University of Victoria | Graduate Studies

Notice of the Final Oral Examination for the Degree of Doctor of Philosophy

of

LU GUAN

MSc (Memorial University of Newfoundland, 2007)
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"Spatial and Temporal Dynamics of Larval Fish Assemblages in the Strait of Georgia"

Department of Biology

Wednesday, April 1, 2015
9:00AM
David Turpin Building
Room A144

Supervisory Committee:
Dr. John Dower, Department of Biology, University of Victoria (Supervisor)
Dr. Verena Tunnicliffe, Department of Biology, UVic (Member)
Dr. David Mackas, Institute of Ocean Sciences (Outside Member)
Dr. Stewart McKinnell, Institute of Ocean Sciences (Outside Member)
Dr. Pierre Pepin, Fisheries & Oceans Canada (Additional Member)

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Dr. Miriam Doyle, NOAA Alaska Fisheries Science Center

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Dr. Alexandre Brolo, Department of Chemistry, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

For marine fishes, the early larval phase is considered a critical stage for survivorship and future recruitment; the spatial and temporal dynamics of larval fish assemblages can influence the trophic structure of marine communities and entire ecosystems. This thesis will provide the first characterization of the larval fish assemblage in the Strait of Georgia (SoG) in terms of diversity, abundance and composition, and their variability over multiple temporal scales (interdecadal and interannual), as well as the first quantification of variability in larval fish distribution in the SoG across multiple spatial scales. On the interdecadal scale, a significant decrease in larval abundance of several dominant fish taxa, in particular the local pelagics (Pacific hake, walleye pollock and northern smoothtongue) and rockfishes, contributed to a decline in total larval abundance and turnover in the composition structure between the early 1980s and the late 2000s. In contrast, both abundance and the relative composition of flatfishes and several demersal forage fish taxa increased during the same period. On interannual scales, abundance, diversity and community structure of the spring larval assemblages varied dramatically through 2007-2010, a period which alternated between strong La Niña and El Niño events. Higher overall larval concentrations, together with dominance by southern species, were associated with warm condition in the SoG in 2007 and 2010. In contrast, the lowest larval concentration, coupled with dominance by cold water species was associated with cooler conditions in 2009. Examination of associations between larval fish assemblages and environmental fluctuations suggests a potential influence of large-scale climate processes between the early 1980s and the late 2000s, but a primary association with local environmental factors on interannual scales. Spatial patterns in larval density of three dominant fish taxa (Pacific herring, Pacific hake and northern smoothtongue) were mostly structured on broad (> 40km) and medium scales (20~40km). Although their scale-dependent associations with environmental factors varied interannually, larval distributions in the central-southern SoG were generally associated with salinity, temperature and vertical stability of water column in the upper layer (0-50m). Our results emphasize the role of local estuarine circulation in structuring hierarchical spatial distributions of planktonic fish larvae in the SoG. To conclude, this study revealed multi-scale variations in the SoG larval fish assemblage in both time and space. These findings will enhance our knowledge of larval fish dynamics and their associations with the marine environment in the SoG, and will provide valuable information for fisheries resource management and conservation strategies such as the application of marine protected areas.