

**Summary Minutes of the
U.S. Environmental Protection Agency (EPA)
Science Advisory Board (SAB)
Hypoxia Advisory Panel (HAP) – Subgroup on Causes of Hypoxia,
November 15, 2006**

Panel Members: See subgroup roster – Appendix A

Date and Time: Wednesday, November 15, 2006

Location: By telephone only

Purpose: The purpose of this teleconference was for members of the Hypoxia Panel's Subgroup on Causes of Hypoxia to discuss their advisory work related to characterization of the causes of hypoxia in the Gulf of Mexico.

Attendees: Subgroup Leader: Dr. James Sanders

Subgroup Members: Dr. Thomas Bianchi
Dr. Alan Blumberg
Dr. Daniel Conley
Dr. Denis Gilbert
Dr. Robert Howarth
Dr. Donelson Wright

HAP Members: Dr. Virginia Dale, Chair

EPA SAB Staff: Thomas Armitage, Designated Federal Officer
Holly Stallworth
David Wangsness (USGS)

Meeting Summary

The discussion followed the issues and timing as presented in the meeting agenda (Appendix B).

Convene Teleconference

Dr. Thomas Armitage, Designated Federal Officer (DFO) convened the subgroup teleconference at 9:00 a.m. He stated that teleconference was being held under the requirements of the Federal Advisory Committee Act (FACA). He stated that summary minutes of the teleconference meeting would be prepared and certified by the subgroup leader. Dr. Armitage then asked the Hypoxia Advisory Panel (HAP) members and others on the call to identify themselves.

Purpose of the Call and Review of the Agenda

Dr. Jim Sanders, subgroup leader, thanked the members for joining the call, reviewed the purpose of the call, and reviewed the agenda. He stated that the purpose of the call was to discuss progress toward developing assigned responses to parts of the charge. He also stated that he wanted to discuss the agenda for the upcoming HAP meeting in December and questions for the invited experts.

Discussion of the Agenda for the Upcoming HAP Meeting on December 6-8

Dr. Sanders reviewed the preliminary agenda for the upcoming meeting. He noted that the meeting would begin with a discussion of material that had been developed by the subgroups. Dr. Dale stated that this would be an opportunity to discuss cross-cutting issues and identify gaps that the subgroups may not have addressed.

Subgroup members discussed the written material that had been developed and how it might be presented and organized for incorporation into the Panel's report.

Dr. Bianchi noted that Subgroup 1 had developed material describing the current state of knowledge of processes causing Gulf hypoxia. However, he questioned whether there was too much overlap between material developed by the subgroup and the papers presented at the Gulf Science symposium held in New Orleans. He stated that the HAP subgroup should specifically address the charge that had been provided.

A member stated that the HAP subgroup #1 charge (i.e., address the state-of-the-science and importance of various processes in the formation of hypoxia in the Gulf of Mexico – paying particular attention to any new information that has emerged since publication of the Integrated Assessment in 2000) was similar to the charge to the speakers at the Gulf Science Symposium symposium. He noted that one might expect significant overlap between the HAP report and the material presented at the symposium. Several other members agreed with this statement.

Dr. Sanders stated that material developed by subgroup should be consolidated into a shorter report, and that some of the material could be included in appendices to the report. He stated that it would be important to ensure that there were no major gaps in the report. Other members noted that some of the material could be reduced to tables. Others stated that the documents produced by speakers at the Gulf Science symposium would be published as scientific papers. Therefore, the format of the HAP report would be different from products of the Gulf Science Symposium.

A member stated that the subgroup should change the style and format of the material that had been developed. He noted that the material developed by the subgroup had been presented as background information but it should be “more synthetic.”

The group discussed developing a table of contents for the report. Members noted that they could move their material into appropriate sections after the table of contents had

been developed. Dr. Dale agreed with this approach and stated that each of the subgroups should develop tables of contents for their sections of the report.

Dr. Sanders stated that the HAP report should not only provide factual information but also clearly indicate important gaps in knowledge and recommended actions to fill those gaps. He noted that the subgroup had developed factual information but must now focus on the more synthetic part of the report. He indicated that this should be the focus of the meeting in December.

