NOAA Scientific Publications Report: April 13-26, 2012

HIGHLIGHTED ARTICLES

1) (NMFS-Northwest) ***A Novel Antibody-Based Biomarker for Chronic Algal Toxin Exposure and Sub-Acute Neurotoxicity***
Journal: PLoS ONE
Expected publication date: April 2012
Authors: **K. A. Lefebvre**, **E. R. Frame**, F. Gulland, J. D. Hansen, **P. S. Kendrick**, R. P. Beyer, T. K. Bammler, F. M. Farin, E. Hiolski, D. Smith, D. J. Marcinek
Abstract: The neurotoxic amino acid, domoic acid (DA), is naturally produced by marine phytoplankton and presents a significant threat to the health of marine mammals, seabirds and humans via transfer of the toxin through the foodweb. In humans, acute exposure causes a neurotoxic illness known as amnesic shellfish poisoning characterized by seizures, memory loss, coma and death. Regular monitoring for high DA levels in edible shellfish tissues has been effective in protecting human consumers from acute DA exposure. However, chronic low-level DA exposure remains a concern, particularly in coastal and tribal communities that subsistence harvest shellfish known to contain low levels of the toxin. Domoic acid exposure via consumption of planktivorous fish also has a profound health impact on California sea lions (*Zalophus californianus*) affecting hundreds of animals yearly. Due to increasing algal toxin exposure threats globally, there is a critical need for reliable diagnostic tests for assessing chronic DA exposure in humans and wildlife. Here we report the discovery of a novel DA-specific antibody response that is a signature of chronic low-level exposure identified initially in a zebrafish exposure model and confirmed in naturally exposed wild sea lions. Additionally, we found that chronic exposure in zebrafish caused increased neurologic sensitivity to DA, revealing that repetitive exposure to DA well below the threshold for acute behavioral toxicity has underlying neurotoxic consequences. This sub-acute neurotoxicity further emphasizes the need for a diagnostic test for chronic DA exposure. The discovery that chronic exposure to low levels of a small, water-soluble single amino acid triggers a detectable antibody response is surprising and has profound implications for the development of diagnostic tests for exposure to other pervasive environmental toxins.
Important conclusions: Repetitive exposure to low levels of a common algal toxin (domoic acid) causes an antibody response in a zebrafish model organism. This antibody is a biomarker for exposure and was also detected in naturally exposed California sea lions, thereby ensuring that the antibody response does occur in mammals under environmentally relevant exposure conditions. Chronic low-level exposure led to increased toxin sensitivity in zebrafish, suggesting a negative health consequence of low-level exposure.
Significance of scientific conclusions for management, policy or to the broader scientific community: As toxin presence continues to increase in the environment, there is a critical need for the development of diagnostic tests for identifying chronic domoic acid exposure in “at-risk” human and wildlife populations. This discovery provides a potential tool for the development of a blood test that can be used to monitor exposure and health risks related to chronic low-level exposure.
Press Release: Yes.

ALL OTHER ARTICLES:

INTERMEDIATE-TIER JOURNALS

(NMFS) ***Reconciling conflict between the direct and indirect effects of marine reserve protection***
Journal: Environmental Conservation
Expected Publication Date: April 16, 2012
Authors: Nick T. Shears, David J. Kushner, **Stephen L. Katz**, Steven D. Gaines.
Summary: No-take marine reserves directly promote the recovery of predatory species, which can have negative indirect effects on prey populations in reserves. When harvesting also occurs on prey species there is potential conflict between the direct and indirect effects of protection, and reserves may not have conservation benefits for prey species. For example, sea urchins are fished in many regions, but may decline in reserves due to increased predation rates. To investigate this potential conflict, this paper compares density, size, biomass and reproductive potential of both a harvested and an unharvested urchin species between a long-term reserve and unprotected sites in California. Consistent with density-mediated indirect interactions, densities of the unharvested species were 3.4-times higher at unprotected sites compared to reserve sites. However, for the harvested species, densities were comparable between reserves and unprotected sites. Both species were consistently larger at reserve sites, and the biomass and reproductive potential of the harvested species was 4.8- and 7.0-times higher, respectively, than at unprotected sites. This is likely due to differences in size-selectivity between harvesting and predators, and potential compensatory effects of predators.
Important Conclusions: We put marine reserves in to protect impacted populations, but when we harvest those populations' forage, the marine reserves are not protecting the forage species. This presents a potential conflict of use on the regional or ecosystem scale.
Significance: Has implications for MPA effectiveness and ecosystem-level assessment.

