Scallop Plan Team Report
February 23, 2015
Federal Building
Anchorage, Alaska

The Scallop Plan Team held their annual meeting in Anchorage on February 23, 2015. Diana Stram chaired the meeting.

Plan Team members present: Diana Stram (NPFMC), Ryan Burt (ADF&G Kodiak), Scott Miller (NMFS Juneau), Peggy Murphy (NMFS Juneau), Jie Zheng (ADF&G Headquarters), Quinn Smith (ADF&G Douglas), and Jim Armstrong (NPFMC staff).

Public and agency personnel present (for some or all of meeting): Karla Bush (ADF&G Headquarters), Jan Rumble (ADF&G Homer) via phone, Chris Siddon (ADF&G Headquarters), Mark Stichert (ADF&G Kodiak), Jim Stone (Alaska Scallop Cooperative), Tom Minio (F/V Provider), and Bobbie Minio (F/V Provider)

Administrative Issues:

Agenda*:* The agenda for the meeting is attached.

Status of Statewide Scallop Stocks

Southeast Region

Southeast Region Fishery Management Biologist and Scallop Plan Team member Quinn Smith presented an update on the Southeast Region weathervane scallop fishery. Southeast Region scallop stocks occur in management Area D (Yakutat and District 16). There is no scallop fishery in Area A (Southeast). Six scallop beds have been identified along the 300 miles of coast stretching from District 16 to Kayak Island. The most southerly bed is divided by the line separating District 16 and Yakutat. A separate guideline harvest level (GHL) is set for the District 16 portion of the bed and remainder of the bed is managed as part of the Yakutat GHL. Industry is considering submitting a proposal to the Alaska Board of Fisheries to combine the GHL for District 16 with the GHL for Yakutat and manage Area D as one stock.

Weathervane scallops in the Southeast Region are not assessed. Management of scallops in Area D relies on fishery dependent data and information collected by scallop observers. The GHL is adjusted based on changes in catch per unit effort (CPUE) by bed, the size and age of the scallop catch, and changes in spatial distribution of effort over time. In addition, in 2013/14, managers began evaluating fishery performance in-season using a minimum performance standard (MPS) to determine possible time and area of a fishery closure. The MPS in Area D is defined as the lowest, cumulative CPUE observed annually since biannual seasons were changed to a single season in 1997. The MPS is evaluated at the point in the fishing season when 50% of the GHL has been harvested. At that point, if cumulative CPUE falls below the MPS, then managers may take action to close the fishery. To date, the cumulative CPUEs of scallops in the Area D fisheries have not fallen below the MPS.

The District 16 GHL has remained at 25,000 pounds of meats since 2009/10. Overall the trend in scallop CPUE has declined since 2004/2005. Scallop harvests from District 16 are unpredictable from year to year. CPUE, meat yield, and meat quality are highly variable. For example, during the 2014/15 season, CPUE declined significantly from the previous two seasons' CPUE. The size of scallops also declined, but meat quality was good and prices were up, so the fishery put in the additional effort needed to harvest about half the GHL.

The Yakutat GHL has remained at 120,000 pounds of meats since 2012/13 and harvests have been comparable. Over the past four fishing seasons there has been an increasing trend in CPUE, though harvests are lower than in the 1990s. Estimated shell height distributions from Yakutat show an increased range of sizes in 2013/14 and 2014/15.

Tanner crab bycatch increased in Area D between 2013/14 and 2014/15. Estimated crab bycatch increased 24% in District 16 and 63% in Yakutat. About 90% of the Tanner crab measured by observers ranged from 20 mm to 50 mm carapace width. No crab bycatch cap has been established in Area D.

Central Region

The Central Region scallop Fishery Management Biologist retired in 2014. The position has been filled, and the new staff person is expected in Homer this spring. This staffing limitation precluded a formal report to the Scallop Plan Team on the status of Central Region scallops stocks and fisheries. The Scallop Plan Team has compiled the following summary from 2014 Alaska Department of Fish and Game (ADF&G) news releases and the 2015 Stock Assessment and Fishery Evaluation report.

