Atlantic States Marine Fisheries Commission

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Atlantic Menhaden Data Workshop
January 13th –16th, 2014
Florida Marine Research Institute - Conference Room 3A/B

TC/SAS: In Attendance: Amy Schueller, Mike Waine, Genny Nesslage, Joe Smith, Jay McNamee, Lindsey Staszak, Jeff Brust, Joey Ballenger, Rob Latour, Micah Dean, Alexei Sharov, Behzad Mahmoudi, Matt Cieri, Shanna Madsen

TC/SAS virtual: Jason Shaffler, Todd Mathes, Rachel Sysak

Public: Andre Buchheister (CBL), Cara Simpson (CBL), Aaron Kornbluth, Bob O'Boyle, & Jud Crawford (Pew), Ron Lukens & Shaun Gehan (Omega), Erik Williams (NMFS Beaufort), Will Smith (NCDMF)

Bold = Task
<u>Bold & Underline = research recommendation</u>
Yellow highlight = final TC/SAS decision

<u>Monday, January 13, 2014</u>

1. Brief review data TORs and goals of the Data Workshop (*Schueller*)
2. Review fishery dependent data sources
   a. Reduction landings (*Smith*)
      i. Historical reconstruction
         i. 1940-2008 reduction landings from industry maintained at Beaufort as daily vessel unload in 1000s of standard fish = 670 lbs (hopper holds 0.3039 mt=1000stdfish). Snapper boats in VA also included when available.
         ii. 1880-1939 from comm stats, 1873-1879 from menhaden fishery document. Done for SRA in last assessment. Doug Vaughan interpolated where necessary.
         iii. Trends: 1958 year class last great year class, poor R in 60s, rebuilding in 60 with closing of NE plants, some factories reopen in 90s (including Russians in ME), 1993 all NE plants close, 1985/86 prices bottomed out (explains one low point in effort)
         iv. **Develop time series of fish meal prices if possible (Joe – done at meeting)**
      ii. Final landings time series
         i. Waiting on final bait landings time series
         ii. **Pull out un-interpolated historical landings time series given we're not redoing the SRA – Joe/Amy**. Look into SEDAR 20-DW02 document on historical landings reconstruction.
         iii. Historical data largely reduction fishery. On par in magnitude with current landings levels and may give us info on stock productivity/capabilities.
         iv. Old plants were much smaller. Mix of purse seine and pound nets.
         v. Note SEDAR 27 reviewers had issues with fish measurement devices and

consistency of hopper dumps across time series. Greer (1914) Rept of US Comm Fisheries volume is 22000 cubic inches ~ 1000 std fish. Uniform machinery used. Use 0.667 or .67 converts weight measured volumetrically into quarter box dumps and led to CV of ~4%. Verified dimensions of fish hoppers in Gulf to satisfy reviewer concerns. Monte Deihl said Reedville remanufactured their dumps in 2008. Recertified dumps and modified dumps to hold 1000 standard fish. Adjust topping off in CAA matrix.

vi. Discussed how changing SAA/WAA affects landings weight. Cutkin measured all sizes of fish and affected most when rancid fish were unloaded which doesn't happen much since refrigeration has improved.

vii. TC/SAS approved landings in weight time series (both historical and recent).

b. Reduction catch-at-age (*Schueller*)
   a. March 1- February 28 is CAA model year.
   b. Port sampling used to develop port/week/area caught level of stratification. Adjust CAA using CDFRs to account for potential bias resulting from topping off (vessels returning to Bay from outside fill up in Bay). Not as much topping off now as in 80s (since less competition among factories and low abundance in NJ). **Develop example calculation of how this is done for instruction purposes – Joe/Amy.**
   c. With Atlantic herring, the sets tend to hang together, so last set reps what's in sample. Probably same for menhaden. Sampler always asks where last set taken.
   d. Observer data rare except turtle project. In RI, have one year's worth of bait observer day. Logbooks have details since 2005. **<u>Research recommendation= to check and see how representative samples are of entire hold.</u>**
   e. Bulk of recent landings were age 2 fish.
   f. 1958 year class example shows age classes can be tracked.
   g. 1 10fish sample per vessel, ~35% of vessels get sampled. Smaller sample size in last year because landings down.
   h. Up until 2004 age-0s hit hard in fall fishery if good year class. Now since Beaufort fishery closed, had to fish 3 miles offshore so not getting age-0s. Rarely come around Hatteras now.
   i. TC/SAS approved reduction landings CAA.

