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**Canadian Science Advisory Secretariat**

**Proceedings Series 2009/017**

**S C C S**

**Secrétariat canadien de consultation scientifique**

**Compte rendu 2009/017**

**Proceedings of the Maritimes Region  
Science Advisory Process on  
the Assessment of Pollock  
in Divs. 4VWX and 5Zc**

**19 January 2009**

**Bedford Institute of Oceanography  
Dartmouth, Nova Scotia**

**Mark Showell  
Meeting Chair**

Bedford Institute of Oceanography  
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**April 2010**

**Compte rendu de la réunion du Processus  
consultatif scientifique de la Région des  
Maritimes portant sur l'évaluation de la  
goberge des divisions 4VWX et 5Zc**

**19 janvier 2009**

**Institut océanographique de Bedford  
Dartmouth (Nouvelle-Écosse)**

**Mark Showell  
Président de la réunion**

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1 Challenger Drive, C. P. 1006  
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B2Y 4A2

**Avril 2010**

## **Foreword**

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings include research recommendations, uncertainties, and the rationale for decisions made by the meeting. Proceedings also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

## **Avant-propos**

Le présent compte rendu a pour but de documenter les principales activités et discussions qui ont eu lieu au cours de la réunion. Il contient des recommandations sur les recherches à effectuer, traite des incertitudes et expose les motifs ayant mené à la prise de décisions pendant la réunion. En outre, il fait état de données, d'analyses ou d'interprétations passées en revue et rejetées pour des raisons scientifiques, en donnant la raison du rejet. Bien que les interprétations et les opinions contenus dans le présent rapport puissent être inexacts ou propres à induire en erreur, ils sont quand même reproduits aussi fidèlement que possible afin de refléter les échanges tenus au cours de la réunion. Ainsi, aucune partie de ce rapport ne doit être considéré en tant que reflet des conclusions de la réunion, à moins d'indication précise en ce sens. De plus, un examen ultérieur de la question pourrait entraîner des changements aux conclusions, notamment si l'information supplémentaire pertinente, non disponible au moment de la réunion, est fournie par la suite. Finalement, dans les rares cas où des opinions divergentes sont exprimées officiellement, celles-ci sont également consignées dans les annexes du compte rendu.

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ISSN 1701-1272 (Printed / Imprimé)

Published and available free from:  
Une publication gratuite de :

Fisheries and Oceans Canada / Pêches et Océans Canada  
Canadian Science Advisory Secretariat / Secrétariat canadien de consultation scientifique  
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Ottawa, Ontario  
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Printed on recycled paper.  
Imprimé sur papier recyclé.

Correct citation for this publication:  
On doit citer cette publication comme suit :

DFO. 2010. Proceedings of the Maritimes Region Science Advisory Process on the Assessment of Pollock in Divs. 4VWX and 5Zc; 19 January 2009. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2009/017.

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## SUMMARY

A Maritimes Region Science Advisory Process (SAP) was held 19 January 2009 at the Bedford Institute of Oceanography, Dartmouth, Nova Scotia, to assess the status of pollock (*Pollachius virens*) in NAFO Divisions 4VWX+5Zc. Participation in this meeting included Fisheries and Oceans Canada (DFO), non-DFO scientists, Nova Scotia Department of Fisheries and Aquaculture, New Brunswick Department of Fisheries, fisheries representatives, and non-governmental organizations. The results of this meeting are expected to inform decisions related to the management of the pollock resource.

## SOMMAIRE

Une réunion ayant pour but d'évaluer l'état du stock de goberge (*Pollachius virens*) des divisions 4VWX + 5Zc de l'OPANO s'est tenue le 19 janvier 2009, à l'Institut océanographique de Bedford, dans le cadre du Processus consultatif scientifique de la Région des Maritimes. Y participaient des fonctionnaires de Pêches et Océans Canada (le MPO), des scientifiques de l'extérieur du MPO ainsi que des représentants du ministère des Pêches et de l'Aquaculture de la Nouvelle Écosse, du ministère des Pêches du Nouveau Brunswick et d'organisations non gouvernementales. Les résultats de cette devraient éclairer les décisions de gestion qui seront prises au sujet de la goberge.

