2017 Fraser Chum Expectations and In-season Management Approach

FRAFS Forum

March 7, 2017

2017 Fraser Chum Expectations

- No pre-season forecast
- Outlook status of "abundant" or 4
- Good escapement in 2013 brood year (escapement 950,000; terminal return 1.26 million)
- Note: poor returns for other Fraser salmon species with 2014 ocean entry year (2015 coho, 2016 sockeye, 2015 pink)

2017 In-season Management Approach

- Fraser River chum fisheries are managed based on decision rules outlined in the IFMP

Run Size	Harvest Plan	Lower Fraser First Nations	Commercial	Recreational
<500,000 in Fraser	<10%	Limited (reduced hours and days/week fishing)	Closed	Main stem Fraser River closed, restricted openings on tributaries
500,000 to 800,000 in Fraser	Directed fisheries limited to FSC	Normal	Closed	Main stem Fraser River closed, restricted openings on tributaries
800,000 to 916,000 in Fraser	Catch not to exceed 91,800 (82,800 First Nations and 9,000 test fishing)	Normal	Closed	Main stem Fraser River open, restricted openings on tributaries
916,000 to 1,050,000 in Fraser	Commercial catch not to exceed 10% for chum.	Normal	Open (35,000-105,000)	Open
>1,050,000 in Fraser	Commercial catch not to exceed 15% for chum.	Normal	Open (105,000 plus)	Open

2017 In-season Management Approach

- Fraser chum are managed as one aggregate
- Fishery management decisions for terminal fisheries are based on in-season estimates of Fraser chum terminal run size
- Fraser chum run size is estimated using a model that relates catch per unit effort (CPUE) from Albion test fishery to post-season estimates of Fraser chum terminal abundance

Albion Chum Test Fishery

- 6.75” mesh drift net
- 2 - 30 minute sets per day at daily high tide
- Alternates days from September 1 to October 20, then daily from October 21 to mid-November, then every second day until approx. November 23
- This fishing pattern (and location) has been very consistent since the test fishery was initiated in 1979
- Kept and released catch is uploaded to the FOS database and is available online immediately after daily sets are complete

http://www.pac.dfo-mpo.gc.ca/fm-gp/fraser/docs/commercial/albionchum-keta-eng.html

Albion Chum Species Retention

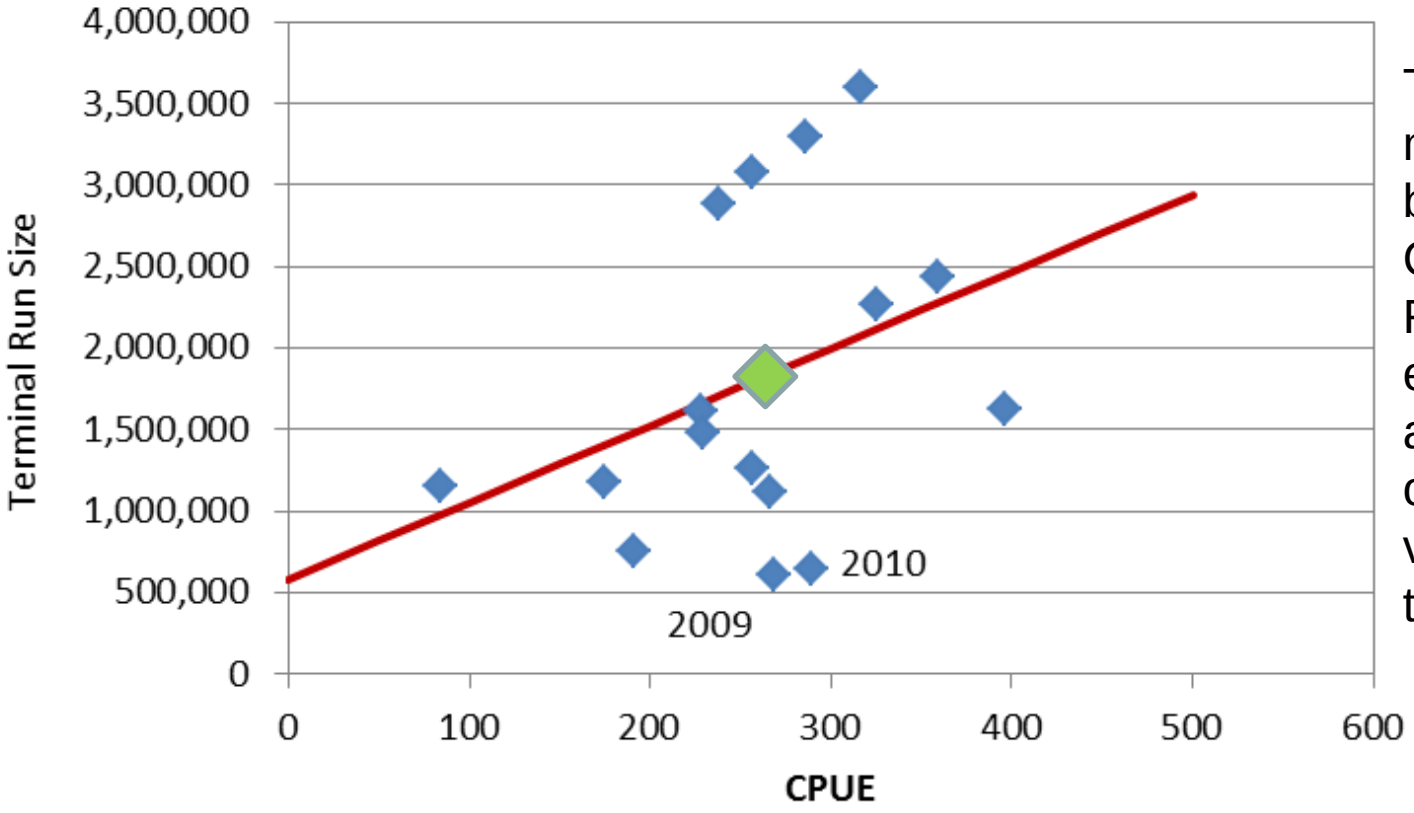
- All chum, Chinook, pink, and sockeye are retained
- Coho are typically released, but have been retained for DNA other biological samples since 2014
- All Chinook are sampled
- A portion of sockeye are sampled as requested by Fraser Panel
- Steelhead are released (unsampled)
- Sturgeon are sampled for PIT tags and released

