BSAI Groundfish Plan Team
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Loh-Lee Low (AFSC), Chair
Grant Thompson (AFSC), Special Envoy to the SSC
Jane DiCosimo (NPFMC), Coordinator
Dave Carlile (ADF&G)
Andy Smoker (AKRO)
Dan Lew (AFSC)
Brenda Norcross (UAF)
Kathy Kuletz (USFWS)
Kerim Aydin (AFSC)
Brenda Norcross (IPHC)
Lowell Fritz (NMML)
Theresa Tsou (WDFW)

The BSAI Groundfish Plan Team convened on Tuesday, November 13, 2007, at 1:00 pm. Mike Sigler participated by phone during pollock and Pacific cod discussions. Twenty five members of the public and ten agency staff attended parts of the meeting.

Pollock Taina Honkalehto presented 2007 summer *EBS Echo-Integration (EIT) pollock survey* results. She reported that 2007 was another cold year, as was 2006. Juvenile pollock concentrations were found in the extreme northwestern part of the survey area, and also the central survey area roughly 60 nmi west of the St. Paul Island. Pollock EIT biomass was distributed 13% east of 170 degrees (Pribilof Islands), 82% were NW of 170 degrees, and 5% were in the Russian waters that were surveyed (part of the Navarin Basin). Age 1 pollock were numerically dominant in the abundance estimates whereas older pollock comprised the bulk of the biomass estimate. The off-bottom component of the pollock stock (between 0.5-3 m off bottom) has consistently averaged about 20% of the water column abundance from 0.5 m to the surface.

The EIT survey group continues to evaluate the use of frequencies other than 38 kHz to help identify the non-pollock backscatter component. Inter-vessel comparisons between the *Miller Freeman* and *Oscar Dyson* are planned in winter of 2008. The Team noted its comments from September 2007 regarding the inter-vessel comparison. The Team discussed the variability between the two vessels regarding survey design and results. MACE staff reported that to date, the differences between the two vessels were small, with no significant differences in backscatter in a study conducted during the acoustic survey in the Eastern Bering Sea in 2006.

Jim Ianelli presented a summary of the *EBS pollock stock assessment*. Abundance of EBS walleye pollock has declined due to below-average recruitment from the 2001-2005 year classes. This represents the longest period of observed consecutive below-average recruitments. Spawning biomass has apparently declined from about 4% above B_{MSY} in 2007 to 28% below B_{MSY} in 2008. Although preliminary indications are that the 2006 year class is well above average, spawning biomass is unlikely to exceed the benchmark until 2010. The age 3+ biomass for 2007 is estimated to be the lowest since 1980.

The Team concurred with the SSC determination that EBS walleye pollock qualify for Tier 1 management. Projected spawning biomass for 2008 is 1.38 million t, dropping it to sub-tier "b" of Tier 1. The maximum permissible ABC harvest rate was based on the harmonic mean of the ratio of yield over fishable biomass and is 0.341 compared to last year's value of 0.243 (which used age 3+ biomass). This value is adjusted by a factor of 72% corresponding to the projected spawning biomass in 2008. The resulting maximum permissible ABC of 1.17 million t is considerably higher than the Tier 3b estimate of 555,000 t (which is adjusted downwards from the $F_{40\%}$ by stock size relative to $B_{40\%}$).

The 2006 and 2007 survey estimates of abundance were both below average levels. The 2007 surveys indicated high levels of abundance for one year old pollock. The new data in this assessment showed lower than expected 7 year old fish. This contrasts with other year classes, e.g., the 1992 year class which increased in expected abundance at later ages. The EIT and bottom trawl survey abundance at age estimates appear to be consistent with other fishery observations. A figure showing the absolute

abundance at length of pollock in the BT survey shows that the mode of 2 year old fish is rare and that 1 year old fish are more common.

Bottom trawl survey-only cohort mortality patterns show higher catches in the last several years. This is consistent with model results in that the total mortality is higher in recent years.

