Reporting Day 1 workshop.

Need to get partipants list…

Noel Cadigan

-Poor data, low value stokcs.

-Time-series length-based time-series.

-No fishery size, poorly known catch accuracy.

**Amorphous uncertainty – known knowns, known unknown, unknown unknowns. Donald Rumfield.**

-Thorny Skate – Landings Accuracy of Thorny- Probably better than winter and small if they occur in the areas.

**-Growth Changes has anyone track cohorts. Growth Changes have occurred in Small pelagics too.**

SAM – Age-Sturcture Catch-at-Age ACL….

-VonB model and covert to Age.

**Nice thing is to make assumptions for particular stocks, but if coding is inaccurate across an agency might be an issue. Standardize or be more accurate at the risk of being inaccurate?**

**Timing of survey – seasonal growth account for it during the survey in your growth model.**

**Calendar Year vs Fish Year. – make sure you track the biology or an artificial construct.**

**Landings accuracy – good place for MSE?? – Process error? MSE?. On the other hand, would land on your fixed 0.5 Process error SD.**

**Applying VonB for a skate? – Lorezen M not good? – Pelagic fishes good? – Same issue**

**SURBA – Type of catchability model. -without landings and predicts landing.**

**Model Age errors – Witchflounder. Huge aging error. -We had aging errors in our stock and has been fixed since.**

**Benefits of SURBA:**

**-Can be used for fleets that have no age samples.**

**-Short-lived vs of a long-lived species like capelin? IF you had a good survey of capelin. Once you know the size of Capelin you will know the age. Could work really well.**

**-TAC removals of F and Fishery Mortality.**

**-Multiple areas or changes in distribution – make multi-fleet. Post Stratification?**

**-Changes in age Structure and Length. Assumption of changes in Growth?\*\*\***

**-Why Use Age structure at all? Why not use probability matrices instead of Age-based surveys?**

**Dr. Tim Barrett – Stock assessment Bmsy, LRPS, stock-recruitment.**

-No analytical model since 1999

-Needs rebuilding since 2001

-LRP defined 2005-2010, Stock below LRP since 2018.

-Natural M. – 3 M scenarios.

-High and Steepness values. Likelihood function. 0.65-0.95 – two unit change for Loglikelihood.

-“Good” fit in S-R. Sarcasm…

-Candidate B0, BMSY, Blim (Sainsbury 2008). Stock dynamics declines for BLim.

-equilibrium BMSY is no good because decline of growth, maturity, and recruitment.

-Time period selected , get completely different estimates. SSBMY – Dynamic Bmsy, change in 50% over years… So what to do?

Longest time period as possible, information from only a low productivity.

-Reevaulate reference points to represent current environmental conditions. Difference in philosophy.

-TESA- fully dynamics BMSY is not appropropraite for an LRP. Decreases in productivity seems to be in conflict with the Precautionary approach.

-Challenges?

– Lack of Stock-Recruitment relationship. Prior? Posterior identifical. No informative priors.

-“substantial extrapolation, one may want to consider a different approach”.

-Solutions to Lack of SR.

**-Hockey stick or Sigmoid BH. -**

**Challenge: Time Varying, Operating Models.**

**Fixed M and H were not estimated. M and H correlated. – Unreasonable productivity scenarios. Low/Low and High/high M and h not plausible.**

**Egg Production and SSB and Stock-recruitment. (See Marshall et al. 2021).**

**-Weight-at-age., Fecundity, 27% less in 2020 than 2000.**

**My preferred LRP:**

-Blim – ICES 2017- Spasmodic stock, lowest biomass where large recruitment occurred. No clear S-R signal.

-Change point analysis – 1985 in production 1990. Lowest observed biomass SSB2007.

-SSB2007 vs acoustic index.

-Some thoughts on LRPS and Small Pelgics. Upper bound to be avoided. LRP not really linked to SSB. 0.2 B0, FX%SPR and equilibrium FX%SPR.

-Brecover/Blim/Br

Lessons learned –

Fixed h and M

-Bmsy on h assumed.

-careful with SPR that use h. Millar and Brooks 2021.

Consider alternative forms of SPR

-Nationa plan forthcoming 2025

Questions

“See SPR why they break, and then learn from the different assumptions”.

Why not Ricker? Not plausible at high biomass, probably recruitment does not decline.

Change of productivity – Assumptions – Is productivity reversible.

Stock-recruitment relationships are not always ideal for small pelagics.

-Moved-on .

