Methods using RTMB and Nimble in Fisheries

Pacific Stock Assessment Renewal Workshop Series

**Format:** In-Person (w/ virtual option to join)

**Location:** Nanaimo, BC

**Dates:** 2 days, September 24/25

**Times:** Day 1: 10:30 – 4:30, Day 2: 9:30 – 4:30

Description: We will review some of the skills that were taught at the RTMB workshop with a special focus on building a stock-recruitment model for salmon to keep things relatively simple. We will explore finding the MLE, a penalized MLE, posterior mode, full posterior (using STAN). We will explore differences in sampling random effects with MCMC (or HMC) compared with using Laplace to marginalize over the random effects. Models will be written in both RTMB syntax and Nimble with basic comparison for speed, ease of use, and inference.

Each day, the first half of the day will be engaged discussion and coding. The second half of the day will be optional and time to complete your own coding with group discussion about improvement for efficiency and other parts.

**Detailed Agenda:** Will update with feedback and planning closer to the date.

**Day 1:**

1. RTMB:
   1. Basic review of how to use RTMB.
   2. Writing a salmon stock-recruit relationship.
   3. Adding in complexity in.
2. Nimble:
   1. Basic introduction to Nimble.
   2. Writing the same model stock-recruit model in Nimble.
   3. Adding additional complexity.
3. Intro to Bayesian methods using Nimble and STAN.
4. Optional (Independent group work time)

**Day 2:**

1. Comparing Frequentist and Bayesian models.
2. Transformations:
   1. Why do some models include a bias correction term?
   2. When do you include a Jacobian for a transformation?
3. Discussion
4. Optional (Independent group work time)