Central Region scallop stocks occur in Prince William Sound and Cook Inlet management areas. The commercial fisheries for weathervane scallops in these areas were closed during the 2014/15 fishing season. In Prince William Sound, scallop beds occur near Kayak Island and are identified as the West Kayak Subsection (WKS) and East Kayak Subsection (EKS). The WKS has been closed to commercial fishing for weathervane scallops since 2010/11, and the EKS has been closed since 2012/13. In Cook Inlet, two scallop beds are located in Kamishak Bay, the north and south beds. The commercial fishery for weathervane scallops has been closed in the north bed since 2013/14, and the south bed has been closed since 2009/10.

Prince William Sound and Cook Inlet scallop beds are assessed in alternating years. Recent surveys have documented a declining trend in weathervane scallop abundance and biomass in both of these areas. The most recent assessment near Kayak Island in Prince William Sound was completed in 2014. Following the assessment, an ADF&G news release dated June 13, 2014, estimated the scallop biomass at 1.3 million and 1.1 million pounds whole weight in the WKS and the EKS, respectively. The biomass in the WKS increased 83% in 2014 from a record low in 2012. The biomass in the EKS in 2014 was the lowest in the history of the assessment. Age structure data from the assessment indicate that 60% of the scallops in the WKS and 37% of the scallops in the EKS are age 7 or less. While this suggests the potential for future recruitment to the fishery, there are currently low numbers of large, older individuals, which are targeted by the commercial fishery. Managers closed the WKS and EKS through the 2015/16 fishing season to allow the current biomass to reproduce and generate potential future recruitment and enable younger scallops to grow and recruit to the fishery.

Westward Region

Westward Region Fishery Management Biologist Mark Stichert presented an update on the Westward Region weathervane scallop fishery. Westward Region includes four registration areas: Kodiak, Alaska Peninsula (Sand Point), Bering Sea, and Dutch Harbor. The Kodiak registration area includes the Northeast District, Shelikof District, Southwest District, and Semidi Islands District. Weathervane scallops in the Westward Region are not assessed. Managers use fishery dependent data, MPSs, and information from the scallop observer program to establish GHLs and manage harvests in-season. Crab bycatch in Westward Region scallop fisheries (except Kodiak Semidi Islands District) is limited by crab bycatch caps. In 2013/14, crab bycatch did not exceed the bycatch cap in any registration area or district.

In 2013/14, managers established a district wide GHL for the Kodiak Northeast District and discontinued use of bed and statistical area GHLs. However, if in-season observer data indicate poor scallop CPUE or localized depletion, then managers may use MPSs to close individual areas before the total district GHL is harvested. The Westward Region began setting MPSs in the Northeast District in 2003/2004.

The Kodiak Northeast District GHL of 55,000 pounds of meats was reached in 2014/15. The CPUE has increased since 2012/13. The distributions of scallop shell heights from observer data have been relatively stable since 2010/11 and show little sign of recruitment. This is consistent with the 2013/14 age composition data, which show age-11 and age-12 scallops were the most represented age classes and represent the oldest scallops to dominate a season's harvest since 2003/04.

The GHL for the Kodiak Shelikof District has been lowered twice since 2010/11 and was set at 105,000 pounds of meats in 2012/13. While harvests in the past two years have reached the GHL, the preliminary estimate of harvest for 2014/15 is 65,779 pounds. The CPUE continues to decline and is the lowest since 1993/94. The shell height and age composition data for Shelikof District indicate that several large recruitment events have progressed through the population and dominate the age classes harvested in the fishery.

The Kodiak Southwest District opened in 2009/10 with a GHL of 25,000 pounds of meats. The fishery is allowed by ADF&G Commissioner's permit and managers are debating whether to continue exploratory fishing or implement management regulations. The GHL was reached in three out of the last four years. The area is very exposed and dominated by large, old scallops. Fishing has allowed better delineation of the bed and crab bycatch has declined.