c. Bait landings and catch-at-age (*Waine*)
   a. Directed and bycatch fisheries. Various collection methods make it difficult to quantify. Estimated to be 20% of harvest and increasing across time series.
   b. Disposition not clear (reduction vs. bait) in historical data. Can pull by gear type and subtract out Beaufort reduction landings records. Previously used bait landings since 1985. As reporting is enhanced, reporting is more accurate.
   c. Amendment II identified personal use issue, so use harvester reports instead of dealer reports as a potential work-around. Atlantic menhaden may also be reported as a lumped bait category.
   d. ACCSP has 1950-2012 landings and will compare with landings provided by state to see if we can use this info to tease apart bait vs. reduction. **Need 2013 bait landings from most states.** Hopefully, with quota-based landings this will be doable.
   e. 1950 to 1984 landings came directly from ACCSP. Doug used pound net and other gear (eliminated purse seines). **Mike will take a look at disposition and compare. Will look again at weird high values possibly being reduction landings (some reduction landings at Port Judith – will get from Joe and inspect).** Ratio of bait vs. reduction changed over time. Disposition and gear type largely unreliable data.
   f. **At AW, explore (again?) assigning time-varying CVs to those early years of bait landings.** CV = 0.05 for 1985+. Prior to that used 0.15 for 1950-1984. **Also explore using 1985 forward time series run of assessment model.**

g. Figure 4.12 = plot of proportions of reduction vs. bait in overall landings over time series.
h. **Compare historical harvest pound net reports through 70s with early ACCSP dealer data – Mike did this at workshop and it's virtually the same.**
i. In some states (eg SC), only food fish required to report, not bait landings.
j. One 10fish sample per 515 mt adequate? Jay did power analysis to address this question. Amendment 2 required one 10fish sample per 200mt landed in CB, and areas north require 1sample per 300 mt. So slightly more than what Jay indicated was needed.
k. Still need to do potential ager-bias study. RI working on an age & growth lab and plans small exchange with Beaufort – other states invited if interested. **Potential for ageing workshop or just exchange (staff talk to Jeff Kipp) - could run in parallel with assessment. Needs to be done before Ethel retires this year! See if Steve vanderKooy at GSMFC interested as well.**
l. Bait CAA: availability of samples varies by state/gear/year – largely sporadic. Regions used to calculate landings in numbers similar but not exactly same as reduction.
m. Mike will redo bait landings and match to model year (beginning March 1) and make seasonal adjustments in years where monthly data not available using seasonal proportions in recent years.
n. **Amy really needs 2013 bait samples sent to Beaufort asap, landings by region through 2013, MRFSS landings by region through 2013.**
o. Need to incorporate annual agency-collected biosamples in CAA in future, but will use regional approach for this assessment.

d. Public comment
a. Bob: can sampling last set info from Gulf be used here? Joe: not much mixing within hold. Amy: correct for topping off but can't correct for more without a study. Bob: do whatever you can to quantify how good bait landings are, esp historical. Also, bait:reduction ratio examination would be good to verify.
b. Jud: would be good to investigate bias in landings, document reasons why not an issue. Joe: on site agent notes ledgers match up with observed landings nicely since 1983.

*Note – Kirk has 50 fish from CT trawl survey he is sending to Joe for ageing.

e. Recreational catch (*Mahmoudi*)
a. Seriously uncertain – all 60-100% CV
b. Sample size 14-470 fish except NC which samples lots of rec fish (4,702). Sample size hasn't increased substantially with MRIP.
c. N->S gradient in size distribution evident, though, even only a few samples available.
d. In past, took landings by region and inflated bait by rec and used same length frequency.
e. Report number of intercepts. Even though there may appear to be a large number of samples in a few cases, they might be from a few intercepts.
f. Keep on with the same approach for incorporating rec data acknowledging the problems.

f. Fishery-dependent CPUE indices (*Dean*)
i. Review methodology/approach
i. 14 datasets reviewed in April, 9 deemed insufficient, 5 selected for further development from MA, RI, NJ, MD, PRFC
ii. CPUE (pounds per net haul) modeled with delta-GLM (dglm function in R), selection via forward stepwise process, lowest BIC, addition of last term explains <2% of null deviance (Maunder & Punt 2004), addition of last term exerts >5% influence on index (Bentley et al. 2012)

ii. Results - local indices
i. MA: trip-level fish trap data from 2002-2012, 86% zero trips, restricted to April-June, year+permit + month as factors, soak time didn't have much effect
ii. RI: fish trap, problems in reporting in soak time, year+permit+month, same trend as MA