## INTRODUCTION

The meeting was convened on 19 January 2009, at 10:00am rather than 9:00am as scheduled, due to inclement weather. After welcoming participants (Appendices 1a and b) and doing a round of introductions, the Chair of the meeting, Mark Showell, provided a brief introduction to the meeting. He noted that this was first and foremost a science peer-review meeting, which means that the first responsibility of participants was to provide an objective review of the information that would be presented by the Population Ecology Section (SABS) assessment team which had been responsible for the work. To assist in this review, two formal reviewers had been invited to attend the meeting: Ms. Lou Van Eeckhaute (SABS) and Mr. Mark Fowler (PED). In addition, the Chair encouraged other DFO Science staff to provide a critical review of the information presented. The Chair noted that there were a number of other invited participants with expertise and knowledge about pollock and the pollock fishery and encouraged active participation in the discussions. Secondly, the Chair noted that this was a DFO science advisory meeting, and the final product would be a Science Advisory Report (SAR). While we would work toward majority agreement on the main conclusions of this report, the final product would represent DFO Science advice to Fisheries and Aquaculture Management Branch (FAM).

The Terms of Reference for the meeting were reviewed (Appendix 2), including the objectives of this meeting, which were to:

- Review and evaluate biological and fishery information on 4VWX+5Zc pollock stock status to be used as the basis for establishing the TAC for the 2009/2010 fishery.
- Update the advice using framework methodologies and the latest information from fisheries and research surveys.
- Evaluate the impact of pollock and the pollock fishery in an ecosystem context, including:
  - Description of bycatches
  - Comment on possible gear impact on the predominant benthic community
  - Update information on pollock predator/prey interactions

To address these objectives, two working papers were prepared, with the intention to proceed to a single research document once reviewed and accepted. This proceedings report is the record of the discussion. A Science Advisory Report (SAR) was also produced out of this meeting (DFO 2009).

The Agenda (Appendix 3) was reviewed, with no further additions or corrections.

**2008 ASSESSMENT OF POLLOCK IN 4VWX AND 5Zc**

Working Paper: 2008 Assessment of pollock in 4VWX and 5Zc. RAP Working Paper 2009/02.

Presenter: H. Stone

Rapporteurs: J. Simon and M. Fowler

**Presentation Highlights**Western Component

Fishery removals from the Western pollock stock component (4Xopqrs+5Yb+5Zc) averaged 6,000t since 2000 and contributed 87% (3,469 t) and 81% (4,679t) of total landings in 2006 and 2007, respectively. Assessment results were based on a Virtual Population Analysis (VPA) model for the Western Component that incorporated indices of abundance from both the summer research vessel (RV) survey (1984-2008) and standardized catch-per-unit-effort (CPUE) from the commercial fishery, excluding the most recent four years (1982-2004). Age 4+ (considered spawning stock) biomass has increased steadily from a low of 7,500t in 2000 to 29,000t in 2007, then declined to 27,000t in 2008. The 2001 year-class was estimated to be slightly lower than indicated during the 2006 assessment (12.4 million vs. 14.5 million recruits) and has been the strongest at Age 2 since the 1988 year class. Current prospects for the 2004 and 2005 year classes are very poor (< 1.5 million recruits).

Reduced quotas and harvests as well as increasing population biomass have contributed to a decline in fishing mortality rates on ages 6-9, which has been below the  $F_{ref}$  of 0.2 since 2006. The range of harvest strategies in the 2009/2010 fishing year that are risk averse (25% risk of exceeding  $F_{ref}$ ) to risk neutral (50% risk of exceeding  $F_{ref}$ ) are about 3,700t to 4,400t, but are based on recruitment levels beyond the range of past model predictions (lower than previously observed for the time series). An alternate base model formulation was examined for projections and risk analyses which assigned the lowest observed value of Age 2 recruitment for the VPA time series (3.4 million) for 2006-2008. Based on this scenario, the range of harvest strategies in the fishing year that are risk averse to risk neutral are about 4,100t to 4,750t for Age 5+. For the 2009/2010 fishing year, there is a 50% likelihood that removals of 4,500t would not allow for any increase in biomass, reflecting the absence of incoming recruitment. These harvest strategies are for 4Xopqrs+5Zc and would be conservative if applied to all of 4X, since an additional 300-400 t of removals have occurred from 4Xmn over the past two years.