The model evaluations showed that adding data reduces uncertainty, and that the ABC appears to be unaffected by this. The biggest change to the ABC is a result of changes in mean weight. The reduction in ABC (compared to last year's model) is partly due to the lower biomass estimate relative to B_{MSY} (being below B_{MSY} changes the rate proportionately). It was clarified that changing from the 3+ biomass to "fishable" biomass will yield the same average catch. The motivation for the change was due to the added inter-annual variability induced by having (highly uncertain) recruitment at age 3 impact the biomass for the calculation. The underlying continuous form for F_{MSY} is unchanged. The fishery has shifted to younger pollock in recent years based on the locations of the operations. This affects future yield calculations since selectivity shifts towards younger ages and the main tenet for management is conservation of spawning biomass.

A question from the public regarding stock-recruitment stationarity was posed. The author responded that the model demonstrates lots of variability; the estimates change with new data and model configurations but that the changes have been relatively minor over time. However, if pollock productivity changes, it may be appropriate to shift the period over which the stock-recruitment relationship is estimated and revise estimates accordingly.

ABC considerations The following highlights some points presented in the assessment that the Team considered in its discussions of whether the ABC should be set to the Tier 1b maximum permissible level:

1) The sum of the survey catchabilities for the accepted model is over 1.5, indicating that there is considerable overlap between the availability of pollock between the two surveys (or some other mechanism such as temporary immigration of pollock into the EBS region from elsewhere).
2) The stock-recruitment relationship continues to be constrained within the model which causes the harvest rate to be more conservative.
3) 2007 weights-at-age appear to be closer to mean values and are above the lower levels observed in the 2006 fishery.
4) In the two surveys conducted in 2007 signs of 1-year old abundance were above average.
5) The precautionary MSY harvest rate has been adjusted downward to nearly 72% to account for the stock being below the *Bmsy* level.
6) In the 1998 assessment, the outlook for 1999 was fairly pessimistic (although the age 3+ biomass was about 1 million t higher than is presently estimated for 2008). In hindsight, the perception of relatively poor stock conditions at the time changed. For example, at the time, the 1992 year class was estimated to be about average whereas now it appears to be more than twice the average and represents the third highest year class.
7) The stock has been at low levels in the past (but this appears to be the lowest since before 1980).
8) The Tier 3 ABC levels are substantially lower than the Tier 1 values due to different assumptions about reference biomass levels (hence a larger adjustment).
9) Future selectivity patterns are unpredictable given fish distribution.
10) If the 2005 year class is in fact below average, then there will have been 5 year classes in sequence that have been below average, an apparently unique event for this stock.
11) Spatially equitable catch rates by the fishery may continue to be impacted (lower catch rates overall are to be expected, and this can manifest as spatial differences in pollock availability).
12) Absorbing some of the anticipated "adjustment" from the ABC control rule will likely reduce the inter-annual variability ABC recommendations.

Arguments in support of Tier 3 (or at least the ABC at the maximum permissible level associated with Tier 3) include:

1) Stock is at a very low level
2) The stock has produced good year classes near B_{40} and hence is preferred over B_{MSY} as a target.
3) Size at age has declined in recent years (thought 2007 indicate about average) and experience at these low biomass levels has been limited
4) The stock/recruitment curve has an unusual shape
5) Recent period of 5 below average recruitments
6) Model shortcomings as noted by the lead author (e.g., retrospective patterns in the data).
7) Ecosystem considerations suggest that we should not rely on the stock/recruitment as under Tier 1.

Public comments also recommended results from tier 1b, tier 3, and lower than model results. Others commented that the Team should not solicit ABC recommendations from the public.

The Plan Team ultimately supported the authors' recommendation of a 1 million t ABC for 2008, but the decision was not unanimous. Some supported lower values of 976,000 t or 555,000 t as additional conservation for the ecosystem. Two issues were noted (1) Tier 3 may be more reflective of the condition of the stock and (2) recent poor recruitments may suggest a regime shift. The team discounted the regime shift argument as more data would be needed to support that a new regime exists for pollock. The team noted that the F value corresponding to an ABC of 976,000 has not been calculated.