**Elisabeth Van Baren – Natural Mortality assumptions. Mackerel.**

-Egg production index

-Landings

Catch-at-age.

-Assumed M at 0.2, probably not fixed M, due to evidence of predation.

A) Defined different fixed M, and then what fit the best.

b) Mark-Recapture – not available.

c) Life history approaches . Very different results from different characteristics.

d) Inside Model estimates, need more data.

e) Consumption Estimates may be easier, because we actually have data on that.

- Github available for consumption estimates – Solution.

Strong evidence of increases M, without predators switching to other Prey items.

-However, some data limitations. Absolute abundance estimates, diet is overlimited.

-How to use information – Separate “Fleet”.

-Outside of model – too much uncertainty.

-“M rescaling”. -Did not improve fit. Small changes in SSB. “best available information” but lots of assumption.

Option 3 – Multiple Models

-Need a framework to capture uncertainty in M, several plausible models. Advisable to use several approaches to estimate M. Ended up with MSE, started 2018.

Many issues with using MSE, key uncertainties may not have been identified, exceptional circumstances were met, MSE iterative and challenging with uncertainties are big. Still struggle plausible models. Subjectiveness of operating models impact selection management strategy.

MSE – Science started it, no buy-in from industry for MSE. Minister/managers do have to stick to a HCR if its in a poor state, so MP does not want to be implemented.

MSE vs stock-assessment – high costs, but high benefits. Start internal to test things first rather than involve everyone from the start.

Conclusions – No golden solution for time-varying M. Consumption history is time consuming. Complex models are theretically, but may not be realistic. Need a really good communication on uncertiainties in MSE and how to use it. (NATIONAL ADVICE HERE).

Next for consumption estimates – External information to the model, but not in the model. Not sure how folks would react with using it with a Time-Varying M. Could have different assumptions which changes your results. So still change

Constant M – fixed 0.3? AIC, whole time series or windows or annual?

**Jennifer Boldt – Forage Fish workshop**

**Filling in the forage Fish Gap – PIES TEAM. Formed from Researchers from ecosystems.**

**-Changes in Staff, budgets, and resources.**

**-Increase efficiencies as much as possible in the absence of current resources.**

**-Objectives to find data gaps and objectives for forage fish monitoring.**

**-Identified samples not sampled well.**

**-Summary Table of methods to sample pelagic fish and Pros/Cons and recommendations,considerations,solutions.**

**-Discussions – Metadata responsitory helpful, standardize data formats. Large data formats hard to store.**

**-Create a network working on forage fish. –**

**-New efforts to help knowledge gaps, complementary sampling required. (summary available in slides). Issues standardization of methods and gears.**

**-IPES survey – Ecosystem-based approach to survey with many different samplings.**

**Recommendations from workshop – Identify methods that complemen, new methodologies that have high cost burden, but useful etc.**

**Proposed National Forage fish working group. –**

**-Jennifer Boldt – Distribution map of Herring Spawning – follow-up.**

**-Identify the forage fish gaps. Reviewed paper. Commercial species more data, Organization articles dominated early time period and now peer-review papers do.**

**-Prey of forage fish least available.**

**-Jennifer Boldt – Haida Gwaii – New Studies for this population. Hypothesized links using literature review.**

**-Data exploration – to determine whether mechanistic approaches correlate.**

**-Science Response for EAFM and what could be pressures.**

**-Use inforgraphics to develop**

**-Forage Fish working group - -> EFAM case-study. Data availability is the challenge. Andy Edwards package with data layer to help inform methods.**

**Sarah Hawshaw – Stakeholder engagement and MSE**

-SCAA, development LRP/USR, MSE, Engagement of indigenous examples. Succcesses and challenges.

-Major SARs – MSE processes -Minor SARs – monitored but not MSE.

-Spring Spawners. Early age mature 2-4. Annual spawn, spawn on kelp. Surveys easy in some ways, egg depositions. Evidence of migratory and non-migratory.

-Geentic structure? – Some evidence.

Stock Assessment – 100% catch validation, spawning survey approach.

SCAA – 1 year ahead projections.

LRP – 0.3SBo, recent period of low-productivity/low-biomass and high mortality. Like Tim proposed.

USR – Average biomass over a productive period, engagement Intention to use it at target biomass point rather than a USR for a HCR rule.? **WITH DFO POLICY CHANGES can this affect it?**

Stock status may not reflect local and indigenous experience may not be true, identified as Cautious or Healthy…. But may be critical.

