0:0:0.0 --> 0:0:3.240  
Aaron Berger  
Always available to go back and and listen to.

0:0:4.220 --> 0:0:5.990  
Aaron Berger  
Today we're just going to jump right in.

0:0:7.490 --> 0:0:13.720  
Aaron Berger  
To our presenters in in here, what they've been doing thus far with the simulated data sets.

0:0:14.380 --> 0:0:16.230  
Aaron Berger  
Umm. We're gonna start off with.

0:0:16.890 --> 0:0:21.420  
Aaron Berger  
Umm, the folks that have been working with multi fan.

0:0:22.230 --> 0:0:27.320  
Aaron Berger  
And then we're going to go to a team working with stock synthesis.

0:0:28.280 --> 0:0:40.400  
Aaron Berger  
And then we're gonna end. We'll have about 30 minutes or so to see how. See how far we get along. But at least 30 minutes to have a discussion afterwards. And again, just reminder, this is work that's in progress.

0:0:40.990 --> 0:0:58.460  
Aaron Berger  
Umm and uh, we really appreciate the presenters coming on to share how how far they've gotten so far and this is all kind of leading up to a workshop in March that's going to occur in New Zealand that we have been sending out information about and will continue to do so as we move forward.

0:0:59.290 --> 0:1:6.560  
Aaron Berger  
Umm, but that's kind of the culmination of this. This simulation experiment is the workshop in March.

0:1:7.420 --> 0:1:17.140  
Aaron Berger  
Umm. So with that, without any further ado. Just gonna check with Simon that we. Oh, yes, I see the recording. Great. So we're doing that.

0:1:18.50 --> 0:1:35.270  
Aaron Berger  
All right. So to start off, we are we, our first presenter is Nicholas Ducharme Barth. He is currently A stock assessment scientist with NOAA fisheries based at the Pacific Islands Fisheries Science Center in Honolulu. HI.

0:1:36.150 --> 0:1:55.30  
Aaron Berger  
However, prior to that he spent three years in New Caledonia at the Pacific Community, or SPC, where he had a real hands on opportunity to learn about spatial models and MULTIFAN CL or MFCL as part of the team that developed TuneIn, Bill Fish Stock assessments for the Western and Central Pacific Fisheries Commission.

0:1:55.850 --> 0:2:7.110  
Aaron Berger  
Umm. So Nicholas gonna be presenting on behalf or as part of Team MFCL? And I'm gonna just pass it over to you, Nicola, to get started.

0:2:8.870 --> 0:2:9.640  
Aaron Berger  
Thanks for being here.

0:2:10.540 --> 0:2:13.460  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Great. Thank you for that introduction, Aaron. Let me.

0:2:14.970 --> 0:2:16.700  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Share my screen.

0:2:27.790 --> 0:2:28.970  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
OK.

0:2:40.550 --> 0:2:41.130  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
All right.

0:2:42.460 --> 0:2:44.650  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Hopefully you can see that OK.

0:2:45.270 --> 0:2:46.750  
Aaron Berger  
That looks perfect. Thank you.

0:2:48.230 --> 0:3:3.940  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Great. I'll go ahead and get started then with Team Multifan CL team MFCL. What we've what we've done so far in this spatial stock assessment simulation experiment. But before I like to thank the organizers for putting this together.

0:3:4.980 --> 0:3:13.660  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Like we've had a lot of fun with this project and we've learned a lot along the way. So yeah, really appreciate you giving us this opportunity.

0:3:14.860 --> 0:3:16.390  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
They'll play with an interesting data set.

0:3:21.550 --> 0:3:51.420  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
So team MULTIFAN CL is actually a whole bunch of us and I had initially wanted to get a get a globe on the side, plot it out where we all are, but we actually can't all fit on one side of the globe. So I've got a nice picture of the SPC campus in new mass since at some point everybody on this list, Claudio, Nick Davies, generally day myself, Paul Hamer, John Hampton, arguing, Magnuson, Tom Tiers and Matt Vincent, we all.

0:3:51.790 --> 0:3:53.680  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Work there are currently working there.

0:3:54.440 --> 0:3:54.890  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm.

0:3:57.720 --> 0:4:12.640  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
But before we get into some results, go into a little bit of the history of of multi fancy all for those that aren't familiar with it. It's an integrated statistical size based age structured and spatially structured model for fishery stock assessment.

0:4:13.630 --> 0:4:29.250  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
It's been around for for quite some time and it integrates the original multifan model from 1990 that is used to estimate growth and proportions at age from links. Frequency data integrates that with the Fournier and Archibald Statistical age structured model from 1982.

0:4:30.680 --> 0:4:35.930  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
It was actually first applied to South Pacific albacore tuna in 1998.

0:4:37.190 --> 0:4:43.500  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And then it was further modified in 2001 to allow for a spatial structure and movement, and the inclusion of tagging data.

0:4:44.690 --> 0:4:58.190  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
So at its core, uh MULTIFAN CL, I was developed to analyze spatially complex fisheries with little to no age data, but we're length or size, frequency data and tagging data or available.

0:5:0.130 --> 0:5:10.180  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Uh, so thinking on how Multifan specifically tackles the the spatial problem kind of split this up into three different components.

0:5:10.860 --> 0:5:27.110  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
There's the tagging component where the tagging data is released conditioned, so there's a few things that you need for that. You need the length that release, which is a little bit different from some of the other platforms. We don't use the age with our tagging data.

0:5:27.510 --> 0:5:29.480  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm yeah, the region.

0:5:30.640 --> 0:5:31.700  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And the time.

0:5:32.720 --> 0:5:36.220  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Of year. So the year and the month when those tags were released.

0:5:37.80 --> 0:5:46.210  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
It also tracks these populations of tagged fish by release group, so you have multiple tag populations going forward in the model calculations.

0:5:47.80 --> 0:5:52.650  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
There's a few different likelihoods that you can choose from. We've only looked at one of them in this.

0:5:53.780 --> 0:6:1.440  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
In the study, the negative binomial, but there are there are some other options available that are in different phases of testing.

0:6:2.440 --> 0:6:14.290  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm, there's a few things that you need to do, one working with the tagging data you need to define a mixing period so period at which the likelihood is desensitized to those tags.

0:6:15.610 --> 0:6:31.190  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Kind of appeared in which the the the model is ignoring ignoring those tags before they're really having an impact on the estimates. Kind of the period in which you would assume those tags are well mixed with the untagged population.

0:6:31.880 --> 0:6:35.90  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
I also need to define fishery reporting rates.

0:6:36.900 --> 0:6:39.330  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Because this is a release conditioned approach.

0:6:40.310 --> 0:6:43.730  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
In terms of movement, there are two.

0:6:44.830 --> 0:6:53.820  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Movement coefficients bidirectional, so one in each direction, estimated for each adjacent region in the model. However the the internal.

0:6:54.930 --> 0:7:13.970  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Parameterization is such that it can allow movement between two non adjacent regions within a single time step. So this parameterization actually cuts down on the number of parameters that is needed to be estimated. Since you don't have to estimate every single pair of regions.

0:7:15.530 --> 0:7:18.780  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
You can also specify quarterly and age specific movements.

0:7:20.660 --> 0:7:27.530  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And these can be estimated within the model if there is sufficient information in the data to do so.

0:7:28.970 --> 0:7:30.140  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
In terms of recruitment?

0:7:31.160 --> 0:7:45.970  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
It assumes the model assumes a single stock recruit relationship applied to all regions, so the spawning biomass and all regions is pooled together to determine the total recruitment, which then gets apportioned.

0:7:47.450 --> 0:7:51.530  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And to each of the different regions, not apportionment, can be estimated.

0:7:52.320 --> 0:7:53.70  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Within the model.

0:7:53.930 --> 0:7:58.990  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
They're also allows for temporal variation and recruitment. Again, that can be estimated.

0:7:59.950 --> 0:8:18.330  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And this temporal variation can be shared across regions, or you can estimate individual regional recruitment deviates. And if you do that, it quickly explodes the number of parameters that you're working with because you have one for every time step and every region or n -, 1 times steps.

0:8:20.20 --> 0:8:20.690  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And every region.

0:8:22.830 --> 0:8:34.870  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
In terms of usage MULTIFAN CL is used almost exclusively by the Pacific Community SPC to produce assessments for the Western and Central Pacific Fisheries Commission that WCPFC.

0:8:35.640 --> 0:8:38.890  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
These are assessments that are predominantly spatial in nature.

0:8:41.150 --> 0:8:53.560  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Most include tagging data and estimate movement and most do not directly incorporate age data, although some of the recent assessments age data is becoming available so.

0:8:54.240 --> 0:8:56.830  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Slowly making its way into the models.

0:8:57.970 --> 0:9:27.480  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
So in the recently assessed species and regional structures, there's the WCPO, skipjack, which was assessed last year. Sorry, this year, WOW, 8 regions. And then big guy in yellowfin tuna in 2020 and 9 region Model S Pacific Albacore with four regions and then SW Pacific striped Marlin was a single region and Southwest Pacific Swordfish. Was it 2 region?

0:9:28.940 --> 0:9:36.720  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The user base of Multifan is is quite small. It's typically people that have worked at SPC at at one point in time.

0:9:37.360 --> 0:9:37.900  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm.

0:9:38.630 --> 0:9:43.720  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
But there's no reason other people, other people, can't use it. That is a good tool.

0:9:46.10 --> 0:9:47.900  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
So in terms of attacking this.

0:9:49.240 --> 0:9:51.270  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Spatial simulation project.

0:9:53.280 --> 0:9:55.20  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
We started off with the single region.

0:9:56.480 --> 0:10:0.710  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Uh, sorry, yeah. We started off with the single region model.

0:10:2.540 --> 0:10:5.510  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Took a look at the composition data likelihood.

0:10:7.400 --> 0:10:19.30  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
It's kind of a multifan specific thing, but how to look at the structure for the catches, whether it was a catch errors formulation that was typically been used for MULTIFAN CL or a catch conditioned approach.

0:10:20.850 --> 0:10:33.840  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Where those independent fishing mortality parameters aren't aren't being estimated as parameters, that being calculated internally. Also, how to look at the fishery structure and selectivity groupings?

0:10:35.60 --> 0:10:42.330  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And as this was kind of the stage where we started thinking about what the four region model might look like.

0:10:43.250 --> 0:10:43.810  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm.

0:10:45.100 --> 0:10:46.150  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
We also looked.

0:10:47.850 --> 0:10:56.410  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
At the I guess the input sample size at this stage as well and the inclusion of the tagging data.

0:10:57.480 --> 0:10:58.220  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And so that.

0:10:59.70 --> 0:11:5.480  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
For region model that uses a kind of a fleets's area, it's 20 fleet single region model.

0:11:6.460 --> 0:11:12.970  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
As the as the baseline that has a look at, we took a look at the selectivity groupings at that stage as well.

0:11:14.240 --> 0:11:23.810  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Kind of in conjunction with the single region model and then started to layer on some of those spatial components that I mentioned before the movement recruitment.

0:11:24.640 --> 0:11:32.160  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Processes the tagging data and the the mixing period associated with the inclusion of that tagging data.

0:11:33.660 --> 0:11:34.630  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The models.

0:11:36.250 --> 0:11:46.440  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
At every time, at every step in the model development, we're checked for convergence. So looking for low gradients and positive definite passion solution.

0:11:48.190 --> 0:11:57.630  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Some of the modifications are fixes that had to be done to multi fancy all along the way. So catch condition model.

0:11:58.630 --> 0:12:6.500  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Is was kind of. I was a big up update to multi fancy all in the last few years and so in applying this.

0:12:7.760 --> 0:12:10.860  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
This feature to the the simulated data sets.

0:12:12.240 --> 0:12:14.420  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
That allowed us to do some more in depth testing.

0:12:15.150 --> 0:12:15.930  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And.

0:12:18.0 --> 0:12:20.430  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
I guess make some small fixes to.

0:12:21.370 --> 0:12:40.220  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
To how to handle initial conditions based only on natural mortality and also how dynamic depletion is calculated with the stack recruit curve adjustment and also incorporated a chronic tag shedding component which wasn't previously a feature in MULTIFAN CL but.

0:12:41.410 --> 0:12:49.280  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Nick Davies worked hard to to add that in so that we could better model the the tagging data from the the simulation.

0:12:52.40 --> 0:13:2.690  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
So in terms of the initial model that we used in the the single region, we didn't work with the the five by 5 spatial data. So we we took that that single region.

0:13:3.920 --> 0:13:11.180  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
One area data set and we began with with seven extraction fisheries, so 7 fisheries that are.

0:13:12.20 --> 0:13:26.710  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Just there to to remove catch from the population and then one index fishery which we associated the CPUE index, the standard CPU index with and each of these fisheries.

0:13:27.450 --> 0:13:37.950  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
We had initially set up As for this activities in independent age specific selectivity curve and that was parameterized using A3 node cubic spline.

0:13:38.880 --> 0:13:39.470  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm.

0:13:40.400 --> 0:13:47.50  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And the long line and the index fishery as indicated in the OM or assumed to be non decreasing.

0:13:48.240 --> 0:14:8.570  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
We started off with the aceuedo catch condition model on this was out of step in the I guess the MFCL development where we're still transitioning between the catch errors framework before where our fishing mortalities at every time step was an estimated parameter to the fully catch conditioned approach.

0:14:9.870 --> 0:14:17.290  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
To the simulation project was was a nice way of of testing the equivalents of those. Those two methods within MULTIFAN CL.

0:14:18.10 --> 0:14:19.800  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
We also started off with the.

0:14:21.30 --> 0:14:22.180  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Kind of the go to.

0:14:22.920 --> 0:14:28.90  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Length composition likelihood in MULTIFAN CL which was robust normal.

0:14:28.920 --> 0:14:59.810  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And we use the the data set that had an effective sample size or an input sample size of five for the length of composition data set. We also had a quarterly fishery and recruitment time step and so on the right you see all the components of the model that we assumed at values that were specified in the OM documentation. So didn't estimate growth. We didn't estimate steepness, we didn't estimate natural mortality maturity was fixed at the values in the OEM documentation.

0:15:0.0 --> 0:15:7.130  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The initial conditions we set to be equal to the initial conditions at equilibrium based on natural mortality.

0:15:8.410 --> 0:15:22.950  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Uh, we assume the general selectivity shapes for the different fisheries based on the descriptions and the operating model, the penalty on the recruitments from the STACK recruitment curve we took from the OM documentation and also the CPUE observation error.

0:15:24.410 --> 0:15:38.520  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
So one of the first things that I talked about in that that pathway development was looking at the length, composition likelihood. And so initially we had used the robust normal.

0:15:40.350 --> 0:15:52.120  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And so each panel is is a different fishery. The blue line is the robust normal model and the Orange Line is the Dirichlet multinomial model and the the sparseness of that.

0:15:53.670 --> 0:15:57.830  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
That ES05 data set cause.

0:15:58.930 --> 0:16:3.860  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Cause a number of problems for the robust. Normally it wasn't wasn't able to handle that all that well.

0:16:5.30 --> 0:16:21.520  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
So we made the switch to the Dirichlet multinomial and it substantially improved the the fit to the length data. You can see an improvement there in the in the figures also improve the fit to the index and improve runtime and convergence, so that was.

0:16:23.610 --> 0:16:24.940  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Something that we are happy to see.

0:16:26.450 --> 0:16:41.60  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm in that application of the Dirichlet multinomial it is a self scaling likelihood for the length composition data, so you estimate 2 scaling parameters per fishery group. And here we defined one group for each fishery.

0:16:41.540 --> 0:16:48.650  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm, that being said, this approach is sensitive to how you choose to group fisheries.

0:16:48.850 --> 0:16:51.720  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm. And also the the maximum.

0:16:52.30 --> 0:16:54.810  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Uh input sample size.

0:16:56.390 --> 0:17:1.10  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Specified although the idea there is to to set a maximum sample size, that's.

0:17:1.860 --> 0:17:10.280  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Large enough that the effect of sample sizes aren't aren't coming up the asymptotes and isn't reaching it, which we did in in this case.

0:17:13.860 --> 0:17:23.470  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The next thing that we had to look at was the transition to a catch condition approach for the treatment of the catch data and the fishing mortalities.

0:17:25.130 --> 0:17:33.260  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And so you have two models here, model 30 in blue, which is the catch condition model and then the equivalent catch errors model.

0:17:35.120 --> 0:17:43.80  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Then orange and the later half of the times are for most of the time series, spawning biomass and the solid line.

0:17:43.810 --> 0:17:53.870  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Very similar between the two approaches, there's a little bit of a discrepancy at the beginning, and that was when we were still trying to iron out the the initial conditions, but that that was resolved later on.

0:17:55.470 --> 0:18:4.460  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm, the other lines that you see there is the in the dotted lines. Is the spawning biomass and fishing mortality is 0.

0:18:5.190 --> 0:18:7.830  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And so one of the the metrics that.

0:18:8.780 --> 0:18:25.150  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm is used a lot by SPC and within WCPFC for presenting stock status. Is this time dynamic depletion which is just the the ratio of the fish to the unfished. So you when you take one over the other you get this.

0:18:25.860 --> 0:18:26.670  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
This depletion.

0:18:27.950 --> 0:18:30.320  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Time series of dynamic Depletion Time series.

0:18:30.440 --> 0:18:38.270  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm, so I just wanted to find that quickly because you'll see some depletion plots in the following slides.

0:18:42.550 --> 0:18:45.820  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
In terms of the fisheries grouping for the.

0:18:47.60 --> 0:18:48.220  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The single region model.