The team recommended setting the 2009 ABC at 1 million t also, but this could be revised lower if next year's assessment does not confirm the current estimated strength of the 2006 year class.

Steve Barbeaux presented the Aleutian Islands pollock assessment. Model 2B is similar to the model accepted by the SSC last year and is recommended by the authors again this year. Age 2+ biomass appears to have increased from 1999 to 2004, after which it has been stable. Spawning biomass appears to have been increasing slowly since 1999. The 2000 year class is estimated to have been well above average (third largest in the time series), and preliminary indications are that the 2005 and 2006 year classes may be slightly above average.

The Plan Team concurs with the SSC determination that this stock qualifies for Tier 3a management. And concurs with the authors' recommendation to set 2008 ABC at the maximum permissible value

No changes in the analytic approach were made in the Bogoslof pollock assessment. Survey biomass estimates since 2000 have all been lower than prior to 2000. The team concurs with management under Tier 5 and past practices for determining ABC.

Pacific cod Difficulties encountered with the 2006 assessment resulted in a thorough review of the 2006 assessment model in April 2007 during a public workshop. Many suggestions for changes and refinements of the analytical approaches were made. The assessment considered four models. Model 1 fixes M at a value of 0.34 based on life history theory. Model 2 fixes M at the traditional value of 0.37. Model 3 estimates M internally. Model 4 differs from Model 1 in several respects to respond to public comments on the use and fitting of the data. The Team observed the following regarding the assessment.

- Estimated selectivity curves appear reasonable, except that IPHC longline survey selectivity curve is peaked and thus not differentiable (increasing the number of parameters from 4 to 6 parameters still doesn't overcome stated problems with estimating selectivity in stock synthesis).
- Model 4 ignores age data. It doesn't make sense to discard data with information on relative cohort strength, even if the fit is "not very good". Length data is not as informative as age data because there is not a one-to-one relationship between length and age, except for youngest ages.

Long-term goal of assessment has been to obtain then add age data to the assessment (~10-year effort).

- Model 1, 2, 3 and 4 biomass (Fig. 2.3) and recruitment (Fig. 2.2) trends are similar. These models differ primarily in M estimate (except that Model 4 has other structural differences). This implies that data are sufficient to estimate trends, but that scale is sensitive to value of M.
- Estimated biomass dictated by choice of M (scales biomass, compare Models 1, 2 and 3). The M value of 0.34 in Model 1 is based on a derivation from standard functional relationships for fish life history (Jensen 1996); Jensen's relationship compares favorably with data and parameter estimates in other studies (e.g., Beverton 1963). Given Jensen's relationship, the M of 0.34 follows from an age at 50% maturity of 4.9 years (Stark 2007). However, it is possible that age at maturity is 3.9 years if age readers are adding a year when reading otoliths. Age at maturity values corresponding to the M values in the four models are 4.45 years (M = 0.37), 7.5 (M = 0.22), 3.58 (M = 0.46), and 4.9 (M = 0.34). However otolith reading is carefully done and best estimate is 4.9 years; in the absence of contradictory information, should go with 4.9 years.
- Modeling approach for selectivity: Asymptotic selection stipulated for some fisheries; survey selectivity allows dome-shape (except in Model 4), as well as time-variance in ascending limb.
- Recommendation for future assessments: Use 3-parameter exponential logistic (Thompson 1994) to represent selectivity.
- Abundance indices received no likelihood weight (computed "analytically"), except for trawl survey which received a weight of "1'.
- Model 3 fits data the best, but model selection ranks M estimate (0.22) as "too low".
- Because the three parameters in the Schnute growth model used in SS2 are confounded in nature, it would be worth exploring a model with fixed L_{inf} at an externally estimated value and let the model estimate L1 and K because that selectivity has more impacts on the observed sizes of young fish than those of older fish, especially when an asymptotic selectivity curve is used. Model estimated growth curves should be lower than the observed for younger age. Figure 2 from the September assessment may be a concern.