Dr. Sanders continued to review the agenda for the December meeting. Several members noted that a modeling roundtable to be held at the meeting would provide an opportunity to discuss the part of the charge focusing on the state of the science for characterizing the onset, volume, extent, and duration of the hypoxic zone (forecasting). Dr. Sanders noted that at the meeting a number of invited experts would be giving short presentations focusing on some of the subgroup's issues and would answer members' questions. These experts include Dr. James Ammerman, Dr. Stephen DiMarco, and Dr. Robert Dean. Dr. Sanders asked subgroup members to think about questions that should be posed to these individuals. Dr. Sanders stated that on the third day of the December meeting the subgroup would meet to discuss how the draft material should be further developed and reorganized, and the entire Panel would then meet to discuss the report.

Discussion of Draft Responses to the Charge Questions

The subgroup discussed their progress toward developing draft responses to the charge questions. Dr. Sanders noted that the group had developed a large amount of material describing the state of knowledge (accumulated since 2001) of the causes of Gulf hypoxia. He stated that the group should focus on identifying additional key points to be addressed in the report.

Physical Processes Controlling Hypoxia (Parts 1.A.i, 1.A.ii, and 1.A.iv)

Dr. Wright reviewed the fourth draft section of the subgroup response describing the physical processes controlling hypoxia. He noted that additional information on upwelling and flux across the air/sea interface had been added. He stated that there were several information gaps in the draft. The draft did not contain a discussion of tidal dissipation and the role of tides in mixing. He stated that some work on this had been conducted in the 1970's. He also stated that material on hydrodynamic models had not been included. Dr. Blumberg noted that he had compiled some of this information. A member noted that information about circulation on the mid to inner shelf should be included in the report. Dr. Wright suggested that some additional information might be provided on changes that have been observed since 2001. He noted that it is hard to find information indicating whether there has been an increase in buoyancy flux over the past ten years.

Dr. Sanders stated that it was important to identify the science questions to be considered. Dr. Wright added that the new ocean observing program can be designed to meet some of the data needs.

Dr. Gilbert stated that he had looked at available databases to find information on tidal mixing. He had found only a few papers that addressed tidal mixing on Florida's coast. He noted that there may be some additional information in the gray literature.

Dr. Gilbert also stated that hypoxic conditions in the Gulf appeared to rapidly return shortly after reoxygenation associated with tropical storms or hurricanes. Dr. Wright agreed that after periods of intense mixing stratified conditions can rapidly return. Dr. Conley mentioned a paper by John Simpson at the University of Wales. Work on the Rhine River showed that after intense mixing stratification could occur rapidly due to the influence of fresh water flow.

Dr. Blumberg stated that he had contacted a number of individuals concerning work on tidal mixing in the Gulf and had not found any new information. He asked whether anyone from EPA's Athens laboratory or Gulf Breeze Laboratory would be attending the December meeting to discuss ongoing modeling work. Dr. Stallworth responded that Dr. Rick Greene from EPA's Gulf Breeze Lab would be attending the meeting. Dr. Stallworth further stated that Dr. Ambrose of EPA's Athens Lab would not attend because modeling work undertaken in this area was still in preliminary stages. However, a written description of the project could be provided.

Biogeochemical Processes Controlling Hypoxia in the Gulf of Mexico (Part 1.A.iii)

Dr. Bianchi reviewed the updated material on biochemical processes controlling hypoxia. He stated that the paper by Rowe and Chapman (discussed on the previous subgroup teleconference) provides a foundation for considering the causes of hypoxia in the Gulf of Mexico. He stated that the available information indicates that processes causing hypoxia differ in various parts of the region. He suggested that this should be a foundation for the subgroup report. A member noted that in previous discussions it had been stated that hypoxia is driven by temporally different biogeochemical cycles in different parts of the region. He noted that, although knowledge about this may be limited, it was important to include it in the report.