Albion Chum Biological Samples

- Up to 25 chum are sampled daily (length, weight, sex, scales)
- Data is entered manually to spreadsheets and are uploaded to FOS post-season
- Scales are read for ages post-season
- Biological sample data are not available on-line, but can be provided upon request
- In 2016, a portion of scales were submitted for DNA analysis as part of the "Fraser-Chilliwack Genetic Mark-Recapture Study" (analysis is not yet complete)

Estimating Fraser Chum Run Size

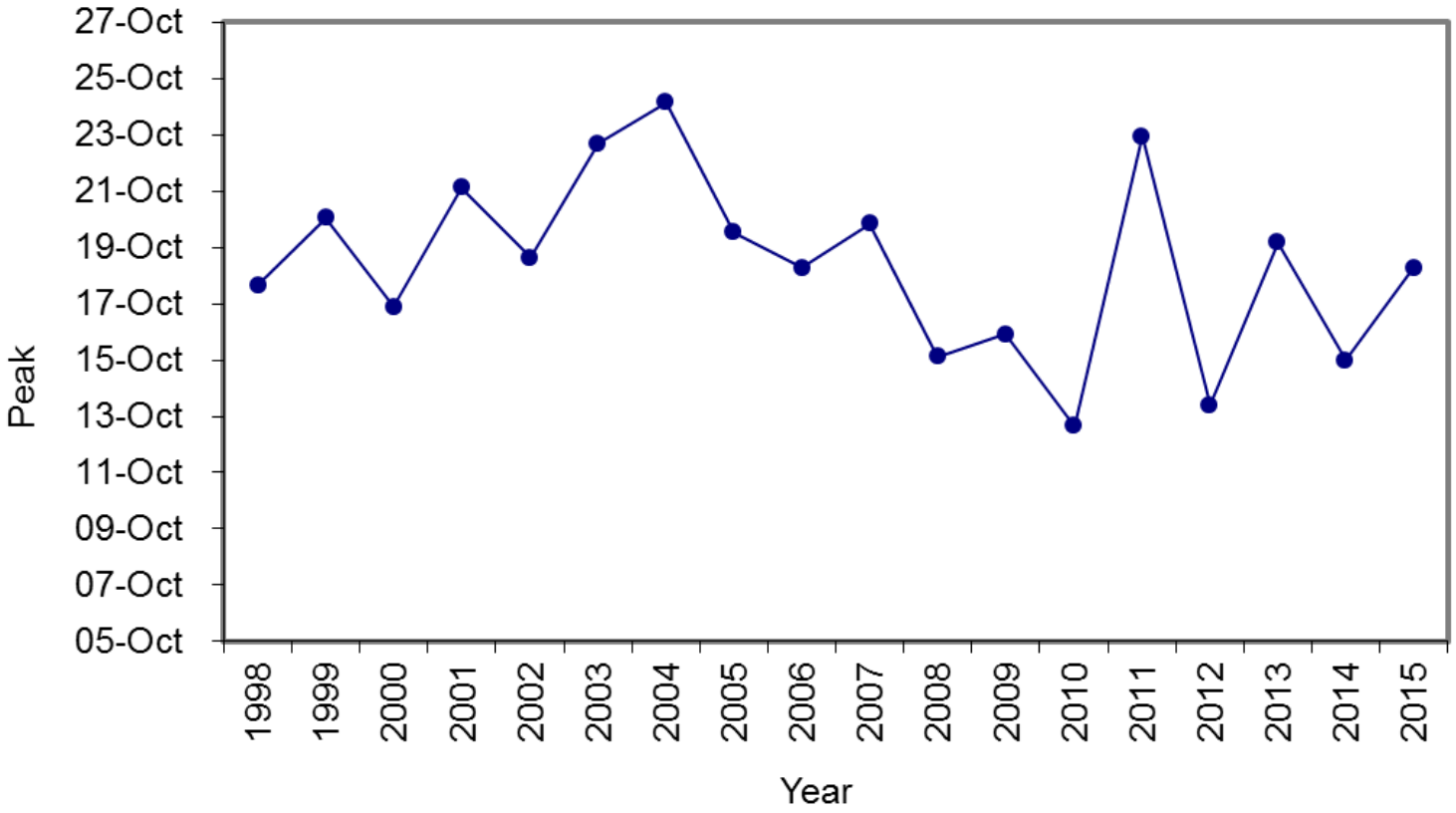
- The most basic models rely only test fishery CPUE at a given date and to estimate run size



This simple model between CPUE and Run Size explains only about 13% of the variability in the data