There was no exploratory effort to harvest weathervane scallops in the Kodiak Semidi Islands District in 2014/15.

The Alaska Peninsula Registration Area supported a weathervane scallop fishery in the mid- to late-1990s near the Shumagin Islands between 160° and 161° west longitude. In 2012/13, the Alaska Board of Fisheries authorized exploratory fishing under the authority of an ADF&G Commissioner's permit to harvest a GHL of 15,000 in Unimak Bight. The GHL was achieved in 2012/13 and 2013/14. Shell height and age distribution data for those two years indicate the population has a broad range of age classes most represented by ages 7 to 10. In 2014/15, the area between 160° and 161° west longitude was open with a GHL of 75,000 pounds of meats. Effort in the area was deterred because of the presence of Pacific cod pot gear.

The Bering Sea Registration Area GHL has remained at 50,000 pounds of meats since 2005/06, and harvests have reached that level in most years. During this time CPUE has shown a slight increase. The distribution of shell height data indicates large scallops are harvested and there has been no recruitment.

The Dutch Harbor Registration Area reopened to fishing in 2008/09 with a GHL of 10,000 pounds of meats, which was split between the Bering Sea and Pacific Ocean. Due to poor fishery performance on the Pacific side, the GHL was reduced to 5,000 pounds in the Bering Sea from 2012/13 through 2014/15. The 5,000 pound GHL in the Bering Sea has been reached each year with the harvest coming from one bed outside Inanudak Bay. While CPUE in the fishery has increased, the shell height distribution has narrowed and indicates scallop size retained in the fishery is increasing. Managers are considering increasing the GHL.

Kamishak Bay Age Structured Model Review:

The team had hoped to receive an updated presentation of the more advanced Kamishak model and the start on a Kayak Island area model at the 2015 team meeting. However, modeling development has not sufficiently advanced to allow presentation at present. Thus, the team has carried forward in our minutes the 2014 review of the model and the team's recommendation on model development for further consideration by the authors.

Last year at the 2014 Scallop Plan Team meeting, the team received a presentation from XinXian Zhang, of ADF&G, on progress in developing a Kamishak Bay age structured stock assessment model. Initial work on this model was by William Bechtol in 2000.

The model estimates catch by age and year as a function of survival of cohort less fishing mortality. The model also uses fishery age composition data and survey data to estimate abundance at age by measuring selectivity as ratio of fish of age "i" caught to sum of fish caught across ages in that year. The model assumes fishery selectivity is a logistic function as a function of age with two parameters, alpha and beta. The model has predicted survey age composition and fishery age composition and these are compared using minimization of the total sum of squares. The model estimates abundance at age over years 1985 to 2012. Preliminary results show that overall abundance has declined consistently during this timeframe. Abundance at age 1 declined through 2009, then increased considerably and may be signaling the beginning of a stock recovery.

The SPT raised several questions regarding the data and estimation techniques. The team specifically asked how the model biomass estimate compares with managers' estimates for the Kamishak beds. The author and Central Region staff indicated that they have not yet made that comparison, as this is the first run of the model and the first time it has been presented. New research on discard mortality may be added to the model: a more advanced Kamishak model and a start on a Kayak Island model are planned for next year.

Central Region managers pointed out that the model does look like it is performing relatively well to what is going on in the Kamishak beds with the major mortality event in 2002 followed by drastic reduction in biomass estimates, and with continued decline to the present. The model applies to the North bed only. One goal is to take peaks and valleys out of the model estimates so that they can better estimate appropriate harvest rates and levels to close the fishery.