The Team appreciated the history of assessment methodology changes provided in the assessment. The Team noted that the model may be more advanced than the data can fit. The Team noted that it is very difficult to track population changes by fishery, area, and size groups. But that the Team concluded that the real debate is in choosing the correct estimate of M, and not with the models, as unexplained mortality of cod is huge. The Team recommended reducing the number of parameters in the models.

ABC considerations

- Bottom trawl survey abundance dropped two years in a row; currently at historic minimum
- Three to five below average year classes estimated, depending on the model.
- All models show decreasing abundance.
- Consistency of model estimates of biomass and recruitment trends and continued decrease of trawl survey biomass estimate implies ABC should also decrease. Author recommendation to decrease ABC to 150,000 matches decrease in trawl survey biomass.
- Low stock abundance (29% of unfished female spawning biomass) at least for next two years; It's below B_{40} but above B_{20}
- Five years of weak year classes, assuming Model 1.
- 2006 has the second highest year class that may affect the ABC as soon as 2009; sign of good recruitment is usually verified in the future for cod, compared with pollock which often tends to disappear

The Team concurred that this stock qualifies for management under sub-tier "b" of Tier 3 because the projected biomass for 2008 (398,000 t) is below $B_{40\%}$. The Team recommended setting the 2008 ABC at the maximum permissible value.

The Pacific cod chapter included a discussion paper on "results from ecosystem models on the role of Pacific cod in the eastern Bering Sea and Aleutian Islands ecosystems" as well as an extended discussion section on "ecosystem considerations." While these discussions provide useful clarifying information about the ecological dynamics of Pacific cod and its fisheries with respect to the rest of the ecosystem, there was no special identification of ecosystem features that would require adjustments to the estimated ABCs or their attendant reference points.

Sarah Gaichas briefly summarized a slide from the ecosystems considerations section. According to information collected on summer trawl surveys, Pacific cod eat pollock (25% of diet) and assorted invertebrates, but generally do not eat arrowtooth flounder (there was a question whether cod ate arrowtooth in the EBS). This diet information is not informative to the Team's discussion of model preference, although accounting of mortality sources may be. In the ecosystem model, up to half of cod mortality is from unaccounted sources. Actual observed consumption of cod by predators is relatively low, which is typical of top predators. Sources of mortality are assumed to balance production in the ecosystem model; therefore, a large amount of "unaccounted mortality" may indicate several things. First, the mortality may be actual mortality coming from sources other than predation and fishing, so it is unaccounted in the ecosystem model. Second, the unaccounted mortality may not be mortality at all, but may represent one or more of the following processes. Cod could be leaving the ecosystem, so they are not dead but effectively unavailable. Alternatively, mortality may be less than production, which suggests that the stock is increasing (this does not appear to be the case for EBS cod). Finally, the estimate of production may be too high, inflating the "unaccounted" mortality. Because production is based on natural mortality estimates used in the cod stock assessment, and cod are not increasing, the high proportion of unaccounted mortality suggests that the value of M used in the stock assessment model is not too low. A higher value of M (such as that estimated in Model 4) would exacerbate the problem, leading to an even higher proportion of unaccounted mortality.

The Team encouraged the Council's consideration of apportioning the ABC by area because of recognized differences between the BS and AI ecosystems. From a modeling perspective, the Team can justify separate ecosystem management for Pacific cod. Some avenue of exploration from a biological perspective is also justified. The Council adopted the AI Fishery Ecosystem Plan as a planning document that identified cod as an important component of the AI ecosystem. The Team has provided apportionment percentages of 84% EBS and 16% AI for several years.
Public comments noted that age at maturity may be about a year younger than the current method used and that it is difficult for the public to be fully engaged when assessment information is provided late in the process.

Sablefish The joint team discussion on sablefish can be found in the joint team minutes.

Atka mackerel Sandra Lowe reported that were no changes in the current model. The Team accepted the author's recommendations.

Greenland turbot Jim Ianelli summarized the Greenland turbot assessment. He provided a simplified Tier 5 approach to contrast with the Stock Synthesis 2 model. The Team agreed that this stock qualified for management under Tier 3a. Although favorable recruitment appears to have occurred in recent years, the Team agreed with the author to recommend less than the maximum permissible ABC to reflect recent fishing mortalities, as has been done for a number of years.

