

Scope of work for review of fishing effects (LEI) model, in preparation for 2015 EFH 5-year Review

North Pacific Fishing Effects Model Assessment - Phases 1 and 2

Phase 1 - Objectives

1) *Review the original LEI model and work with NOAA scientists to understand the details of its structure, requirements, and implementation.*

- a) Meet with NOAA personnel to discuss EFH review process and LEI model data inputs.
✓ *Completed* - FAST Lab met with HCD Anchorage on 1 and on 14 January 2014
- b) Meet NOAA personnel to discuss LEI structure and implementation.
✓ *Completed* - FAST Lab reviewed essential LEI structure and inputs with AFSC/RACE staff in Seattle on 6 and 7 January 2014 and with HCD Anchorage on 14 January 2014
- c) Acquire LEI Model code (Matlab) and data inputs.
✓ *Completed* - AFSC/RACE provided the code and data on 7 January 2014.

2) *Review other models, including the SASI model, for applicable code and features.*

- a) Compare LEI and SASI model structure and determine costs and benefits of replacing LEI with SASI vs updating existing LEI.

✓ *Completed* - FAST Lab met with HCD Anchorage in Anchorage on 14 January 2014. We determined that moving from LEI to SASI had no discernible benefit due to the paucity of detailed spatially explicit habitat data.

3) *Propose potential model structures for the next analysis, including alternatives for features and feasibility and tasks/resources required to implement them in later phases.*

- a) Review LEI implementation in Matlab to determine the costs and benefits of re-constituting the model in R.

✓ *Completed* - FAST Lab met with HCD Anchorage in Anchorage on 14 January 2014. We determined that moving LEI from Matlab to R was beneficial because the change enhances the potential for adding features (e.g. recursive tools for estimating model output uncertainty and sensitivity) and for making the model implementation transparent (R is widely used freeware).

- ✓ *To do* - 1) FAST Lab list benefits and better/ new model capabilities in R

The present version of the Fujioka-Rose Long Term Effect Index fishing effects model (LEI) could be improved by streamlining and organizing code, and providing code commenting to facilitate knowledge transfer and transparency of methods amongst analysts. In the process of making these improvements, we recommend that the extent Matlab version of the LEI model be moved into the R statistical programming environment (www.r-project.org). R is freely available, and at present, R enjoys substantially wider use amongst fishery analysts than Matlab. We anticipate no loss in functionality in migrating LEI from Matlab to R, and because R is open access, the programming environment is rapidly expanding. R is supported by the QGIS project (www.qgis.org), an open source and freely available GIS software platform, providing future opportunities to migrate the LEI analyses or other essential fish habitat analyses requiring spatially explicit GIS information into a purely open-access environment.

- b) Review new data (not used in LEI during 2010 EFH cycle) to determine if model structural changes were needed.

- To do* - HCD Anchorage and FAST Lab compile a summary of the new data available by regions. Include steps for merging into existing LEI matrices (in process)

(1) Inputs

- (a) Geol Hab (Sed data, bathy) = 0-7, habitat -z
- (b) Biol Hab (RACE Survey, FEAST/ FATE) = 4 groups
- (c) Fishing (CIA/VMS) = effort x gear type
- (d) Consolidate regions (AI,BS,GOA) into single coverage

(2) Effects Table

- (a) Lit update = % contact x effect
 - (i) Find fishing effects papers since 2009 (pull from Hilborn group)
 - (ii) Review with SASI DB tool
 - (iii) SASI database to LEI tables? (Grabowski et al. 2014)

- To do* - FAST Lab discuss model structure and data table changes needed to accommodate new information. Identify costs/benefits.

- c) Draft document indicating proposed changes to LEI and defining options for features (For BS, AI, and GOA). Include feasibility and tasks/resources required to implement them in later phases.

- To do* - FAST Lab

Phase 2 - Objectives

- 1) *Modify proposal for updated model based on NOAA personnel feedback on Phase 1*
- 2) *Implement a basic version of the model sufficient to run the original data for comparison and validation with original results.*
- 3) *Compiling updated information on all significant input parameters*
- 4) *Interacting with NOAA and NPFMC personnel to select features for full implementation of the model.*
- 5) *Presentations to and discussions with NPFMC plan team members and the Scientific and Statistical Committee as needed.*