0:18:49.550 --> 0:19:8.830  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
We we looked at at three different grouping types. Those are models 3435 and 37 where that first Model 34 in the blue is that single region model with seven extraction fisheries, one for each gear and then the one index fishery.

0:19:9.930 --> 0:19:11.0  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And then seven.

0:19:12.260 --> 0:19:18.700  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Selectivity, groupings and length, composition, groupings, and so made the decision to group.

0:19:19.780 --> 0:19:24.140  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The index fishery with the the longline fishery.

0:19:25.340 --> 0:19:29.50  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Also looked at another formulation, kind of getting more towards a.

0:19:29.860 --> 0:19:45.20  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Fleets's areas with 16 extraction fisheries, so those are gear regions specific. So that's when we still working within a single region framework. We use the data set provided with the four region structure.

0:19:46.440 --> 0:19:57.150  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
That four index fisheries there. But again, we had just the same 7 selectivity and length composition groupings that were geared specific that we saw before.

0:19:58.370 --> 0:19:59.700  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And then we also.

0:20:1.580 --> 0:20:12.330  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
We also considered a model with again the same fishery structure, 16 fisheries, that were gearing region specific with four index fisheries, but that.

0:20:13.10 --> 0:20:19.220  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
When possible, allowed for gear or region specific estimations of selectivities.

0:20:20.840 --> 0:20:40.950  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Although we we still kept all the index fisheries grouped together for selectivity, and then we also kept the same 7 length composition groupings that were gear specific, again with the index fishery group together with the longline fishery. And that was for the Dirichlet multinomial those line composition groupings.

0:20:44.170 --> 0:20:47.280  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
In terms of depletion, the different.

0:20:48.10 --> 0:20:49.320  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Uh, I guess.

0:20:50.590 --> 0:20:54.560  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Fishery groupings in terms of selectivity and length, composition that.

0:20:55.480 --> 0:21:4.30  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
It didn't really make that big of a difference around the year 2000, you see some divergences from the two different approaches.

0:21:6.20 --> 0:21:12.570  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Some slight differences in in scale, but generally I'll following the same trend.

0:21:14.800 --> 0:21:18.650  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Ultimately, we ended up with the the simplest.

0:21:20.340 --> 0:21:26.770  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Configuration of that Model 34 with the seven extraction fisheries that were gear specific.

0:21:28.520 --> 0:21:30.540  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Yeah, we had a lot of discussion about this.

0:21:30.980 --> 0:21:34.670  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm, and eventually given the.

0:21:35.600 --> 0:21:48.190  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The documentation of the operating model that indicated that selectivity was consistent across gears and space within a gear.

0:21:49.550 --> 0:21:52.700  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
We opted for this more simplified approach and.

0:21:53.340 --> 0:21:58.710  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
With the idea being that maybe once spatial processes are added into it.

0:21:59.740 --> 0:22:10.10  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Such as movement and the regional recruitment that can maybe explain some of the differences that are seen, however, in an operational assessment.

0:22:10.750 --> 0:22:13.970  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And might be treated a little bit differently.

0:22:15.370 --> 0:22:32.810  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
So the index fishery and an operational assessment would typically receive its own composition data weighted by the spatial CPUE and the extraction fishery composition data would be reweighted by the spatial cache and since we didn't work with that 5 by 5 more.

0:22:33.780 --> 0:22:35.280  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Resolve spatial data.

0:22:37.270 --> 0:22:40.310  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
That wasn't an option for us in this instance.

0:22:40.810 --> 0:22:42.810  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm but.

0:22:43.780 --> 0:22:55.450  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Yeah, that there's. I think there's an opportunity for further investigations into how fisheries are defined and and groupings used to define selectivity and composition groupings.

0:22:56.860 --> 0:23:2.690  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
I guess if if we were to start from scratch and and use that that more highly resolved.

0:23:4.560 --> 0:23:6.230  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
5 by 5 data, we might end up.

0:23:6.940 --> 0:23:13.150  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Doing what's closer to what is done in the operational assessments, which is which is that second bullet.

0:23:14.550 --> 0:23:20.470  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
That being said, we went forward with the simpler Model 34, that blue line.

0:23:23.420 --> 0:23:25.970  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
So in terms of the the current model.

0:23:26.270 --> 0:23:26.860  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm.

0:23:28.550 --> 0:23:37.800  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
For the single region, we've got that that 7 extraction fisheries structure, one for each gear, the one index fishery with that index selectivity shared with the long line.

0:23:40.220 --> 0:23:41.770  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
7 fisheries.

0:23:42.950 --> 0:23:51.250  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Age. So 7 distinct age specific selectivity curves using A7 node cubic spline. There's a lot of sevens there.

0:23:53.260 --> 0:24:0.260  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
You had a long line and and index fishery assumed to be parameterized with the logistic curve and not with a a cubic spline.

0:24:1.130 --> 0:24:8.240  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
We went with the catch conditioned approach Dirichlet multinomial self scaling likelihood for the length composition data.

0:24:9.340 --> 0:24:10.470  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And used.

0:24:12.360 --> 0:24:17.810  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
I think we'll need to to check this to make sure it's consistent with.

0:24:18.940 --> 0:24:21.530  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
With the documentation of the of the data sets.

0:24:22.810 --> 0:24:24.250  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
But I believe we use that.

0:24:25.820 --> 0:24:30.630  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
That raw sample size for the length composition data we didn't modify.

0:24:31.330 --> 0:24:35.280  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
What I mean to say is we didn't whatever was in the test data set, we didn't modify it.

0:24:36.870 --> 0:24:42.750  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Wouldn't change with change the numbers of the length, composition data. So whatever that was, that's what we used.

0:24:44.870 --> 0:24:49.100  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And then in terms of the, the fishery and recruitment time steps, it was, it was out of quarter.

0:24:50.630 --> 0:24:51.250  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And so.

0:24:52.280 --> 0:24:54.530  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Considered a number of models, some of which are.

0:24:55.770 --> 0:25:0.10  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Very early on in development, so these blue ones here, eventually we kind of.

0:25:1.310 --> 0:25:7.520  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Narrowed it down to a clump of models that all had very minor tweaks between them.

0:25:9.500 --> 0:25:17.90  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Ultimately ended up with this red red line here indicated by the two pink arrows at the start and the end. The biggest jumps though.

0:25:18.20 --> 0:25:20.530  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Is when we updated the.

0:25:21.730 --> 0:25:22.190  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The.

0:25:23.300 --> 0:25:30.180  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The simulated data I think back in March, there was a data update and that actually had a big effect on our on our estimates.

0:25:30.840 --> 0:25:32.860  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm. And then.

0:25:33.900 --> 0:25:34.580  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
We.

0:25:35.580 --> 0:25:44.280  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
We changed how we were. We were treating the sample, the composition data we used before we were modifying.

0:25:45.260 --> 0:25:45.960  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The.

0:25:47.730 --> 0:25:49.580  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The sample size for each fishery.

0:25:50.900 --> 0:25:56.740  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Observation to some to five, and then we switch to just using how it was.

0:25:57.730 --> 0:26:0.790  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
How is provided from the simulation, so whatever the sum?

0:26:1.580 --> 0:26:13.930  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Across bends was we. We left it as is instead. So playing with the the composition data had the biggest effect up and down in terms of the the results and there's more recent models.

0:26:15.620 --> 0:26:23.130  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
So the other thing that we looked at for the single region model was the inclusion of tags on so mixing periods of.

0:26:23.770 --> 0:26:30.200  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Well, whether or not we wanted to include tags at all, and whether or not we wanted to include them with the mixing period of four or mixing period of five.

0:26:32.200 --> 0:26:37.840  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And so a couple things happened when we threw tagging data into this single region model.

0:26:38.840 --> 0:26:54.190  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Is also a model without tags. Is in blue, and then the models with tags but with different mixing periods are in these orangey Reds, so this shape of the selectivity curve was sensitive to the inclusion of the tag data in single region model.

0:26:54.970 --> 0:27:4.180  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
But that didn't really translate too much difference on and fits to the Lync composition data on the fits. We're pretty consistent.

0:27:5.300 --> 0:27:13.530  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Both at the aggregate and also at the looking at the the fits to the mean length over time.

0:27:14.620 --> 0:27:22.730  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm couple things I wanna point out is here for the person saying this was something that we identified very early on.

0:27:24.480 --> 0:27:26.440  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Is it? It looks like it's.

0:27:27.810 --> 0:27:38.820  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
It's not fitting this early person data all that well. There's a declining trend that the model estimates just not quite capturing as as well as you wanted to see.

0:27:40.510 --> 0:27:46.470  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
So there, there could be some sort of process on their likely is some sort of process that we're not getting right with this formulation.

0:27:47.50 --> 0:27:51.260  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm. And the other thing with this is.

0:27:53.760 --> 0:28:18.370  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The model kind of jumps up in around 2010 to match this this person data and this is there's a lot in terms of the sample size, there's a lot of samples here. And so the model chases this a little bit. It fits, it fits it better than in the early period. But it chases this and this has some implications. When you look at the fit to the CPUE.

0:28:19.600 --> 0:28:25.240  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm, so fit to the CPUE for the single region model again.

0:28:26.30 --> 0:28:27.800  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Inclusion of the tagging data.

0:28:28.860 --> 0:28:30.900  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Not a huge effect.

0:28:32.330 --> 0:28:33.730  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
It's just in the last.

0:28:35.920 --> 0:28:47.170  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
10 years or so of the model period. Once the tagging data is in there, you start to see that blue line without the tagging data start to diverge from the orange yellows or tagging data is included.

0:28:49.90 --> 0:28:49.670  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm.

0:28:50.580 --> 0:28:52.250  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Uh, going the wrong way?

0:28:52.980 --> 0:29:1.10  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And then as I pointed out before, the model follows that person data up all those high samples of persons.

0:29:3.120 --> 0:29:5.470  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And it completely misses the spit.

0:29:7.600 --> 0:29:11.10  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Of the of the CPUE index, so that's a bit of a problem.

0:29:11.890 --> 0:29:13.170  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Ohm that.

0:29:14.440 --> 0:29:21.610  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Even though we identified it, it given the formulation that we had up to this point, we we still weren't able to resolve that so.

0:29:22.330 --> 0:29:26.220  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
A bit more work to do before we're we're completely happy with with these fits.

0:29:28.360 --> 0:29:43.990  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm, in terms of the fits to the tagging data. So the reason I showed this this slide is is if within the mixing period, so models with tagging data four was the smallest mixing period 4-5 and six.

0:29:45.250 --> 0:29:46.530  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Within a mixing period.

0:29:47.750 --> 0:29:49.410  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
SO123.

0:29:50.860 --> 0:29:51.580  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
4.

0:29:53.620 --> 0:30:3.190  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Yeah. For the the the model is is fitting the tags exactly because it's doing a numerical calculation. But when we change the mixing period.

0:30:5.250 --> 0:30:11.780  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
So we look at how the model with the mixing period of four performs that immediate time step after.

0:30:13.810 --> 0:30:27.700  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
It it doesn't do do so well and and so we had a a big discussion when we were looking at these results. So mixing period of five and six, the results were quite similar, but there was pretty bad misfit.

0:30:29.0 --> 0:30:31.570  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
For this next observation for mixing period of four.

0:30:33.590 --> 0:30:39.740  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
So that was something that we wanted to to account for and and to bring through the rest of the development is that.

0:30:40.820 --> 0:30:42.230  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The the difference?

0:30:45.50 --> 0:30:46.700  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The difference between those two models?

0:30:48.500 --> 0:30:51.580  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Again, looking at the the aggregate.

0:30:52.400 --> 0:31:2.620  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Uh fits for each of the different mixing periods, so mixing period of four mixing period of five, mixing period of 6, there's a there's a pattern that emerges.

0:31:4.250 --> 0:31:9.980  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
But these really high observations of tags, the model just it's not getting there.

0:31:11.280 --> 0:31:17.230  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
So that's that's a I guess an example of a persistent misfit or misspecification, that.

0:31:18.880 --> 0:31:21.750  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
That we haven't been able to deal with at this point.

0:31:22.940 --> 0:31:26.120  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Ideally you'd you'd like to fit these observations a little bit better.

0:31:29.140 --> 0:31:34.610  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
But maybe that will improve in the four region model. We'll see in a few slides whether or not that's the case.

0:31:36.870 --> 0:31:38.260  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
So in terms of the?

0:31:40.800 --> 0:31:42.790  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The the current single region model.

0:31:44.910 --> 0:31:51.380  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Were left with a model in blue without tags, so this is the the spawning biomass.

0:31:51.940 --> 0:31:56.450  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm. And then the models with tags that scale the population down.

0:31:58.930 --> 0:32:6.700  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Models 5 and 6 tag mixing of five and six are very are very similar to each other. The model with tag mixing of four.

0:32:8.450 --> 0:32:9.560  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Is is even lower.

0:32:9.980 --> 0:32:24.900  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm so small. Lower mixing periods gives more influence to the tagging data in the model. So as you reduce that mixing period you get more influence to the tags and and that's having the effect of of bringing the model model scaled down.

0:32:26.780 --> 0:32:27.310  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And.

0:32:28.470 --> 0:32:29.660  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Those effects.

0:32:30.780 --> 0:32:34.190  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Translate into depletion, so the model.

0:32:34.940 --> 0:32:35.520  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
With.

0:32:36.220 --> 0:32:41.430  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
With the most effective the tags, that's the lowest scale. It's the most depleted, the highest level of F.

0:32:43.440 --> 0:32:48.840  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Overall pattern though in recruitment is very similar between all the different models.

0:32:50.220 --> 0:32:52.530  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
So something that I I wanna point out here.

0:32:53.790 --> 0:33:3.370  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Is that at the beginning of the model period, there's very little information, limited length, composition, data. There's no CPUE data at this point from which to estimate recruitment.

0:33:4.310 --> 0:33:21.940  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And currently in MULTIFAN it's it's not possible to constrain these recruitments. I know in synthesis you can have the early period and and the main period of recruits where that early period is constrained closer to to zero in terms of the deviates. And I think that's something that we would we would like to see.

0:33:22.940 --> 0:33:25.150  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Uh is to because this.

0:33:25.880 --> 0:33:29.850  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
This kind of jumping biomass is is really.

0:33:30.520 --> 0:33:31.590  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
It really spurious.

0:33:31.730 --> 0:33:32.300  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm.

0:33:34.50 --> 0:33:38.480  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
It's it's the model is chasing very few composition data.

0:33:39.680 --> 0:33:40.370  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Here and.

0:33:41.100 --> 0:33:41.630  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
That's.

0:33:42.600 --> 0:33:43.500  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
It's it's not real.

0:33:43.940 --> 0:33:44.370  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm.

0:33:46.350 --> 0:33:52.140  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
However, even though the model is going up and down in this period, the dynamic depletion.

0:33:54.260 --> 0:33:56.600  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
For the same time period, it is very robust so.

0:33:57.340 --> 0:33:58.10  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
At least.

0:34:0.640 --> 0:34:11.290  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Yeah, when you're like when when we consider these these different results always have to remember to look at at the multiple indicators of of stock status, because one can definitely hide something from the other.

0:34:14.320 --> 0:34:31.490  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
For looking at the UH-4 region model development, again we didn't work with the five by 5 spatial data. We began with that 16 extraction fishery and four index fishery model from the single region and assign those fisheries to the regions.

0:34:32.570 --> 0:34:36.790  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And then we progressively added the estimation of quarterly movement, so.

0:34:38.20 --> 0:34:43.90  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Uh, we had independent movement for each quarter.

0:34:44.870 --> 0:34:55.240  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And there were five adjacencies between the different boxes. They're the four different regions and each had bidirectional movement. So that gave us 40 total parameters added into the model.

0:34:57.410 --> 0:35:16.560  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Estimated the average regional recruitment distribution. It's an extra 4 parameters and then the estimation of regional recruitment deviates SO4 regions times North minus one quarterly time steps. That's where things really start to get out of hand in terms of the number of parameters and you're adding 1020 parameters at that stage.

0:35:17.890 --> 0:35:25.330  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
In terms of the tagging data, similar to the single region model we're estimating or assuming a negative binomial distribution and S.

0:35:26.20 --> 0:35:30.100  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Estimating the overdispersion parameter and we made.

0:35:30.790 --> 0:35:38.140  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
All the same assumptions from the OM documentation as before, including the reporting rate.

0:35:38.760 --> 0:35:41.250  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
At the assumed reporting rate for the different fisheries.

0:35:46.250 --> 0:35:55.740  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
So in terms of refining the structure, we considered a few different things with respect to movement. So movement and MULTIFAN CL.

0:35:57.450 --> 0:36:5.0  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
You define a a a prior a penalty on the likelihood where you either.

0:36:6.280 --> 0:36:10.760  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Assume that movement rates are are zero or.

0:36:12.510 --> 0:36:15.20  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Or some value that you that you specify.

0:36:16.660 --> 0:36:18.590  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And we considered a number of different.

0:36:19.330 --> 0:36:24.90  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm, I guess weights on those those priors.

0:36:25.10 --> 0:36:32.950  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Our our initial values I guess is a better word for it and ultimately didn't make much of a difference in terms of the fits.

0:36:34.570 --> 0:36:42.200  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Maybe slightly better fit with assuming kind of initial value of of 0.1 for the movements, but as you can see.

0:36:43.340 --> 0:36:44.880  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The estimated movement rates.

0:36:45.750 --> 0:36:54.0  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
For the for the regions where there isn't much information, it's it's going to 0, so it's it's moving off of that, that initial value.

0:36:55.500 --> 0:36:58.350  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
We also looked at grouping of quarterly movements.

0:36:59.730 --> 0:37:4.430  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
So as mentioned before, you could have a quarterly movement estimated in each time step.