Eastern Component

Landings from the Eastern Component (4Xmn+4VW) traditionally come from the Tonnage Class 4+ sector, and have been following a declining trend, although they exceeded 1,100 t in 2007. Since 1993, much of the Eastern Component was closed to cod and haddock directed fishing, which further reduced pollock landings from that area. Summer RV survey biomass, while variable, has increased since 2006. Most of this increase is due to good catches in 4Xmn, but not in 4VW. Estimates of total mortality from the RV survey indicate a decrease in Z for 2006 and 2007 due to higher abundance in the 2007/2008 surveys, however, it is too early to tell if the situation is actually improving. While the current level of removals has allowed for some rebuilding of the Eastern Component (i.e. in 4Xmn), it is not rebuilt yet (i.e. 4V). Directed pollock fisheries for the east should proceed with caution.



### Ecosystem Considerations

With the exception of the 2007/2008 4W test fisheries and to a lesser extent 5Z, observer coverage for pollock directed mobile gear fisheries is very low and has been implemented largely to address management issues. Notwithstanding these limitations, most of the total catch (82-99%) is landed and counted against respective quotas for these species. Dogfish appears to be the most commonly discarded bycatch species, with other species occurring at low levels. The highest amount of discarded catch appears to occur in the mobile gear fishery for redfish (4Xpq). Bycatch discards may also occur in the 4X pollock gillnet fishery, but observer coverage is far too low (i.e. two trips for 2006-2008) to make any conclusions.

The habitat over which the directed pollock fishery takes place is highly energetic and of high complexity. The impact of the pollock fishery on the sea floor is currently unknown.

The diet of pollock from the Scotian Shelf and Bay of Fundy has shown decadal changes, with euphausiids (krill) being predominant in the diet in the 1960s, less so in the 1990s and once again since 2003.

### **Questions and Comments**

#### Fishery

Industry provided a number of comments on the fishery to help clarify the information presented as well as putting their information into the context of these observations.

Industry felt that quotas were restrictive on some inshore fleet sectors, but not the offshore components. They also felt that longline landings had increased more than indicated by the 2007 data presented.

Questions were raised as to the magnitude of pollock bycatch in the redfish fishery, and how much of this might be discarded and not reported. The catch-at-age includes pollock from redfish directed trips, but is likely an underestimate. Observer coverage has been very low, and estimating by pro-rating observed to unobserved trips was not seen as appropriate. In 2010 there are plans for a groundfish bycatch study with approximately 25% observer coverage, which may provide information on pollock discards.

Clarification was sought on the number of vessels fishing fixed gear within the Eastern Component. There was felt to be at least 20 vessels at this time.

Information was provided by industry on the mesh sizes in the gillnet fishery due to questions on the consistency of the mesh size used. Regulations are for 5 and half to 6 inches on the Scotian Shelf and 6 inches on Georges Bank. However, it was noted that the single gillnet fisherman active on Georges Bank is using 7 inch mesh.

The proper definition of the stock was felt to be 4VWX+5. This accounts for 5Yb and 5Zc.

#### Sampling/Catch at Age

Clarification was sought on the catch at age presented.

### Indices of Abundance

Questions arose over catchability of young pollock and whether Age 2 abundance could be used as an index of recruitment. The summer survey was not felt to be a good indicator of year class strength at that age, but the results from the 2008 spring survey in 4X show high abundance of Age 2 fish.

It was noted that the methodology used to test for consistency and potential bias in aging might allow for the ager to memorize the test sample. It was suggested that a larger dynamic reference sample be created and this was stated to be the eventual goal.

There was an observation that the number of otoliths used in the eastern component was relatively low, but it was felt by Science that it was adequate.