-Evidence of DD, changes in predator community.

-Large uncertainty in SR and B-H model.

**MSE Process**

**2016-2018 development.**  Development of MPs at a aggregate stock rather than local level.

-Effects of uncertainty. “Taking care of herring” collaboration with he Nuu-cha-nuth nation. Landmark fisheries research and DFO.

-Haida Gwaii Pacific Herring Rebuilding Plan: An Ecosystem Approach.

**-Taking Care of Herring**

**-** **Led by nation, hired Landmark. Predation mortality on Herring.**

**-bio-energetic requirements. Consumption estimates.**

**Predators on herring based on traditional knowledge. (harvests of predators and balance).**

**-Some data time-series with Predator abundances.**

**-Predator increases leading to slower recovery of stock.**

**-First-Nation raised concerns about changes to ecosystem and access to the resource.**

**-Current estimates balance herring production.**

**-Use diet work consumption study to update this work.**

**Haida Gwaii – Iiaang Pacific Herring.**

* **1 Major and 1 Minor Herring Stocks.**
* **Co-developed with Haida Gwaii, DFO, Parks Canada . Reconilation agreements.**
* **Incorporates both science and traditional knowledge.**
* **Showed different layers of Ethics & Values, Traditional Knowledge, and EBFM.**
* **Low Biomass-Low growth state since 2000. No commercial fishery in 2004.**
* **Indicates 33% under no fishing of rebuilding the stock.**
* **Try to define aggregate stock at a small scale.**
* **Locations identified by Haida Gwaii coincide with DFO surveys.**
* **Sub stock areas for the two components.**
* **Cycle 2 – rebuilding – rebuilding targets based on a productive period 76-85. Included haida knowledge and coincided with western knowledge.**
* **Trying to get back to high productive period, but realistic in the sense it has intermediate goal of getting to 50% unfished biomass estimate.**
* **Results of rebuilding plan – little difference in growth of the stock, tested various options no-fishing vs fishing. The stock ability to recover is due to environmental factors outside of our control.**
* **Perhaps allow low harvests over a rebuilding harvest.**

**Sucesses and Challenges of MSE Pacific Herring.**

**Sucesses**

**-collaborations were scope to address key uncertainties**

**-no commercial fishing meaning no contention with fishing decisions,**

**-Understanding predation.**

**-**

**Challenges :**

**-Spatial management areas.**

**-large amount resources to collaborate.**

**-**

**-Similar trends in SSB for both areas – but cause-effect for low productivity still low.**

**-What research pieces are necessary to help with mechanistic understanding with stocks in low productivity.**

**Francois Turcotte.**

Trends in Natural mortality across sGSL species.

-Potential causes of M – doug swain investigations.

-Cod -> Changes in water temperature, less suitable habitat, and top predators consumption.

-Herring -> Seal consumption, unknown source of catch exists but small (bait),.

Spring Model

-Look at variety of models. “Best” lowest AIC, had time varying q and M models.

Few things. Increases in M in older fish.

Change in Scale SSB.

Fall Model –

Aware that SSB is underestimated, but at least not overestimate to be precautionary.

-Benoit and Raill 2016- Provided estimates of annual herring consumptions.

-Coorelations between Changes in predation and increases in M for older cohorts

-Bluefin tuna – corelations with herring and Tuna, with Tuna index going up.

-BFT – stomach samples – Herring and Mackerel 50/50, post 2018, no herring in diet.

**-Opportunistic sampling – with diet so annual estimates may not be accurate?**

**Keith Lewis – capelin Reference point.**

**Background** – Revisions to Fish Act. Every stock needs an LRP.

-LRP National Advisory Process.

-spoke about tradeoffs between Data richness and possible LRP approach.

-Life-history – K vs r, well capelin are probably r selected, so probably not a strong S-R relationship.

-Soviets did surveys in the 70s, large biomass estimate.

-capelin crashed in 1991, followed by Cod and groundfishes in 1992.

Common Themes – Predator/Prey consumption and Predator estimates.

-LRP when the stock shows signs of low productivity when do you look slough off previous data.

-Precautionary Approach Policy likely needs review to reflect current sicnece and current rebuilding policy.

-Recover of pelagics is slow, but related to predator biomass increases.

Lesson-learned: Used whole time series, but maybe try to get consensus within DFO or with consultants prior to the RAP.

-Capelin – “great” stock recruitment approach. ICES approach for Capelin even worse.

-Lesson read SAR for capelin.

-RAP – Table for LRP approaches.