0:37:6.410 --> 0:37:14.510  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Or you could group the different time steps, so we considered a number of different groupings and.

0:37:15.230 --> 0:37:16.140  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The the one that.

0:37:17.450 --> 0:37:21.680  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
That had the best fit, while also balancing parsimony.

0:37:22.760 --> 0:37:26.310  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
So we looked at AIC within nested models and that was this.

0:37:28.90 --> 0:37:36.160  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
This 22 groupings of quarterly movements, so quarters one and two had the same movement pattern and.

0:37:37.820 --> 0:37:43.390  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Quarters three and four had had another movement pattern and just something to point out.

0:37:44.860 --> 0:37:45.380  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Which?

0:37:46.480 --> 0:37:59.530  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Or make some more sense on a later slide is is the model is estimating, at least in the second-half of the year, quarter is 3 and four it's estimating a fair amount of movement from region three end to region 1.

0:38:1.0 --> 0:38:1.400  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Ah.

0:38:2.950 --> 0:38:5.370  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And then we also looked at whether there was.

0:38:6.610 --> 0:38:12.680  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
I guess information available to estimate each specific movement, so we consider it estimating.

0:38:13.540 --> 0:38:30.170  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Age specific movement as a linear function of age or or a nonlinear function of age. A logistic ramp in terms of the movement rates. So that's either adding one parameter for each movement coefficient or two parameters for each movement coefficient, and none of those.

0:38:31.630 --> 0:38:41.570  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
None of that added complexity was was supported by. Increases in and fits to the data, so we just left it at at No Edge specific movement.

0:38:44.970 --> 0:38:55.220  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Something else that we had to play with was the recruitment, and I'm gonna mention the orthogonal polynomial recruitment even though we didn't ultimately end up using it.

0:38:56.480 --> 0:38:58.690  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
But as I mentioned earlier.

0:38:59.560 --> 0:39:7.770  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The When you estimate the regional recruitment deviates, that's a that's a large number of parameters, 1020 extra parameters.

0:39:8.940 --> 0:39:25.830  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Not all of those parameters may be super well estimated. There could be regions and time steps where there just isn't a ton of it. Estimation of information available on particularly early on in the model period, we saw that there was that weird kind of hump of biomass initially.

0:39:27.310 --> 0:39:34.200  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
So one of the ways we tried to look at constraining that was to use this orthogonal polynomial recruitment.

0:39:35.940 --> 0:39:47.190  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And and it dramatically reduces the number of estimated parameters needed. Four regional recruitment and it also had the effect of constraining some of those recruitments.

0:39:47.970 --> 0:39:48.480  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm.

0:39:49.640 --> 0:39:53.610  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Particularly in the model period to be closer to to the mean.

0:39:55.770 --> 0:40:4.310  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
We didn't end up using the orthogonal polynomial parameterization, just cause there's there's a few things that need to be tweaked on it before it's ready for prime time.

0:40:5.450 --> 0:40:11.930  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
But at least in in this example it it did show some promise, so it's worth mentioning here.

0:40:12.790 --> 0:40:13.240  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm.

0:40:14.640 --> 0:40:22.210  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
We also looked into whether or not we needed to estimate those regional recruitment deviates again, that's that's a lot of parameters.

0:40:23.590 --> 0:40:27.560  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And when we we turn the estimation of that on and off.

0:40:28.200 --> 0:40:48.820  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm. Model selection criteria actually said that that it the degradation and and fit did not outweigh the reduction in and all those parameters. So AIC would have supported not estimating the regional recruitment deviants and so kind of the biggest difference that you saw.

0:40:50.420 --> 0:41:1.150  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Turning those regional recruitment debits on or off is here illustrated in region. The region 2 CPUE the fit to that, the Orange Line is is with the.

0:41:2.270 --> 0:41:10.560  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
With the regional recruitment deviates turned on and it doesn't do a great job of fitting this early stuff, but it at least makes an attempt at it.

0:41:11.920 --> 0:41:21.780  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Turning that off it it it essentially just gives up and it just fits smoothly through that first half of the the CPUE period and.

0:41:22.920 --> 0:41:25.20  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Yeah. And then it kind of it's.

0:41:25.790 --> 0:41:30.950  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
It's an even worse fit. Let's just leave it at that. And the other thing that it did that was.

0:41:31.720 --> 0:41:35.550  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Well, we felt was unsatisfactory was.

0:41:36.300 --> 0:41:46.540  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
In region one it when you turned off those regional recruitment deviates, it put no recruits and region one, which from kind of a biological standpoint.

0:41:47.180 --> 0:41:50.550  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Region one is is kind of where you want all your recruitments to be.

0:41:51.990 --> 0:41:58.550  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Or at least that's what the OM is assuming, and so we didn't feel it realistic to even though.

0:41:59.880 --> 0:42:7.370  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
From a parsimony standpoint, it was supported. We didn't feel it was realistic to to not estimate those regional recruitment deviates.

0:42:9.340 --> 0:42:21.220  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm, another thing to point out is when we estimated the average recruitment distribution, the model chose to put most of the recruitments and region 3 and if you remember back a few slides.

0:42:22.110 --> 0:42:26.860  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And the second-half of the year, there's, there's a lot of well, they're not a lot, but there is.

0:42:27.700 --> 0:42:32.820  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
There is some movement from region 3 into region 1 so.

0:42:33.340 --> 0:42:40.980  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm, while not biologically realistic or or matching the OM multifan is is.

0:42:41.890 --> 0:42:48.60  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Is finding a way to to produce recruits somewhere else in the model to?

0:42:48.880 --> 0:43:3.530  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
To to shove into region 1 where where a lot of the the fisheries action is is happening and it's it's there's a kind of a tradeoff that you're seeing between the the average recruitment distribution and the movement rates.

0:43:4.650 --> 0:43:6.160  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Estimated between those regions.

0:43:9.240 --> 0:43:16.80  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
For the tagging data that estimated over dispersion parameter, what what's pretty much straight to one?

0:43:16.770 --> 0:43:17.460  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm so.

0:43:18.250 --> 0:43:26.260  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Morba more of a Poisson distribution than a than a negative binomial. It would seem, and then similar to the single region model.

0:43:27.840 --> 0:43:33.160  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The model scale was sensitive to the mixing period that was assumed, although really had a.

0:43:34.0 --> 0:43:46.100  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And negligible impact on the fits to the CPU index or the length composition data. It it pretty much was just changing your your scale in terms of the biomass which had a trickle down effect into.

0:43:46.940 --> 0:43:49.540  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
What you assumed what you saw depletion to be?

0:43:50.460 --> 0:43:51.310  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Dynamic completion.

0:43:54.220 --> 0:43:55.610  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
So the the current model.

0:43:57.320 --> 0:44:5.890  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Where we are with the the four region approach. Here we have the the fit to the the four different index fisheries, one in each region.

0:44:6.770 --> 0:44:7.310  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And.

0:44:8.690 --> 0:44:10.960  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Region 1, Region 4.

0:44:11.870 --> 0:44:12.680  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
That's are OK.

0:44:14.420 --> 0:44:15.310  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Region 2.

0:44:17.70 --> 0:44:17.920  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Not so good.

0:44:19.750 --> 0:44:29.720  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Wrong way and it looks like in region 2 there's some sort of kind of cohort year class type effect.

0:44:31.690 --> 0:44:38.40  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Or you just have these increases. Don't know if that's that's recruitment related or or movement related.

0:44:39.690 --> 0:44:48.460  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Either way, the model is not doing a good job of fitting that as it's currently formulated, so that's perhaps another bit of additional work.

0:44:50.710 --> 0:44:52.730  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
That that could be done to improve things.

0:44:54.500 --> 0:44:55.640  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The other thing is.

0:44:56.590 --> 0:44:57.580  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Is similar to that.

0:44:58.970 --> 0:45:8.220  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The single region model when you have that increase in the the composition data sample size for the persane around 2010.

0:45:11.960 --> 0:45:16.730  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The way this model is formulated right now, it's it's completely missing that.

0:45:18.300 --> 0:45:32.210  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Which is a which is a bit undesirable and I think the reverse actually of what we saw before. I'd have to go back to check, but either way it's it's missing this. So something else to to improve.

0:45:36.510 --> 0:45:44.690  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
In terms of comparing things between the the four region model and the single region model, so the single region models.

0:45:45.430 --> 0:45:47.370  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm, the solid line?

0:45:48.840 --> 0:45:54.160  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The mixing period is denoted by the color and the four region model is.

0:45:54.890 --> 0:46:1.380  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Denoted by the the dotted lines. We didn't run a form region model without tags.

0:46:4.110 --> 0:46:5.30  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
At this stage.

0:46:6.520 --> 0:46:14.310  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
But the general trend is that the if you look at the the equivalent single region with the four region model is that.

0:46:15.0 --> 0:46:16.330  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The scale is shifted up.

0:46:18.410 --> 0:46:20.280  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
For the the four region model.

0:46:21.410 --> 0:46:22.180  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And.

0:46:24.120 --> 0:46:24.530  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
That.

0:46:25.940 --> 0:46:26.840  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Results.

0:46:27.610 --> 0:46:35.560  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
In, in less of depletion and I think I forgot to add us add the slide in of the the regional specific estimates.

0:46:37.140 --> 0:46:44.70  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
But I'll quickly describe it as is. What's going on there? Is that a few of the regions show very high levels of of depletion.

0:46:46.140 --> 0:46:51.920  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And then there's a couple of the regions that I think regions three and.

0:46:52.630 --> 0:46:53.320  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Or.

0:46:54.150 --> 0:47:6.640  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
That are less depleted and kind of act as a buffer to to where the action is happening in the fishery, and that gives you the phenomenon of that four region model.

0:47:7.870 --> 0:47:8.400  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Being.

0:47:9.740 --> 0:47:18.200  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Having a slightly better stock status than the single region model where effort is is not compartmentalized spatially.

0:47:20.560 --> 0:47:25.970  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Another thing that that we wanted to point out with the single region versus the four region model is.

0:47:27.40 --> 0:47:33.150  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Is moving to the four region model did improve the fit to the tagging data somewhat?

0:47:34.680 --> 0:47:38.390  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
It's it's chasing those high observations and.

0:47:39.830 --> 0:47:51.240  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And one of the years a little bit better and with the four region model, it's still not getting all of them. So there's something weird going on that the model's not quite able to match the dynamics.

0:47:52.410 --> 0:47:56.680  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm, but there was an improvement, small improvement when switching to.

0:47:58.110 --> 0:47:59.60  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The forager model.

0:48:0.410 --> 0:48:19.730  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
When we looked at the likelihoods between the two different models, is actually interesting to see that the four region model had more conflict. So this Gray line is the tagging data and it doesn't appear to be an agreement with the overall minimum is in.

0:48:20.400 --> 0:48:21.630  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Conflict with the.

0:48:23.110 --> 0:48:35.960  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The length data in orange and you don't see that so much in the single region model which which was kind of interesting. You would have thought that if there was more conflict, it would be in the single region model than in the four region model. So that was a bit of an unexpected.

0:48:37.150 --> 0:48:37.710  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Result.

0:48:40.960 --> 0:48:43.750  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Now to to move on to the, the replicates.

0:48:45.890 --> 0:48:53.790  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
As you see on the slide, we thought we were done, but something seems off. So for the single region model, the kind of the.

0:48:55.40 --> 0:49:11.600  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The current final model for the single region is shown in the solid line, and so that one without tags is is higher than the ones with with the two tags with the tagging included and the shaded region is the results of the 100 replicates.

0:49:12.420 --> 0:49:14.190  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Uh fit with those different?

0:49:15.700 --> 0:49:17.10  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Treatments of the tagging data.

0:49:18.0 --> 0:49:25.880  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And I think in an ideal world, you'd like to have your solid lines inside of your shaded lines on, but that's not the case.

0:49:27.0 --> 0:49:30.390  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
So we we did a little bit of digging.

0:49:30.510 --> 0:49:39.380  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm. And we didn't use the same composition data. It turns out that if you're treatment of composition, data is different. If you're gonna give different results, so.

0:49:40.390 --> 0:49:40.990  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The.

0:49:41.740 --> 0:49:55.930  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The test data set with that effective sample size of five that ESS under score 05 X data is in the blue, and what we use for the replicates actually was the ESS under score 00X, which is in the.

0:49:56.680 --> 0:50:10.570  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm the grey and that much smoother length composition data. The Dirichlet multinomial estimated a much higher effective sample size for that relative to that sparse.

0:50:11.610 --> 0:50:23.200  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Data that we were initially fitting the models to and it it completely dominated the fit. So looking back here you see that there is quite a bit of a difference between the models with the different treatment of tagging data.

0:50:24.660 --> 0:50:39.610  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
One, we use those replicates that had the the really good. The high sample sizes of that length, composition data, the the length comps just totally overwhelmed the model and you don't really see much difference between the different model runs that have the different treatment attacking data.

0:50:40.880 --> 0:50:41.350  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
So.

0:50:42.230 --> 0:50:43.600  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
We need to revisit this.

0:50:45.290 --> 0:50:46.130  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
At least correct it.

0:50:47.170 --> 0:50:56.620  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
But that is why you're not going to see replicate results for the single region or the four region model, because we thought we were finished. But turns out we did it wrong.

0:50:58.930 --> 0:51:0.890  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Uh, so in terms of of discussion?

0:51:2.750 --> 0:51:23.550  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Just kind of to wrap up quickly in a few slides to some of the strengths that we discussed for multi fancy all the tagging module, a lot of work over many years has gone into that. So we consider it to be an asset, the movement parameterization, that movement to non adjacent regions within the same time step.

0:51:25.800 --> 0:51:34.850  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And also the orthogonal polynomial recruitment parameterization even though not showing results from that it it definitely.

0:51:35.980 --> 0:51:42.60  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Can greatly reduce the number of parameters that that you estimate, and particularly if there are.

0:51:42.860 --> 0:51:45.470  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Periods of your model that are our data poor.

0:51:46.550 --> 0:51:56.160  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
It it could be something useful to use because when you go to the recruitment deviates parameterization, that's a lot of free parameters that can sometimes do weird things.

0:51:57.600 --> 0:51:58.580  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
In terms of a.

0:51:59.750 --> 0:52:14.20  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Wish list to address some of the things that we saw in the simulation that maybe we weren't quite able to fit as well as we wanted to, but maybe would like to to try to fit better if these were possible.

0:52:15.150 --> 0:52:20.910  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Nick, if you're watching, I'm. I'm not saying to to go ahead and develop this. This is just a a hypothetical exercise.

0:52:22.410 --> 0:52:25.900  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Time varying movement was one of the things that we discussed.

0:52:26.200 --> 0:52:34.430  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm, the ability to fix estimate some movement parameters rather than either estimating all of them or estimating none of them.

0:52:36.420 --> 0:52:37.790  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Related to that.

0:52:39.570 --> 0:52:56.30  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Recruitment issue that we saw being able to split up a recruitment estimation and take an early period in the main period. So constraining those early period recruits when there's less information to be, have a deviate closer to 0.

0:52:58.690 --> 0:53:2.760  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And then also I think random effects.

0:53:3.960 --> 0:53:12.70  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
In terms of estimating some of these, these different processes, so movement, recruitment, time, bearing selectivity.

0:53:14.740 --> 0:53:19.90  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Rather than estimating them all is fixed effects could be better to treat them as random effects?

0:53:20.0 --> 0:53:26.670  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And then in terms of a data wish list, so if if the data were to be restimulated for a completely new experiment.

0:53:28.500 --> 0:53:35.740  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Perhaps a finer scale composition data 5 centimeter bins were were a little bit coarse.

0:53:37.50 --> 0:53:39.590  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
To see good modal progression.

0:53:41.910 --> 0:53:49.100  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Especially in the those younger those younger years where where the fish are growing growing quickly and then.

0:53:50.290 --> 0:53:51.580  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Because we.

0:53:52.390 --> 0:53:57.840  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
We use the growth that was provided in the OM. We were able to get away with this.

0:53:59.260 --> 0:54:7.420  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
But for the data sets that the tagging data was provided the the Ajax at release rather than the length that release, and so we were able to convert.

0:54:8.90 --> 0:54:15.940  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Or try to convert from age to length using the growth curve. But if we were to estimate growth internally to the model.

0:54:17.480 --> 0:54:25.790  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
This would be a bit problematic because then you could get a mismatch between the converted the growth curve that you used to convert.

0:54:26.10 --> 0:54:33.900  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Uh ages to lengths and the growth curve that is actually being used with the population dynamics estimated internal.

0:54:37.960 --> 0:54:40.600  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
So in terms of things that.

0:54:42.60 --> 0:54:50.530  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
We would like to improve on this model, but don't necessarily know if we will get around to it pending availability of.

0:54:51.200 --> 0:54:51.950  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Of time.

0:54:53.540 --> 0:55:1.10  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
For this this project, there was a few systemic misfits to the length composition data. The CPU and the tagging data.

0:55:3.30 --> 0:55:9.40  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
That would like to, if we had the opportunity to get another crack at it. So part of that would be.

0:55:10.90 --> 0:55:13.60  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
We didn't use the five by five data and developing the model.

0:55:13.240 --> 0:55:15.10  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm and I think.

0:55:16.990 --> 0:55:30.260  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
If we were to do things over again, we'd start with that five by five data and perhaps revisit the selectivity groupings and and fishery structure. As a result, it also looked like in some of the the fits.

0:55:32.930 --> 0:55:35.860  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Particularly for that person, the fit to the mean length data.

0:55:35.960 --> 0:55:43.450  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm, there could be some seasonal or time varying component as the fisheries moving around within within those big boxes.

