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REPLY COMMENT

Marine nurseries and effective juvenile habitats

Craig A. Layman[1,*], Craig P. Dahlgren[2], G. Todd Kellison[3], Aaron J. Adams[4], Bronwyn M. Gillanders[5], Matthew S. Kendall[6], Janet A. Ley[7], Ivan Nagelkerken[8], Joseph E. Serafy[9]

[1]Department of Ecology and Evolutionary Biology, Yale University, PO Box 208106, New Haven, Connecticut 06520-8106, USA

[2] Perry Institute for Marine Science, 100 N. US Highway 1, Suite 202, Jupiter, Florida 33477, USA

[3]Biscayne National Park, 9700 SW 328th Street, Homestead, Florida 33033, USA

[4]Mote Marine Lab, Charlotte Harbor Field Station, PO Box 2197, Pineland, Florida 33945, USA

[5]Southern Seas Ecology Laboratories, Darling Building, School of Earth and Environmental Sciences, University of Adelaide, South Australia 5005, Australia

[6]NOAA Biogeography Team, 1305 East West Highway, Silver Spring, Maryland 20910, USA

[7]Australian Maritime College, PO Box 21, Beauty Point, Tasmania 7270, Australia

[8]Department of Animal Ecology and Ecophysiology, Institute for Water and Wetland Research, Faculty of Science, Radboud University, Nijmegen, Toernooiveld 1, 6525 ED Nijmegen, The Netherlands

[9]National Marine Fisheries Service, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, Florida 33149, USA

We were encouraged to see the 'Comment' by Sheaves et al. (2006, this volume) regarding the Effective Juvenile Habitat (EJH) concept (Dahlgren et al. 2006). Our intention was to provoke discussion on the juvenile habitat evaluation model proposed by Beck et al. (2001), and this Comment suggests that we have done so. In this Reply Comment, we discuss some of the issues raised by Sheaves et al. (2006), but do not attempt to individually address every point in the 'Comment'. Instead, we suggest that apparent discrepancies between the Sheaves et al. (2006) perspective and that of Dahlgren et al. (2006) stem from divergent views of how nursery value should be measured (and thus how to prioritize conservation and management strategies), but not from a different fundamental understanding of the factors which ultimately affect the value and function of juvenile habitats.

In Dahlgren et al. (2006), we provided a general definition of EJH, modifying the nursery habitat model of Beck et al. (2001). A definition is 'a statement expressing the essential nature of something' (http://merriamwebster.com/). As such, our manuscript focused on providing a description of the essential nature of EJH, and thus a framework for examining, comparing, and identifying important juvenile fish habitats. We did not imply that we were providing a comprehensive methodological approach for assessment of every aspect of nursery value or function, but instead the essential information necessary to apply this approach. Alternatively, Sheaves et al. (2006) provide a litany of factors that may affect nursery value. Many of these factors have been well discussed by other authors (e.g. Beck et al. 2001, Manson et al. 2005), which we acknowledge and detail in Adams et al. (2006, this volume). However, while providing valuable insight, the Comment by Sheaves et al. (2006) gives no practical guidance for assessing nursery function and thus fails to provide resource managers with any means to effectively evaluate and manage resources. For example, we agree that reproductive output may affect the overall value of a potential nursery habitat (see also Beck et al. 2001). However, how can this be practically measured and integrated into the assessment of nursery value, especially given the daunting task of simply mapping juvenile habitat, let alone tagging sufficient numbers of fish to gauge connectivity (Gillanders et al. 2003, Adams et al. 2006)? By presenting the EJH framework, we are not 'ignoring complexity', but offering a tractable framework that simplifies complexity into a quantifiable heuristic which then can be used to advance marine resource management and direct further scientific inquiry.

A core criticism of Sheaves et al. (2006) is that we do not acknowledge the importance of connectivity among habitat types. However, we never claim that habitats are 'individual, independent entities that can

*Email: cal1634@yahoo.com

be excised from each other and be preserved or allowed to degrade with independent consequences' (p. 305). Beck et al. (2001) discuss at length the fundamental importance of connectivity for understanding nursery function, and we concur with this view (Adams et al. 2006). But despite the element of complexity that arises from inter-connected habitats within an ecosystem, we must still work to identify the core components (e.g. habitats) that are most important in maintaining overall ecosystem function. We hope the EJH framework is one of many tools that can be used to this end.

Clarification of another point also should dispel concerns of Sheaves et al. (2006) That is, the EJH framework is inherently scale-independent. Depending on the suite of habitats, natural history of focal species, and other features of the system of study, EJH can be defined in the way most relevant for the core questions of interest. The example of 'fresh' and 'brackish' habitats used by Dahlgren et al. (2006) was based on data from a system in which these habitat distinctions were determined to be the relevant habitat units for assessing juvenile contributions to adult populations (Kraus & Secor 2005). Other examples in Dahlgren et al. (2006) are based on habitat units defined at smaller scales (e.g. seagrass- versus macroalgal-dominated substrates). Thus, far from being 'rigid', the EJH framework is a flexible approach which can be adapted to address a variety of scales and questions by biologists and resource managers alike.

We feel a major weakness in the Sheaves et al. (2006) Comment is an emphasis on criticism at the expense of suggesting viable alternatives. For example, we surely agree it is critical to understand the way in which '…individual responses are modified by interactions with other components in the system' (p. 305). However, is the solution to refrain from prioritizing conservation and management initiatives until we have a complete understanding of the structure, function and dynamics of complex ecosystems, or do we apply — with due caution — available tools to make the most informed decisions based on present data? With increasingly widespread and pressing anthropogenic threats to coastal and marine ecosystems, we advocate the latter. We hope that the EJH concept provides a step forward in this direction, and we look forward to further refinement and discussion of this and other approaches that can be used to assess the value of juvenile habitats.

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