Dr. Bianchi stated that he had provided some additional information on nutrient loads due to coastal wetland losses, but he noted that the contribution of these loads to the formation of hypoxia is different depending upon the region considered. He stated that as one moves from east to west one sees a change in the signal (moving from near to far field). The group further discussed changes in diagenesis moving from east to west and its relation to oxygen uptake. Several members agreed that the Panel's report should be written in the context of processes occurring in different zones. A member noted that Dr. DiMarco could talk about this at the December meeting.

A member stated that he agreed with discussing processes in different zones but stated that the role of the Atchafalaya and erosion of coastal marshes had been overlooked. Another member noted that Dagg and Turner had addressed this in a recent publication. Dr. Sanders suggested that the group address this issue in the report and also note that it needs clarification. Dr. Bianchi stated that nutrients from the Atchafalaya can move to the east or west.

Nutrient Dynamics and Linkages to Biogeochemical Processes (Parts 1A.iii, 1A.iv, and 1A.v)

Dr. Howarth reviewed material he had provided on nutrient dynamics and linkages to biogeochemical processes. He stated that he had developed material in the form of a short synthesis. He asked whether the Panel's report was being developed as a comprehensive review or a short synthesis. Dr. Sanders responded that the report will be a synthesis and that additional material could be provided in appendices as necessary. He suggested that the subgroup should look at the material that had been developed and explicitly focus on identifying information gaps and questions to be answered over the next five years

Dr. Conley described material he had developed on the topic of denitrification in the water column and sediment. He stated that he had questions about the role of denitrification. He stated that some processes enhance denitrification and some slow it down. Hypoxia affects these processes but the effect of hypoxia on denitrification was not clear. Dr. Gilbert noted that he had seen recent information indicating that there is strong denitrification at relatively low levels of oxygen. He noted that at levels of less than 20 micromolar oxygen, denitrification had been observed. He further noted that, because the Winkler technique becomes less effective at these low levels of oxygen, an additional element of uncertainty was present in this work. Dr. Bianchi noted that top layer of sediment within the hypoxic zone is not anoxic but there are areas where the oxic layer is thin.

Dr. Conley also discussed benthic community shifts associated with reduced oxygen. He noted that changes in the benthic community could be observed after the 1980s. He stated that changes in the benthic community affect the ability of the community to process N and P. He expressed the opinion that this should be addressed in the Panel report.

Implications of Reducing P and N (Part 1A.iv)

Dr. Sanders updated the group on progress on this section. He stated that he would be developing more of the written response before the meeting in December.

Questions for Invited Experts

The group discussed questions for invited experts. Dr. Paerl had developed a list of questions for Dr. Ammerman. Dr. Blumberg had developed questions for Drs. Scavia

and DeMarco. Members agreed these were good sets of questions for the invited experts. Dr. Gilbert noted that he would like to hear Dr. DiMarco's interpretation of the spatial patterns of intensity of the anoxic region. A member stated that he was interested in hearing how Dr. Scavia's model supports or contradicts other modeling efforts. Another member noted that he would be interested in hearing more about why and under what circumstances rapid recurrence of stratification takes place on the Louisiana shelf.

Dr. Wright stated that the Corps of Engineers is considering a project that would abandon the birdsfoot delta and diverting the Mississippi River to the west. This is likely to have an impact on hypoxia. Dr. Wright stated that he would like to ask Dr. Dean to comment on this.

Public Comments

The DFO noted no members of the public were participating on the call and no comments had been provided to the subgroup.

Review Action Items and Assignments

Dr. Sanders thanked the members for participating and reviewed the action items and assignments. Dr. Sanders stated that he would develop a list of questions for invited experts who will be attending the December Panel meeting and will send it to the DFO. He asked members to send him any additional questions within the next 2-3 days. He stated that he would develop look at the written material that had been developed and prepare to present a summary of it to the entire panel at the December meeting. He asked that members provide any additional written material to him and the DFO within the next two weeks (by November 28). Dr. Sanders then adjourned the teleconference.