0:55:44.900 --> 0:55:45.130  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
That.

0:55:46.150 --> 0:55:52.280  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Could offer some improvement if if if a seasonal processor time varying selectivity was included.

0:55:53.910 --> 0:56:3.980  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Also another thing that that could be good to do would be evaluating the the tag releases relative to the regional boundaries. So a lot of the tags are released and region, not a region 2.

0:56:4.800 --> 0:56:8.220  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm, which is quite close to the boundaries with regions one and three.

0:56:9.10 --> 0:56:18.840  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm. So perhaps those boundaries are not are not placed in optimal places with respect to the tags and for the estimation of movement. Another thing that can be done.

0:56:18.940 --> 0:56:28.880  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm is to define different mixing period lengths by release group. So if there are some that are closer to the boundary or further away, they're level of mixing might be different.

0:56:29.700 --> 0:56:30.260  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm.

0:56:31.570 --> 0:56:36.320  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And then some other things that we need, continued development of diagnostics for.

0:56:38.220 --> 0:56:39.710  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
We we spent a lot of time.

0:56:40.400 --> 0:56:42.780  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Trying to identify an appropriate mixing period.

0:56:43.120 --> 0:56:48.30  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm, but the the fits to the data were very similar.

0:56:49.710 --> 0:56:55.950  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Even across different mixing period assumptions, but the the stock status was.

0:56:56.760 --> 0:57:1.210  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Was not there were some large shifts and so we really struggled with.

0:57:2.550 --> 0:57:5.890  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
With how to define an appropriate mixing period?

0:57:7.250 --> 0:57:7.670  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm.

0:57:8.450 --> 0:57:27.540  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Evaluating fit to tagging data. I could be useful to have some some better diagnostics for that and also evaluating the estimated movement rates and what is informing that movement estimates. So an example diagnostic for that that could be developed would be like an empirical movement rate.

0:57:28.250 --> 0:57:33.270  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm. Residual where you look at what the movement rate indicated by just the.

0:57:34.240 --> 0:57:40.960  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Empirical tag release and we capture locations and the the model estimated movement and and seeing.

0:57:41.870 --> 0:57:51.430  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
If those are consistent, or if the model estimate recruitment movement is being pulled in a different direction due to the composition data or the CPU we index.

0:57:53.830 --> 0:57:58.470  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And so lastly, thinking about some of those discussion questions that were.

0:57:59.160 --> 0:58:4.770  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Posted in the presentation prep guide limitations to implementing spatial stock assessments.

0:58:5.390 --> 0:58:7.810  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm, we talked about model complexity.

0:58:8.710 --> 0:58:17.190  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Being a lot of potential limiting limiting factor, at least in MULTIFAN CL, the models are very slow to run when you add spatial complexity.

0:58:18.210 --> 0:58:27.240  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And the other thing that needs to be considered is that you actually have sufficient data to estimate all those additional spatial processes are particularly movement and recruitment.

0:58:30.0 --> 0:58:37.550  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Another limitation to implementing spatial stock assessment could be the lack of tagging data. Do sufficiently estimate movement.

0:58:38.870 --> 0:58:48.180  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Not ideal world. You wouldn't want your length composition data to drive your movement estimates just because if you're length, composition is primarily fisheries dependent.

0:58:48.550 --> 0:59:7.800  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm, you could have irregular spatial temporal sampling of that composition data. Also, you could have spatially varying growth, and if you've got either one of those or both of them going on, it could bias your estimates of movement. If that's the primary driver of your movement rather than the tags.

0:59:9.320 --> 0:59:14.610  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And so some some general comments based on examples from the WCPFC.

0:59:15.410 --> 0:59:25.90  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Is that in our limited investigation, nonspatial models tended to produce lower estimates of stock status that were more depleted relative to the corresponding spatial model.

0:59:25.870 --> 0:59:32.710  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And that partitioning of fishing mortality and biomass and spatial models leads to buffering overall stock status.

0:59:33.410 --> 0:59:36.990  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
While some model areas show higher levels of depletion.

0:59:37.990 --> 0:59:44.850  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And at least in the WCPFC I lack of regional specific reference points means that this behavior.

0:59:45.510 --> 0:59:47.850  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Isn't always accounted for in management advice.

0:59:48.660 --> 0:59:49.160  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm.

0:59:49.910 --> 0:59:54.910  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And with that, it's the end of my presentation and I would.

0:59:55.600 --> 1:0:2.430  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
I should have done it at the top, but I would really like to thank all the other members of the Multifan CL team.

1:0:4.210 --> 1:0:8.660  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
This was a a collaborative effort and it was. It was really fun working on this.

1:0:9.460 --> 1:0:9.750  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Thanks.

1:0:13.910 --> 1:0:18.100  
Aaron Berger  
Yes, thank you, Nicola. Thanks for your great presentation and very thorough.

1:0:19.740 --> 1:0:22.170  
Aaron Berger  
Explanation of all that you guys have done, which is quite a bit.

1:0:23.490 --> 1:0:25.580  
Aaron Berger  
We are at the top of the hour.

1:0:27.250 --> 1:0:37.340  
Aaron Berger  
Let's we can pause here for a couple quick questions. Just noting that we'll have, you know, full half hour after Rick's presentation.

1:0:38.520 --> 1:0:40.220  
Aaron Berger  
But if there's a burning question.

1:0:41.130 --> 1:0:41.600  
Aaron Berger  
Umm.

1:0:42.450 --> 1:0:44.50  
Aaron Berger  
Yet, Rick, Rick, are you speaking?

1:0:51.190 --> 1:1:3.700  
Aaron Berger  
Ohk OK. And so if we have a question or two real quick for Nicola, we can do that now. You can either raise your hand in the use the raise hand feature or type something in the chat.

1:1:4.660 --> 1:1:5.110  
Aaron Berger  
Umm.

1:1:6.240 --> 1:1:12.650  
Aaron Berger  
Just give a a second here to see if anybody has something right away. I see Mark has a question. Go ahead and Mark.

1:1:14.720 --> 1:1:18.490  
Mark Maunder  
Yeah. Thanks, Nicola for the presentation. I found it very interesting.

1:1:19.670 --> 1:1:21.530  
Mark Maunder  
One thing I noted is that.

1:1:22.300 --> 1:1:23.910  
Mark Maunder  
You got recruitment.

1:1:24.620 --> 1:1:26.390  
Mark Maunder  
No recruitment in one area.

1:1:27.120 --> 1:1:32.630  
Mark Maunder  
Which was unusual, but you also have that in some of your actual applications as well.

1:1:33.510 --> 1:1:42.210  
Mark Maunder  
And I was wondering, is there anything inherent in MULTIFAN CL that's being assumed that's causing something like that to happen?

1:1:45.440 --> 1:1:47.610  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
That's a that's a good question, mark.

1:1:49.10 --> 1:2:11.920  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And I'll I'll take a stab at it. And if I notice, there's quite a few of the the team multifan CL members in attendance tonight. They wanna jump in. I don't know about any assumptions, but Multifan has a lot of flexibility, especially when you're starting to estimate those regional recruitment deviates. And I think it's possible that in some situations.

1:2:13.490 --> 1:2:23.520  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
The same solution can be derived either by doing something with the regional recruitment deviates or with doing something with the movement rates.

1:2:25.650 --> 1:2:32.620  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And so it's I think it it could be an issue of confounding, especially if if some of those regional recruitment deviants.

1:2:33.880 --> 1:2:35.110  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Cousin and the.

1:2:35.820 --> 1:2:46.390  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Operational assessments when you've got 8-9 regions and you quarterly time step back to 1952 or 1972 that that begins to be quite a quite a lot of parameters.

1:2:48.10 --> 1:2:53.360  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
So it it, it could be kind of a trade off between how the model chooses to.

1:2:54.320 --> 1:3:1.410  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
To fit the data, whether it it does it through the recruitment deviates and the movement, the combination of of the two.

1:3:2.360 --> 1:3:2.950  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
That's.

1:3:3.800 --> 1:3:7.710  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
My intuition, but I'm happy for other people to correct me.

1:3:15.30 --> 1:3:18.180  
Rick Methot (Guest)  
We'll say that we saw the same kind of confounding.

1:3:35.450 --> 1:3:37.900  
Aaron Berger  
OK. Yeah. Dan Fu, go ahead please.

1:3:40.800 --> 1:3:47.210  
Fu, Dan (NFITD)  
But as thanks Nicola, that's a great presentation, very comprehensive work. Just quick question on the.

1:3:48.0 --> 1:4:9.300  
Fu, Dan (NFITD)  
The estimation of movement the model seems to estimate on some of the model estimate quite high movement rates. Do you have a few? How much of that is driven by the tagging data and how much was, you know influenced by the other datasets? I mean you you did a lot of sensitivities on the.

1:4:10.50 --> 1:4:13.230  
Fu, Dan (NFITD)  
You know the mixing period. Do you have a field that the mixing period?

1:4:14.650 --> 1:4:31.450  
Fu, Dan (NFITD)  
Ordering some different has some influence on your estimate of movement rates as well, because when you took different mixing periods, a lot of those uh, you know the text has not been included in your in the model. Fixed right? That should that have an impact on your on the, on the you know movement testing.

1:4:35.890 --> 1:4:40.620  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Yeah, that's a that's a great question, Dan. Thank you. So there's.

1:4:41.480 --> 1:4:46.930  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
If you look at this movement matrix for one of the example models, there's.

1:4:48.80 --> 1:5:13.390  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Actually, there's a lot of internal self movement fish, fish not leaving the region. There's not a ton of connectivity between all of the different regions and suspect that's because there isn't. So tags are only released in one predominantly in one area. So you have information out of that area to get to some of the other regions, but you don't really have a lot of information to tell you what.

1:5:14.170 --> 1:5:34.400  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
What movement might be in the other direction or between these regions that don't have tagging because it's so concentrated and not kind of spread out across the spatial domain? So that might be one of the reasons why we're seeing kind of this limited transfer of biomass between regions and something that we were actually discussing today.

1:5:35.970 --> 1:5:45.40  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Is is what actually is driving these estimates of movement. Whether it's the tagging data, whether it's the length, composition data, whether it's the CPUE.

1:5:46.720 --> 1:5:48.550  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
And it's.

1:5:50.20 --> 1:5:56.320  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
That was that was one of the things that we had on our wish list is is kind of a better diagnostic of that because we haven't.

1:5:58.50 --> 1:6:9.980  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
We tried to do some profiles which may be indicated that length composition was was important, but we didn't have consensus within our group that that was the correct conclusion.

1:6:10.70 --> 1:6:12.170  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Umm, so kind of the.

1:6:14.170 --> 1:6:20.640  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
At least in this model, it's it's. It's tough. It's tough to tell and we didn't have a great diagnostic developed.

1:6:22.240 --> 1:6:28.910  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
Today to to really, to tease that out, I see John's got his hand up. I'm sure he.

1:6:30.280 --> 1:6:32.770  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
We'll do a good job of following up my answer.

1:6:39.750 --> 1:6:40.800  
Aaron Berger  
Yeah. Please go ahead, John.

1:6:40.100 --> 1:6:49.250  
John Hampton  
Well, I yeah, I was actually gonna comment on an on another aspect. So I think you you covered that one pretty well, Nicola.

1:6:50.580 --> 1:6:54.810  
John Hampton  
The the aspect I was gonna mention was this Dirichlet multinomial size likelihood.

1:6:55.540 --> 1:7:3.770  
John Hampton  
That we're still kind of learning about, but we were reasonably encouraged with what we found using it on the simulated data.

1:7:5.730 --> 1:7:7.530  
John Hampton  
You know, even even though.

1:7:8.380 --> 1:7:16.30  
John Hampton  
We had observed sample sizes in some of these data sets, you know, massive observed sample sizes.

1:7:17.220 --> 1:7:35.220  
John Hampton  
You know, I think for the person fishery, is it fishery 6, that there were some, you know, quarterly sample sizes of over over 1,000,000 fish that the Dirichlet multinomial was still down waiting that size data, you know, quite massively into single figures.

1:7:36.640 --> 1:8:9.330  
John Hampton  
So we weren't telling it to do that. That's that's what it was coming up with through the statistics of the Dirichlet multinomial, and inadvertently we just discovered this afternoon that we were using different types of size data in the replicates, which Nicola alluded to. But these these size data in the in the replica, and we're still trying to get to the bottom of it. But the the sample size is the observed sample sizes were very large, but the the data looked much smoother and more regular.

1:8:9.690 --> 1:8:40.640  
John Hampton  
And the Dirichlet multinomial was coming up with effective sample sizes a couple of orders of magnitude above what we had used in the reference model datasets. And if you looked at the fits to to the data, you could understand, you can see why that happened. So it was it was actually, if inadvertent, it it was a good test to see how that those Dirichlet multinomial statistics respond to what it perceives as the quality of the data.

1:8:53.560 --> 1:9:16.900  
Rick Methot (Guest)  
I might comment on that point that with such course length, composition, data, and especially for the person, not very many bins of that length composition even having any fish at all, it's not surprising that the effect of sample sizes go down to a very low number because there's just not that much detail there for it to be able to capture.

1:9:29.30 --> 1:9:59.100  
Aaron Berger  
OK, let's say I'm sure others have some more questions. I'll let you write those down and think about those and we can come back to those lingering questions at the end in our in our discussion time. For now, I'd like to move on to Rick Methot, who's going to give us a presentation on what him and his team has been doing with stocks synthesis. And as in way of an introduction, Rick.

1:9:59.220 --> 1:10:14.660  
Aaron Berger  
Is Noah's senior scientist for fish stock assessments. In this role, he serves on the NOAA Fisheries Science Board and the NOAA modeling team, where he aligns fish assessment modelling practices with weather, ocean and ecosystem modeling.

1:10:15.580 --> 1:10:42.490  
Aaron Berger  
He is active on the steering committee for CAPAM, the Center for the Advancement of Population Assessment methodology, and with work on developing standards for science based fisheries management. Reference points. He has devoted much of his career to development of the stock synthesis assessment model, which is one of the models being used in the spatial modelling project, and one of the ones that he's going to be well, the one that he's going to be talking about today. Rick, please go ahead. Thank you.

1:10:44.150 --> 1:11:15.280  
Rick Methot (Guest)  
You're good and thanks for that introduction and I thanks for the the project. I mean, it's great for us. There will be working together on something like this. So I applaud the efforts and the challenges to feel the to do the work involved to produce these datasets and for all the teams to work on setting. So let me go ahead and start up a presentation which will be shorter than we had we from Nicholas's presentation. It's clear that their team was able to put a good bit of energy into this and I think we probably don't have quite as much.

1:11:15.380 --> 1:11:17.710  
Rick Methot (Guest)  
But we do have some good information to share.

1:11:20.630 --> 1:11:21.590  
Rick Methot (Guest)  
College here.

1:11:31.400 --> 1:11:31.590  
Rick Methot (Guest)  
OK.

1:11:31.660 --> 1:11:38.200  
Rick Methot (Guest)  
OK, I'm gonna be talking about the S3 models for this yellowfin case study the team has.

1:11:38.270 --> 1:11:56.450  
Rick Methot (Guest)  
Of five of us are working on it and and you know most of the work was done by Dan and Regresan. Max's have made a good contribution and Catherine and I, you know, helped organize things a bit. But, you know, they they they get a lot of credit for the work that we've been able to do here today.

1:12:2.840 --> 1:12:4.190  
Rick Methot (Guest)  
OK, let me work on that.

1:11:59.90 --> 1:12:5.90  
Aaron Berger  
Rick, we see it's not in presentation mode. If if you could get it there, it might be a little bigger than, yeah.

1:12:5.290 --> 1:12:8.600  
Rick Methot (Guest)  
Yeah, yeah. Let me work on that. Hold on just a second.

1:12:20.840 --> 1:12:22.450  
Aaron Berger  
Add the multi monitor shuffle.

1:12:23.80 --> 1:12:25.220  
Rick Methot (Guest)  
Yeah, yeah, I know. I'm almost there.

1:12:30.820 --> 1:12:31.630  
Rick Methot (Guest)  
Did that work?

1:12:34.800 --> 1:12:35.0  
Rick Methot (Guest)  
We're.

1:12:38.20 --> 1:12:38.570  
Rick Methot (Guest)  
Alright.

1:12:33.750 --> 1:12:39.290  
Aaron Berger  
Uh, do we still see the? Yeah, the one with the sidebar of the slide. So not in full presentation.

1:12:49.710 --> 1:12:50.160  
Rick Methot (Guest)  
Better.

1:12:59.770 --> 1:13:0.750  
Rick Methot (Guest)  
That makes sense.

1:12:53.530 --> 1:13:4.730  
Aaron Berger  
Uh, no. So sometimes I think you gotta stop sharing and then start resharing for those those effects to come up, let's try that. And if not, maybe we can zoom in and touch and we'll be OK.

1:13:4.730 --> 1:13:7.30  
Rick Methot (Guest)  
No, no, no. I could get there. I have a couple minutes.

1:13:8.700 --> 1:13:9.490  
Rick Methot (Guest)  
Sharing.

1:13:11.140 --> 1:13:13.250  
Rick Methot (Guest)  
But you need to stop the slideshow.

1:13:28.990 --> 1:13:30.850  
Rick Methot (Guest)  
Didn't have things previewed here.

1:13:31.830 --> 1:13:33.40  
Rick Methot (Guest)  
For Microsoft meat.

1:13:55.660 --> 1:13:56.470  
Rick Methot (Guest)  
Almost there.

1:14:9.530 --> 1:14:10.540  
Rick Methot (Guest)  
That should work, right?