(NMFS - Southwest Fisheries Science Center) ***Pelagic predator associations: tuna and dolphins in the eastern tropical Pacific Ocean***
Journal: Marine Ecology Progress Series
Expected publication date: June-August, 2012
Authors (NOAA authors in bold): Michael D. Scott, **Susan J. Chivers,** Robert J. Olson, **Paul C. Fiedler** and Kim Holland **(both at NMFS Southwest Fisheries Science Center)**
Summary: The association of yellowfin tuna and pantropical spotted dolphins in the eastern tropical Pacific Ocean (ETP) has been exploited by tuna fishermen and has intrigued scientists for decades, yet we still have questions about what the benefits of the association are, whether the association is obligatory or facultative, why the tuna are most often found with spotted dolphins, and why the species associate most strongly in the ETP. This paper reviews several hypotheses and present results from three studies: a simultaneous tracking study of spotted dolphins and yellowfin tuna, food web study comparing their prey and daily foraging patterns, and a spatial study of oceanographic features correlated with the tuna-dolphin association. These studies demonstrate that the association is neither permanent nor obligatory and that the benefits of the association are not based on feeding advantages. However, they do support the hypothesis that one or both species reduce the risk of predation by forming large, mixed-species groups. The association is most prevalent where the habitat of the tuna is suppressed into the warm, shallow, surface waters due to regions of low oxygen. The association has been observed in other oceans with similar oceanographic conditions, but it is most prevalent and consistent in the ETP where the oxygen minimum zone is the most hypoxic and extensive in the world.
Important conclusions: (1) The tuna-dolphin association is neither permanent nor obligatory, (2) the benefits are not based on feeding advantages, (3) the association is most prevalent where

the habitat of tuna suppressed due to regions of low oxygen, and (4) one or both species reduce the risk of predation by forming large, mixed-species groups.
Significance: This is a comprehensive assessment of a question that has long been posed by marine mammal and fisheries scientists, and by tuna fishermen.

REGIONAL/HIGHLY SPECIALIZED JOURNALS

(**NMFS Southeast Fisheries Science Center**) ***Resistance to alternative management in fisheries - Economic and cultural considerations of North Carolina's commercial fishers***
Journal: Politics and the Life Sciences
Expected publication date: Spring 2012
Authors: **Scott Crosson**
Abstract: Research in recent decades has shown that although conventional fisheries management can provide sufficient biological protection to fisheries stocks, it does not necessarily lead to satisfactory social or economic outcomes. In its stead, the merits and shortcomings of a variety of alternate management systems have been proposed, implemented, and analyzed in recent years. There have been few investigations, however, of actual fishers' preferences between different management systems. Integrating results from a survey of North Carolina commercial fishers with their individual harvest histories and sociodemographic profiles shows that economic and cultural variables both play a significant role. I introduce the use of the Herfindahl-Hirschman Index (HHI) as an individual measurement of diversity in harvest and demonstrate that it is associated with management preferences. Social and family factors were also notable indicators.
Significance of scientific conclusions for management, policy or to the broader scientific community: Certain social and economic indicators may be predictive of commercial fisher's attitudes towards switching management to catch shares or ITQs.

(NMFS Southwest Fisheries Science Center) ***Management reference points to account for direct and indirect impacts of fishing on marine mammals.***
Journal: Marine Mammal Science
Expected publication date: Late 2012
Author: Jeffrey Moore
Summary: Regulations developed under the Marine Mammal Protection Act (MMPA) address reduction in marine mammal population due to direct mortality events (caught in nets, hit by boats, etc.) but it does not account for indirect mortality due to prey depletion from fishing. This paper proposes a more complete assessment of marine mammal mortality using a measurement for generalized Potential Biological Removal (PBR*) which would include prey depletion as a cause of mortality. The authors hypothesize that PBR* can help identify when indirect fishing effects (alone, or combination with direct mortality estimates) may stymie MMPA objectives, and could inform catch limit estimates for target species that are also important as marine mammal prey. This paper utilizes PBR* in a case study to evaluate the possible combined direct + indirect effects of fishing on cetaceans in northeastern U.S. waters. Based on this analysis, increased risk of marine mammal depletion due to indirect fishing effects was not evident, although this result must be interpreted cautiously given limited understanding of cetacean diets and marine food web dynamics. This study is intended to illustrate a possible

practical approach for incorporating indirect fisheries impacts on marine mammals into a comprehensive management framework, and it raises several scientific and policy issues that merit further investigation.
Important conclusion: Generalizes the MMPA's Potential Biological Removal (PBR) framework to account for indirect fisheries impacts in the form of reduced carrying capacity from prey depletion.
Significance for management: Raises several scientific and policy issues that merit investigation as we attempt to implement an ecosystem approach to fisheries management. Reference points can help implement an ecosystem approach to fisheries management by establishing precautionary removal limits for non-target species and target species of ecological importance.