        iii. NJ: all months, gill net, assigned each trip average mesh for that trip, 4X higher zero catches, DelBay used, soak time reported and most 24 hours, year+permit+month but soak and mesh didn't have big effect, looks like MA & RI
        iv. MD: all months, seasonal pattern to effort, areas with zero menhaden were omitted, opposite pattern in MD, but trend starts in 2005 when reporting changed from monthly to trip level, monthly tracks trip level though, year+permit+month, suspicious break in 2005 but correlates with PRFC
        v. PRFC: total lbs/net days (net days estimated in past based on #licenses), no zero catches, have zero catches for last 10 years and daily catch and effort by permit, 22% zero catch, all months but Jan, year+port+month, similar pattern to MD in later years. With daily trip-level data model was year+permit from 2000 forward that includes zeros similar to traditional and monthly glm. Could split into two time series.
        vi. Examine NJ gill net catch distribution and see if gear is saturating – if so, won't be good index of abundance if catchability is being affected by soak time.
        vii. **Consider filtering out permits that never catch menhaden. Look at when permits are active. Try using FIG's rubric of dropping records for factors with <5% of pos catch.**
    iii. Results - composite/regional indices
        i. Year+state+month
        ii. Weighted by number of obs by 1/# in yr & mo
        iii. Break N vs. S but NJ turned out to be more correlated with NE than MD & PRFC,
        iv. Combo MA & NJ (MA correlated highly with RI, which was not as extensive), combined MD & PRFC. Regional breakdown appears to be DELMARVA as Joe predicted.
    iv. VA (Jason)
        i. 1993-2012, 49,000ish trips report menhaden. Large number of reportees never reported menhaden. Reported as weight and converted to numbers using average fish weights from SA.
        ii. Bait category in records dominated the landings 34:1, there are menhaden in this category but bait drops off over time series. Could be improved species-specific reporting. Identified a handful of harvesters who will work with VMRC to see what their bait catches contain (net-level info).
        iii. Reported by stat areas in CB, but very uneven effort. Combined data into tribs vs. mainstem regions, 22%pos in Main and 15% in tribs,
        iv. zinf negbin glm, no effort metric, lines up with old PRFC and compared using ts cross-correlation function 62%, also compared VIMS juv index to VA lb net lagged by 2 yrs and 40% correlation, 1 yr lag was 10%
        v. See if Ethel can age those same scales that Jason read – Joe & Jason
    v. Historical pound net records US Fish Commission->BCF->USFWS→NOAA FUS
        i. Effort, catch in lbs; only looked at states with continuous records across time series. 1929 did all states every year
        ii. Other gears available (including purse seines), but not transcribed
        iii. One way trip of increasing CPUE in 40s/50s, NJ/MD/VA correlated
        iv. Large effort numbers in early years, may be coastline saturation issue
        v. May be same data as ACCSP or at least highly correlated
        vi. Same quality data (catch & effort) as PRFC but goes back farther
        vii. Explore potential effect of market price on index – explored at workshop and deemed minimal.

vi. Criteria for inclusion in assessment
   i. Hyperstability/gear saturation if can't be corrected
   ii. Sufficient time series, minimum 10 yrs
   iii. Spatial extent – all else being equal use the larger
   iv. Includes zero trips unless evidence that it's not impacting the index
   v. Consistent data collection over time or ability to account for changes with model/correction
   vi. Identification of species
   vii. Ability to evaluate uncertainty
   viii. Evidence that true population fluctuations are not being reflected in the data (e.g. change in species targeting)
   ix. Standardization model successfully developed (e.g., convergence achieved)
   x. Info on gear selectivity - info to tell whether the index is YOY or adult

g. CPUE in reduction fishery (*Smith*)
   a. SEDAR reviewers had concerns with CDFR-based indices: hyperstability bec of spotter pilots, but may be informative
   b. Compared Gulf CPUE with YOY lagged by 1 yr, also correlated highly with trawl YOY index
   c. Joe generated indices - fish at age 1 by number of sets per year by region, also for age 2s lagged
   d. Evidence for tracking year classes in these CPUE indices. Age 1 and age 2 indices track.
   e. **Try for NJ as well (although fewer sets overall) – done at workshop**
   f. Spotter pilots make it hyperstable, making it easy for them to maintain a constant level of catch even as density declines, also max out now given only one processing plant
   g. Use as corroborative evidence only

h. Spotter pilot survey (*Joe*)
   a. Squire 1972 index for apparent abundance of AM, chose arbitrary intervals to start
   b. CB cap has been around since 2006, but haven't hit it. Active avoidance of Bay by fleet, but that shouldn't affect the spotter pilot data.

i. Spotter pilot survey (*Amy*)
   a. In addition, Jay sent data from RI for comparison.
   b. Most likely reps ages 1&2
   c. Biosamples indicated indices different ages: bay (ages 1&2) and outside bay (ages 2&3)
   d. Narragansett Bay likely age 3&4, area 3 may be wonky because of the airport no fly areas
   e. Correlates well with RI fishdep index (high 2008 and drop following years)
   f. Use as corroborative evidence. **Recommend continued collection and collect consistently and through time (including weather/spotter conditions**).

j. Public comment:
   a. Ron: Monte Deihl says reduction fishery bought fish from pound nets (so not all bait?). Matt: how much extra reduction landings ended up as bait? Amy: doesn't matter as long as we apply the right selectivity function
   b. Bob: species composition in these multispecies fisheries may be informative. Also, landings levels now similar to historical levels and there may be some rare size info out there (eg Baird study).

k. Review final data source inclusion/exclusion decisions and task list
   a. Include all indices except VA (species identification categories), RI (too few years and correlated well with MA so could use size info to inform MA)
   b. Include PRFC even without zero catches because zeros don't matter during time period when daily reporting occurred.

c. *May include historical pound net CPUE index after evaluation of effect of market price on trend*