SPT Suggestions and Comments:

- Run this for just exploitable age groups to better estimate biomass of exploitable stock.
- Age 1 increase is highly uncertain. We will need a few more years to see if that continues.
- At present natural mortality is a constant (15%) across all years. The author should consider a range of natural mortality levels and conduct a sensitivity analysis on how this affects the model estimates. Similarly, how does gear efficiency estimate affect model results?
- The author should do diagnostics of different data and age proportions of catch and survey data.
- Survey biomass should be considered in the model. Presently the model biomass is based on catch.
- The present abundance estimate is uncertain: it may be too big or too low. Thus, the model should focus on exploitable biomass.
- A sensitivity analysis of the survey data would help show how that uncertainty may impact the model estimates.
- The model would benefit by including growth equations and from conducting Monte Carlo simulations of mortality and growth estimates to create confidence intervals for those estimates.
- The author should present this model to the Council's Scientific and Statistical Committee for their review and comment.

Although the age structured model was not presented, the team did receive a presentation from team member Jie Zheng of ADF&G. Jie presented preliminary findings of a sensitivity analysis of survey and harvest data conducted to determine statistical uncertainty in the data as well as the prevalence, or lack thereof, of normality of height distributions by age for developing a potential combined age/height structure stock assessment model. This analysis has compared the annual Kamishak scallop age and shell height data distributions from survey data, commercial harvest data, and also a composite of the two. The comparison of annual survey data shows a pattern of gradual growth from age 4 through age 7 follows a generally normal distribution. However, by age 8 normality of height distribution begins to break down.

The analysis also considered a longer timeframe from 1985 to present. Over the long term the results are mixed: some years show normality and others don't. This analysis in the commercial data is complicated by several years of closure when no data are available. In the composite data, the commercial closures have created similar issues and a direct comparison of the commercial and survey data shows a pattern of the survey catching smaller animals than caught in the commercial harvest. In many years the survey catches older age 12 through age 15 scallops; however, the commercial shows very few animals that are that old. Also evident is considerable inter-annual variability with some years (e.g. 1998-99) having similar catch at age for both survey and commercial data, while other years (e.g. 1993-94, 1996-97) the catch at age is dissimilar. Over the long time series, there is considerable normality in catch at age patterns; however, the relationship is not consistent across all years.
This analysis also compared patterns of height by year. The comparison shows that there are some similarities but in many years survey height data and commercial height data are dissimilar data sets. However, a plot of high height subsample from survey data with a high height subsample from commercial fishery data provides a good relation and may be useful in model development.
A growth plot of age and height to identify growth trends over time also provides a good relation and may be useful to model growth over time. Commercial data height frequency shows increasing size

distribution from 1996 forward in height frequency by age by year. It appears that growth is faster in younger age scallops and slows as they age with normality in the distribution. However, the normality distribution of height frequency is not present in older scallop height by age data. This also shows weakness in the distributional structure of the commercial harvest data; however, by combining both survey and commercial data we see potential for a good growth model of height by age.
Some preliminary work has also been done on Kodiak area data: specifically a Shelikof growth plots were compared with Kamishak plots. These comparisons show that there is a lot more variability in age structure in the Shelikof data: at age 3 the cycle shifts from small to large in 1997 then down for several years before coming back up. Industry representatives suggested that this may be due to fishing deeper in some years where scallops grow slower. The team also discussed the possibility that avoiding crab bycatch may also drive relocation of effort in such a way that growth data may be changing due to fleet behavior and not just environmental conditions. In addition, economics may play a role: industry representatives indicate that prices for smaller scallops have risen in recent years and that higher profitability in smaller scallops over time may change location choice as well. All of these issues may need to be parameterized into an age structured/height structured model approach.

The team had a discussion regarding the apparent decline in scallop size at age over time. Age 4 scallops show a similar pattern and by age 6 the data quality improved and showed a temporal trend of declining size until age 10 when the trend tends to flatten. By age 11 the data is limited; however, scallops are still declining in size in most recent years. Age 11, 12, and 13 scallops continue that trend but on much less data. Further, scallops in some regions, such as Yakutat, appear to be smaller at age across all ages in recent years.