1:14:13.390 --> 1:14:15.910  
Aaron Berger  
Yeah, yes, that looks great. Thanks, Rick. Go ahead.

1:14:16.510 --> 1:14:17.320  
Rick Methot (Guest)  
Try this again.

1:14:23.410 --> 1:14:32.220  
Rick Methot (Guest)  
So just going over briefly the basic capabilities of S3 with regard this specific characteristics of this exercise.

1:14:34.520 --> 1:14:47.920  
Rick Methot (Guest)  
S3 is is has a lot of the same characteristics as Multifan CL in this regard, but let me go over what we are using here. The areas are basically virtual compartments. They're just.

1:14:48.810 --> 1:15:18.900  
Rick Methot (Guest)  
Units that have fish in them and fish can move from one area to another versus a transfer coefficient. So you could have any combination of area movements and each one is defined individually. They aren't defined as pairs, they're defined as movement from area A to area B without anything implied about movement from area B to a. They're all separate movement pairs. There's a global spawner recruitment pool that is summed across all the areas.

1:15:19.190 --> 1:15:33.440  
Rick Methot (Guest)  
And then recruits are partitioned out to the area. So there's recruitment partitioning that happens in that recruitment. Partitioning can be time varying. We are not invoking that degree of detail view and the data that we have.

1:15:35.730 --> 1:15:41.50  
Rick Methot (Guest)  
The movement is as a percent transfer among Decidated source sync areas.

1:15:41.860 --> 1:15:57.440  
Rick Methot (Guest)  
Umm. And this can be a age specific movement with some defined of shape of that movement or rates for you know. So young fish can have a different movement rate than old fish according to some kink in that curve.

1:15:59.120 --> 1:16:4.800  
Rick Methot (Guest)  
Importantly, fleets are assigned to a single area, so if you know.

1:16:5.560 --> 1:16:5.970  
Rick Methot (Guest)  
What?

1:16:6.970 --> 1:16:12.630  
Rick Methot (Guest)  
I wouldn't with the catch of a fleet. You know the catch is come from a particular area.

1:16:13.460 --> 1:16:29.560  
Rick Methot (Guest)  
You can share characteristics among fleets such that you could have a long line fleet in area one and a long line fleet in Area 2. There are different fleets, but you could have them share the same selectivity or capabilities as needed.

1:16:32.140 --> 1:17:1.170  
Rick Methot (Guest)  
Tags are seated into an area at some designated age dot length. We've not tracked the the growth characteristics of tags, although it is an idea we are interested in implementing an S at some point, so tags are come in as a designated age, and if you happen to have A tag group that spans a wide size range, but you could break it up into small fish and.

1:17:1.630 --> 1:17:5.290  
Rick Methot (Guest)  
All fish and create different tag groups out of it.

1:17:7.360 --> 1:17:20.10  
Rick Methot (Guest)  
Recapture tags are then tracked over time to inform mortality and the distribution of recaptured tags across fleets, which again represent only areas, will inform movement.

1:17:21.270 --> 1:17:31.60  
Rick Methot (Guest)  
So what sort of basic characteristics that? And clearly, you know very much similar because we're dealing with the same kind of problems as the characteristics you see in multiplayer.

1:17:33.630 --> 1:17:35.390  
Rick Methot (Guest)  
In this particular model.

1:17:36.750 --> 1:17:40.700  
Rick Methot (Guest)  
We've working with 16 fishing fleets.

1:17:41.470 --> 1:17:54.190  
Rick Methot (Guest)  
Only one of these fleets, the long line fleet is treated as having asymptotic selectivity with a logistic function. All the others are treated with a double normal selectivity function.

1:17:55.880 --> 1:18:12.390  
Rick Methot (Guest)  
We see some spikiness in these distributions even when aggregated, and this is one of the characteristics that I'll I'll get to later on. I have some concerns in that regard and how it's influenced our ability to have have well performed in models.

1:18:19.690 --> 1:18:25.160  
Rick Methot (Guest)  
And in particular, this longline fleet across the four areas.

1:18:26.510 --> 1:18:27.250  
Rick Methot (Guest)  
Is.

1:18:29.220 --> 1:18:43.990  
Rick Methot (Guest)  
Is is something that is treated as an aesthetic selectivity and hence has the most influence? It's this size comp has a particularly large influence on inference about what the mortality rates have been in these fisheries.

1:18:49.670 --> 1:18:55.870  
Rick Methot (Guest)  
The catch in this bottle across these four areas that I have it labeled in here.

1:18:56.670 --> 1:18:57.70  
Rick Methot (Guest)  
Nope.

1:19:0.10 --> 1:19:12.500  
Rick Methot (Guest)  
So area one in the upper left has by far most of the catch and most of it is from pursuing. So if a large catch of young fish in that area, 74% of the total catch.

1:19:13.590 --> 1:19:17.430  
Rick Methot (Guest)  
Area 2 has per seen in troll Catch.

1:19:18.330 --> 1:19:32.80  
Rick Methot (Guest)  
Area 3, just as a very small amount of catch and it's all long line and then area 4 again has mostly control catch and then a smattering of other fleets operating in Area 4.

1:19:33.330 --> 1:19:51.790  
Rick Methot (Guest)  
We we questioned on what is the merit of even including area 3I. You know we we could have pooled area three with area four with really no loss of information about what we can or can infer for the data that are available here.

1:19:56.850 --> 1:19:58.80  
Rick Methot (Guest)  
For the tags.

1:19:58.830 --> 1:19:59.260  
Rick Methot (Guest)  
Umm.

1:20:1.100 --> 1:20:3.840  
Rick Methot (Guest)  
There was a large number of releases.

1:20:5.530 --> 1:20:8.280  
Rick Methot (Guest)  
But they're almost all in area 1.

1:20:9.350 --> 1:20:37.460  
Rick Methot (Guest)  
And we have 10% of those tags recovered with over 10%, but they're mostly by per say again still an area of 1 and very few are pursuing an area 2 and Perseid 4. So you know we we really have not very much direct information, very much sparse empirical information about movements between areas.

1:20:38.170 --> 1:20:43.40  
Rick Methot (Guest)  
But we do have a large number, especially in area one and two from which.

1:20:43.890 --> 1:20:52.870  
Rick Methot (Guest)  
We should be able to infer the mortality rates of that area, except it's gonna be confounded by movement to other areas, but we don't have any.

1:20:54.510 --> 1:20:58.390  
Rick Methot (Guest)  
Enough tags are coming from the other areas to constrain it very well.

1:21:4.20 --> 1:21:25.950  
Rick Methot (Guest)  
And we also see that see in terms of the recoveries here of a very large fraction of the recoveries. See maybe Dan will have to help you out. This one, two sides of this curve must be the tags from area two are recovered mostly in area 2. That's what it's showing on the right hand side here.

1:21:33.260 --> 1:21:56.340  
Rick Methot (Guest)  
In terms of our model structure, we also tackle this with A1 area model and the four area model. In the one area model, it's treated simply as one pooled area where we have a single abundance index from the long line and seven fishery groups without having things broken up across the areas. In the four area model.

1:21:56.530 --> 1:22:26.550  
Rick Methot (Guest)  
Several other fisheries get broken up across the areas and we now have a regional recruitment and then with limited movement between the areas we are not even allowing movement to occur between all the area peers. Just looking at the characteristics of the situation, it's clear that the person fisheries operate in areas one and two because that's where the young fish must be. The fisheries are able to find it.

1:22:26.700 --> 1:22:37.950  
Rick Methot (Guest)  
And so you know, that's where the we assign most of the recruits as the base recruitment and then it'll let some fraction of recruits occur in other areas.

1:22:40.10 --> 1:22:55.320  
Rick Methot (Guest)  
In terms of the time steps, the temporal sequencing of the model, we do it as continuous quarters and so each quarter is effectively inside the model operating as if it's a year.

1:22:56.50 --> 1:23:11.570  
Rick Methot (Guest)  
Of only three months. And so that's the age of the animals are now reported in the quarters. And so we have not looked 28 quarters as the the duration of A A generation in the model.

1:23:12.680 --> 1:23:22.420  
Rick Methot (Guest)  
We did some work with uh fleet's area, but principally we just looking at the one area model and the four area model to date.

1:23:32.310 --> 1:23:32.570  
Rick Methot (Guest)  
We.

1:23:32.650 --> 1:23:34.140  
Rick Methot (Guest)  
We took from the.

1:23:36.170 --> 1:23:49.980  
Rick Methot (Guest)  
Description of the data sets in the simulation we are using our Bertolt stock recruit relationship with Steve, myself, .8, Sigma R of .6. And then there's the regional recruitment of portion of it.

1:23:51.20 --> 1:23:51.830  
Rick Methot (Guest)  
We have.

1:23:52.950 --> 1:24:10.720  
Rick Methot (Guest)  
Assign movement rates between areas one and two in both directions. Areas one in four and three and four so we are not allowing animals to be moving from area to to area 3 or 4. OK, we saw no.

1:24:12.450 --> 1:24:21.460  
Rick Methot (Guest)  
I've tags going in that direction, and so we did not even attempt to estimate movement parameters for that configuration.

1:24:23.110 --> 1:24:26.400  
Rick Methot (Guest)  
Taking the growth maturity is not to brutality rate is provided.

1:24:27.830 --> 1:24:31.580  
Rick Methot (Guest)  
We're using a shared catchability for the CPUE.

1:24:32.630 --> 1:24:34.980  
Rick Methot (Guest)  
And and now on the length comps.

1:24:37.460 --> 1:24:42.270  
Rick Methot (Guest)  
What we have ended up with, and I think this is something that maybe worth revisiting.

1:24:42.970 --> 1:24:57.160  
Rick Methot (Guest)  
Uh, we did. We did not use the Dirichlet multinomial, we did use the assigned sample size of five fish for every single composition observation we did not.

1:24:59.560 --> 1:25:1.640  
Rick Methot (Guest)  
Use the total number of.

1:25:2.440 --> 1:25:32.170  
Rick Methot (Guest)  
Fish in the link comp as the sample we just used the five and unfortunately I think that has caused us to greatly underweight the per Sean and some of the other large catches. And on the other hand, it's clear from just looking at the size comps especially for like the longline fishery, even though it's a substantial fishery, the link comps were very spiky and they were almost as if the sample itself for that quarter for that fleet.

1:25:32.790 --> 1:26:3.630  
Rick Methot (Guest)  
Only had less than 10 fish in it, so a very spiky and hence I'm sure quite a masking of any of the recruitment signal that had been there. So I think you know if we were able to continue working on this that we might relook at the sample size waiting for the length comp observations and the use the Dirichlet multinomial. That is certainly available in a functional in stock synthesis.

1:26:11.760 --> 1:26:36.410  
Rick Methot (Guest)  
Going to sort of the our bottom line of what we see overall, you know we were able to fit the observations pretty well. There's no really glaring patterns that are of lack of fit of the spatial model that seems to do a bit better job with the regional differences than the single area model, which isn't surprising given how different the trends look.

1:26:36.500 --> 1:26:37.910  
Rick Methot (Guest)  
So between the four areas.

1:26:38.820 --> 1:26:53.190  
Rick Methot (Guest)  
Uh, putting prior constraints on the regional biomass distribution, the spatial modelling by doing that, be using the shared catchability that helped a lot in getting a sense of the distribution of biomass.

1:26:54.290 --> 1:27:3.280  
Rick Methot (Guest)  
It data don't really seem very informative on regional recruitment and migration, and again, it's likely that these are confounded.

1:27:4.60 --> 1:27:20.190  
Rick Methot (Guest)  
Because there's just not enough of the right kind of information to to estimate these parameters gives they. They are inherently confounded and you need to have some separate information, and we can, which can come from the tags in order to to estimate it.

1:27:21.580 --> 1:27:30.810  
Rick Methot (Guest)  
In the the various spiky length compositions for Sona fleets also probably contributed to this situation as well.

1:27:32.730 --> 1:27:52.920  
Rick Methot (Guest)  
What we find is that we ended up with comparable spawning stock biomass estimates between the the four area model and the single model, but the when we include the tagging data in it, we see some greater difference there. So better understanding of just what is causing that would be helpful.

1:27:57.170 --> 1:28:3.200  
Rick Methot (Guest)  
We find differences in estimation of scaling parameter between the two model.

1:28:4.680 --> 1:28:8.650  
Rick Methot (Guest)  
And we see similar biomass distributions on the areas.

1:28:10.520 --> 1:28:12.460  
Rick Methot (Guest)  
And we've had some difficulty.

1:28:13.750 --> 1:28:36.230  
Rick Methot (Guest)  
You know, sorting out the temporal structure, we we tried doing this as a season within year model versus 1/4 as year. We're generally happier at this point with the quarter as year approach. But we did do some investigation of the year, your season approach as well, which would have a different recruitment structure to it.

1:28:39.770 --> 1:28:46.770  
Rick Methot (Guest)  
So what are the questions we have in here? We're showing the CPUE trend across the four areas.

1:28:48.150 --> 1:28:48.580  
Rick Methot (Guest)  
And.

1:28:49.800 --> 1:29:19.570  
Rick Methot (Guest)  
We, you know, again we see that in Area 3, you know there is a very flat trend there where there is very little catch in that area, very little trend in that area. And we also see that the seasonality, it seems to be some there, but we really without the movement parameters into area three, we did not attempt to try to reconcile what might be going on in that. the IT does seem to be some.

1:29:19.830 --> 1:29:25.910  
Rick Methot (Guest)  
I seasonality in the patterns in Area 3 where we weren't able to to take that very far.

1:29:26.850 --> 1:29:36.900  
Rick Methot (Guest)  
We do questioned whether or not we even needed to treat this as a seasonal that you structured model given the the patterns that we saw in the other areas.

1:29:45.140 --> 1:29:46.570  
Rick Methot (Guest)  
In the one area model.

1:29:48.550 --> 1:29:49.140  
Rick Methot (Guest)  
We.

1:29:50.110 --> 1:29:55.980  
Rick Methot (Guest)  
Looked at how long the time series should go back and what the influence of tag data should be.

1:29:56.780 --> 1:30:5.690  
Rick Methot (Guest)  
And in the four area model, we tried looking at the regional recruitment distribution over time and whether or not we could make it time varying.

1:30:6.890 --> 1:30:22.540  
Rick Methot (Guest)  
And try to smooth out just what it was driving the distribution of biomass between the areas. Given that we we don't have a lot of information in a lot of it is going to be dependent upon things like the assumptions about catchability across areas.

1:30:23.210 --> 1:30:25.200  
Rick Methot (Guest)  
So we have number of area.

1:30:26.200 --> 1:30:28.290  
Rick Methot (Guest)  
Configurations that we developed here.

1:30:28.850 --> 1:30:38.970  
Rick Methot (Guest)  
Umm. In the main model we ended up with is the I/O model in red. The single area Model 7 fleets 1 CPUE index and then the four area a spatial model.

1:30:52.960 --> 1:31:21.140  
Rick Methot (Guest)  
So when we do the one area present a four area model, we we see a difference in the upper left panel here of the scaling of spawning violence. See very similar trends between the two. But we see that the the overall model single area model shows a greater proportional decline than the Fourier area model. And this is probably because of the.

1:31:22.130 --> 1:31:33.600  
Rick Methot (Guest)  
The The four area bottle is better able to allow the higher biomass retention in areas three and four where we don't see the downtrend caused by the persane fishery in area one and two.

1:31:39.450 --> 1:32:8.0  
Rick Methot (Guest)  
If we were to do this without the tagging data, which is again allow some degree of movement between areas, we see a closer agreement between the two of that's in the lower right hand corner. Here the IO model with no tag and the IO4 model with no tag end up being pretty similar and exactly what drives that difference. I think we would have to look at that out a bit bit further, but the.

1:32:8.90 --> 1:32:15.990  
Rick Methot (Guest)  
Clearly, the also shows that the tag data are influential in driving the overall result to a higher level.

1:32:17.530 --> 1:32:29.630  
Rick Methot (Guest)  
As the Multifan team, I think we would look further into the effect of the mixing period and whether or not that influence the overall sense of mortality that we're getting out of the the tag data.

1:32:37.940 --> 1:32:40.230  
Rick Methot (Guest)  
We did some degree of.

1:32:40.300 --> 1:32:45.240  
Rick Methot (Guest)  
Umm. Or is he all? Or is your old profiling and.

1:32:46.330 --> 1:32:54.360  
Rick Methot (Guest)  
In the one area model on the left hand side, we see that the model tends to fit better.

1:32:55.100 --> 1:32:55.450  
Rick Methot (Guest)  
At.

1:32:57.340 --> 1:33:28.90  
Rick Methot (Guest)  
Uh it towards the the higher biomass trends, but it gets it's pretty flat in the area, that area as well. And there was a it's the tag data that is tending to push things to the right whereas the the length data in the recruitment trend now we we we asked why is it that we end up with such a large recruitment penalty showing up here in the R0 profile and I think this is because of the.

1:33:28.420 --> 1:33:54.970  
Rick Methot (Guest)  
The fixed steepness value so that if you have a fixed steepness and you also externally have a fixed catch in the model, so by profiling on R0 you're essentially profiling on the depletion early in the time series and that causes a different trend in recruitment over time. But you have a fixed steepness. So I think what's happening is that as you profile to.

1:33:55.660 --> 1:34:11.840  
Rick Methot (Guest)  
A lower R0 you end up creating a trend in the recruitment deviations that causes this. This penalty to show up here I think. If we had estimated steepness you would not see such a high response in the recruitment deviations.