Tuesday, January 14, 2014 *8:30 am – 5:30 pm*

1. Review homework from Monday night
    a. Mike updated us on bait:
        i. Compared historical reports pound net data with ACCSP data. Micah's were typically higher but by only about 1%.
        ii. **Mike will compare ACCSP with what states sent and present that to group for decision on which dataset to use for 1985 forward. TC/SAS approved historical ACCSP time series.**
        iii. Percent increase over time in ratio of bait to reduction. Caused by increase and better reporting in bait, lower landings in reduction fishery.
        iv. Jump in 1985 seems suspicious.
    b. Joe:
        i. Fishmeal prices from Seafood Business News international fish meal prices from 1982 forward. Menhaden traded in short tons. May not be adjusted for inflation. Huge spike since 2000s. **Put graphs in report.**
        ii. Mid-Atlantic CDFR
            1. Effort high in CB, not many sets in NJ because they were so abundant in the Bay
            2. Mid-Atlantic index age 2s and 3s match until 2010/2011, but both increase. Years that don't match up are years with low effort.
2. Life history data
    a. Ageing error matrix (*Schueller/Smith*)
        i. Scale to scale done by Ethel (within reader)
            i. 3700ish scales reread, used agemat to create an aging error matrix used in BAM, data from age 0 to 5 and beyond is model prediction, good up to age2. If you use asymmetric matrix you have to assume one age is correct and the other is wrong but we don't have known ages.On Gulf, tested for ager reading drift but didn't find it.
        ii. Scale to otolith comparison (ODU/Jason)
            i. ~61 scales and otos read by Jason a few years ago. Only one mismatch.
            ii. Another recent project prepared poorly by student. If you assume oto is true. Usually read scales as younger than older. Only have ages through age 4. Looks great (for 96 comparisons) except for age 2s which as often read as age 3. Likely due to poor mounting (tissue and marks on edges). This study may not be trusted because of poor prep.
            iii. **Recommend that we do ageing error study and oto/scale comparison for ages 4+.**
            iv. Bias could be a reason for problems with the model. Evidence for possible bias in age-length plots. But increment measurements don't indicate much evidence for bias.
            v. **Consider exploration of effect of biased ageing error using Atlantic herring matrix. Matt send it to Amy/Genny.**
            vi. **Include reader error matrix in model.**
    b. Growth (*Schueller*)
        i. WAA for fishery based on fishery data fit to observed landings, density dependent SAA is more characteristic of cohort than annual.
            i. But noticed that B param not changing over time (except once fall fishery goes away, which is a sampling issue), so fish are growing slower but size at length

same over time. Expect change would occur at size at maturity. Historically, we used time-varying weight at length matrix because Doug used to show biologically implausible jumps in weight between ages.

ii. Use time-varying length at age based on yearly VonB curves based on cohort. Plug yearly length at age into overall weight-length relationship to get weight at age. Use this to fit to landings time series. If we do this and we have bad fits to landings CAA, we'll know there's a problem.

ii. WAA for N (population)
    i. Fishery dependent data adequate to characterize landings but probably not population length at age and SSB. Data from FI surveys had larger fish in their sampling. Selectivity issue too. Which would lead to biased growth curve estimates.
    ii. See Schueller et al 2013 paper. Tested with and without corrections (missing smaller and larger sizes in samples). Correction does better than ignoring the bias completely.
    iii. We're effectively underestimating SSB in example shown.
    iv. How pick max and min. Pick max by eye (kinda obvious).
    v. **Amy will do the analysis using the corrections and present to group.**

iii. If we provide SSB in weight,
    i. In past predicted LAA with yearly vonB to get WAA to get biomass
    ii. Use overall WL using time-varying LAA based on vonB curves fit to cohort data with the bias correction.

c. Public comment:
    i. Ron: pound net sales to reduction plants stopped in early 90s.
    ii. Andre: Ecosystem modeling would be interested in biomass estimates.
    iii. Bob: Compare topped off composition and spatial coverage with those that are not topped off. Bias in ageing should be resolved as much as possible (exchange to see if problem) and if not describe degree of uncertainty in report. SSB in weight would be desirable. Be explicit about hypothesis through which growth would be density dependent.
    iv. Jud: Biomass time series desirable because everyone thinks in terms of biomass.

d. Maturity/fecundity (*Smith /Brust*)
    i. Joe on maturity:
        i. Age 2 %mature highly variable (sample size issues too). Tried to make Reedville trip in Nov 2013 and took mostly age0s and older fish, so not many age2s to sample.
        ii. Trish Murphy had her peeps collect ~100 fish from FI gillnet surveys now in freezer. May be able to get intact gonad weights for age2 and round out that estimate. No other new data since 2009 assessment.
    ii. Joe on fecundity:
        i. Can't find Lewis et al. 1987 raw data.
        ii. Again, Trish found some specimens. Asked Wilson for samples but winter tagging cruise not running this year. **Ask what biodata SBWTC may have.**
    iii. Jeff on maturity info in NEAMAP trawl survey
        i. Samples from fall 2007 to spring 2013. Percent mature very different even when lagged from what's used in assessment.
        ii. No length data after 2011
        iii. Spring vs. fall. Spring looks similar and lines up with assessment with some variability. Fall is very different and more variable even when lagged.
        iv. Jeff reran and included fish below 135mmFL and looked better for age1s but age2s still consistently much larger p(m) than old paper. Need to consider how representative these samples are vs. NEAMAP.