ALL OTHERS - BOOK CHAPTERS and REPORTS

(NMFS Southwest Fisheries Science Center) ***California Hatchery Review Statewide Report***
Journal: Report prepared for the US Fish and Wildlife Service and Pacific Marine Fisheries Commission. California Hatchery Review Statewide Report
Acceptance date: April 2012
Estimated pub date: April 2012.
Authors: California Hatchery Scientific Review Group (California HSRG): **Garza C**, Hamelberg S, Hankin D, Lacy M, Lee D, May B, **Mohr M**, Nandor G, Niemela K, Reisenbichler R, True K
Summary: Comprehensive scientific review of California's anadromous salmon and steelhead hatcheries in the Central Valley and Klamath River basin. This report provides standards and guidelines for the operation of all programs, and specific recommendations for each of the 19 programs based on these standards and guidelines.
Important conclusions: Major recommendations include:

(a) implementing specific marking/tagging programs that will allow real-time identification of all hatchery-origin fish;
(b) eliminating all off-site release of hatchery Chinook salmon production in the Central Valley;
(c) revising the PFMC management objective for Sacramento River fall Chinook salmon to explicitly account for the status and productivity of fish spawning in natural areas;
(d) assigning a high priority to implementing HSRG recommendations for the state's steelhead programs, several of which were observed to be underperforming or potentially detrimental to native steelhead populations.

Significance of scientific conclusions for management, policy or to the broader scientific community: Hatchery programs must be managed to minimize their negative consequences on natural populations subject to meeting their mitigation responsibilities.
Degree of Controversy: High. It is expected that fishery advocates will believe that some of the major recommendations in this report, if implemented, would seriously undermine the viability of the fishery and their livelihood. It is also expected that natural-production advocates will view this as a major opportunity to put substantial pressure on policy makers to implement the major recommendations in this report.

(NOS, Office of Ocean and Coastal Resource Management (OCRM), Coastal Programs Division) ***Protecting the Public Interest through the National Coastal Zone Management Program: How Coastal States and Territories Use No-Build Areas along Ocean and Great Lake Shorefronts***
Expected publication date: April/May

Authors: **Christa Rabenold**

Abstract from paper: To better understand and communicate how state coastal management programs (CMPs) manage ocean and Great Lake shorefront development, OCRM conducted a study to look specifically at where states are employing shorefront no-build areas, typically on dry privately owned land, to protect the public interest. The term "no build areas" incorporates a number of mechanisms that states are using to prohibit development, including setbacks, rolling easements, and zoning.

The information was compiled first by OCRM and then confirmed by state Coastal Management Programs (CMPs). OCRM researched state laws and regulations and worked with state CMPs to ensure the information was current and accurate. These laws and regulations vary considerably from state to state, but it is important to note that this compilation is not a comparative analysis, nor a policy position on no-build approaches.

The report provides an overview of the findings followed by individual summaries for each of the states that employ no-build areas. These summaries include information about regulating agencies and authorities; shoreline type; where development and redevelopment is not allowed; variances, exemptions, and exceptions; and other related and notable provisions.

Important conclusions: Roughly 80 percent of the states that regulate ocean or Great Lake shorefront development (outside of submerged lands) employ no-build areas along some portion of their shorefront. The art and science of regulating shorefront development and protecting the public interest continues to evolve.

Significance of scientific conclusions for management, policy or to the broader scientific community: In the face of continued population growth and increasing economic activity along our nation's coasts, more devastating storm events, and sea level rise, states must balance shorefront development with protection of the natural resources that attract it and life and property. The report is a meant to be a resource for states that are considering revising their current laws and regulations as well as for other states that may be interested in adopting similar safeguards. In recent months both Connecticut and South Carolina have asked for this information.