1:34:13.600 --> 1:34:35.870  
Rick Methot (Guest)  
Now over on the right hand side, we also see that the tag data are tending to pull the bottle towards higher biomass levels, as is the the index data and in this case the fit to the link data is goes in both directions.

1:34:36.250 --> 1:34:45.80  
Rick Methot (Guest)  
You know we it degrades in both directions. So this model, the Fourier area model seems to be strongly constrained by the the length data.

1:34:46.280 --> 1:34:54.880  
Rick Methot (Guest)  
And you know that's makes some sense given how different the regions are in the the link data that we have.

1:35:5.540 --> 1:35:13.600  
Rick Methot (Guest)  
Did some investigation of how far back to go with the recruitment deviations. Again, exploratory model runs.

1:35:14.0 --> 1:35:33.780  
Rick Methot (Guest)  
Umm, you know, we don't have high quality information back there. And so I I don't think we need to put too much weight on this but it is good to see that by going back further with recruitment deviations we have pretty negligible influence on the 5th to the index later in the time series.

1:35:35.140 --> 1:35:37.20  
Rick Methot (Guest)  
But we also see, you know.

1:35:37.700 --> 1:35:56.360  
Rick Methot (Guest)  
Quite a bad bobble in the fit to the index here in the what about 2005 to 2009? You know that time period, there's a large sequence of a deviations there that clearly came from somewhere that we have not modeled.

1:36:10.930 --> 1:36:12.520  
Rick Methot (Guest)  
We did a.

1:36:14.0 --> 1:36:16.450  
Rick Methot (Guest)  
And each structure production model comparison.

1:36:17.430 --> 1:36:29.720  
Rick Methot (Guest)  
Essentially just just fixes the recruitment deviations to zero and we don't use the linked data at all. So basically we're just driving the model with the CPUE and catch as if it's a production model.

1:36:31.200 --> 1:36:51.750  
Rick Methot (Guest)  
And in this case, the scaling is pretty similar, so you know what we're seeing in the in the analysis of, let's see, Dan, maybe you can put in the chat where how we dealt with the tag data presumed the tag data also is not in this one, but let us know if it was.

1:36:59.690 --> 1:37:4.20  
Rick Methot (Guest)  
In the four area model we do overall.

1:37:4.740 --> 1:37:10.400  
Rick Methot (Guest)  
Quite well in estimating the fit to the index of the four areas.

1:37:11.100 --> 1:37:20.190  
Rick Methot (Guest)  
Uh, I think just as we saw with the multifan model in Region 2, this area right here, I know if you can see my oops, sorry.

1:37:21.280 --> 1:37:51.670  
Rick Methot (Guest)  
Don't know if you could see my cursor, but in the about 2006 to 2009, there's a large sequence of positive deviations in the 5th of the index in Area 2, and then we saw the same thing in MULTIFAN model. Where is area one? We see that the model is picking up the that positive sequence of the index there in that region, so it would be interesting to take a look at the work closely and what might be going on.

1:37:52.150 --> 1:37:53.100  
Rick Methot (Guest)  
In that area.

1:37:54.510 --> 1:37:54.960  
Rick Methot (Guest)  
Umm.

1:37:56.860 --> 1:38:3.50  
Aaron Berger  
Rick, I just wanted to let you know that dance is in the chat that the tag data are included in the age structure production model.

1:38:3.630 --> 1:38:3.980  
Rick Methot (Guest)  
OK.

1:38:4.400 --> 1:38:8.780  
Aaron Berger  
And that we can see your cursor as long as just kind of as long as it doesn't say stagnant, we can see it.

1:38:9.410 --> 1:38:12.620  
Rick Methot (Guest)  
Great. So I'll try not to keep bouncing around quite as much.

1:38:14.320 --> 1:38:14.760  
Rick Methot (Guest)  
Umm.

1:38:15.870 --> 1:38:22.240  
Rick Methot (Guest)  
And and then it fits to region 3 and region four are all all quite quite region reasonable here?

1:38:27.50 --> 1:38:30.520  
Rick Methot (Guest)  
In terms of the fifth of the length frequencies.

1:38:33.640 --> 1:38:36.970  
Rick Methot (Guest)  
Most of them are reasonable on.

1:38:37.940 --> 1:38:38.870  
Rick Methot (Guest)  
And.

1:38:43.170 --> 1:39:5.150  
Rick Methot (Guest)  
The this the hand line one hand on in in Area 1 is not fitting the the right hand shoulder very well. It's much more spiked towards the younger animals, perhaps using a selectivity function that is more flexible than double normal could have been useful there. See this is hand line one. Let's go over to.

1:39:8.710 --> 1:39:13.410  
Rick Methot (Guest)  
Ah, so that one was treated it as being asymptotic, and so that may have been.

1:39:13.830 --> 1:39:18.620  
Rick Methot (Guest)  
Umm, you know, not the best choice for for that, that fishery.

1:39:22.850 --> 1:39:27.680  
Rick Methot (Guest)  
But overall, the selectivity curves and the.

1:39:28.370 --> 1:39:30.380  
Rick Methot (Guest)  
The patterns that we see in the fits are.

1:39:31.540 --> 1:39:39.340  
Rick Methot (Guest)  
Not as expected, given that we were working with a sample size of five for all of the the composition observations.

1:39:54.320 --> 1:39:55.670  
Rick Methot (Guest)  
In some cases.

1:39:57.30 --> 1:40:3.620  
Rick Methot (Guest)  
And this here we're looking at the trend overtime for each fleet of the mean length.

1:40:5.380 --> 1:40:35.50  
Rick Methot (Guest)  
And in some cases like PS1, let's go to that one down here. There's some pattern in the deviations here and PS1 and and there's at least one of the others that it was not as close as I would would expect it to be. But again, we're dealing with a pretty small sample size of. And so you know the the recruitment penalty and the tag data.

1:40:35.280 --> 1:40:44.750  
Rick Methot (Guest)  
Are gonna be pretty influential here, potentially more influential than a sample size of five, so perhaps this degree of difference is not unexpected.

1:40:48.200 --> 1:40:49.550  
Rick Methot (Guest)  
In terms of the.

1:40:51.420 --> 1:41:18.420  
Rick Methot (Guest)  
Or is your profile by fleet for the comp data you know we we not unexpectedly have a bit of a mixed bag in that regard in all of this sort of work. The closer you look the the more patterns you can see correct. And so in this case that's the case. There are some fleets like and I think it's interesting here and it's exactly as expect that for hand line one.

1:41:20.690 --> 1:41:49.190  
Rick Methot (Guest)  
We get a better fit at a higher R0A pretty strong trend here and I think that's consistent with what we saw on the the pattern and the 5th to the length comp. So that the pattern in the 5th to the length comps wanted there to be more large fish and that would be something that would occur if we were running the model at a higher R0. So consistency there and how the model is performing. But overall across fleets.

1:41:49.260 --> 1:41:49.930  
Rick Methot (Guest)  
You know some.

1:41:50.640 --> 1:41:53.30  
Rick Methot (Guest)  
Fitting a bit better at high some of the bit better at low.

1:42:8.80 --> 1:42:12.270  
Rick Methot (Guest)  
For the four area bottle here.

1:42:13.500 --> 1:42:36.530  
Rick Methot (Guest)  
Things seemed reasonable except again for hand. Line one we see that this again is looking at mean length residuals and here for hand line one it's pretty much all negative residuals and so that's I think an indication that the selectivity off for that fleet is not quite dialed in at the right degree of flexibility.

1:42:47.540 --> 1:42:53.450  
Rick Methot (Guest)  
In terms of, you know, some of the fits to the the tag data.

1:42:54.600 --> 1:42:59.390  
Rick Methot (Guest)  
Uh, we ran with a mixing period of four periods.

1:43:1.150 --> 1:43:1.870  
Rick Methot (Guest)  
And.

1:43:7.730 --> 1:43:10.860  
Rick Methot (Guest)  
Yeah, we, we were looking at the effect of.

1:43:12.200 --> 1:43:13.510  
Rick Methot (Guest)  
Only using.

1:43:14.690 --> 1:43:28.710  
Rick Methot (Guest)  
Tag groups that had sufficient recoveries after the end of the of the time period after the end of the mixing period because in many cases there are number of tags were returned within the mixing period.

1:43:29.600 --> 1:43:38.870  
Rick Methot (Guest)  
But we did work with the mixing period of four and draw with this change, we did not see much change in the behavior here.

1:43:40.190 --> 1:43:47.520  
Rick Methot (Guest)  
Many of these cases we see pretty good fits to the patterns you know looking here in.

1:43:48.450 --> 1:44:13.520  
Rick Methot (Guest)  
2004, 2005 we see that the the time sequence of tag recaptures is pretty much matched between the model and the data, although there are other circumstances here in 2003 where there's more noticeable residuals in some circumstances where it goes the other direction, so there's.

1:44:14.290 --> 1:44:16.60  
Rick Methot (Guest)  
More noise in the.

1:44:17.940 --> 1:44:44.250  
Rick Methot (Guest)  
In the production of the tag data then we understand there, you know must be some other factors going on that could allow such large number of tags to sometimes show a pattern like this. It's sometimes show a pattern like this and that kind of inherent tag specific tag group specific flexibility is not something that we have in the model formulation.

1:44:47.10 --> 1:44:50.860  
Rick Methot (Guest)  
I suppose if we, you know, played with the initial mortality.

1:44:51.300 --> 1:44:55.0  
Rick Methot (Guest)  
Uh, we might be able to do something with that, but we did not attempt it.

1:45:13.740 --> 1:45:26.410  
Rick Methot (Guest)  
In the yeah. Don't know what to say about this one. We do end up seeing some pattern at the end of the time series and recruitment deviations. I think we saw that with the multifan result as well.

1:45:27.50 --> 1:45:35.720  
Rick Methot (Guest)  
Umm, and again, with such large fisheries capturing young fish at the end of the time series.

1:45:36.280 --> 1:45:52.90  
Rick Methot (Guest)  
Uh, not surprised to see this kind of sensitivity showing up here, but we do see some fairly market trends in the recruitment deviations in the four area model. And so it it's.

1:45:53.390 --> 1:46:20.720  
Rick Methot (Guest)  
It is interacting I'm sure with the, you know, the catches at the end of the time series and this is also the time period where we have the tag recurrent. We don't have tags early in the model. We have tags late in the model. So the later recruitment deviations and the mortality of those recruitment events, it's probably interacting here at the end of the time series to be affecting the recruitment deviations in these ways.

1:46:31.590 --> 1:46:44.260  
Rick Methot (Guest)  
In terms of the biomass distribution, IO1 model of on the no sorry, this is the all with the IO4 model and.

1:46:45.580 --> 1:46:49.700  
Rick Methot (Guest)  
I with move it on one side and and no movement on the.

1:46:53.550 --> 1:47:23.620  
Rick Methot (Guest)  
I'm sorry. No movement in this model configuration here and we see the the biomass time series. We see the steepest decline in biomass in region 1, which is where most of the catch has been and we see the lowest and flattest biomass trajectory in Area 4, which has the least cache. So no surprises there. But the absolute scaling of area three and four relative to the others is.

1:47:23.710 --> 1:47:28.450  
Rick Methot (Guest)  
It's gonna be driven strongly by the the CPUE Q constraints.

1:47:31.890 --> 1:47:34.270  
Rick Methot (Guest)  
And then the proportion of recruitments.

1:47:36.550 --> 1:47:55.680  
Rick Methot (Guest)  
We end up with most recruits to the area, 2 and smaller numbers in area 3-4, but it seems likely that this has been a confounded with the movement and how little information we have on movement between those areas.

1:47:57.520 --> 1:48:7.210  
Rick Methot (Guest)  
But Everlast in terms of proportion of recruits to areas three and four, it seems consistent with the the overall model.

1:48:12.840 --> 1:48:23.250  
Rick Methot (Guest)  
Ohh yes and sorry didn't not doing enough clicks to hit a time in the Halo 4 model. If we don't have movement that's down here in the lower right hand corner.

1:48:24.810 --> 1:48:45.70  
Rick Methot (Guest)  
You know, here we see that there is a a flip flop of the region one and region 2 recruitments. So what we're seeing is that with movement we see more recruits in Area 2, but then they're moving into area 1 whereas with no movement we end up with more of the recruits starting off in area 1.

1:48:55.170 --> 1:49:22.560  
Rick Methot (Guest)  
You know, we really don't get any information on movement of the adult fish. And so, you know, our movements between areas one and two is from the tagging of those small fish. And what we see in the differences in long line length, composition between areas and. And there are some notable differences in the length composition between the areas that then is going to influence the movement rates and so.

1:49:23.10 --> 1:49:33.470  
Rick Methot (Guest)  
I'm not going to try to interpret all the details here, but we do see that you know we end up with very low movement rates of.

1:49:34.280 --> 1:49:41.300  
Rick Methot (Guest)  
To and from areas three and four, just because there is, there's really not enough information to decipher that.

1:49:45.940 --> 1:49:54.490  
Rick Methot (Guest)  
We profiled on the movement from area one to area 2. It's a little spiky here, but I think we get an overall pattern.

1:49:55.50 --> 1:50:5.440  
Rick Methot (Guest)  
Umm that you know, it's not that sensitive to it, even though we we ended up with a you know low movement rates in this area where.

1:50:6.280 --> 1:50:17.60  
Rick Methot (Guest)  
So what consistently performing better, but the change in likelihood is not great across these models. Not as great as we saw in the overall R0 profiles.

1:50:18.210 --> 1:50:18.910  
Rick Methot (Guest)  
And.

1:50:20.390 --> 1:50:31.80  
Rick Methot (Guest)  
In in this the tag opposition data that does show you know the most consistent changes here to take opposition and yellow and it's showing oops.

1:50:33.140 --> 1:50:41.200  
Rick Methot (Guest)  
Showing that there there is au shape in the likelihood for movement from area one to area 2.

1:50:43.560 --> 1:51:1.530  
Rick Methot (Guest)  
But the overall result doesn't much change because again, we saw the model can adjust the recruitment distributions to compensate. So by fixing the movement rate at one level, the molar can compensate with the recruitment distribution to achieve essentially the same results.

1:51:12.250 --> 1:51:37.460  
Rick Methot (Guest)  
Looking at the four year model with and without movement, you know we we see it's sensitive to that. But again, it's not surprising given the differences in removals across the Fourier areas and so having some areas with no movement and a lot of catch, you know, really forces the model to estimate them well and the other models, other areas just.

1:51:38.250 --> 1:51:39.300  
Rick Methot (Guest)  
Go along with that.

1:51:41.570 --> 1:51:42.120  
Rick Methot (Guest)  
Don't need that.

1:51:42.900 --> 1:51:45.820  
Rick Methot (Guest)  
Umm, get a little bit of retrospective?

1:51:46.760 --> 1:52:2.900  
Rick Methot (Guest)  
Even though we saw quite a bit of of pattern in the recruitment deviations near the end of the time series when we saw that I was expecting to see more of a retrospective pattern as we peeled back data.

1:52:3.570 --> 1:52:10.480  
Rick Methot (Guest)  
But we don't see very much and and so you know it's pretty stable here at the end of the time series.

1:52:19.210 --> 1:52:25.60  
Rick Methot (Guest)  
Uh, we were able to set up the model with both quarter as year and season within year structures.

1:52:27.170 --> 1:52:38.360  
Rick Methot (Guest)  
But you know the the concept of aging is different between the two, and. And we ended up seeing some differences in the results.

1:52:40.220 --> 1:52:46.730  
Rick Methot (Guest)  
We we can estimate or seasonal effect on movement but it but it's harder with with the.

1:52:47.700 --> 1:52:49.890  
Rick Methot (Guest)  
I season within year structure.

1:53:8.520 --> 1:53:22.390  
Rick Methot (Guest)  
Here we have again our our selectivity occurs on the right hand side, our growth curve in the upper left quadrant and A recruit to use in the lower left hand corner.

1:53:24.50 --> 1:53:33.580  
Rick Methot (Guest)  
And as we go from the year within season model to the quarters, we see different levels of.

1:53:34.700 --> 1:53:40.710  
Rick Methot (Guest)  
Selectivity showing up and I think this is because as we move to the.

1:53:42.960 --> 1:53:44.950  
Rick Methot (Guest)  
To the structure that had of.

1:53:45.750 --> 1:54:4.880  
Rick Methot (Guest)  
Seasons within years in order to achieve enough flexibility in selectivity, we switch to doing it. A Dome shaped selectivity in in length. I I believe this is where we we made that switch and we ended up with a very different.

1:54:6.240 --> 1:54:19.570  
Rick Methot (Guest)  
Flexibility to have Dome shapes selectivity so it's very hard to have that sort of a Dome when we do the year, the season within year approach. So I actually doing it as a.

1:54:20.450 --> 1:54:33.740  
Rick Methot (Guest)  
Uh, yes, straight quarter. So we ended up with more flexibility in the H specific selectivity when we did that. So in that case, I would say that that was a preferable approach for how we approach this.

1:54:38.410 --> 1:54:44.860  
Rick Methot (Guest)  
And this is another look at the recruitment, I mean the the movement parameters.

1:54:47.910 --> 1:54:50.940  
Rick Methot (Guest)  
And got this one in the slide deck twice.

1:54:54.210 --> 1:54:55.180  
Rick Methot (Guest)  
So in summary.

1:54:56.790 --> 1:55:12.370  
Rick Methot (Guest)  
You know, we see that the Fourier area model and the single area model are generally consistent in estimated scaling parameter when the tag data aren't used. So the tag data certainly are influencing the overall scaling because they're influencing the overall mortality rate.