Model uncertainty - TIMING

- Timing of return varies from one year to the next



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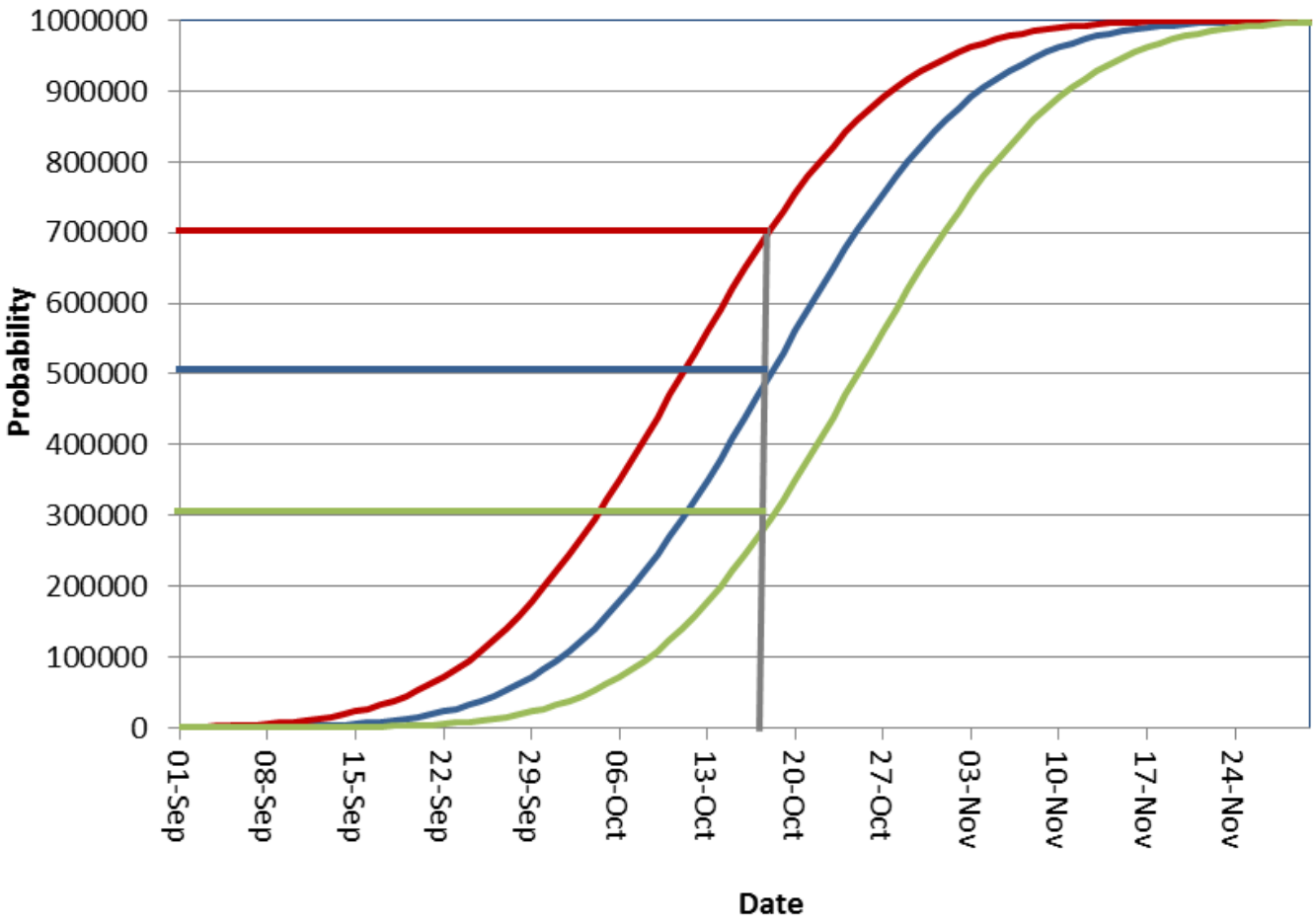
Model uncertainty - TIMING



If a run is later than average, assuming average timing will underestimate the run size

If a run is earlier than average, assuming average timing will overestimate the run size

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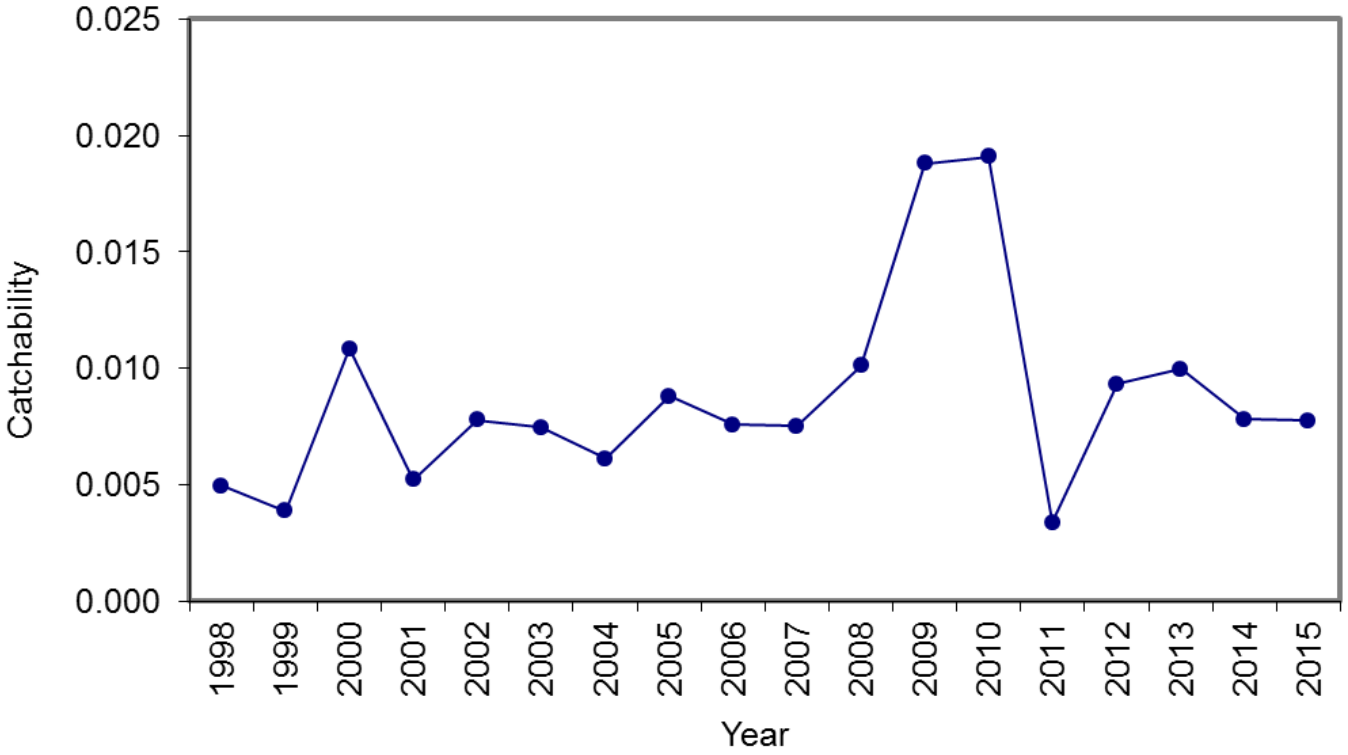
Model uncertainty - CATCHABILITY

- The proportion of chum returning to the Fraser that are harvested by the Albion test fishery is referred to as the "catchability" of the test fishery.
- This value is highly variable between years, due to a combination of physical conditions (flow, water clarity, channel movement), and biological conditions (size of fish, location of fish within the channel, abundance)
  - If catchability is lower than average, assuming an average value will underestimate the run size
  - If catchability is higher than average, assuming an average value will overestimate the run size

Albion Test Fishery Chum Catchability



Catchability can vary greatly from one year to the next.