1. Pros:
    a. Spatial distribution of NEAMAP is wide across range. NEAMAP has multiple years of data.
    b. Could get scales from fish.
2. Cons:
    a. AL key age assignments may be way off.
3. Note that old paper imm/mat was misinterpreted!! Don't have raw data. Jeff - use NEAMAP fall, all years combined.

e. Natural mortality (*Cieri*)
    i. Charnov, Lorenzen, point estimators
        i. Similar to MSVPA estimates (averaged over ages and years)
    ii. BERP – revised M matrix
        i. Problems (likely in new sbass results) with latest run (last 2 years added) so need to clean up prj file
        ii. Similar Ms over age/time to previous runs of the MSVPA (corrected and updated prey pref and spatial overlap didn't have much of an effect).
        iii. **BERP needs to fix updated prj file and figure out how and why new spatial overlap and prey pref affects results.** May have to do with bay anchovy for younger menhaden.
        iv. If we want an age and tv M…could use tag-based M and scale that with MSVPA in later years (either scaled or estimate devs for a constant M). If we want to use MSPVA matrix as in past, we need to discuss more underlying M1.
        v. Use of MSVPA will affect what ref pts are valid to use or vice versa (early time series constant) vs later.

3. Tagging subcommittee report (*Smith*)
    a. 1966-1970 adults tagged in ocean, 5 spatial strata
    b. Numbers in Coston 1966-68 didn't match with beginning of dataset. Data either lost…but re-entered data has age data and one extra years. Data matched for 1969.
    c. For prelim, use D&C for first few years, then use re data
    d. Brownie-tag return, 2nd dimension is space, can be structured by age
    e. Only age/length at tagging, not recovery
    f. Age/length data missing entirely for NY&NJ, but most were age1 so may be safe to assume the un-aged/measured fish were age 1
    g. Assume:
        i. All tags reported – magnets get estimate of report rate/magnet efficiency
        ii. No tags shed – tank study done in 1972, N=100, 17 died or shed tags
        iii. Closed system – no emigration (may be violated if they move beyond NY spatial strata) that could confound mortality parameters
        iv. Some sampling in all spatial strata – OK here
    h. Used prior estimate of M from 2012 MSVPA, Mage1 = 0.889, Mage2=0.683
    i. Model selection
        i. M age-based/fixed across ages or fixed internally estimated
        ii. Movement probability options varied as well
        iii. Compared BIC
        iv. Best model was age-specific, MSVPA-informative prior, transition probabilities that vary by age, Internally-estimated M
        v. M=0 in NY and FL, M=1.5ish in NJ, 0.7 in CB, 1.7ish in NC
    j. Age1 P(movement) matrix agrees nicely with Dryfoos. Most move north except for FL fish. Consistent across ages. As fish age, there is a lower probability of fish moving south.
    k. Internally-estimated M relied heavily on MSVPA prior and produced super low age-specific Ms and highly variable high Fs, so future runs should include constant age-specific M

l. Could **try truncating out recoveries at large above #years expect to reach the top regional strata then estimate movement rates.**
m. **Will will try to run simple coastwide model without spatial approach and estimate M. Then use that value as a fixed value in spatial model. NY, NJ, CBS movement rates if possible. If not enough data, go back to 2-region.**
n. Seasonal data there, but only had fishery in winter in NC. One assumption is nonzero probability of sampling and that would be violated if model run seasonally.
o. So far, movement and M don't appear to be highly correlated. Inspect residual pattern once models in better shape.