The Team noted that the slope survey was canceled in 2006 due to lack of funding. The Team recommended that the AFSC conduct the EBS slope survey in 2008. Such information is necessary to determine whether abundance is sufficient for the Team to recommend an ABC set to the maximum permissible level in the future. The slope survey is recognized as the only one that covers the prime habitat for Greenland turbot.

Comments from the Center for Independent Experts review were noted for all flatfish assessments and several pertained to turbot. He intends to consider including information if available from Greenland turbot in the Russian zone. He will also participate in a workshop in February 2008 for a management strategy evaluation of Atlantic stock for the European Union; this stock is fished at ten times the US rate. A recent paper by Cooper (2007) published a lower M (0.112 instead of .18) for this stock. There is new information that they are longer lived. They are not found where the survey is and appear to disappear at larger size.

Yellowfin Sole Tom Wilderbuer presented all but one of the flatfish assessments. The Team concurred with the SSC's 2006 decision that yellowfin sole qualify for management under Tier 1. The Team noted that Tier 1 is about matching the stock/recruitment curve and determining where F_{MSY} is on that curve. The Team noted that there is one selectivity curve for all years, compared with pollock that has a selectivity curve for each year. Above average recruitment from the 1995 and 1999 year-classes is expected to maintain the abundance of yellowfin sole at a level above B_{40} in the near future.

Loh-lee Low observed that the Chinese market is transitioning from a consumer market to processing, also. Tom Wilderbuer noted that Amendment 80 will change how the fishery is prosecuted, in that the cooperatives will manage halibut bycatch which constrains harvest. Theresa Tsou noted that the model tends to predict more younger fish than is observed. This also occurs for northern rock sole in past years. A better fit occurs in recent years.

The catchability of yellow fin sole appears to be related to water temperature. This relationship was examined for arrowtooth flounder. However, at this time, the authors are uncertain as to how to interpret their findings. The Team suggested investigating the relationship between bottom temperature and q for all flatfish

Northern Rock Sole This stock is also now managed under tier 1. M and q were estimated within the model yielded M=0.15 and q=1.87. This was very different from the previous estimates of M=0.16 and q=1.52. While experiments indicate herding, this estimate of q means that 40% of fish are herded into the net. The authors do not think this is a realistic estimate of herding. It is most likely biased because of the skewed age composition from low recruits in 1990s. Therefore, the q estimated in past assessments was used (M=0.15, q=1.5). The rock sole stock is expected to remain stable through 2009. However, good recruitment in 2001 through 2004 should increase the stock biomass at the beginning of the next decade.

The SSC requested continued management strategy evaluation (MSE) for Tier 1 management. The authors intend to continue this exploration for climate and productivity changes and will examine a split-sex model for the fall 2008 assessment.

Arrowtooth flounder The stock assessment was expanded to include the 10 Aleutian Islands surveys and the survey size composition for arrowtooth flounder. The BSAI stock is therefore redefined with 73% of the stock on the Bering Sea shelf with the AI data added, compared with 87% when only the shelf and slope were considered. The AI component is 17% with the remaining 10% from the Bering Sea slope. While the ABC appears to have increased, it is an artifact of adding Aleutian Islands data. Structural problems with this model must be resolved before arrowtooth flounder can be changed to Tier 1 status. As there is little to no fishery for arrowtooth flounder the model is mostly driven by the survey data.

The long-term trend of increasing arrowtooth flounder biomass in the EBS is expected to continue as recruitment has also been increasing for the last 10 years. Arrowtooth flounder in the AI leveled off in 1990s, but has been steadily increasing since then. The ABC recommendation continues to include Kamchatka flounder. Though Kamchatka flounder can now be identified and separated from arrowtooth flounder on AFSC surveys, it is not distinguished in the fishery.