The highest catchabilities recorded at Albion were seen in 2009 and 2010.

The lowest catchability recorded was noted the following year.

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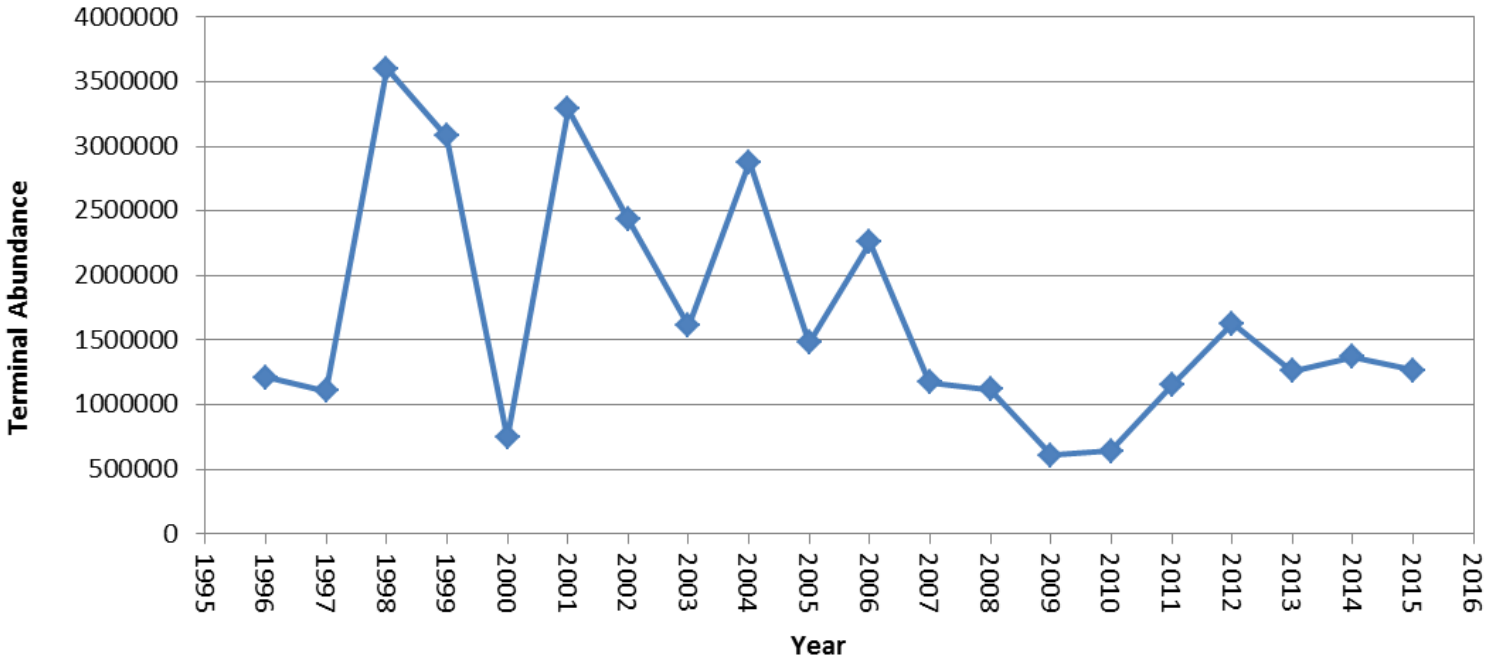
Model Uncertainty – POST-SEASON ABUNDANCE

- Post-season abundance = in-river catch + escapement
- Because Fraser chum are managed as one aggregate, there are no stock composition data required



