Summary of Sea Cucumber CSRF Meeting

<u>DATA NEEDS</u>
- QMA resolution modeling: average split weight by QMA for calculating biomass
- Tom wants varying habitats that give a range of exposed vs sheltered areas
- Biologists opinions about which sub-areas should be used specifically
  - Contrast this with management
- A solid rational to use sub-areas, makes it easier for Tom
- A biomass estimate for each sub-area
  - Pauline has the calculation to achieve this
  - Jill also might have the R code for this, potentially just the extrapolation
- Need to give Tom the access tables and R code for densities and biomass estimates
- Tom wants to use catch numbers as opposed to catch weight, this works with the model
- Wants to know how the management strategy (exploitation rate) is decided on, and other closely related strategies to test
  - Can get this from Pauline
- He wants the baseline numbers (catch) for every year by sub-area
  - From Pauline
- Look into density dependent growth for Seacucumbers
- Preliminary work done by Jill
  - The split weight and fecundity relationship does not exist
  - We could remove or add it into the model and see the impact
- He wants a better way to justify the reason for choosing factors for the model
- Want to know the survival of juvenile sea cucumbers
  - No one is 100% sure on this
- What keeps the sea cucumber densities low
  - Food availability
  - Exposure
  - Sea Stars (Pycnopodia)
    - Pauline: seen densities go up and size go down, thinks that this might have to do with seastar wasting disease
- Tom wants to create a worst case scenario to test
  - For each area create the worst and the best scenarios
  - Along with the middle ground as well
- Want the experimental fishery data
  - Can be found referenced in the IFMP
- Absolute biomass/numbers survey
- He does not want to infer biomass from the last recorded density, he wants to calculate it using the data form the year it was collected
- He wants the absolute biomass estimate plus the year that estimate was calculated
  - Could be from Pauline
  - COuld be in Jill's table
- Mackenzie: get the dive hours for commercial CPUE
- Tom wants the Biomass mean rather than the Biomass90
- He wants Jill;s R code for calculating densities and biomass
- Needs the update 2023 data for LRP and harvest rates
  - New LRP is density based by area, not shoreline

- Need to get the density estimate per m^2 for a year
- Tom's prioritize:
  - The R code/data access for calculating current absolute abundance/numbers
    - ASW by subarea (survey year) in extracted table
    - Send list of surveyed sub areas to DFO Managers to select 1-20 sub areas that represent a range of ecological/ biological conditions and management approaches
  - Commercial CPUE
- Get rid of the weight by sub area in Jill's table, these numbers are not official science advice
- Rotational closures
  - What regulations change from area to area as they rotate?
  - How does the decision of opening or closing them get made?
  - How could this be defined and added to the model?
  - Ability to show the decision of opening or closing sub areas to people who to know this info (like industry)
- Factors taken into account when setting adaptive management
  - Size of cucumber (low tac)
  - Fisherman think tac is too high
  - Area might need a rest (too many smalls/low density last year)
  - Balancing catch (maybe don't need as much catch in one area)
  - Effort distribution
- FM would like to see basic economic model in case they ever need it
- Could we be more specific of the level that we should be considering when deciding to close an area/give it a rest for a bit
  - IT would show the cost benefit of closing/keeping open areas
  - On a sub area basis
- Question: do we need no take reserves, what are the impact of conservation areas
- Next steps
  - Data finalization
  - Areas for operating model refinement
  - Management questions
  - Robustness
  - Performance metrics
- Management measures
  - NEEDED: status quo for each sub area (hard to obtain)
- Jill is looking at the harvester's behavior over a time period to better map the fishing activity over time
- Maybe look at hours of dive time by harvesters as a metric
  - See where they are spending more time
  - It tells you about relative preference per area
    - No sure how well they would report their time spent
- Robustness tests
  - Sea Otters
  - Illegal Harvest
  - Maturity/Fec (on/off) (density dependent)

- - - o Sigma R (recruitment variability)
  - o Subarea- QMA dynamics
  - o Natural mortality (level (max age), variability, trend)
  - o Average split weight calcs
  - o Biomass/numbers calcs
  - o Selectivity
  - o Economics model (on/off)
  - o Steepness
  - o Density dependent selectivity
  - o Imposed spatial closures (30-30)
  - o Unreported catches (community based fishery with other reporting systems)
- NEEDED: density vs mean weight plot
- Pauline will share list of no-take subareas (at least with Jill)

MODELING WORK TO DO
- Selectivity in highly selective fisheries
  - o Might have size and survey data for other dive fisheries
- Tom has better data at the sub-area level

DECISIONS MADE
- Going to use sub-areas instead of QMAs

MANAGEMENT QUESTIONS
- What density per subarea is indicative of overfishing
- How precautionary are current management approaches?
- What is the conservation benefit of no-take subareas?
- Is the 2.5 C/m shoreline reopening threshold important to conservation?
- Which areas are currently most at risk?
- What is the relative performance of Control points based on unfished density (by subarea) rather than a nominal density (e.g. x c/m-sl)
- What is the relative performance of alternative control points?
- Subarea control points - how well do these achieve overall (summed) LRP performance across multiple areas?
- 15 cm 'pencil' effect (is there some other reference that is better for fishermen?)

PERFORMANCE METRICS
- Yield
- Conservation (LRP), SSB0, BMSY, density
- Stability in yield
- Economic viability (eg. catch rate over minimum threshold)
- Accessibility (access to high density areas)
- Harvest rate (efficiency)
- Localized over harvesting (masked by coast-wide stock definition)