Regarding the catch rate analysis, in many cases fishermen are now directing for pollock whereas in previous years it was more of a bycatch fishery. As a result of these changes, it was pointed out that a number of experienced fisher's catch rate information would not be included in the CPUE series since they would not have the required 5 years of directed fishing effort. It was also observed that the number of gillnet and longline fisher's had decreased and this would also affect recent landings information.

It was noted that to aid in interpretation, standard error bars should be added to the CPUE plot.

Industry also noted that in recent years many trips may land < 50% pollock, and would not be included in the catch rate series.

Other changes noted in fishing patterns was that the Digby fleet is now fishing off of southwest Nova Scotia and the Individual Transferable Quota (ITQ) fleet has been reduced from 365 to 100 vessels. The result has been the annual number of trips used in the catch rate series had declined from 300 to 90 due to the above observations and this would increase the variability in the data. This series has been used to calibrate the VPA in earlier assessments but the decision had been to not include the last four years of the series in the VPA in this assessment.

There were concerns expressed that Georges Bank was not surveyed at the same time as the summer survey and this was a potential source of error in the analysis.

It was suggested that condition factor from the RV surveys should be examined. Condition had been analyzed in preparation for the assessment, but no major changes were observed and hence the information was not presented.

### Estimation of Current Population State

#### *West*

A 'base model' VPA was run, excluding 2005-2008 from the catch rate series. These years are not thought to be comparable to the rest of the series due to changes in the nature of the fishery.

Industry representatives expressed concern that their perception of population status was different than that presented. However, low recruitment in the most recent two years creates a more negative stock status prognosis.

Industry argued that recruitment was being missed by the DFO RV survey because recruits are inshore of the waters sampled by the survey. Further, Industry reported unusually high bycatches of small pollock in the mackerel fishery and in lobster traps. It was pointed out that we will know in the next few years whether the recruitment apparent from RV-based indices is true or false. Survey estimates of Age 3 abundance are highly variable, but more accurate estimates of year class strength will be available in future.

Industry is concerned that exclusion of Georges Bank from the Summer RV survey misrepresents indices of abundance, with a mis-match between the area surveyed and the area fished.

The partial recruitment pattern from the analysis shows an increasing trend, and it was suggested that this may be the result of faster growth seen in recent years. All ages show an increase, but Age 4 is particularly anomalous.

The reason for truncating the CPUE series was questioned, and it was suggested that excluding 2005-2008 may be introducing instability to the model. However, as noted before, changes in management of the pollock fishery make these years non-comparable with the rest of the series.

Cohorts can be tracked in the CPUE series, but are not clear in the RV series. This is puzzling, but cannot be explained at present.

A stock recruitment figure was requested and produced over lunch. The relationship indicates there is generally good recruitment when the Spawning Stock Biomass (SSB) is above 30,000mt. It was noted that SSB in the last two years have been below this. A second plot was recommended, where trends in RV, CPUE, and model output are presented together. This would allow quantification of the difference between the Industry perception of stock status and the model results.

A figure showing total biomass and production was thought to be useful, and should be included in future.

It was observed that the relative errors associated with the CPUE calibration coefficients for the VPA were too high to be believed. This was partially explained as an artifact of using a power fit for the CPUE series to the model.

The truncated CPUE series fit the VPA model rather poorly, despite the fact this series seemed to track cohorts well. Conversely, the RV series fit the VPA model well, yet tracked cohorts poorly. This is counterintuitive, and requires investigation.

Patterns were seen in the residuals from the CPUE series, with most negative prior to 1995 but positive since, indicating potential problems with the time series.

Given the nature of pollock distribution, it will be difficult to reduce the variability in the RV survey series, and reinforces the importance of the CPUE series.

The ITQ survey provides better inshore coverage in 4X, but shows a different trend compared to the RV and CPUE series. This may be due to catches of small (harbour) pollock.

*East*

Any signs of improvement for the Eastern pollock component are associated with the most westerly borders of the Eastern zone - 4Xmn and the test fishery area in 4W. The bulk of the eastern zone remains as unpromising as ever. This raises concerns about the identity of the pollock in 4Xmn and the test fishery area. It was further noted that the 4W test fishery pollock had a size/age composition like that of the 4Xmn RV pollock.