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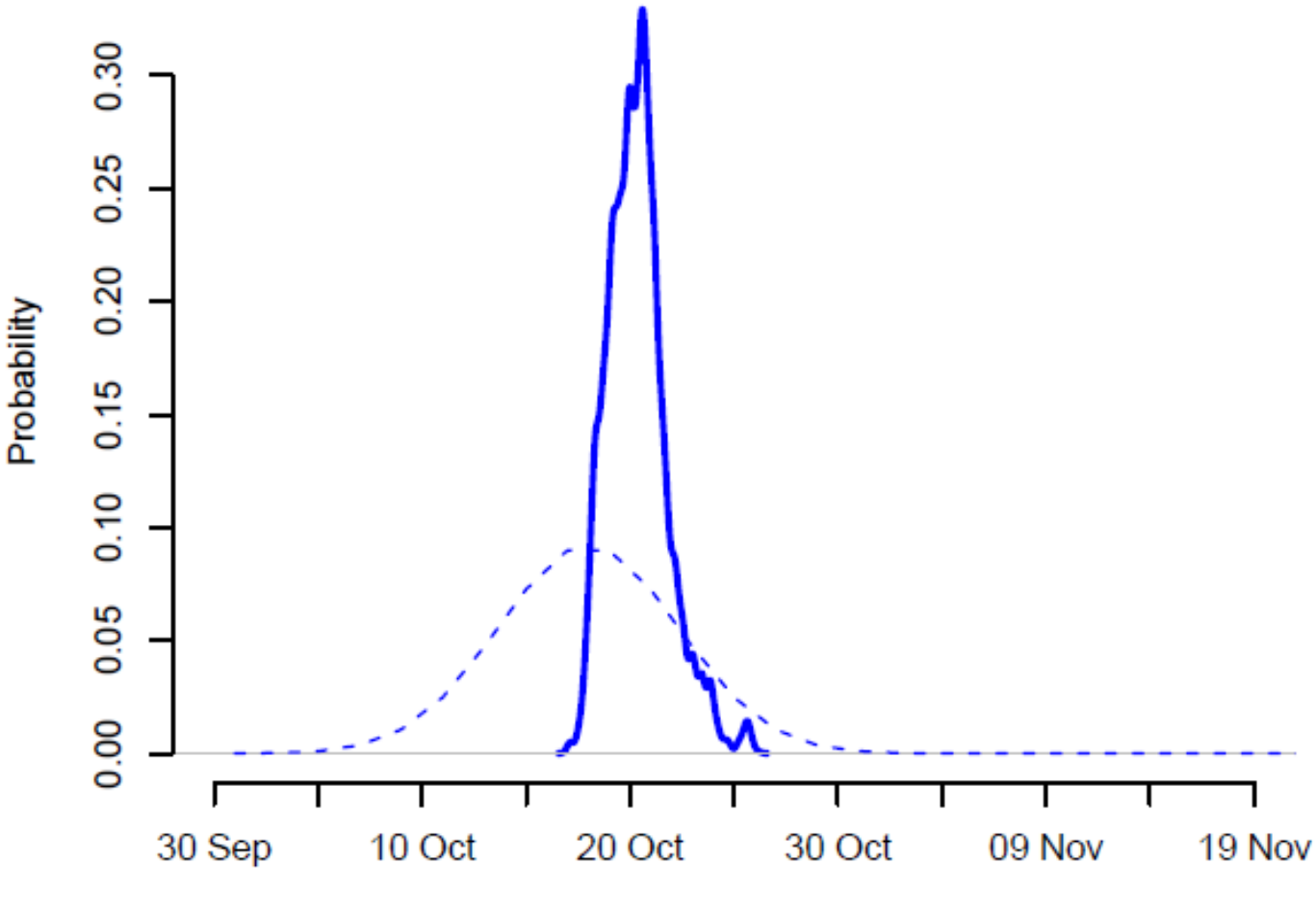
So how do we deal with all this uncertainty?

Build a model that explicitly accounts for the key factors contributing to the uncertainties and gather data to measure the values of these key factors.

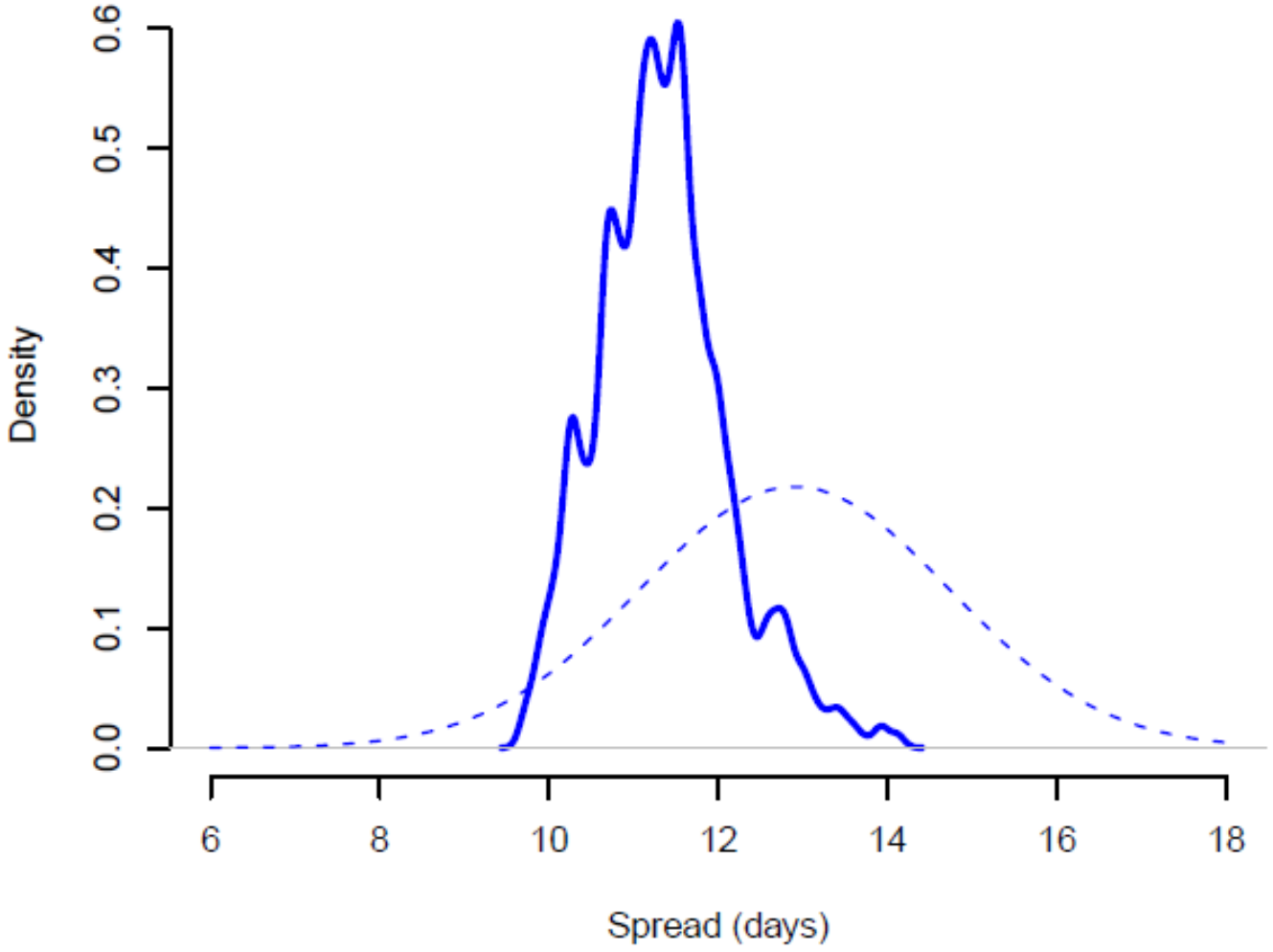
Albion Bayesian In-season Update Model

- Includes "prior" information on factors affecting in-season estimates: post-season terminal run size, peak timing and spread of the run, and catchability
- Priors provide bounds on the estimates for these factors
- Priors are based on historical data
- Run size prior based on median and CV from years 1980 to present (2015)
- Peak timing, spread of the run, catchability based on median and CV from 1998 to present