The team also had a discussion of the shell height subsampling approach and selectivity issues. Ideally, a random sample would be used; however, some sample selection error may occur when the observer chooses which shells to measure. There is a wide height distribution in the Kodiak/Shelikof height data that might be due to sample selectivity issues. ADF&G is planning to conduct a retroactive variance analysis to see what the error might be and to review their sampling protocol.

Update on Socio-Econ Report (Glass, et al. 2015)

Plan Team member Scott Miller provided an overview of the paper. Scott began by describing Jessica's project. Gordon Kruse (Jessica's graduate advisor) approached Scott about collaborating on conducting a socioeconomic analysis focusing on the weathervane scallop fishery. Scott did some research of available information with the goal of determining how best to obtain more/updated information - they decided on using the framework of an SWOT (strengths, weaknesses, opportunities, threats) analysis, a strategy commonly used to analyze the internal (strengths, weaknesses) and external (opportunities, threats) components of an industry. This analysis involves interviewing members of different user groups which, in the case of the weathervane scallop fishery includes fishermen, fishery managers and biologists.

Scott then described a summary of some of the aspects and results of the paper:

- The sunset of the State of Alaska vessel based limited entry program in 2013 helped motivate this study because new vessels could now enter the fishery within state waters.
- Semi-structured interviews were conducted with 27 participants who were identified as having detailed knowledge of the fishery through professional involvement.
- Scott went over the results of these interviews by describing Figure 3 of paper (page 157) and touching on the following subjects related to the fishery: Public perceptions of the fishery,

Marketing, Fishery efficiency, Fishery expansion, Marketing cooperative members versus non-members, Expiration of the LEP program, Environmental impacts and Research needs and data gaps.

Paper Citation

Glass, J.R., Kruse, G., Miller, S. 2015. Socioeconomic considerations of the commercial weathervane scallop fishery off Alaska using SWOT analysis. Ocean & Coastal Management. Volume 105, Pages 154–165.

Abstract

We conducted a socioeconomic assessment of the commercial weathervane scallop (*Patinopecten caurinus*) fishery off Alaska. The research was structured within the framework of an SWOT (strengths, weaknesses, opportunities, threats) analysis, a strategy commonly used to analyze the internal (strengths, weaknesses) and external (opportunities, threats) components of an industry. Specifically, we focused on five categories: social, technological, economic, environmental, and regulatory. Semistructured interviews were conducted with 27 participants who had detailed knowledge of the fishery, including industry members, fishery managers, biologists, and members of coastal communities who interact with the fishery. We addressed topics such as attitudes of the Alaskan public towards scallop dredging, impacts of the scallop industry on Alaskan coastal communities, market influences of U.S. east coast and imported scallops, changes in the management of the fishery, and a number of environmental considerations. Several unifying opinions emerged from this study, including a lack of awareness of the fishery in many Alaskan communities and fears about rising fuel costs and diminishing harvest levels. Whereas the data-poor status of the stock appears to be the fishery's biggest weakness, the greatest strengths come in the form of conservative management, industry self-regulation, and the small footprint of the fishery. Impending threats include stock decline, unknown long-term detrimental effects of dredging, and changes in the management and structure of the fishery with the sunset of the State of Alaska's limited entry permit program. Most participants consider the fishery to be managed sustainably, although lack of data on scallop recruitment and abundance is a large concern. This analysis provides relevant information to both fishery managers and scallop industry members to contribute to the environmental, economic, and social sustainability of the scallop fishery.

Plan Team related Personnel Changes and Alaska CamSled.

ADF&G Chief Scientist Chris Siddon reported on a number of personnel changes from 2014 that affected the Plan Team. There have been three retirements in the plan team and ADF&G Scallop Program. Rich Gustafson Central Region ADF&G Biologist and Plan Team member; Gregg Rosenkrantz ADF&G scallop biometrician and Plan Team Co-Chair; and Marsha Spafard ADF&G scallop program technician. Of these only Rich Gustafson's replacement has been hired, it is planned that the person filling the position will also fill the vacant position on the Plan Team. The biometrician position was advertised, but the vacancy was cancelled and the position will not be rehired due to ADF&G budget cuts. The biometric duties will be absorbed by other biometricians in ADF&G. Current plans call for reclassifying the scallop program technician position to a fishery biologist position and rehiring, however it is unknown if this position will be refilled in the near future due to budget cuts. Chris noted that although final budgets for fiscal year 2016 will not be known until later this spring it is likely that many ADF&G programs statewide may be restaffed and funds reallocated so that the highest priority projects will be accomplished, it is not known where scallop assessment and management fall in these priorities.

