LRP Project – South Coast Chum Case Study

Working Notes

Luke Warkentin

**General questions for Kendra:**

1. Is MU necessary?

2. Check that Year is actually brood year in the infilling code

3. Check that Escape column is spawners (as opposed to the Return column)

4. FLAG: Should probably limit stock-recruit data to year > 1959/1960 to allow for full brood year returns up to age 6. This may be done automatically, see retroFunctions.r line 20

**Notes on data:**

Why remove summer run? They fill in some gaps in Upper Knight and Bute Inlet CUs

Check in report, if not, follow up with Pieter Van Will.

Why remove Qualicum River, Little Qualicum River, Puntledge River?

Source variable: what is difference between RACK, Enhanced, and Brood?

**Chum Data infilling**

Luke’s notes on infilling:

* Data filtering step
  + remove summer run
  + remove Qualicum River, Little Qualicum River, Puntledge River
  + remove non-wild fish
* Get geometric mean of spawners across all years
* Get sum of geometric means across CUs
* Get proportion

**Observations related to infilling**:

* There is a lot of by-stream infilling (although by the numbers, it doesn’t add a lot of abundance for most years/CUS, but there are some exceptions, especially for Howe Sound/Burrard Inlet and Georgia Strait).
* Sensitive to high-abundance streams, especially in years with few monitored streams
* Are the stock-recruit relationships (recruits?) based on infilled escapement data?
* IF so, this could partially explain the very large residuals from mean Ricker.
* Could there be a better way of doing it (e.g., percentile, but select the highest observed spawning escapement for each stream, add, to get a kind of max observed aggregate abundance? Then get 25% of that?)
* This infilling assumes that escapement between streams within a CU is correlated. When you actually look at whether observed escapements, for some CUs, they are as likely to be correlated as not.

(from:

Adapting benchmarks of biological status for persistent changes in productivity and

variability in exploitation history with a focus on data-limited populations (Conservation

Units) of chum salmon in southern BC

Carrie Holt, Brooke Davis, Lyse Godbout, Pieter Van Will, and Wilf Luedke

<https://www.psc.org/download/466/information/8412/s15-i13-adapting-benchmarks-of-biological-status-for-persistent-changes-in-productivity-and-variability-in-exploitation-history-with-a-focus-on-data-limited-populations-of-chum-salmon-in-southern-bc.pdf> )

Stream-specific escapement for inner south coast chum were aggregated to the CU level, and

identified as either wild, or enhanced (hatchery-origin fish, or those fish used for hatchery brood

stock). Wild escapement were infilled at the stream level and then again at the CU level when

there were no escapement estimates for a site within a given CU or a CU within the inner south

coast region. Infilling assumed that sites within CUs, and CUs within the region contributed their

geometric average proportion of overall escapement in years when data were missing. Infilling

occurred at the CU level for two out of seven CUs: Upper Knight (1979, 1980, 1982, 1984, 1989,

1991, 1996, 2004-1013) and Bute Inlet (2005, 2006, 2008-2013). CU-specific returns were

estimated for all fish using backwards catch reconstructions with variable vulnerability levels for

each CU to each fishery (Van Will 2014). To estimate wild returns, we applied the same

proportion of wild fish in escapement to catches, i.e., we assumed that enhanced and wild fish

were equally vulnerable to the fishery. Brood year returns were calculated assuming annual

estimates of age-at-maturity from the mixed-stock fishery in Johnstone Strait (Van Will 2014).

Notes on data infilling/PVW data process

**“Chum Escapement With Areas.xlsx”**

tab “Updated 2018” is the raw escapement data, no infilling. This tab is currently saved in the SCChumStudy/DataIn as “ChumEscapementDataWithAreas\_2018.csv” . This is what the infilling code goes into.

* Questions for Pieter: why did Brooke remove summer run?

**“Copy of AllInfilled\_2\_26\_16.xlsx”**

This file gets four files input as tabs (which are generated by Brooke’s infilling code, as far as I can tell)

* “All By Site” tab: Total escapement (wild + hatchery) infilled by stream
* “Wild By Site” tab: Wild escapement infilled by stream
* “By CU” tab: Escapement infilled by CU, columns for wild and total escapement
* “By Area” tab: Wild and total escapement (infilled) by CU and area, this goes into PivotArea tab.
* How does infilling happen by “CU and Area”?  (e.g., infill Area 16 in Georgia Strait CU by other Areas in Georgia Strait in that year?)

Check Brooke’s code

* Do you understand why there would be negative values in the “Enhanced Esc” column of the “By Area” tab?  (i.e., why is the “All Escapement” column sometimes lower than the “Wild Escapement” column”

Check Brooke’s code

The next two tabs summarize the input data

* “PivotArea” tab: summarizes total escapement (infilled) by CU and Area (Areas are the scale that fisheries catch is monitored at) -> this goes into “Updated Wild ISC Chum Stock by Year.xlsx”
* “PivotProportionWild” tab: gets the proportion of wild:total escapement (infilled) by CU and Area -> this goes into “Updated Wild ISC Chum Stock by Year.xlsx”

My initial thought was ‘should we switch to only using infilled by sites’ here, but I am now realizing that this is not possible because we have no way to separate catch as belonging to streams for which infilling by site is possible.  All sites that possibly contribute to catch must be accounted for, so for this step, infilling by CU is needed.  Am I right in my understanding here?

The last tab:

* “Read Me” tab: appears to be notes from Brooke and Pieter

**“Updated Wild ISC Chum Stock by Year.xlsx”**

master xlsx, organized by CU, Area, and year.

Inputs:

1. Infilled total escapement (wild + hatchery) from “Copy of AllInfilled\_2\_26\_16.xlsx”
2. Catch data (from another file, from Pieter?)
3. Proportion wild from “Copy of AllInfilled\_2\_26\_16.xlsx”

This file adds infilled escapement + catch data to get total stock (total returns/recruits) then multiplies the proportion wild to get wild returns/recruits.

* Question for Pieter: Why are Areas 11+12 combined for Southern Coastal streams?

Other concerns: proportion wild is currently calculated using infilled data by stream (and by CU for Bute, Knight inlets). Is this okay? Unless we use proportion wild using only observed escapement data (which might not be good), it is the best we have.

I think my last question was related to this, although I understood that the “PivotProportionWild” tab of **“Copy of AllInfilled\_2\_26\_16.xlsx”** was infilled by CU and Area rather than stream.

Then the wild recruits go into a code that makes a brood table based on age distribution.

My understanding is that Pieter needs to run his run reconstruction model to get the catch by CU and Area.  The input data to the run reconstruction model would be (1) mixed-CU-Area catch, (2) escapement by CU-Area, and (3) assumptions about CU-Area run timing and migration paths.  The run reconstruction model would then use all of these inputs to divvy the mixed-CU catch among CUs (or possibly sites, depending on the scale it works at).

This means that Pieter needs an updated copy of **Copy of AllInfilled\_2\_26\_16.xlsx**” from us so that he can run the run reconstruction model and send you the catch by CU and Area.  I suggest also sending him the proportion wild input data so that he can calculate the wild Returns himself.  I don’t think we want to be involved in opening the run reconstruction model can of worms … but, we can talk more about this by phone.