Prior Distributions – Peak Timing



Prior Distributions - Spread



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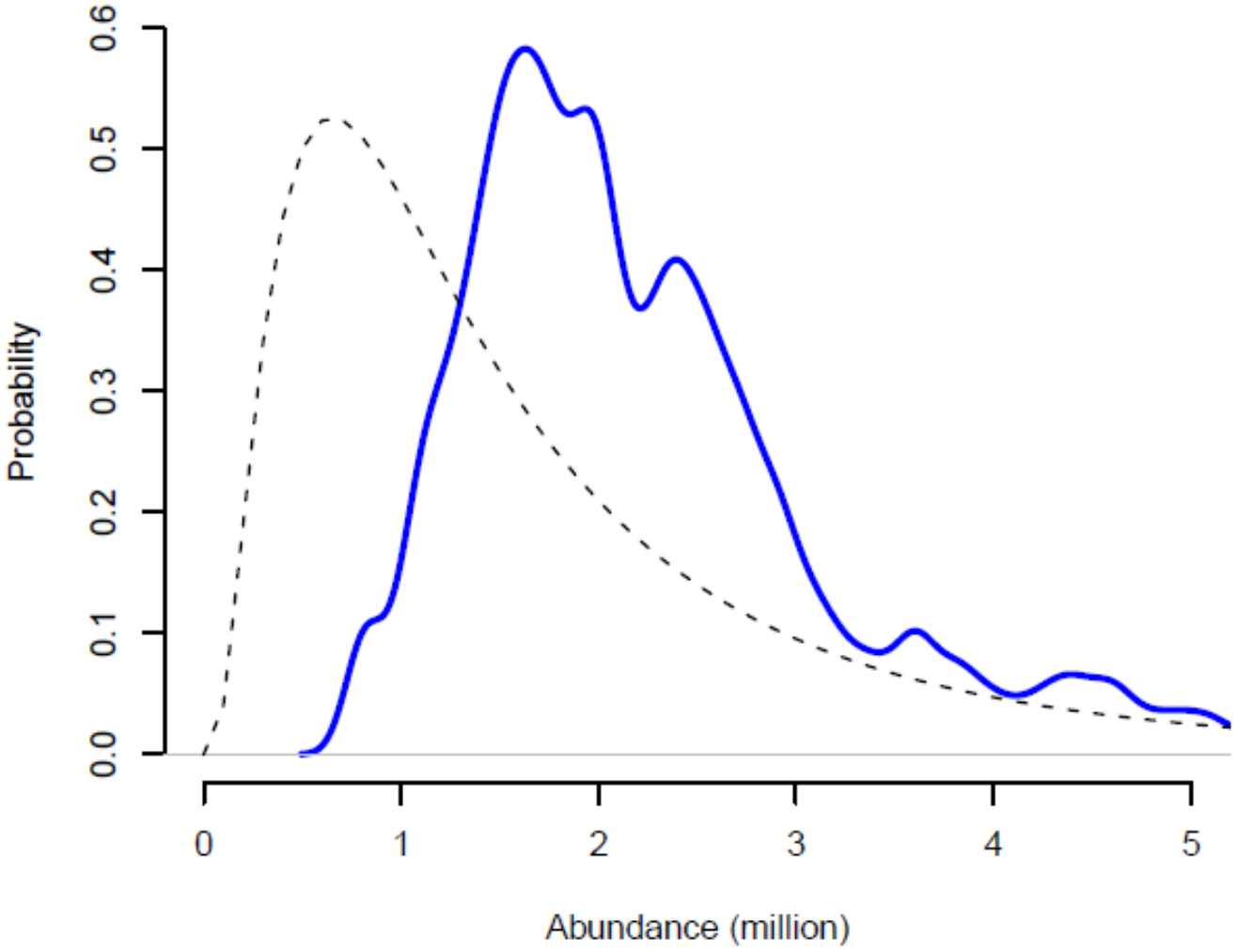
Prior Distributions – Run Size