More female arrowtooth flounder are caught than males during the fisheries and the surveys. It is hypothesized that males are not missed by the survey, but that they experience higher mortality than the females and do not behave differently than females. Allowing the maximum selectivity for shelf males to be a bit lower than 1.0 leaves room for some males to migrate down slope or be missed in survey. The age data from the GOA indicates males reach17 yrs, whereas many females have been aged as high as 25 yrs. Therefore, natural mortality of male arrowtooth flounder must be increased, as opposed to decreasing gear selectivity at older ages in the male population.

Alaska plaice The female spawning biomass and total biomass trends were slowly decreasing from 1985 to 2005 but have since been increasing and is expected to continue. The shelf survey biomass has been fairly steady since the mid 1980s and the stock is very lightly exploited. Above-average recruitment year classes since 1998, with an exceptionally strong year class in 2003, will support the increasing trend in this stock. The authors extended the range of the length bins to mimic the dynamics of larger fish, at the request of the SSC. The authors will implement a split-sex model next year.

Other flatfish complex Since 2002, the SSC has classified "other flatfish" as a Tier 5 species complex. No progress was made on the assessment of bottom temperature effect on catchability of other flatfish species. There was discussion regarding separating Bering Flounder from flathead sole in the combined chapter and adding Bering Flounder to the Other Flatfish chapter since there are now able to be identified in both surveys and fisheries.

Flathead sole Buck Stockhausen presented the flathead sole stock assessment. This stock qualifies for management under Tier 3. More research is needed in the Chukchi and Beaufort Seas to better characterize the geographical distribution of the flathead sole and Bering flounder stocks. In response to SSC and Plan Team comments, the author examined the distribution of Bering flounder with respect to the fishery. The northerly distribution of the species did not seem to overlap the spatial distribution of the fishery, although mismatch in seasonal timing of the survey versus the fishery means that this is not conclusive. The Team recommended placing Bering flounder in the "other flatfish" category in future assessments, but that the flathead model may always carry some Bering flounder with it into the future (due to species misidentification early in the catch and survey time series). The Team was concerned that Bering flounder maybe harvested at too high a rate. NMFS catch accounting started a species code in 2007. Historical catches could be identified for this species.

A public comment was posed regarding the control rule for this stock and the author's recommendation that ABC be set at the maximum allowable ABC for a Tier 3a stock, given the recent declining trend in stock abundance and moderate recruitment levels,. Current biomass is high relative to the mean but has dropped from the 1990s. High recruitment occurred in the 1970s and 1980s, then decreased in the 1990s and currently remains around the mean. The control rule puts this stock at twice the value of B_{MSY} and B_{40}, and it is lightly exploited. The author responded that since stock biomass is high and the TAC is typically set much lower than the ABC, there is less concern that recommending the maxABC for 2008-9 will lead to overfishing or an overfished condition in the near term. Declining recruitment will be more of a concern in the future.

Rockfishes Paul Spencer reported on the off-year assessments for the rockfish assemblages. There were no changes to the models this year and he summarized plans for 2008, in response to SSC comments and the 2006 CIE review.

Other Species Olav Ormseth presented the squid assessment. The Team discussed whether this group may more appropriately reside in the forage fish category. He reviewed squid life history and indicated that the predominant species in this group (*Berryteuthis magister*) may experience multiple cohorts within a single year. The assessment includes more complete ecological, biological, and survey data (although survey biomass estimates are unreliable). The Tier 6 specifications did not change from last year.

Olav Ormseth presented the 2007 skate assessment that estimated the Alaska skate component of the assemblage within Tier 3 and applied Tier 5 to the remaining species. The authors recommended that if Tier 3 is not applied to Alaska skates this year, that a value of M= 0.1 should be used in the Tier 5 calculations, as it has been in past years. The Team encouraged the authors to address a discrepancy between increasing survey biomass estimate in recent years relative to the model projections of declining biomass, and discussed the idea that this discrepancy may be due to temporal changes in length composition. Since 2000, there has been a decrease in the proportion of skates in the smallest length bins. This may reflect poor recruitment in recent years which results in model estimation of declining biomass.