1:55:13.820 --> 1:55:31.780  
Rick Methot (Guest)  
You know, so the tag data are influential, so setting it up appropriately gives you the right regional structure, but we really didn't have the enough tag recapture pairs across all the areas to do this as well. As you know, we would have been able to with with the fuller data set.

1:55:32.870 --> 1:55:33.320  
Rick Methot (Guest)  
Umm.

1:55:36.170 --> 1:56:7.690  
Rick Methot (Guest)  
You and because of that the movement rates are pretty confounded with the regional recruitment and I don't see a way around that given this quantity of data. So I think that forces us into making some assumptions using some auxiliary information in order to constrain models like this with that in that regard, they're just is not going to inherently be enough information to do that without having a, a really full set of tag data or something else.

1:56:12.120 --> 1:56:31.900  
Rick Methot (Guest)  
So that's what we have. Again we, you know, I don't, I don't think we spend as much time on this as we all wanted to. Yeah. But we feel as though we've you know got a better understanding of where we stand now. I I think we certainly can do some more with the waiting of the length composition data in order to.

1:56:32.740 --> 1:57:2.390  
Rick Methot (Guest)  
You get it to perform as well as, so we should be able to clear that we we underestimated the importance of the, the, the pursuing of length computation data in the way we've set up things so far. But overall, you know, like to open it up to Dan and Max and others who may be on to fill in some of my gaps in our presentation, which I did the best I could. But you know we we I think we have a a ways to go in order to get.

1:57:2.690 --> 1:57:3.960  
Rick Methot (Guest)  
A fully story out of this.

1:57:5.570 --> 1:57:8.500  
Rick Methot (Guest)  
It's all stop sharing there and.

1:57:11.530 --> 1:57:15.720  
Rick Methot (Guest)  
But let me know if you want me to pull it back up for any slides.

1:57:16.900 --> 1:57:21.480  
Aaron Berger  
All right. Thanks very much, Rick for your presentation. That was excellent.

1:57:23.340 --> 1:57:38.280  
Aaron Berger  
You did ask Dan and Max and others if they had anything to add, so I'll go to you guys 1st to see if there's anything that you wanted to chime in and then I see we have a question in the chat already, but others feel free to raise hands in the meantime.

1:57:48.720 --> 1:57:51.170  
Rick Methot (Guest)  
To see John has the question in the chat.

1:57:53.510 --> 1:58:0.840  
Aaron Berger  
OK. Yeah. And and not hearing anything from others. So it sounds like you you you were spot on there Rick. So yeah, let's go ahead and.

1:58:2.260 --> 1:58:6.440  
Aaron Berger  
If if you got it up there, you can go ahead and read it and go for it.

1:58:6.720 --> 1:58:23.890  
Rick Methot (Guest)  
Yeah. So John asked. He says that the spiky behavior of at least one of the long line datasets seemed to be replicated in the fit, and I did notice that as well. So given that the selectivity was smoothly asymptotic, I'm wondering how this was done.

1:58:25.130 --> 1:58:36.190  
Rick Methot (Guest)  
Well, it may be that that the, you know the data are following a growth curve and we have the same growth curve. So the fish are at the right length.

1:58:36.810 --> 1:58:53.380  
Rick Methot (Guest)  
Umm. And we may well be picking up the model ages and perhaps it's just that the the spread in size at age was not sufficient to blur that out. So we're able to pick up the spikes.

1:58:53.820 --> 1:58:56.100  
Rick Methot (Guest)  
Uh, yeah, where they actually occurred.

1:59:6.220 --> 1:59:11.370  
Rick Methot (Guest)  
Good. I'll take a quick look at the Sigma R on movement on.

1:59:12.670 --> 1:59:14.910  
Rick Methot (Guest)  
No, it was .1. This was not that small.

1:59:18.220 --> 1:59:27.200  
Aaron Berger  
OK, John says thanks for your response, Rick. And then we've got, I believe, Dan, your hand was up first. Yeah, go ahead.

1:59:30.600 --> 1:59:47.670  
Fu, Dan (NFITD)  
Yeah, just a quick comment on the difference in terms of the scaling parameter between the spatial and non spatial model. I think the Nicholas the multi band Seal team, they also highlight this and I think they basically mentioned about this.

1:59:47.740 --> 1:59:48.140  
Fu, Dan (NFITD)  
The.

1:59:48.720 --> 2:0:20.30  
Fu, Dan (NFITD)  
Umm, offering effect. Whereas some area you can serve as a buffer for a lot biomass that you can get higher biomass whereas non state non stage model you tends to have lower biomass. I I was wondering whether that you know with the spatial model where you kind of partition some model into different region where there's a constrained of you know each region has to support certain amount of cache that tends to act as constraints to influence the scaling parameter as well.

2:0:20.480 --> 2:0:36.790  
Fu, Dan (NFITD)  
So one of The thing is that if the model tends to have a higher for the region model, if we tends to estimate a higher movement rates or higher mixing between the area, then that sort of kind of mitigate that kind of effect that kind of can.

2:0:37.580 --> 2:0:42.660  
Fu, Dan (NFITD)  
And probably make the skating parameters team a more consistent with the with the single area mode.

2:0:43.400 --> 2:0:44.310  
Rick Methot (Guest)  
Yeah, yeah.

2:0:45.580 --> 2:0:54.860  
Rick Methot (Guest)  
It in our model compared to multifan, we did not allow it movement from areas three and four back in the areas one and two.

2:0:56.480 --> 2:1:10.800  
Rick Methot (Guest)  
Maybe. I guess we we did have a move it from 1 from 4 back to one but not from 3 and so I think that might have reduced the flexibility to do the buffering from the lightly fished areas back into areas one and two.

2:1:18.90 --> 2:1:19.80  
Rick Methot (Guest)  
Marcus essendo.

2:1:22.960 --> 2:1:24.860  
Mark Maunder  
Yeah. Hi, Rick. Thanks for the presentation.

2:1:26.620 --> 2:1:28.70  
Mark Maunder  
Couple of questions.

2:1:29.60 --> 2:1:34.600  
Mark Maunder  
Well, once a comment one question. So with the shared catchability in the multi area model.

2:1:35.860 --> 2:1:38.570  
Mark Maunder  
Did you wait those by the?

2:1:39.950 --> 2:1:40.320  
Mark Maunder  
That.

2:1:41.60 --> 2:1:43.230  
Mark Maunder  
The area of each of those regions.

2:1:45.720 --> 2:1:46.260  
Rick Methot (Guest)  
Yeah.

2:1:50.340 --> 2:1:50.580  
Rick Methot (Guest)  
Right.

2:1:44.510 --> 2:1:53.600  
Mark Maunder  
So that when you shear the queue, it's the right thing because you can't just shear a queue with a, you know, with a CPUE standardization you have to somehow wait it by the areas.

2:1:53.970 --> 2:1:56.140  
Rick Methot (Guest)  
That that's correct. That's correct.

2:1:57.760 --> 2:2:20.390  
Rick Methot (Guest)  
I would have to defer to that or look at my first day at the model files to see how we handle that. I recognize that we do have that curability and S32. Basically, you know, build the area effect into the queue so that you are comparing abundance by area, not density by area.

2:2:22.190 --> 2:2:22.630  
Mark Maunder  
You know.

2:2:22.270 --> 2:2:24.110  
Rick Methot (Guest)  
The maybe Dan can respond to that.

2:2:25.580 --> 2:2:55.150  
Fu, Dan (NFITD)  
Uh, yes, I see. Simon raised his hands up because we are the beginning of the workshop. We did queries with the organizer that, you know, the TV standardization we understand is done in a way so that you know, they have this regional scaling thing building. So the different scalings CPV does reflect the, I mean, they sort of have done the analysis. So that reflects the distribution of biomass among the region. We know it's additional constraint that that we kind of.

2:2:55.200 --> 2:3:27.120  
Fu, Dan (NFITD)  
Motional information that's been put into the to to this exercise, but in in in, in, in real practice, in a, in a, in a real assessment, the probably it's better to just when you have original model to just use the cache and see if we in each rating itself to determine its relative biomass distribution. But we find that in the I mean from my experience it's really a lot of time. It just doesn't work. The model just can't handle the determined biomass distribution among the region. So that additional constraint does helps a lot.

2:3:27.740 --> 2:3:28.0  
Fu, Dan (NFITD)  
Thanks.

2:3:29.160 --> 2:3:29.610  
Rick Methot (Guest)  
Very good.

2:3:34.170 --> 2:3:34.790  
Mark Maunder  
Yeah.

2:3:34.190 --> 2:3:38.350  
Aaron Berger  
Yep, and looks like Simon is confirmed that in the chat and mark you had something else.

2:3:39.90 --> 2:3:45.960  
Mark Maunder  
Yeah, the the other comment I wanted to make was about the the one area model, but it was the.

2:3:47.570 --> 2:3:49.520  
Mark Maunder  
Areas as fisheries model.

2:3:50.360 --> 2:3:54.360  
Mark Maunder  
And so it looked as though you were using 4 indices, one for each.

2:3:55.830 --> 2:4:0.850  
Mark Maunder  
Area in the single area model, which is probably a big nono because they all have different.

2:4:1.580 --> 2:4:2.920  
Mark Maunder  
UM trends?

2:4:3.420 --> 2:4:4.870  
Rick Methot (Guest)  
I don't think we did that.

2:4:5.580 --> 2:4:11.410  
Mark Maunder  
And it looked as like an in the slide on the areas as fleets model because you had four indices.

2:4:12.430 --> 2:4:17.460  
Mark Maunder  
So I'm assuming it was four longline indices, one for each area.

2:4:17.600 --> 2:4:28.810  
Rick Methot (Guest)  
Oh yes, that, that, that would be correct then. But but that's what areas as fleets is. So we're not saying that it's the right way to do this. I was just showing that if you did areas as fleets, that's what it would be.

2:4:29.690 --> 2:4:37.460  
Mark Maunder  
Yeah, because in in the one haikun did he did the areas as fleets for the fisheries, but for the index it was just a single index across the whole.

2:4:38.50 --> 2:4:38.420  
Rick Methot (Guest)  
OK.

2:4:38.960 --> 2:4:39.950  
Mark Maunder  
Indian Ocean here.

2:4:51.230 --> 2:4:54.320  
Aaron Berger  
Yeah. Brickell asked a question and I guess I was wondering.

2:4:56.470 --> 2:5:3.600  
Aaron Berger  
And the Nicola brought this up about the wreck dives early in the period or early in the time series and.

2:5:4.590 --> 2:5:14.990  
Aaron Berger  
And the the the constraint that Multifan had not to use the kind of early period specification like s s had and you mentioned that too. So I was just wondering if if if.

2:5:15.790 --> 2:5:31.990  
Aaron Berger  
If if any of the tools in s s why? I guess they're probably in our for S anyways that they kind of help guide you to specify that early period, if any of those came out to help in in your explorations.

2:5:31.870 --> 2:5:38.560  
Rick Methot (Guest)  
Yeah, I don't think we used the early period. I think we did it all. I'm looking right now.

2:5:46.580 --> 2:5:55.230  
Rick Methot (Guest)  
We did not use an early period, so I think you know we either had, you know, no Deus early on or.

2:5:56.810 --> 2:6:5.190  
Rick Methot (Guest)  
Or, you know, in one case extended to Dees back to the beginning. We didn't use the early period Deez, that's a separate vector of drives.

2:6:5.870 --> 2:6:15.860  
Rick Methot (Guest)  
Uh, I I do think we have more to learn about the difference between modeling with Deus as.

2:6:17.320 --> 2:6:47.930  
Rick Methot (Guest)  
With some 0 constraint versus just treating them as Deus, I think we have just gotten ourselves locked into doing it as some to 0 because that was the common way to do it for so long and we've are just defaulting to that without critically looking at its impact, especially when we have such heterogeneous information about rec use over time. So I think you know, there are various options in that regard to be explored.

2:6:48.30 --> 2:7:11.690  
Rick Methot (Guest)  
We just need to sort of a definitive paper to be done comparing those options. I think that's important as we start developing new new assessment models that we get a better handle on the relative importance of that. Some of the 0 constraint and where the constraints that it imposes on us. So how it model treats those early deeds would be part of it.

2:7:19.130 --> 2:7:19.760  
Fu, Dan (NFITD)  
Ohh.

2:7:17.500 --> 2:7:29.610  
Aaron Berger  
Yeah. Thank you, Rick. And then and just for everybody, you know we're we're kind of into the period of of open discussion on anything that was presented today or or ideas of any sort. So feel free to ask questions.

2:7:30.710 --> 2:7:32.800  
Aaron Berger  
To Rick, to the group, to Nicola.

2:7:37.310 --> 2:7:38.590  
Aaron Berger  
Dan, gather go ahead.

2:7:39.480 --> 2:8:9.530  
Dan Goethel  
Yep, yeah, I just wanna say those are two great presentations. So a lot of stuff to kind of digest there, but it seemed like one of the main issues that both presentations were really harping on was this issue of the tagging data. And you know, what is sufficient tagging data for a spatial model? And it seemed like both groups kind of approached it like it was pretty much necessary to include the tagging data in order to estimate, you know, movement. But then.

2:8:9.620 --> 2:8:37.0  
Dan Goethel  
Once you start analyzing the data that's in there, you know it's short time series really localized in terms of the temporal and spatial distribution of the tag releases. So I wonder if anyone could kind of elaborate and you know what they feel like would be in theory, you know, sufficient tagging data and also whether mark or capture data is even what we would define as sufficient at this point.

2:8:37.450 --> 2:8:37.930  
Rick Methot (Guest)  
Yeah.

2:8:38.320 --> 2:8:38.700  
Dan Goethel  
See you.

2:8:39.700 --> 2:8:56.20  
Rick Methot (Guest)  
Yeah, we'll make a quick stab at that. You know, I think it is important to have the tagging data in a model like this, but the I think the question is more, why did we do a four area model when we knew that we didn't have?

2:8:56.740 --> 2:9:7.240  
Rick Methot (Guest)  
Tag data to really help set up a 4 area model, but didn't we start with the three or two area model given the information that we had?

2:9:8.820 --> 2:9:18.730  
Rick Methot (Guest)  
And I I think it's a case of, you know, real assessment. You'd have a little bit more anecdotal information. You know the history of the fishery to help in your model configuration.

2:9:19.840 --> 2:9:22.280  
Rick Methot (Guest)  
But you know, here it was. It would be harder.

2:9:30.50 --> 2:9:31.10  
Aaron Berger  
Yeah, go ahead, Simon.

2:9:32.850 --> 2:9:34.200  
Simon Hoyle  
Uh, yeah, I guess some.

2:9:35.430 --> 2:9:40.260  
Simon Hoyle  
Just to the history of this project, the reason that we went with the four area model.

2:9:42.150 --> 2:9:53.210  
Simon Hoyle  
Is that the approach that they use in the Indiana should stock assessments. So in a sense, this really is a a real model. But in this case, the data that you're fitting to are.

2:9:54.490 --> 2:10:2.520  
Simon Hoyle  
The the generated from an operating model that's internally consistent. And so if you are when you get those.

2:10:3.680 --> 2:10:12.890  
Simon Hoyle  
Conflicts in the likelihoods and so on. That's that's the result of probably some conflict within the model setup itself. The model that you've developed.

2:10:14.370 --> 2:10:15.440  
Simon Hoyle  
Rather than.

2:10:16.760 --> 2:10:27.10  
Simon Hoyle  
Yeah. And just the difficulty of fitting those different kinds of data with, with with a a simplified spatial model and with the lack of information that you have about things like movement rights and so on.

2:10:27.900 --> 2:10:28.150  
Rick Methot (Guest)  
Yeah.

2:10:28.10 --> 2:10:28.450  
Simon Hoyle  
Umm.

2:10:29.650 --> 2:10:33.380  
Rick Methot (Guest)  
I think some of the same questions come up in the original model, not frankly.

2:10:34.510 --> 2:10:35.580  
Simon Hoyle  
Yeah, definitely there's.

2:10:36.580 --> 2:10:41.830  
Simon Hoyle  
It's a very good question. Why that, why it's done as a Fourier area model, and it's probably not a good idea to do that.

2:10:50.200 --> 2:10:51.230  
Aaron Berger  
Yeah, go ahead, Mark.

2:10:54.30 --> 2:11:3.450  
Mark Maunder  
Yeah, I've got. I've got another question, but the the to follow up on on Simon's one just to clarification of how the operating model works.

2:11:4.240 --> 2:11:19.420  
Mark Maunder  
If the operating model is on a finer spatial scale of, that's my understanding, but it has four areas. Does that mean the movement rates on the small spatial scale are different in those four areas, or am I confusing things?

2:11:26.110 --> 2:11:26.440  
Mark Maunder  
Yeah.

2:11:20.940 --> 2:11:27.680  
Simon Hoyle  
Yeah, the the operating model is actually not for areas, it's 221 areas. So you've got.

2:11:29.830 --> 2:11:34.780  
Simon Hoyle  
Yeah, the the fish are actually moving around within those 221 areas according to the.

2:11:35.720 --> 2:11:48.330  
Simon Hoyle  
Umm this sea surface temperature like they're following patterns in the St and they're following their chlorophyll distributions and that's kind of how we drive the official round and then.

2:11:49.190 --> 2:11:55.400  
Simon Hoyle  
Of course we're trying to, then we generate data and we put it into those four areas structures and then.

2:11:55.820 --> 2:12:2.980  
Simon Hoyle  
Umm, you have to fit models to that which is a replication of what? What we all try to do when we first stock assessments.

2:12:3.480 --> 2:12:10.170  
Simon Hoyle  
Umm. And I guess that's I mean I might explain a little bit more about the sample size waiting as well.