Plan Team member Quinn Smith, among others, will be working with the Alaska CamSled this spring in an effort to establish its utility in scallop assessment in the future. Students in Dr. Brad Harris's lab at Alaska Pacific University continue to process images captured in Alaska CamSled surveys. It is not known whether there will be funding to continue this program in the future.

State Open Access Fishery

NMFS economist and Plan Team member Scott Miller addressed the open access program for state waters which was in place in 2014. The state plan is described in the last two paragraphs of Section 1.3 of the SAFE. A total of eight vessels obtained open access permits in 2014, however, none of these vessels fished for scallops. Two reasons were offered as to why the vessels did not fish: 1) they were not able to cover the cost of carrying observers, and 2) the vessels were not ready logistically, i.e., were not in possession of all the gear needed to participate. It was pointed out that while this program is independent of the Federal FMP, the potential for additional harvest by new participants could affect the fishery managed under the federal FMP.

Data-poor workshop planning

Diana Stram updated the team about the data poor workshop planning. The workshop will include all North Pacific stocks, rather than just scallop stocks. The focus is for the data poor problems in the North Pacific. The workshop hopes to benefit from the upcoming Lowell Wakefield Symposium which will consider a wide range of approaches for assessing and managing data-limited fisheries worldwide. The timing of the workshop is still pending, and it will likely occur during the winter of 2005/2006. The team discussed the potential travel budget constraint for the ADF&G staff due to the coming budget cuts and suggested that the workshop could be paired with another meeting like the annual interagency crab meeting to maximize the participation of ADF&G staff.

During the data poor workshop, there may be opportunities for additional analyses on scallop MSY.

Response to SSC Comments

The Team notes that in the most recent suite of SSC comments, items 1, 2, and 5 relate directly to alternative approaches for data-poor stocks. The team suggests that these items could be addressed as part of the upcoming Data Poor Workshop (see above). Item 3 which relates to the age-structured model will be addressed when progress is made (see summary above). Under Item 4, the Team attempted to improve the SAFE in this year's version and hopes that it is less confusing.

Research Priorities

The team went through each priority in 2014 and discussed them. Due to completion of the research project, the team suggested to delete research priority # 154 (multiple-variable bycatch analysis) from the list. The team's suggested changes to the research priorities are indicated in the table at the end of this document.

Due to priority category issues, the scallop research priorities the team developed in 2014 were not included in the Council update in 2014. Instead, the Council used the scallop research priorities the team

created in 2013. Jim Armstrong mentioned the ongoing modification of research priority definitions and suggested the Team use the old categories until the new classification is clear. When the new category approach is finalized, the team expects to have a teleconference to determine the order of the priorities.

New business

BOF issues
There were no BOF issues for discussion in this cycle.

SPT meeting for 2016
The SPT identified the week of February 23rd for their 2016 meeting. The meeting will be held in Kodiak.

New Chair / Vice-Chair
With modification of Council staff assignments, Diana Stram is no longer on the Scallop Plan Team. Her role as Team Chair is filled by Quinn Smith and her role as plan coordinator is filled by Jim Armstrong, who will also serve as Vice-Chair.

The meeting adjourned at 3:15pm on February 23rd.