4. Public comment:
    a. Jud: Time-varying M happens and is important, please use

<u>Wednesday, January 15, 2014</u>

1. Review fishery independent survey data
    a. Review generation of abundance indices (*Schueller & GLM subcomm*)
        i. Icthyoplankton-based SSB index (*Cara Simpson*)
            i. Different mesh sizes between MARMAP and ECOMON
            ii. Joe asked if larvae in GOM could be advecting from south. Hongsheng wants to look at that. Probably not being advected from Cape Cod south. Going to work on back calculating using length data. Species ID done in Poland, and NEFSC will be double checking species ID through 2008-2009. Rob pointed out that we could tie in with ROMS model to explain patterns in R and SSB. Could do first stab by chopping up coast into strata. Good to ID oceanic hot spots of production.
            iii. Harvey said couldn't calculate calibration factor for MARMAP/ECOMON combination (low menhaden N at that time). Higher retention rates for smaller mesh. Will need to do length-based calibration calculation. They calculated index via Richardson et al method (nonlinear LS larval index). Accounts for larval mortality, seasonality of spawning, and timing of sampling. Data Sept-Feb, chose strata based on spatial pattern of distribution, age estimated from Lozano et al 2012. Low points could be low sampling coverage in 2002 and 2004.
            iv. If egg and larval indices track that would give us more confidence that the trends are not environmentally driven and could indicate SSB.
            v. **Decided to include as ancillary info but not as index of abundance at this time.** Perhaps with further work in future.
        ii. Rehash fecundity
            i. Discussed potential for underestimating fecundity of older ages**. Try both approaches (based on lengths vs. ages) in prep for assessment workshop outside model and see if has a big effect - Alexei.**
        iii. Review methodology/approach of GLM subcommittee (*Schueller*)
            i. Rubric on how to approach analysis
                1. Catches >=5% in a category, etc.
        iv. Results - juvenile indices (*Latour/Nesslage/McNamee/Ballenger*)
            - JAI seine (NC, VA, MD, NJ, NY RI, 2 in CT)
                1. Poor %dev explained overall
                2. NC model quite poor
                3. VA had more enviro data, better model
                4. MD longest time series, good diagnostics, mostly YOY (a few age1s based on spot checking but not corrected for that at moment)
                5. NJ 1999 had super high peak
                6. CT no factors but year effect

7. CT Thames newest and shortest time series
8. MD largely dominates coastwide with exception of one extra peak
9. Rob also showed a coastwide model with the data weighted that showed a couple of more peaks that MD didn't
10. **Rob will run correlations with trends in proportions coastwide. Will explore how to treat large tows.**

- JAI Trawl
  1. RI trawl-Aug through November, 5 stations used, 1990-2013, censored large tows due to problems, used bottom temperature, final model included ~year+btemp for a negative binomial model,
     a. Convert censored tows into max catch value and see if makes a difference
  2. NY Peconic Bay trawl-YOY index, July and August, 1991-2012 with a few years exluded, bottom temp, neg binomial GLM with log link, ~year+salinity+bottomtemp+month
  3. DE midwater trawl-YOY index, May to September, 2003-2013, most site in Indian River Bay, smaller proportion of positive tow, highly correlated with bay trawl
  4. DE inland bays-bottom trawl, YOY, 1986-2012, tow duration was consistent, month correlated with sea surface temp, used sea surface temp, negative binomial GLM with log link
     a. Make sure that we are not excluding too many records
  5. Maryland Trawl Survey (eastern shore, coastal)-1989 to 2012, assumed all YOY, May to July, final model ~year+seasurfacetemp, same trend with old CB side seine survey
  6. VIMS juvenile trawl survey- May to June, two different types of length cutoffs which didn't matter too much, 1988 to 2012, censored large tows (>1,000), data goes back to 1955 but significant gear changes over time, sufficient tows, used only certain systems, negative binomial GLM with log link, final model~year+system+bottomsalinity, bottom trawl
     a. Could combine some of the systems, because some are branches of larger tributaries
  7. Georgia trawl-YOY, January to March, more variable, do we have confidence that they are Atlantic menhaden (Todd responded that yes, these are A. menhaden)
  8. Inland bay and mid-water DE are highly correlated, probably can include just one (longer time series)
  9. **Genny – explore adult indices for VIMS and GA**
  10. **Genny – report total deviance.**

v. Results - adult indices (*Schueller/McNamee/Ballenger*)

- Jay – northern mixed indices
  1. CT LIS – high std residuals (**candidate for zero infl or delta**) and very diff from nominal in terminal year for adult index. More covariates for YOY model.
  2. ***Use expand.grid function and average coefficient for categorical factors – Jay and Genny.**
  3. DE TS – adult and YOY, YOY has huge std resids (**candidate for zero infl or delta**)
  4. NEFSC – **need to include enviro variables still,** adult and YOY
  5. NJ – adult and YOY which had high residuals (**candidate for zero infl or delta**)

6. **Plot size distributions**
7. **Jay will look into beta neg binomial**

- Joey – southern mixed indices
  1. YOY
     a. SCDNR electrofishing YOY - **Drop higher order polynomial terms.**
     b. CHESFIMS
        i. Combo TIES and CHESFIMS
        ii. Horrible CVs, 95%zeros
     c. ChesMMAP
        i. Caught ~400 age0s over 12 years
     d. NEAMAP
        i. Too short and only spring had enough
  2. Adult
     a. SCDNR trammel net
        i. Looks good
     b. SEAMAP
        i. Look good - plot 1-yr lag between this and GA Trawl JAI
     c. CHESFIMS
        i. Small catches across all seasons
        ii. On the fence, survey ends in 2007
     d. ChesMMAP
        i. Similar to CHESFIMS
     e. Correlations
        i. CHESFIMS and ChesMMAP highly correlated
        ii. SC and ChesMMAP neg corr
        iii. SEAMAP and CHESFIMS and ChesMMAP with lag
- Amy – adult
  1. MD sbass gill net
     a. A few years had almost no menhaden, 93% zeros, convergence issues, don't use, maybe use to check large year classes, big mesh
  2. DE 30ft
  3. VA shad
  4. NC gill
  5. Rutgers IP
     a. Sparse spatial coverage (1site), horrible qqplot, inland
     b. Ditch