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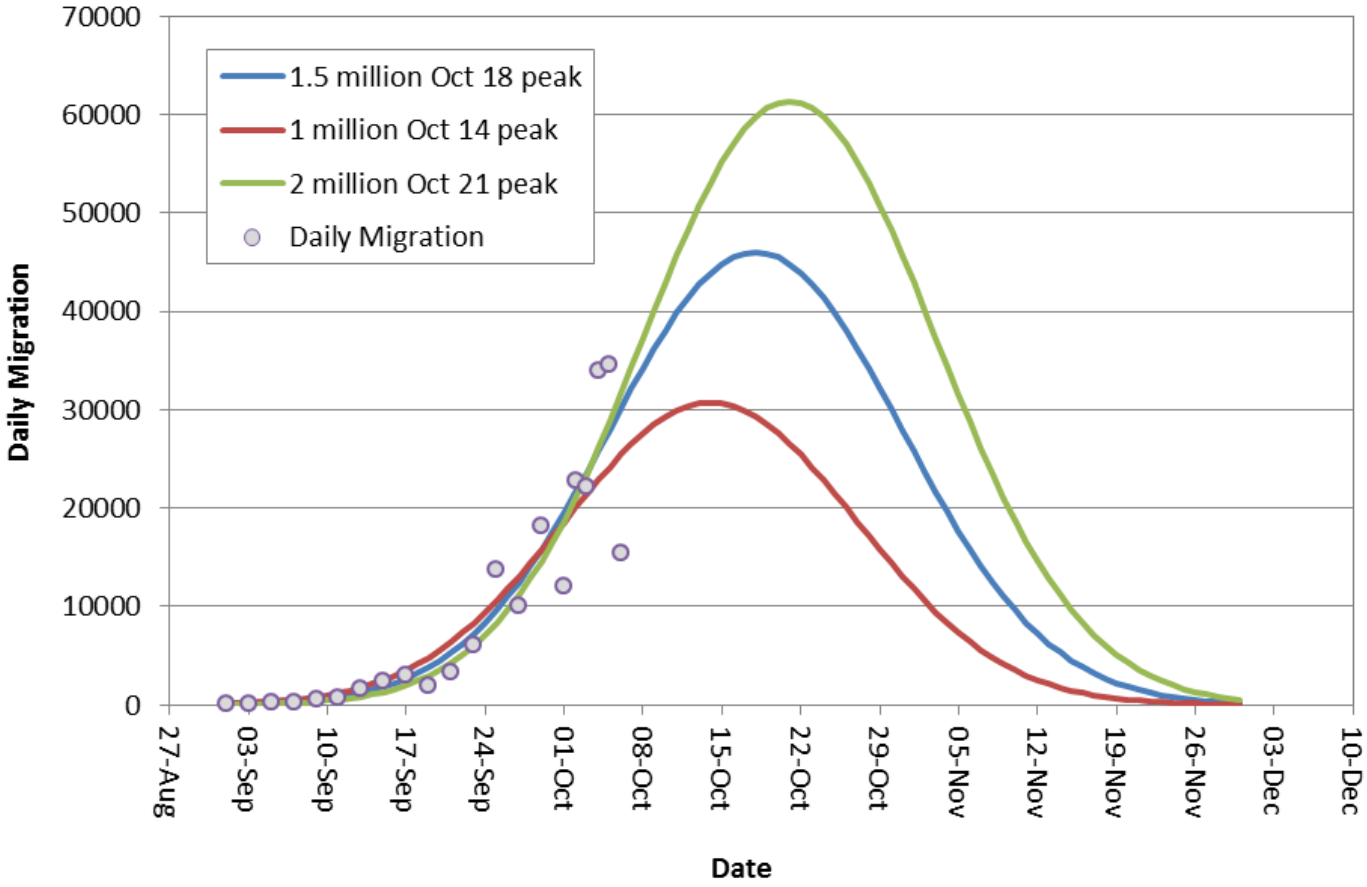
How do priors and test fishery data come together to provide an update?

- Prior information bounds in-season estimates of run size, catchability, timing and spread
- CPUE data collected in-season from Albion test fishery informs estimates of peak timing and spread and run size
  - Must observe the peak of the curve
- Run-size is estimated based on expanding CPUE data using catchability priors
- No in-season information to update catchability

Estimating Timing and Spread



Use CPUE data and fit a normal curve to it

This only works after you see the peak of the curve

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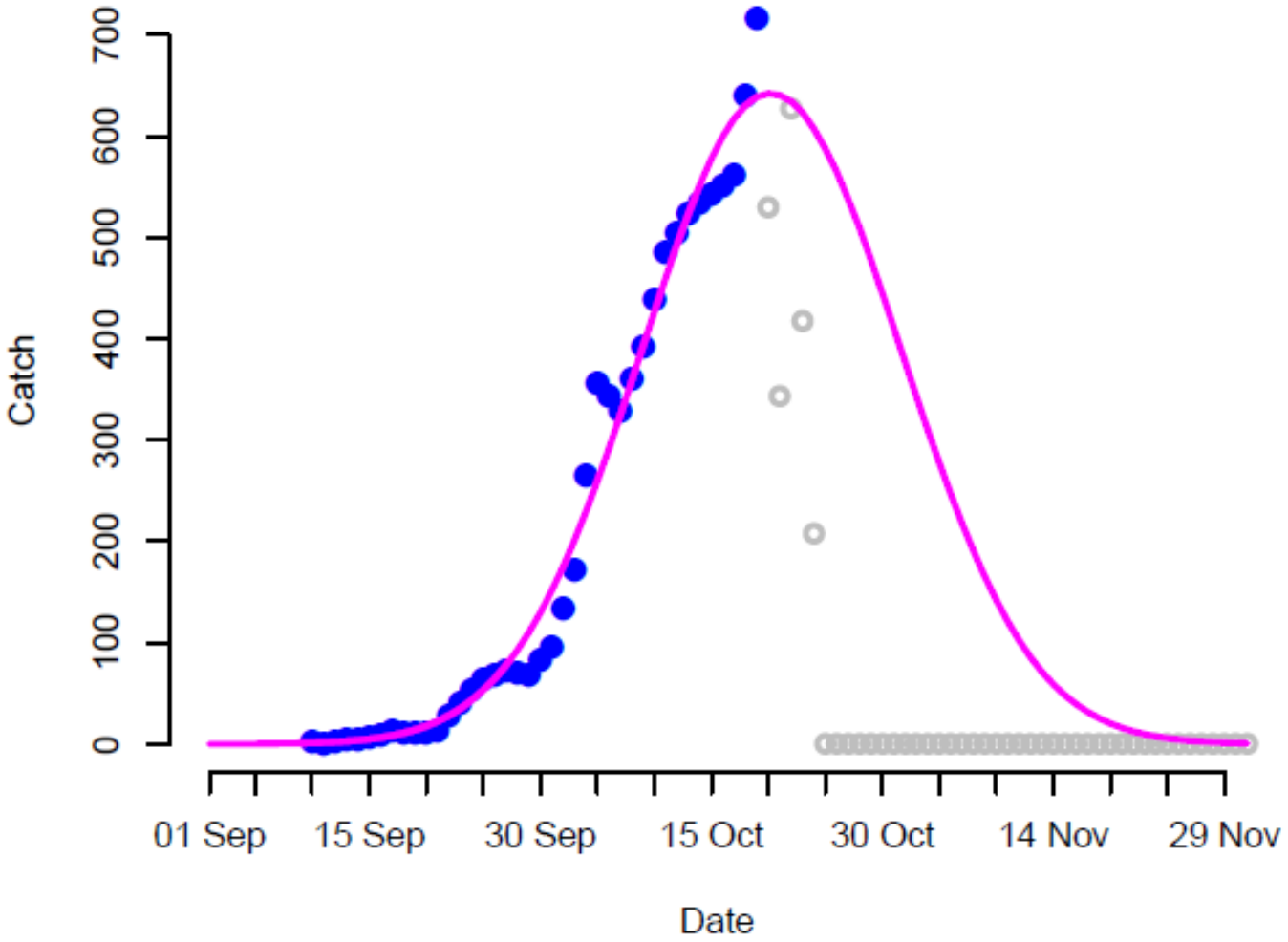
Are the data any good?