Respectfully Submitted:

Certified as True:

/Signed/

/Signed/

Dr. Thomas Armitage
Designated Federal Officer

Dr. James Sanders, Leader
Hypoxia Advisory Panel – Subgroup
Causes of Hypoxia

APPENDICES

Appendix A: Roster of Subgroup 1

Appendix B: Meeting Agenda

Appendix A – Subgroup Roster

U.S. Environmental Protection Agency Science Advisory Board Hypoxia Advisory Panel Subgroup on Causes of Hypoxia

LEADER

Dr. James Sanders, Director, Skidaway Institute of Oceanography, Savannah, GA

MEMBERS

Dr. Thomas Bianchi, Professor, Oceanography, Geosciences, Texas A&M University, College Station, TX, USA

Dr. Alan Blumberg, Director, Department of Civil, Environmental, and Ocean Engineering, Stevens Institute of Technology, Hoboken, NJ

Dr. Otis Brown, Dean, Rosenstiel School of Marine and Atmospheric Science, Miami, FL

Dr. Daniel Joseph Conley, Professor, National Environmental Research Institute, Department of Marine Ecology, Roskilde, Denmark

Dr. Denis Gilbert, Research scientist, Ocean and Environment Science Branch, Maurice-Lamontagne Institute, Dept. of Fisheries and Oceans Canada, Mont-Joli, Quebec, Canada

Dr. Robert W. Howarth, David R. Atkinson Professor, Dept. of Ecology and Evolutionary Biology, Cornell University, Ithaca, NY

Dr. Hans Paerl, Professor of Marine and Environmental Sciences, Institute of Marine Sciences, Univ. of North Carolina, Chapel Hill, Morhead City, NC, USA

Dr. Donelson Wright, Chancellor Professor, School of Marine Science, Virginia Institute of Marine Science, College of William and Mary, Gloucester Point, VA

SCIENCE ADVISORY BOARD STAFF

Dr. Thomas Armitage, Designated Federal Officer, U.S. Environmental Protection Agency, Washington, D.C

Appendix B – Teleconference Agenda

AGENDA

SCIENCE ADVISORY BOARD
Hypoxia Advisory Panel – Subgroup on Causes of Hypoxia
Public Teleconference
November 15, 2006, 9:00 a.m. – 12:00 p.m. (Eastern Time)

Purpose: The purpose of this teleconference is for members of the Hypoxia Advisory Panel’s (HAP) Subgroup #1 to discuss advisory work related to characterization of the causes of hypoxia in the Gulf of Mexico.

9:00 a.m.	Convene meeting	Dr. Thomas Armitage Designated Federal Officer
9:10 a.m.	Purpose of the call	Dr. James Sanders, Subgroup Leader
9:15 - 9:30	Discuss agenda for HAP meeting on December 6-8	Dr. Sanders and Subgroup
9:30 - 11:00 a.m.	Discussion of draft responses to the charge	
	Physical processes controlling and hypoxia (parts 1.A.i, 1.A.ii, and 1.A.iv of the charge)	Lead Discussants: Drs. Denis Gilbert, Don Wright, Alan Blumberg, and Otis Brown
	Biogeochemical processes controlling hypoxia (part 1.A iii of the charge)	Lead Discussant: Dr. Thomas Bianchi
	Nutrient dynamics (parts 1.A.iii, 1.A.iv, and 1.A.v of the charge)	Lead Discussants: Drs. Robert Howarth and Hans Paerl
	Linkages between biogeochemical processes and nutrient dynamics	Lead Discussants: Drs. Daniel Conley and Robert Howarth
	Historical changes in productivity and hypoxia	Lead Discussant: Dr. Daniel Conley

	Implication of reducing P and and N (part 1.A.vi of the charge)	Lead Discussant: Dr. James Sanders
11:00 - 11:30 a.m.	Discuss questions for invited experts at upcoming HAP meeting	Dr. Sanders and Subgroup
11:30 - 11:45 a.m.	Public comments	
11:45 a.m. - 12:00 p.m.	Review assignments	Dr. Sanders and Subgroup
12:00 p.m.	Adjourn	