b. Review final data source inclusion/exclusion decisions
   i. Eliminate:
      i. NEFSC –eliminate bec of super low %tows, not nearshore enough especially for YOY
   ii. Decisions:
      i. **Combine seine and trawl JAIs in coastwide index given we don't have a single index of abundance that represents the coast**
      ii. Relative weighting scheme: combined indices – take average catch rate and multiply by area of survey then add together surveys
      iii. Try with common years and one with all data even if some years missing. Do for seines and trawls separately and combined.
      iv. Combine DE 30 and 16 ft trawl in one model. Same for CHESFIMS & ChesMMAP. Same for 3 NC program numbers.
   iii. Final – surveys censored

i. Rutgers IP
ii. MARMAP and ECOMON
iii. NEAMAP
iv. RI fishery-dependent
v. VA fishery-dependent
vi. SEAMAP (Y)
vii. CHESFIMS (Y)
viii. CHESMAP (Y)
ix. MD striped bass gill net
x. DE midwater trawl
xi. NEFSC trawl

- Retained adult surveys for SAS consideration:
  - Coastwide
  - North
    - MA fishery-dependent, NJ fishery-dependent
    - CT LIST, NJ trawl, DE 30ft trawl/Delaware 16 trawl
  - South
    - MD fishery-dependent, PRFC
    - SC trammel
    - SEAMAP
    - CHESFIMS/CHESMAP
    - NC (river, sound, south) gill net
    - VA shad survey
  - Historical fishery-dependent
- Retained YOY surveys for SAS consideration:
  - Coastwide
    - Seines
    - Trawls
  - North
    - NJ seine, CT-Thames River seine, CT-Connecticut river seine, RI seine, NY seine?
    - NJ trawl, CT Long Island Sound Trawl, RI trawl, NY peconic, DE inland bays, Delaware 16 trawl
  - South
    - MD seine, VA seine, NC seine
    - MD trawl, VIMS trawl, GA trawl
    - SC electrofishing

iv. **Time series analysis of seine and trawl survey coefficients – Andre/Rob**
v. **Correlations between trawl and seine YOYs – Rob&Genny**

c. Micah plotted historical price trend and obvious trends not evident – Genny rests her objections
d. Rely on historical FD index only if FI index not available or needed for model.
e. Public comment:
   i. Ron: you guys rock
   ii. Bob: area based index approach is good/only way. Frame discussion in terms of statistical framework/design. **Plot area covered vs. stock area.** Seine q is pretty much the same but

trawls may not have same q so make sure you consider it and then how would you handle electrofishing? **Check and see if trawls are sampling similar ages and sizes.** Decide how to characterize uncertainty consistently (Punt paper showed through sim that bootstrapping did not perform as well). Incidence of large sets in JAIs (**plot number of large sets over time to see if function of abundance**). Update 2010 and 2012 assessment indices if there are differences you'll have to explain it. Ichty data in between SSB and R but may not rep of anything and would be cool to combine MARMAP and ECOMON if possible.

iii. Andre: Remember that low deviance explained in his models was for positive part of model. Should look at combined total deviance.

<u>Thursday, January 16, 2014</u>

1. Discuss availability of power plant/impingement data (*Dean*)
   a. Compared with seine indices from last assessment – close match in some areas (Brayton Pt and Pilgrim esp which were modeled with delta glm ~ year).
   b. Single fixed station, but very long time series back to 70s in most cases.
   c. Menhaden has been a reported value for time series.
   d. Brayton and Manchester St had most impingement in winter in NarBay because in northern estuaries they are pumping out warm water that attracts fish. Like a lure.
   e. Entrainment data huge in May and June in NarBay.
   f. Brayton plant closing.
   g. Length data indicates lots of YOY and gear selectivity concerns. Manchester attracts adults due to warm water plume.
   h. Southern plants correlate with southern JAIs too.
   i. Hyperstability issue given these warm waters are attractants. Pros are consistent methodology. Cons will be difficult to get the data and sampling may have changed with permitting requirements.
   j. **Use as corroborative evidence for JAIs.**
2. Joe's spatial ppt
   a. Biosampling regions north Atlantic (GOM to LI), mid-Atlantic goes down to eastern shore VA, CB below MD/VA line including lower CB (not MD) and VA ocean areas down to Avon, south Atlantic rest of Atlantic coast
   b. Any fish landed in NC after first week of November = temporal distinction for migratory fish
   c. Areas 1&2 = northern area and Areas 3&4 = southern area proposed and would require no further data manipulation. Break just north of CB opening.
   d. Would have to deal with migratory fish that go north.
   e. Last set of day info could be used to tease out MD line with some effort.
   f. Mean size of fish by plant for reduction and for bait very different DE and north vs. south of there.
   g. **Look at historical samples vs. current to see if temporal trend.** But southern fish could be even lower if not accounting for migratory fish in these mean size graphs.
   h. Seasonal time step would be difficult but wouldn't account for patterns over range (fishery selectivity is the issue).
   i. NE fishery stopped in 1993. Russian fleet IWP included samples and catch data. Mostly age 5 fish. After that had two Reedville plants and Beaufort.
   j. Would need at least two selectivity periods for Northern region.
   k. **PCA of age/size of catch to look for how to identify regions.**
   l. Not a lot of crossover of fleets between areas at least until 70s. Didn't go as far when vessels wooden vs. modern steel vessels. Now don't go much farther north of central Jersey.
   m. No transfer of fish between plants for reduction fishery.