(NOS - NCCOS, NMFS) ***National Coastal Condition Report (NCCR IV)***

Status update: Publication available online at:
http://water.epa.gov/type/oceb/assessmonitor/nccr/index.cfm

Journal: EPA Publication - EPA-842-R-10-003

Acceptance date: Public Release Date by EPA - April 2012

Expected publication date: April 2012

Authors:

1. EPA: Greg Colianni, Jim Casey, Virginia Engle, James Harvey, Linda Harwell, John Kiddon, John Macauley, Walt Nelson, Eric Osantowski, Lisa Smith, Kevin Summers, Marysia Szymkowiak
2. NOAA: **Marie-Christine Aquarone** (National Marine Fisheries Service, LME Program), **Len Balthis** (National Ocean Service, NCCOS), **Cindy Cooksey** (National Ocean Service, NCCOS), **Jeff Hyland** (National Ocean Service, NCCOS), **Kenneth Sherman** (National Marine Fisheries Service, Narragansett, RI), **Rebecca Shuford** (National Ocean Service, Office of Science and Technology), **David Whitall** (National Ocean Service, NCCOS)
3. FWS: Thomas Dahl
4. USGS: Pete Bourgeois

Abstract from paper: The National Coastal Condition Report IV (NCCR IV) is the fourth in a series of environmental assessments of U.S. coastal waters and the Great Lakes. The report includes contiguous 48 states and Puerto Rico, southeastern Alaska, Hawaii, the U.S. Virgin Islands, Guam, and American Samoa based on data collected from 2003 to 2006. The NCCR IV presents four main types of data: (1) coastal monitoring data, (2) coastal ocean/ offshore monitoring data, (3) offshore fisheries data, and (4) beach assessment and fish advisory data. The NCCR IV relies heavily on coastal monitoring data from EPA's National Coastal Assessment (NCA) to assess coastal condition by evaluating five indices of condition—water quality, sediment quality, benthic community condition, coastal habitat loss, and fish tissue contaminants. NCCR IV was developed through collaboration among EPA, the National Oceanographic Atmospheric Administration, U.S. Fish and Wildlife Service, and coastal state agencies. For further details see NCCR IV factsheet: http://water.epa.gov/type/oceb/assessmonitor/nccr/upload/Final-NCCR-IV-Fact-Sheet-3-14-12.pdf.
Important conclusions: Overall condition of the Nation's coastal waters was rated fair based on data from 2003 to 2006. The three indices that showed the poorest conditions throughout the U.S. were coastal habitat condition, sediment quality, and benthic condition. Southeastern Alaska and American Samoa received the highest overall condition scores (5=Good). The Great Lakes received the lowest overall condition score (2.2=Fair to poor). Comparison of the condition scores shows that overall condition in U.S. coastal waters has improved slightly since NCCR I.
Significance of scientific conclusions for management, policy or to the broader scientific community (*one or two sentences*): This report on the status of ecosystem conditions in coastal waters around the Nation will support more informed decisions concerning protection of its natural resources and will increase public awareness about the extent and seriousness of pollution impacts. In addition to information on the health of coastal regions covered in previous reports, NCCR IV for the first time includes data on status of ecological condition for the U.S. Virgin Islands, Guam, American Samoa, and selected coastal-ocean (continental shelf) waters.

(NOS) *NOAA's Ocean Circulation and Predictive Modeling Study of Two Sea-Disposed Military Munitions Sites in Hawaii: Ordnance Reef – HI-06 and HI-01*
Expected Publication date: June 1, 2012
Authors: Tony Reyer, Jason Rolfe, Glen Watabayashi, Dr. Melissa Rice, Dr. Brian Powell, Dr. Margaret McManus, Jeff Sevadjian, Dr. Ivica Janeković, Drew Rak, and Dr. Deborah Hunka
Summary: NOAA performed an ocean current and predictive modeling study to support a Department of Defense (DOD) evaluation of the potential human health hazards posed by military munitions present at Military Munitions Sea Disposal Sites HI-01 and Ordnance Reef HI-06, both offshore of the west coast of O'ahu, Hawai'i. NOAA (with support from Noblis, Inc.) anlyzed the chemistry of munitions constituents present at each site and determined that of the substances present at deepwater site HI-01, hydrogen cyanide presents the greatest human health hazard, and ammonium picrate presents the greatest human health hazard of any substance at Ordnance Reef–HI-06. NOAA and the University of Hawaii measured ocean currents in the vicinity of the two sites for 13 months to better characterize ocean circulation in the area, then (with support from Genwest, Inc.) performed predictive modeling of the "worst-case" release of munitions constituents from each site to determine the spatial and temporal extent of the hazard area should a release occur.
Important Conclusions: Modeling of the worst-case ammonium picrate release from Ordnance

