Développement durable des écosystèmes aquatiques »
22—25 octobre 2013

Workshop
"AARMS-CRM Workshop on Sustainability of Aquatic Ecosystem Networks"
October 22—25, 2013

# Multistate Markov Models as tools to assess the effects of hydropower developments on fisheries productivity

Daniel Boisclair [*]

daniel.boisclair@umontreal.ca

WEB: bio.umontreal.ca/repertoire-departement/vue/boisclair-daniel/

---

Human activities have long been recognized to affect aquatic ecosystems. Ecologists attempting to assess population-level consequences of the effects of human activities on aquatic ecosystems face at least four challenges: First, any given human activity $H$ may have a different effect on different age classes or life-stages (e.g. $H$ may have a negative effect on larval stages, no effect on juveniles, and a positive effect on adults). Second, any given human activity may have a different effect on the different ecological processes that determine the demographic success of fish populations (e.g. $H$ may have a negative effect on the capacity of fish to reach appropriate reproduction grounds, but a positive effect on survival). Third, any given activity may have a different effect on organisms at different locations of an ecosystem (e.g. $H$ may have a positive effect on organisms located in lakes of a watershed, but a negative effect on organisms found in rivers of this same ecosystem). Fourth, any given activity may have a different effect on organisms at different times (e.g. $H$ may have a positive effect on growth during the summer, but a negative effect on growth during the winter). Population-level consequences of $H$ are the amalgamation of the, often contradictory, effects of this human activity on a population. There is a need for a framework to integrate the results of studies designed to assess the effects of $X$ on different age-classes, ecological processes, at different locations, and at different times. The framework that we propose is based on the realization that different age-classes, different ecological processes, different locations, and different times constitute different states occupied by individuals that contribute to the demographic success of a population. In this context, Multistate Markov Models may be suitable to integrate what has often been perceived as disparate, divergent, and irreconcilable results. The structure of the proposed

[*] Département de sciences biologiques, Université de Montréal, C.P. 6128, succ. Centre-ville, Montréal, QC H3C 3J7, CANADA.

framework, and the opportunities and the challenges associated with the use of Multistate Markov Models to assess the effects of hydropower developments on fisheries productivity, will be presented and discussed.