Jon Heifetz summarized the shark assessment. The rationale for the Team's recommendations for applying tier 5 in 2006 was that the calculation of biomass was a minimal estimate and would be better than applying tier 6 based on catch history. The assessment could be viewed more as a repository of information, rather than an assessment. The assessment included a modified tier 6 and tier 5 calculations but the latter relies on an unreliable estimate of M. The Plan Team concurred with the SSC's conclusion in 2006 that survey information was not reliable enough to promote the Tier 5 assessment. However, applying the modified Tier 6 would not be constraining on directed fisheries if this group were managed separately from the assemblage under a proposed plan amendment. This could result in a conservation issue since very limited information is available for management.

Rebecca Reuter summarized the sculpin assessment. She reported significant strides for age/growth information from North Pacific Research Board funds (for estimating M for four species) and species identification in that 2008 will be the first year that observers will be asked to identify sculpins to species. In contrast to the Tier 5 assessment in 2006, where a single M (0.19) and two biomass estimates (one for the EBS and one for the AI) were used, the 2007 assessment applies distinct M estimates from the literature and species or species group biomass estimates for the five most predominate sculpin species/species groups. The Team noted that lower estimates of M are not reasonable to assume and it was faced with two bad choices: last year's approach or justifying using new estimates of M.

The assessment authors noted that species composition differs among the BS shelf, BS slope, and the AI. The Team noted that the flatfish fisheries are the principal known remover of sculpins. Approximately 51% of sculpin catch in the flatfish bottom trawl fisheries is from the yellowfin sole fishery; 24% from the flathead sole fishery, and 24% in the rock sole fishery.

Liz Conners presented the octopus assessment. The team concurred with the author's conclusions that 1) the octopus biomass and mortality estimates are not reliable and therefore do not support a Tier 5 assessment and 2) the Tier 6 estimate based on average catch likely underestimates the population and would unnecessarily constrain fisheries, primarily the pot fishery for Pacific cod, if octopus were managed separately from the 'other species' category. The author recommended a revised Tier 6 based on recent maximum catch. Ongoing research includes species identification discard mortality estimates. The Plan Team recommended Tier 6. The Team noted that octopus biomass estimates from food web models are orders of magnitude bigger than survey biomass estimates. Therefore Tier 6 management would be

unnecessarily constraining, particularly to the Pacific cod pot fishery, if managed separately. Three years of special project data could generate pot cod survival rates (believed to be high).

The Team noted that results from a cooperative research project collected from the plants showed that larger octopus are Giant Pacific octopus *Enteroctopus dolphinei*. It may be possible in the future to separate adults of this species from smaller species based on size.

Ecosystem Issues The BSAI plan team discussed the development of a set of indicators to summarize the trend in the 'state' of the ecosystem. Time series of indices such as average trophic level of the catch, fish community diversity as evidenced in bottom trawl surveys, estimates of annual surplus production, production at upper trophic levels, and other summary indicators could be considered so that a 'movie' of ecosystem status could be produced. The ecosystems considerations authors stated that this year they have begun to develop such a set as part of moving the Ecosystem Assessment into part of an Integrated Ecosystem Assessment (IEA), but that finalizing the set of indicators would be an iterative process including input from the Council and multiple users. This was discussed with reference to a suggestion by the SSC and Council in August 2007 that the carrying capacity for Steller sea lions may now (since the early 1990s) be lower than it was in the past (1960s and 1970s), while at the same time, carrying capacity for their prey may have increased or remained stable (as evidenced by surveys, stock assessments, and fishery catches). NMFS-Protected Resources will evaluate all factors that affect the recovery of Steller sea lions, including if and why carrying capacity has changed, as it finishes the Steller sea lion recovery plan and the status quo biological opinion on the effects of the BSAI-GOA groundfish fisheries. A set of ecosystem indicators that may reflect a time series of carrying capacity for upper trophic levels would assist NMFS-Protected Resources in this process.

Adjourn The team completed its assessment reviews at 10 am on Friday; the teams worked on summaries for the introduction. The teams adjourned at approximately 4:00 pm.