

Proposal for a Methodological Review of the Data-Limited Methods Toolkit (DLMtool) for Use in the Pacific Fishery Management Council's Stock Assessment Review (STAR) Process

Proposed by

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The Pacific Fishery Management Council (PFMC) is responsible for setting annual catch limits (ACLs) and associated management measures for dozens of stocks and stock complexes that lack conventional assessments. This challenge has led to the development and application of many data-limited methods (DLMs) that are currently used as the basis for establishing the overfishing limits and acceptable biological catch levels from which ACLs are derived. Commonly used methods include: DCAC, DB-SRA, XDB-SRA, SSS, exSSS, and basic catch scalars. Independent studies have demonstrated that the performance of such methods in terms of maintaining target biomass and reducing the likelihood of overfishing and stock depletion will vary according to the biology and characteristics of different fisheries (Carruthers et al. 2014).

Overfishing Limits (OFLs) for most data-limited stocks in the PFMC Groundfish Fishery Management Plan were adopted in 2011 to meet the requirements of the Magnuson-Stevens Fishery Conservation and Management Reauthorization of 2006. As of 2017, OFLs for over 30 groundfish stocks remain based on the original estimates from that effort (Dick and MacCall, 2010). These methods were not designed to serve as long-term static yield estimates (E. Dick, NMFS SWFSC, pers. comm.). Methodologies reviewed and approved in 2018 could be eligible for use in the 2019 assessment cycle, informing OFLs in the PFMC's 2021-2022 management cycle.

It is therefore advisable to test the efficacy and applicability of different DLMs to ensure they are robust to the characteristics and uncertainties of the specific fisheries in which they are employed. Management strategy evaluation (MSE) is an effective means of conducting such tests and determining which methods are most likely to achieve the desired management objectives (Butterworth and Punt 1999, Punt et al. 2016). The Data-Limited Methods Toolkit (DLMtool, [v4.4](#), Carruthers and Hordyk 2017; www.datalimitedtoolkit.org) provides a customizable scientific framework for conducting rapid MSEs to analyse alternative DLMs in an objective and measurable way. The Toolkit is an open-source software package that is used to implement a standardized process to gather available information, define management objectives, evaluate feasible management strategies, and implement the best available scientific methods for obtaining practical management recommendations. The open design of the software provides transparency in the underlying code and ensures that future modifications do not require third-party assistance outside.

The DLMtool is a collaboration between the University of British Columbia and the Natural Resources Defense Council that emerged from research examining the [diversity of methods](#) used for managing data-limited fisheries in the United States and a [management strategy evaluation of their relative performance](#) across a range of fisheries

(Newman et al. 2015; Carruthers et al. 2014). In early 2014, a conceptual version of the Toolkit was [presented at a workshop](#) of experts from NOAA Fisheries, state agencies, academic institutions, and non-governmental organizations to determine its utility and to refine its functionality (Newman et al. 2014).

The Toolkit has been developed in close collaboration with fisheries scientists and has been used for management and academic research for over 30 fisheries, including by NOAA Fisheries' Southeast and Mid-Atlantic Regions, the California Department of Fish & Wildlife, and the Canadian DFO. The NOAA Fisheries' Southeast Fisheries Science Center has used DLMtool to review data-limited methods and their application to [six tropical reef fish in the U.S. Caribbean](#) and [eight similar stocks in the Gulf of Mexico](#). These applications were the subject of peer-review with independent experts as part of the SEDAR process (SEDAR 46, 2016; SEDAR 49, 2016). The Mid-Atlantic Fishery Management Council (MAFMC) also has used the DLMtool to inform the management of three stocks: black sea bass, blueline tilefish, and Atlantic mackerel. In conjunction with UBC and NRDC, the State of California recently conducted a [demonstration of the DLMtool with four case study stocks](#) for possible adoption as part of the State's fishery management program (Hordyk et al. 2017). Canadian DFO also has used the DLMtool for MSEs of [two Pacific rockfish](#), and is in the process of initiating a three-year program to expand the use of MSEs for all of its unassessed stocks under management (Carruthers 2016).

For this project, we propose to demonstrate the utility of the DLMtool by conducting case study MSEs for data-limited stocks from the Pacific region. The MSE process will involve developing operating models with detailed information on the species, fishing fleets, and assumptions regarding observation and implementation error. The project team will then work to develop performance limits and objectives that are consistent with NOAA policy under the Magnuson-Stevens Act. The MSE will simulation test all potentially applicable data-limited methods, including any additional methods developed specifically by NOAA, to identify the best available methods for providing catch advice for each stock. The project team will then work with NOAA scientists to input into DLMtool all available and relevant fishery data for each stock and to run the best available methods identified through the MSE. The resulting output will be specific catch recommendations for each stock. The project will also identify the value of information to inform future data collection. We will use the results of the MSE to highlight the value of improving the quality (i.e., accuracy and precision) of current data and the benefits of prioritizing future data collection on the highest value information. Finally, we will provide recommendations for a process that integrates the use of the DLMtool into the Pacific Region's fisheries management system, including how use of the DLMtool can be standardized and scaled up to be applied to all unassessed stocks under management, the resources and training that will be required to accomplish this, and an acceptable peer review process for resulting advice.

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