Believing that the 4W test fishery results indicate better stock status than the RV, Industry would like to expand the test fishery into areas further east for more comparisons with the RV survey. It was also suggested that considering factors such as tide and water temperature in the analysis of the survey data might reduce variability in the estimates.

The age composition of the eastern catches changed between 2007 and 2008, but exploitation based on relative F was thought to be low (< 2%).

RV total mortality estimates for the Western component (as presented for the Eastern Component) would have been useful as they might provide supporting evidence of lower exploitation.

Given the total mortality estimates from survey data in the Eastern Component, assuming a natural mortality of 0.2 is questionable. A review of m should be conducted in the future.

Industry maintains that the RV/VPA results are inconsistent with the problems they have avoiding high abundances of pollock when directing for other species. Most pollock are caught by fisheries trying to avoid pollock.

It was noted that more information on pollock abundance might be available from the March RV survey, and that expanding coverage of this survey to include Emerald Basin would help a great deal. Information may also be available from the 4VsW longline sentinel survey, although the number of stations sampled in this survey has decreased in recent years.

Ecosystem Considerations*Bycatch Analysis*

Discards of regulated groundfish were noted for the gillnet fishery in 4X and questioned. These discards are small amounts of unmarketable fish – either small or damaged.

The need to represent the incidence of by-catch in some manner other than just a percentage of weight was emphasized. For example, basking shark was 14% of by-catch weight, which was from only two individuals. Perhaps some analysis of percent occurrence and/or total weight/numbers should be included.

Industry noted that most basking shark by-catch is released alive, including one which was tagged in September 2008.

Caution should be used with extrapolation of observer by-catch data as the directed species is sometimes hard to determine and may vary from set to set. This makes comparisons between areas difficult and can lead to over/underestimation.

A review of by-catch regulations to provide context for the landings versus discard information would be useful, as there seems to be some discrepancy in opinions on how these data are reported.

### Habitat Impacts

While the effects of fishing on habitat have been studied and reported in different areas and for various fisheries, impacts specific to the pollock fishery are not known.

Structures on the shelf are not generally regarded as seamounts and the term should probably be changed in this document, as 'true' seamounts have been identified as areas of interest and high biodiversity and may raise unnecessary flags.

### Diet and Feeding

Based on an analysis of more than 4,000 stomachs, euphausiids are generally the most important component of pollock diet, although during the early 1990s shrimp, amphipods and fish were important also. Pollock shows an increase in piscivory with increasing size, and larger individuals consume sand lance, silver hake and herring.

While the species accumulation curves of prey items in 4X seemed to be different than that of 4VsW, it was noted that the scales were different between the two figures and they were actually quite similar.

It is possible that the cold water period in the early 1990s may have reduced euphausiid abundance and caused pollock to switch prey. A decline in pollock condition (weight at 60cm) was seen during this same general period. Euphausiid abundance is thought to have increased in recent years, as has the pollock condition index.

The high proportion of empty stomachs was seen as curious, particularly for periods when spawning would be occurring.

## **CONCLUSIONS AND NEXT STEPS**

Presenters were thanked for their excellent presentations and for all the hard work that went into this assessment, including work that was completed during breaks at the meeting. Participants were thanked for their willingness to engage in the discussion, and for helpful comments and suggestions.

An editorial meeting to review and finalize the Science Advisory Report was held on 4 February 2009, and the proceedings of this meeting (this document) will be distributed to participants once it has been finalized.

## **REFERENCE**

DFO. 2009. Pollock in Div. 4VWX+5. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2009/025.