Scallop Plan Team meeting
February 23, 2015
Anchorage, AK

Monday February 23: 9:00am – 5:00pm

9:00 am

- Introductions and approval of agenda, schedule for SAFE compilation / minutes assignments (Stram/Armstrong)

- Status of Statewide Scallop Stocks and SAFE report-Catch specifications by area
    - Central Region
    - Westward Region (Stichert)
    - Southeast (Smith)

- Central region age-structured model review (Zhang)
- Update on benthic community analysis and socioeconomic analysis

12:00-1:00pm Lunch

1:00 pm

- Update on Camsled research and ADF&G personnel changes (Siddon)

- Discussion on participation by new open access registrants (Miller)

- Review/respond to SSC comments

- Research Needs
    - Review / revise stock structure template; discussion of PSPA analyses
    - Data poor workshop discussion
    - Potential for additional analyses on MSY
    - Research priorities: review and revise

New business

SPT meeting for 2016
Election of new Chair

Adjourn

Research Priorities

141	**Estimate scallop stock abundance**
	Status: No Action
	Estimate scallop stock abundance in un-surveyed areas using fishery independent methods including computerized image analysis of current camera sled data.
151	**Acquire basic life history information (e.g., natural mortality, growth, size at maturity) for data-poor stocks.**
	Status: Partially Underway
	Acquire basic life history information needed for stock assessment, PSC, and bycatch management of data-poor stocks, such as scallops, sharks, skates, sculpins, octopus, grenadiers, squid, and blue king crab (Bering Sea), golden king crabs (Aleutian Islands), and red king crab (Norton Sound). Specifically, information is needed on natural mortality, growth, size at maturity, and other basic indicators of stock production/productivity). Source/sink dynamics for scallop stocks is critical to understanding stock structure [note highest overall priority for assessment]
163	**Expanded studies to identify stock and management boundaries**
	Status: Underway
	To identify stock boundaries, expanded studies are needed in the areas of genetics, mark-recapture, reproductive biology, larval distribution, and advection. Such boundaries are to be evaluated so that consequences of management and risks are clear. Verify stock structure and source/sink dynamics including physical oceanographic, genetic and life-history studies.[Note refer to 151 as well]
166	**Develop age-structured models for scallop assessment**
	Status: Partially Underway
	Age structured models for scallop are needed to increase understanding of population dynamics and harvestable surpluses.
154	**Conduct multivariate analysis of bycatch data from the scallop observer program**
	Status: Completed
	Conduct multivariate analysis of bycatch data from the scallop observer program (haul composition data) and camera sled data.
316	**Ocean Acidification and Scallops: monitoring water quality**
	Status: No Action
	Seasonal water quality monitoring in known scallop areas
317	**Effects of Ocean Acidification on Scallops**
	Status: No Action
	Studies to understand the mineralization of scallop shells through life cycle and across spatial variability
106	**Improve discard mortality rate estimates for scallop**
	Status: Partially Underway
	Field studies estimating Alaskan scallop discard mortality: relationship between capture, release condition and survival of scallops

112	**Analyses of fishery effort and observer data for scallop**
	Status: No Action
	Assess impacts of temporal and spatial effort by a limited number of vessels on CPUE and observer data for management purposes
160	**Develop and evaluate global climate change models (GCM) or downscaled climate variability scenarios on recruitment, growth, spatial distribution**
	Status: Underway
	Quantify the effects of historical climate variability and climate change on recruitment, growth, and spatial distribution, develop standard environmental scenarios (e.g., from GCMs) for present and future variability based on observed patterns.
161	**Climate and oceanographic information covering a wider range of seasons is needed**
	Status: Partially Underway
	There is also a need for climate and oceanographic information that covers a wider range of seasons than is presently available.
315	**Area-specific variability in scallop population processes**
	Status: No Action
	Investigate area-specific variability in vital population processes including growth, recruitment, natural mortality and movement, including mark-recapture tagging studies.
New	**Evaluate causes of variable meat size, undersize meats in scallops**
	Status: Pending
	Exploratory tows in the Bering Sea (District Q) and some areas open to harvest around Yakutat (District D) have shown scallops with disproportionately small meats relative to shell height. The cause of this condition as well as potential for recovery is unknown to industry.