Reef–HI-06 indicated that dissolved ammonium picrate concentrations would not exceed hazardous levels at any depth within about 100 m (330 ft) from shore. Modeling of a worst-case hydrogen cyanide release from deepwater site HI-01 indicated that dissolved hydrogen cyanide concentrations would reach established exposure limits only within 300 m (980 ft) from the ocean bottom, more than a mile (about 2 km) below the surface and too far offshore to threaten swimmers or divers.
Significance: High. Under Section 314 of the John Warner National Defense Authorization Act for Fiscal Year 2007 (NDAA, Public Law 109-364), the Secretary of Defense is required to identify sites where military munitions were disposed in coastal waters, and to research the effects on the ocean environment and those who use it. This study area is the first chosen by DOD for analysis under this mandate and represents the standard by which additional studies in other areas will be measured.

(NOS-ONMS) *Office of National Marine Sanctuaries Review of Artificial Reefs*
Journal: Office of National Marine Sanctuaries Conservation Series
Expected Publication Date: June 2012
Authors: Kathy Broughton (ONMS)
Summary: Artificial reefs are human-made structures that are deliberately submerged underwater, usually with the purpose of mimicking some characteristics of a natural reef. Artificial reefs alter local habitat by providing hard substrate and complex vertical relief where typically none previously existed. General agreement exists in the scientific community that artificial reefs can be effective attractants for fish and other organisms. Somewhat less understood are the effects of artificial reefs on living resource production, their ability to act as stepping-stones that facilitate native and non-native species dispersal, how they affect disease frequency in fish and invertebrates, toxicological impacts, their long-term structural integrity, and changes to the socioeconomic climate. The purpose of this paper is to summarize the current scientific literature and findings on these subjects.
Important Conclusions: This document provides a literature review of the following impacts that artificial reefs may have on ecosystem dynamics: attraction versus production, range expansion, invasive species, disease introduction or acceleration, toxicological impacts, impacts to the physical and chemical attributes of the ecosystem, longevity and structural integrity of artificial reefs, and human use and economic impacts. The issues presented in this document are complex with varying degrees of scientific controversy surrounding them.
Significance: The ONMS Policy Division will be updating the ONMS Artificial Reef Permitting Guidelines in FY12. In anticipation of that update they have requested that the ONMS Science Team develops a report that provides a scientific summary, or literature review, on the topic of artificial reefs in order to support any changes that will be made to the guidelines.

(NOS-ONMS) *Gray's Reef National Marine Sanctuary Condition Report Addendum*
Journal: ONMS Condition Report Series
Expected Publication Date: June 8, 2012
Authors: Greg McFall1, George Sedberry, Becky Shortland, Sarah Fangman, Steve Gittings, Kathy Broughton (NOS)
Summary: This document is an addendum to the Gray's Reef National Marine Sanctuary 2008 Condition Report. The 2008 report provided a summary of resources in the National

Oceanic and Atmospheric Administration Gray's Reef National Marine Sanctuary (sanctuary), pressures on those resources, current conditions and trends, and management responses to the pressures that threaten the integrity of the marine environment. Specifically, the 2008 Condition Report presented responses to a set of 17 questions posed to all sanctuaries. These responses provided information on the status and trends of water quality, habitat, living resources and maritime archaeological resources, and the human activities that affect them. This addendum updates the 2008 Condition Report. The 17 questions found in the State section of the Condition Report have been revaluated for accuracy and completeness given new data sets, published literature, and expert opinion that have become available since 2008. For those that have new information to report (questions 1, 5, 6, 8, 9, 10, 12 and 14), new status and trend ratings, and updated narratives are provided. Trend ratings are generally based on observed changes in status since 2008.

Important Conclusions: New status and trend ratings and updated narratives are provided for questions 1, 5, 6, 8, 9, 10, 12 and 14. The condition summary table in the document provides a comprehensive summary of these changes (conclusions) along with the full set of 17 questions.

Significance: This is the second effort to comprehensively describe the status and trends of resources at Gray's Reef National Marine Sanctuary. The report helps identify gaps in current monitoring efforts, as well as causal factors that may require monitoring and potential remediation in the years to come. The data discussed will enable resource managers and stakeholders to not only acknowledge prior changes in resource status, but will provide guidance for future management challenges, including the revision of the Gray's Reef National Marine Sanctuary Management Plan.