**APPENDICES****Appendix 1. List of Participants**

**Assessment of Pollock in Div. 4VWX and 5Zc  
Maritimes Region Science Regional Advisory Process**

George Needler II Boardroom  
Bedford Institute of Oceanography, Dartmouth, NS  
19 January 2009

**ATTENDEES**

<b>Name</b>	<b>Affiliation</b>
Belliveau, Ray	Charlesville Fisheries Limited / MG < 65 ITQ
Boudreau, Cyril	NS Fisheries and Aquaculture
Boyd, Catherine	Clearwater Seafoods
Comeau, Peter	DFO Maritimes / PED
Cook, Adam	DFO Maritimes / PED
d'Entremont, Claude	Inshore Fisheries / MG < 65 ITQ
Docherty, Verna	DFO Maritimes / FAM
Fowler, Mark	DFO Maritimes / PED
Gray, Patrick	Halifax Commercial Fishermen's Assn.
Hansen, Jorgen	DFO Maritimes / FAM
Hurley, Peter	DFO Maritimes / PED
LeBlanc, Daniel	SWNS / Toffee Trawling Ltd.
Levy, John	South Shore Gillnet Fishermen's Assn. (SSGFA)
Maxwell, Judith	Scotia-Fundy Inshore Fishermen's Assn. (SFIFA)
Mohn, Robert	DFO Maritimes / PED
Nicholas, Hubert	Unama'ki Institute of Natural Resources (UINR)
Showell, Mark (Chair)	DFO Maritimes / CSA
Simon, Jim	DFO Maritimes / PED
Stone, Heath	DFO Maritimes / SABS
Van Eeckhaute, Lou	DFO Maritimes / SABS

## Appendix 2. Terms of Reference

### Assessment of Pollock in Div. 4VWX and 5Zc Maritimes Region Science Advisory Process

George Needler II Boardroom,  
Bedford Institute of Oceanography, Dartmouth, NS  
19-20 January 2009\*

#### TERMS OF REFERENCE

##### Context

Since 2000, pollock catches have averaged 6,000t. The fishery consists of a western and eastern component, with the west contributing about 90% of the total landings. Advice was requested by Fisheries and Aquaculture Management on the stock status of pollock to inform management of the 2009/2010 fishery. The last DFO Science assessment of pollock in 4VWX and 5Zc was in 2006, using an assessment framework that was completed in 2004.

##### Objectives

- Review and evaluate biological and fishery information on 4VWX+5Zc pollock stock status to be used as the basis for establishing the TAC for the 2009/2010 fishery.
- Update the advice using the 2004 assessment framework and the latest information from fisheries and research surveys.
- Evaluate the impact of pollock and the pollock fishery in an ecosystem context, including:
  - Description of bycatches
  - Comment on possible benthic impacts
  - Update information on pollock predator/prey interactions

##### Outputs

CSAS Science Advisory Report  
CSAS Proceedings summarizing the discussion  
CSAS Research Document

##### Participation

DFO Science  
DFO Fisheries and Aquaculture Management  
Fishing industry  
NS and NB provincial representatives  
Aboriginal communities / organizations  
Non-governmental organizations

\* Meeting originally scheduled for two days, but was completed in one day (January 19<sup>th</sup>).

**Appendix 3. Agenda****Assessment of Pollock in Div. 4VWX and 5Zc  
Maritimes Region Science Advisory Process**

George Needler II Boardroom  
Bedford Institute of Oceanography, Dartmouth, NS  
19-20 January 2009\*

**DRAFT AGENDA****19 January 2009: Monday**

09:00 – 09:15	Welcome and Introduction (Chair)
09:15 – 09:45	Summary of Assessment Input Data and Other Indicators
09:45 – 10:15	Stock Status – Western and Eastern Components
10:15 – 10:30	Break
10:30 – 11:00	Bycatch Analyses
11:00 – 12:00	Assessment Review
12:00 – 13:00	Lunch
13:00 – 15:00	Assessment Review
15:00 – 15:15	Break
15:15 – 17:00	Ecosystem Considerations

**20 January 2009: Tuesday**

09:00 – 09:15	Review of Day 1
09:15 – 10:00	Framework Discussion
10:00 – 10:15	Break
10:15 – 12:00	Review of Draft of Science Advisory Report
12:00 – 13:00	Lunch
13:00 – 15:00	Review of Draft of Science Advisory Report (as required)

\* Meeting originally scheduled for two days, but was completed in one day (January 19<sup>th</sup>).