2:12:11.440 --> 2:12:12.180  
Simon Hoyle  
The samples.

2:12:13.840 --> 2:12:14.170  
Simon Hoyle  
Sure.

2:12:11.150 --> 2:12:17.630  
Mark Maunder  
But before you, before you do that, just to clarify, the four areas that you've chose.

2:12:18.400 --> 2:12:23.790  
Mark Maunder  
It sounds as though they have nothing to do with the actual movement or the population structure.

2:12:25.170 --> 2:12:25.780  
Simon Hoyle  
No.

2:12:24.540 --> 2:12:31.510  
Mark Maunder  
What? How? How? How the. How were those four areas chosen compared to the biology of the simulated stock?

2:12:32.80 --> 2:12:36.410  
Simon Hoyle  
That's probably a historical question for the Indian Ocean Tuna Commission because that's.

2:12:37.160 --> 2:12:42.590  
Simon Hoyle  
That's why they're set up that way. That's the way the regions are set up in the yellowfin assessment for the IOTC.

2:12:45.390 --> 2:12:45.700  
Mark Maunder  
OK.

2:12:45.10 --> 2:12:50.20  
Simon Hoyle  
So we just basically this this whole simulation is based pretty closely on the.

2:12:51.80 --> 2:12:57.460  
Simon Hoyle  
On the IOTC yellowfin data set and the way they've set up their stock assessment.

2:12:58.200 --> 2:13:7.250  
Mark Maunder  
But the movement is independent of that, and it may not may or may not be relevant to those four areas, depending on.

2:13:8.480 --> 2:13:17.40  
Mark Maunder  
Where the sea surface temperature that's driving movement is related to how the Indian Ocean originally set up their areas. Is that correct?

2:13:18.500 --> 2:13:22.630  
Simon Hoyle  
The movement is estimates come from fitting.

2:13:23.370 --> 2:13:26.590  
Simon Hoyle  
The operating model to the data set.

2:13:26.870 --> 2:13:28.690  
Simon Hoyle  
Umm so those.

2:13:29.560 --> 2:13:33.90  
Simon Hoyle  
Yeah, the like all of the data were put into the SPM model and then?

2:13:33.840 --> 2:13:40.770  
Simon Hoyle  
Those movement rates were estimated and then that operating model was used to generate a bunch of new datasets.

2:13:42.650 --> 2:13:43.810  
Rick Methot (Guest)  
But the movements aren't.

2:13:47.400 --> 2:13:47.810  
Simon Hoyle  
Yeah.

2:13:49.380 --> 2:13:50.10  
Simon Hoyle  
That's right.

2:13:45.60 --> 2:13:51.910  
Rick Methot (Guest)  
Or a dereference as Mark was saying to these four areas. So there's an inherent structural mismatch going on.

2:13:53.480 --> 2:13:54.630  
Mark Maunder  
Possibly. Possibly.

2:13:53.240 --> 2:13:55.200  
Simon Hoyle  
Yep, which is pretty realistic.

2:13:56.340 --> 2:13:56.680  
Rick Methot (Guest)  
Yeah.

2:14:4.110 --> 2:14:7.590  
Aaron Berger  
Looks like, uh Dan fu. You might have more to add to this conversation here.

2:14:9.860 --> 2:14:10.360  
Fu, Dan (NFITD)  
Umm.

2:14:11.300 --> 2:14:14.530  
Fu, Dan (NFITD)  
Slightly different, but related. I was just wondering you know the.

2:14:15.230 --> 2:14:27.990  
Fu, Dan (NFITD)  
Related to a discussion on utility of of you know the adequacy of tagging data in those type of model, you know what including the tagging data. There's two functions really two use it. One is to estimate.

2:14:28.810 --> 2:14:44.630  
Fu, Dan (NFITD)  
One of them, the other is abundance. I believe in S3 and multi financial. When you building a spatial model you has to estimate if the tag is distributed across area. You has to estimate those movement, abundance and fishing mortality the same time you know you can't.

2:14:45.540 --> 2:14:56.910  
Fu, Dan (NFITD)  
I mean the reason masking it because to estimate using tagging, data, estimate, abundance and movement, they're based on slightly different assumption there there's different assumption that needs to be made. I mean for, for.

2:14:57.630 --> 2:15:27.500  
Fu, Dan (NFITD)  
For fishing mortality estimate abundance estimates, the tax has to be homogeneous mixing. But to estimate movement, I guess you know it's better to use archive tags, but conventional tags I I guess it's a question of how representative those those recovery represents movement. So I was wondering whether there's a needs to allow you know those softwares to. I mean if one if you believe one of the something is not made whether that kind of can be turned off to to allow the model just to estimate either abundance or movement.

2:15:27.570 --> 2:15:32.870  
Fu, Dan (NFITD)  
Or or the other way if that's if, if. If that's a a sensible since since since to do.

2:15:33.680 --> 2:15:42.120  
Fu, Dan (NFITD)  
Uh, because we have a lot of discussion now. Yeah, my point really is different assumptions that needs to be made on the different part of the the tagging.

2:15:51.620 --> 2:15:57.870  
Aaron Berger  
I saw uh Mark sand and then John's hand. If you guys had, if you had a response to Dan's question.

2:15:58.770 --> 2:16:1.340  
Mark Maunder  
Yeah, I don't have the response to dance question really.

2:16:0.600 --> 2:16:1.540  
Rick Methot (Guest)  
I have a response.

2:16:2.20 --> 2:16:3.230  
Aaron Berger  
OK. Yeah. Go ahead then, Mark.

2:16:3.420 --> 2:16:7.120  
Rick Methot (Guest)  
Just quickly, Dan, you can wait the two components separately.

2:16:8.400 --> 2:16:9.460  
Rick Methot (Guest)  
You have different lambdas.

2:16:28.260 --> 2:16:29.690  
Aaron Berger  
OK, we'll go. We'll go to you, Mark.

2:16:32.310 --> 2:16:46.500  
Mark Maunder  
Umm well, well, in response to Dan's question, there is the catch conditioned tagging likelihoods that rip Mugabe has for just estimating movement and not things. But I don't think that's implemented in in the software at the moment.

2:16:47.810 --> 2:16:58.110  
Mark Maunder  
The the thing I wanted to point out was that there's a couple of big issues with with the tagging data and and and one of them is is tag mixing.

2:16:59.300 --> 2:17:16.140  
Mark Maunder  
And the problem of tag mixing is you gotta choose a tagging, you know a period to try and remove those tags that haven't mixed yet, so you don't get a biased influence both on movement and abundance, but I guess abundance and fishing mortality is might be more important.

2:17:16.920 --> 2:17:17.550  
Mark Maunder  
Umm.

2:17:18.290 --> 2:17:32.900  
Mark Maunder  
The thing that we have we're doing in the EPO now is we've got our Tobias and and Anders working almost fine scale spatial model which can model the tagging data.

2:17:33.560 --> 2:17:36.0  
Mark Maunder  
Umm to estimate abundance?

2:17:37.720 --> 2:17:51.200  
Mark Maunder  
When you don't have to worry about the mixing because it takes that into consideration because it's done on a fine scale and then that can be used as a as an index of abundance of absolute abundance that you put back into the stock assessment model.

2:17:52.240 --> 2:18:11.400  
Mark Maunder  
Umm, I'm not sure when they're gonna be in a stage where they can actually apply that to the simulated data, but I think at some stage it might be a good idea to to apply that method to see, you know if that's gonna be more reliable than putting it directly into a, you know, a four area model.

2:18:27.10 --> 2:18:29.180  
Aaron Berger  
Yeah, I think that's a good idea. It's a.

2:18:29.980 --> 2:18:32.230  
Aaron Berger  
Simulation experiment 2.0.

2:18:33.870 --> 2:18:34.410  
Aaron Berger  
Umm.

2:18:37.80 --> 2:18:39.30  
Aaron Berger  
Let's see. John, you have your hand raised.

2:18:41.640 --> 2:18:45.870  
John Hampton  
Yeah. Thanks, Aaron. Just on this spatial mismatch thing.

2:18:47.260 --> 2:19:10.900  
John Hampton  
Yeah, it it'll be kinda interesting at the end of this process to see how much better we could do if we had some flexibility to better match the four regions specification. You know, if we were doing this based on you know things like the environmental data and and some information about how that was likely to impact the distribution and and movements etcetera.

2:19:13.390 --> 2:19:34.990  
John Hampton  
And I guess at the end of the day, I mean these these models are are are to be used to provide useful information for fisheries management. So it it would be interesting to see, you know, how much do we actually suffer by through these mismatches. Certainly we suffer in terms of biological reasonable ISM.

2:19:36.260 --> 2:19:56.10  
John Hampton  
But at the end of the day, do we suffer a that much in terms of the quality of management advice and how much those indicators may or may not be robust to those sorts of misspecifications? So I just, you know, if if we're gonna take this forward in the future, those might be some interesting concepts to explore further.

2:20:0.280 --> 2:20:4.50  
Simon Hoyle  
I'll just follow that one up. I think that's a really good idea the.

2:20:4.760 --> 2:20:10.550  
Simon Hoyle  
The tighter actually are available that all of the 221 cell data are available so.

2:20:13.550 --> 2:20:24.420  
Simon Hoyle  
I guess The thing is to decide on that configuration that you wanna try and and they can be good to 21 sell data can be manipulated into whatever structure you like really.

2:20:45.380 --> 2:20:49.400  
Aaron Berger  
Yeah, and I'll just, I'll just uh and on that today, I think you know, of course there's.

2:20:50.720 --> 2:21:0.30  
Aaron Berger  
Everybody has limited time to to continue to explore things, but if time is available, though, those, as, as Simon Says, there are other alternative data.

2:21:1.10 --> 2:21:23.140  
Aaron Berger  
That are already simulated that could be imputed relatively quickly into your already existing workflows if that's something that was of interest in time allowed, that would be very interesting to present at the the workshop, or at least discuss some comparisons that would be fantastic if somebody or a group or several groups wanted to try that.

2:21:24.300 --> 2:21:25.840  
Aaron Berger  
I did see a hand.

2:21:27.270 --> 2:21:29.480  
Aaron Berger  
During clicking neck back and forth.

2:21:30.370 --> 2:21:33.520  
Aaron Berger  
Uh, Craig, I see your hand is up.

2:21:35.770 --> 2:21:38.840  
Craig Marsh  
I think Mark might have been a bit before me. If you wanna go back.

2:21:41.10 --> 2:21:41.350  
Craig Marsh  
And then.

2:21:40.520 --> 2:21:43.890  
Mark Maunder  
I'll let Craig. I've been talking enough, so I'll wait for afternoon.

2:21:44.950 --> 2:22:0.790  
Craig Marsh  
I'm not mine. I just had a quite a specific question actually, because I about the the catch is errors or the catch condition and the in the first presentation I'm currently.

2:22:1.660 --> 2:22:8.270  
Craig Marsh  
Going through that situation, well, I've got a model that estimates free ifs and.

2:22:9.90 --> 2:22:22.980  
Craig Marsh  
Trying to move it towards a the spatial model as well towards a model that will solve for those ifs, but there was a part of me that was a little bit reluctant given the computational overhead and I just wanted to.

2:22:24.450 --> 2:22:28.450  
Craig Marsh  
Have a general query. If anybody had any insight on whether.

2:22:29.640 --> 2:22:38.600  
Craig Marsh  
You know, although they're free parameters really cause the CV are so small on our observed cache, they're really penned or constrained.

2:22:39.280 --> 2:22:43.10  
Craig Marsh  
And I just wanted to know if anybody had any insight on.

2:22:44.50 --> 2:22:46.480  
Craig Marsh  
Do you know whether it's definitely worth doing or?

2:22:48.110 --> 2:22:50.650  
Craig Marsh  
Or is that just keep the free gifts?

2:22:54.700 --> 2:23:0.750  
Craig Marsh  
But maybe that's too dramatic for Nicholas or or Rick. I imagine you've kind of gone through that with stuff.

2:23:1.650 --> 2:23:2.660  
Craig Marsh  
Is this as well?

2:23:10.770 --> 2:23:11.550  
Aaron Berger  
Yeah, go ahead, Rick.

2:23:12.410 --> 2:23:19.740  
Rick Methot (Guest)  
Yeah, we, we've not looked at constrained desks. We've treated apps as free parameters nearly entirely.

2:23:20.250 --> 2:23:33.830  
Rick Methot (Guest)  
Uh. The only place where we start seeing that breakdown is when we are fitting to both discarded catch and retained catch. And now the same F needs to.

2:23:34.770 --> 2:23:59.590  
Rick Methot (Guest)  
Contribute to both and and that is, you know, raise some questions about, you know, just how to go about dealing the balance between the basically the precision on the retained catch, which is generally very high in precision on discarded catch, which generally is low, but nevertheless they are going to be at somewhat at conflict if they're both influencing the scene F.

2:24:0.900 --> 2:24:3.10  
Rick Methot (Guest)  
That's the only place where we starting to look at that.

2:24:8.80 --> 2:24:14.40  
Aaron Berger  
I saw some other hands pop up if if others wanted to also respond to Craig, just jump right in.

2:24:16.390 --> 2:24:44.540  
John Hampton  
Yeah, I had a quick response. I mean, in in MFCL land, I think we started off the other way compared to stock synthesis and that we will routinely using this sort of catch errors version which you know you can think of as being the sort of fairly constrained computation of fishing mortality using extents, making extensive use of of.

2:24:45.330 --> 2:25:16.230  
John Hampton  
I'm fishing effort information in in those computations, along with estimates of catchability and what we call effort deviations now the the the upside of that is that you don't have to do like an internal Newton raphson to compute the the fishing mortality for each catch observation, but the downside is that you're, you know, even though the the the effort deviation parameters are are constrained by distributions et cetera.

2:25:17.550 --> 2:25:46.860  
John Hampton  
They are formal parameters in the in the the function minimizer and and so that attracts an overhead as well. You gotta compute gradients et cetera at every function of valuation so you know it swings and roundabouts to some extent. I think in terms of computational efficiency, there's you know that where we've done those sorts of direct comparisons, they're probably isn't a lot in it between catch conditioned or.

2:25:47.240 --> 2:25:54.320  
John Hampton  
The catch errors type type approach but but obviously it's gonna be a little bit case case specific.

2:25:56.320 --> 2:26:0.440  
John Hampton  
You know, depending on the number of fisheries that you have, etcetera. Number of observations.

2:26:11.250 --> 2:26:13.140  
Aaron Berger  
Nicola, did you want to jump into?

2:26:14.450 --> 2:26:15.530  
Aaron Berger  
Did you have a new question?

2:26:17.230 --> 2:26:24.590  
Nicholas Ducharme-Barth (NOAA Fisheries) (Guest)  
It it's a comment to the same question that that Craig had, but I think I think John mostly mostly covered it.

2:26:28.740 --> 2:26:35.390  
Aaron Berger  
All right. We're kind of winding down here. Mark, you've had your hand up and being patient. I'm going to give you the last question. Go ahead.

2:26:36.140 --> 2:27:0.770  
Mark Maunder  
OK. Yeah, it's it's more a comment about the mismatch between the the fine scale and the large scale spatial areas. And so in Highlands analysis, you know, he actually estimated what the areas were in the in this fishery fisheries areas approach, which presumably was somehow approximating the the areas.

2:27:1.360 --> 2:27:11.40  
Mark Maunder  
Umm, which might be different than those four areas, so it might be a good idea for people to go back and look at that to see how close those areas that haikun used were.

2:27:11.810 --> 2:27:29.240  
Mark Maunder  
To the the current areas and possibly run a, you know, one of the spatial models with haikun's areas rather than the the original areas or. Or do the same approach, but maybe do it on CPUE or something else that's that may be more related to.

2:27:29.910 --> 2:27:34.190  
Mark Maunder  
The actual spatial fishery structure, rather than just the link frequency structure.

2:27:38.350 --> 2:27:38.960  
Aaron Berger  
Thanks mark.

2:27:40.850 --> 2:27:49.400  
Aaron Berger  
The tying in webinar one with Webinar 2, he didn't you have you. You've been to these types of rodeo before, haven't you? It was a great ending comment.

2:27:50.810 --> 2:27:51.810  
Aaron Berger  
I'd like to.

2:27:52.520 --> 2:27:58.650  
Aaron Berger  
Thank everybody for coming, but especially the presenters Rick and Nicola, really great presentation today.

2:28:0.190 --> 2:28:21.340  
Aaron Berger  
Thanks for those. Also the Multifan team and the s s IOTC team for being here today. And of course everybody that's online has been listening and participating. We thank you as well and I did just want to close by letting everybody know that the next webinar that we have is on December 12th.

2:28:23.350 --> 2:28:38.140  
Aaron Berger  
I have listed here Pacific Time. Sorry I don't have all of the time zones converted here, but we'll be hearing from another team from the ICC region with s s as well as.

2:28:39.140 --> 2:29:8.710  
Aaron Berger  
A-Team from Gadget and then also a team from Castle Two. That's gonna actually be looking at different species. The other data set that we had simulated Antarctic toothfish. So that will be quite interesting as well. So we really look forward to seeing everybody in a little less than a month time. And again thanks everybody for coming and staying up late or whatever time zone you're in. We really appreciate it and hope to see you at the December 12th webinar 3.

2:29:8.940 --> 2:29:9.580  
Aaron Berger  
Thanks everybody.

2:29:12.720 --> 2:29:13.70  
Rick Methot (Guest)  
If they.

2:29:16.540 --> 2:29:17.240  
Arni Magnusson  
You. Bye bye.

2:29:18.60 --> 2:29:18.750  
Simon Hoyle  
Thanks everyone.