- Run size - evaluating alternate approaches to estimate basin-wide Fraser escapement
- Catchability – need to examine variables that affect catchability to adjust prior annually
  - Relationship between abundance and catchability confounds this work (net saturation)
- Peak and spread – could improve post-season estimates by adjusting CPUE data that falls in the "shadow" of other fisheries

How did the model work for 2016?

- Width on the prior for run size was increased based on huge catch observed in Johnstone Strait – allowed more movement on run size
- Other priors based on historical data, as usual
- Significant issues with Albion test fishery data in "shadow" of other fisheries – did not use CPUE data for days that were affected
- In-season estimate of 2.0 million, peak of Oct 20, spread of 11 days, catchability of 0.009
- Post-season estimate not yet complete

2016 Albion CPUE Data and Timing Curve



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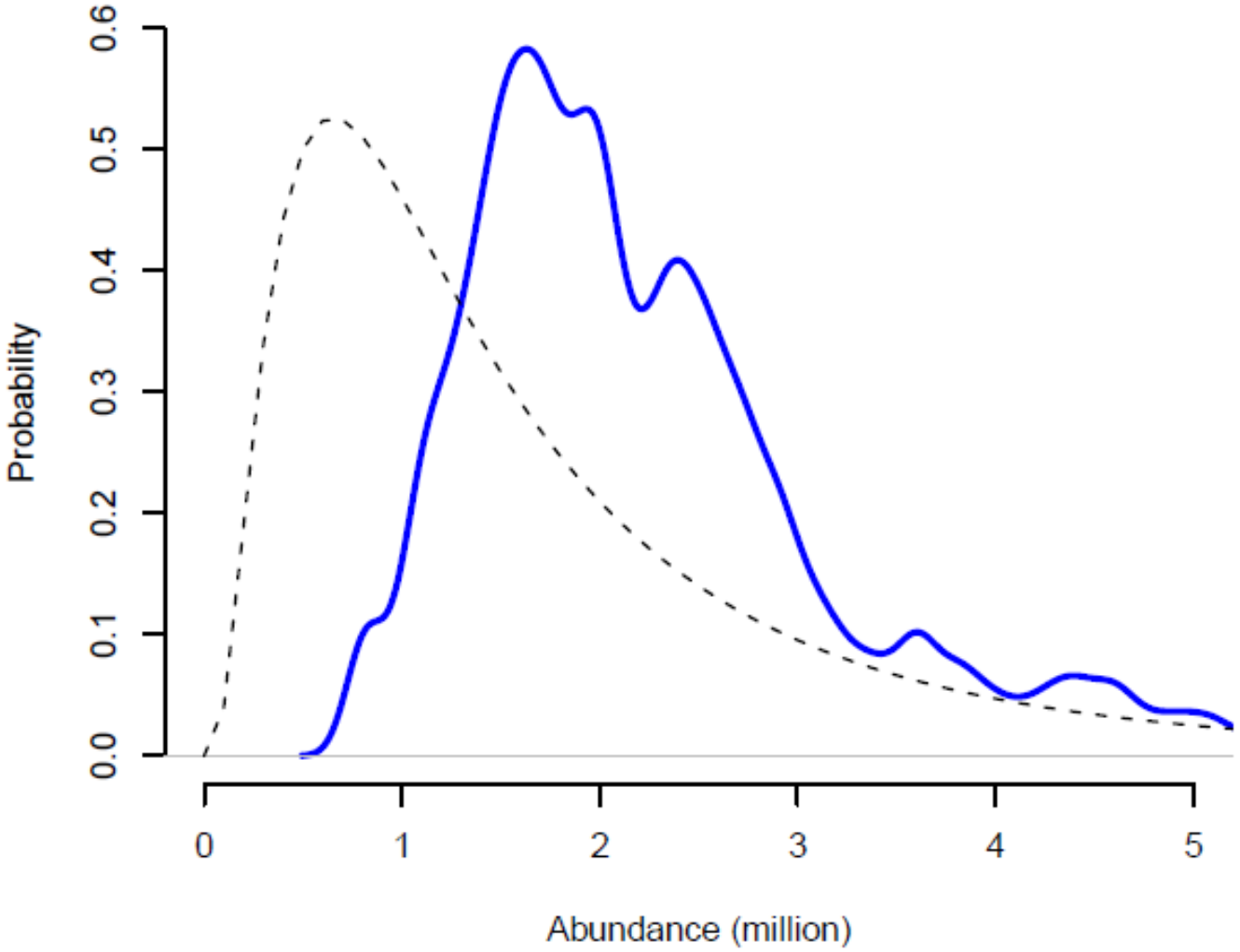
2016 Fraser Chum Abundance



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Summary

- The Fraser chum in-season update model uses a combination of post-season and in-season information to inform in-season estimation of Fraser chum timing and run-size.
- While the current model provides a superior approach to in-season abundance estimation compared to simple linear regression models, there are still large uncertainties in the estimates provided.
- Where feasible, work is ongoing to improve the quality of the data that informs the model. These revisions will be incorporated into the model as they become available.