n. Con of too many fleets is too low sample size in that region to estimate selectivity. If area fleets use dome-shaped selectivity need to think about how we'll estimate them because data may not be informative enough. If appropriate regions structured won't need dome shaped selectivity.

3. Brainstorm and outline plan for modeling approaches
   a. Traditional/old school approach – use XSA from MSVPA as "continuity"/coastwide run to compare our new approach with old coastwide approach
   b. Start with regional fleet approach BAM structured or with minor modifications.
      i. See notes above from Joe's ppt discussion
      ii. Begin with confirming regions using PCA or similar approach. Probably start with N/S split and see if additional regions needed.
      iii. May need to figure out regional breakdown of R between regions if a) being caught or b) if separate production in north/south. But if mixing well and there is no differential survival of age0s between regions don't need to worry.
         1. Kroger and Guthrie TAFS 1973 tagged 80000 age0s in late summer/early fall before left estuaries. Fish moved as far as FL (most to Beaufortish region) and then redistribute. Fish caught in cast nets so mostly peanuts. Sampling at all factories south of LIS. But north Atlantic plants closed and not available for recovery in winter so can't get rate of who stayed. No data to investigate R events throughout year and across range.
      iv. Not pursue seasonal time step at this time. Use fleets as a proxy.
   c. Migration/movement-based model – if possible, build in migration rates from tagging into BAM
      i. 2 box spatial model using tagging data an option
      ii. Would need age-specific movement rates but only have tagged fish up to age 3.
      iii. Genny will give SS a shot - advantage is more sophisticated growth modeling than BAM. Put in both age and length data and can go to smaller time step.
   d. Discussed value of running ASPIC
      i. Would not be used for stock status determination
      ii. Can use to evaluate influence of indices on model fit, better to use BAM and turn off age comp fitting.
      iii. Better evaluate uncertainty through sensitivities
   e. Potential sensitivity runs – formulate hypotheses
      i. States of nature
         1. M configuration (constant, age-specific & tv M in later years combo with early)
         2. Index development choice
         3. Start model in 80s
         4. Selectivity function
         5. SR function/treatment
      ii. Model behavior
         1. Herring ageing error matrix
         2. Sensitivity to base M scalar
4. Update on Will's migration/tagging
   a. Tried NY/NJ vs CB south regions
      i. Best model MSVPA-based prior, p(m) based on age – similar results to last run
      ii. Higher Fs in previous runs due to error in input matrix, now Fs are between 1 & 2 between 1966 & 1970
      iii. M estimate issues resolved (too low), new estimates for age1 were just a little higher than MSVPA prior, age2 about 0.5, but older ages are probably immigrating out of model domain (north of NY) for age3+, age5 has info so set at prior

iv. P(m) lots of mixing among NY/NJ esp for younger fish, SA fish stay put esp for age 1, remember p(m) affected by area of strata
v. Plotted history of parameters to inspect for correlation between M and p(m). lots of even scatter, so no major correlations obvious.
vi. Fishing and non-fishing seasons needed for this data to be useful in 2-box model. Data is summarized at monthly level. Most tagged off reduction boats so most tagged off NC.
    1. Try restricting recaptures to fishing season only then assume fall fishing only occurs on fish the box we think the fishing is occurring in. Mar-Sept only.
    2. Eliminate records from fall.
vii. Feed in p(m) and use logistic selectivity curves and let model estimate sel params or let model estimate using CAA info but may not be informative enough.

5. Florida conservation equivalency proposal for Amendment 2
    a. Will not reducing harvest harm the stock
    b. Gill net fishery targeted *B. smithii*, so high proportion of this may be different species.
    c. Overfishing was estimated by model even after incorporating gill net ban reduced landings. Scale of FL landings alone will not be influential on stock, but if multiple states are exempted there could be an effect on the stock. Even with the gill net ban we are still overfishing. Need to sample species composition to determine if they are even catching their quota. FL needs to manage with quota or there could be a growth in fishery from non-residents.
6. Public comment:
    a. Ron: it will be difficult for company to understand how/why reference pts change. When time comes, report to Board pls put in super layman's language so that non-fisheries people can understand so we can evaluate if company actions were effective.