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HIGHLIGHTED ARTICLES

Effects of elevated CO_2 in the early life-stages of summer flounder, *Paralichthys dentatus*, and potential consequences of ocean acidification

Retrieval of tropical cyclone statistics with a high-resolution coupled model and data

Water loss from Great Lakes

A novel approach for estimating location and scale specific fishing exploitation rates of eastern Bering Sea walleye pollock (*Theragra chalcogramma*)

Contribution of sea surface carbon pool to organic matter enrichment in sea spray aerosol

Impact of hypoxia on habitat quality of pelagic planktivorous fishes in the northern Gulf of Mexico

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Resilience and water governance: addressing fragmentation and uncertainty in water allocation and water quality law

Contribution of local and remote anthropogenic aerosols to the 20th century weakening of the South Asian Monsoon

Accounting for subgroup structure in line-transect abundance estimates of false killer whales (*Pseudorca crassidens*) in Hawaiian waters

Individual calling behavior and movements of North Atlantic minke whales *(Balaenoptera acutorostrata*)

Patterns of age-0 yellow perch growth, diets, and mortality in Saginaw Bay, Lake Huron

Sexual reproduction and seasonality of the Alaskan Red Tree Coral, *Primnoa pacifica*

On the drag and heat of Washington, DC, and New York City

Estimating point and nonpoint sources of pollution loadings in the Saginaw Bay watershed

A role for shellfish aquaculture in coastal nitrogen management

Managing a marine stock portfolio: stock identification, structure, and management of 25 fishery species along the Atlantic coast of the United States

Foraging site fidelity and stable isotope values of loggerhead turtles tracked in the Gulf of Mexico and Northwest Caribbean

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Assessing real-time tornado information disseminated through NWS products

Age and growth of the bull shark, *Carcharhinus leucas*, in the Western North Atlantic Ocean

Effects of sea surface temperature fluctuations on the occurrence of small cetaceans off Southern California: implications for climate change

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HIGHLIGHTED ARTICLES

Effects of elevated CO_2 in the early life-stages of summer flounder, Paralichthys dentatus*, and potential consequences of ocean acidification*

Biogeosciences

R. C. Chambers, **A. C. Candelmo**, **E. A. Habeck**, **M. E. Poach**, **D. Wieczorek**, K. R. Cooper, C. E. Greenfield, and **B. A. Phelan (NMFS/NEFSC)**

- Survival of summer flounder embryos declines with increasing carbon dioxide concentration in seawater.
- Rates of growth and development of larvae increase with carbon dioxide and these rates affect the size and timing that larvae metamorphose into juveniles. This in turn affects the timing of the juveniles' habitat shift into estuaries.
- Alterations in survival, growth, and early-life stage development from elevated CO_2 suggest that this species may be further challenged by ocean acidification.

The authors reported on the responses of summer flounder early life-history features to experimentally manipulated CO_2 levels. No reduction in survival with CO_2 was observed during the first four weeks of larval life, and experiments ended at 28 days post-hatching (dph) when larvae were initiating metamorphosis. Relative survival of flounder embryos from local ambient conditions (775 ppm pCO_2, 7.8 pH) reduced to 48% in experimental conditions (1860 ppm pCO_2, 7.4 pH), and to only 16% at the highest treatment concentrations (4715 ppm pCO_2, 7.1 pH), which was consistent for all three female flounder used as embryo sources. Larvae were initially longer and faster growing when reared at intermediate and high CO_2 levels, but with less energy reserves, which was apparent midway through the larval period (14 dph). Larvae from the highest CO_2 conditions initiated metamorphosis at earlier ages and smaller sizes than those from intermediate and ambient conditions. Tissue damage was evident in larvae as early as 7 dph from both elevated CO_2 levels, including liver vascular dilation, epithelial hyplasia, and trunk muscle separation. Additionally, cranial feature changes were observed with age. Larval skeletal elements in ambient and experimental concentrations were comparable or smaller for younger larvae (7 and 14 dph), but were larger at developmental stage for older larvae (21 and 28 dph).

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Expected Publication Date: March 2014
http://www.biogeosciences-discuss.net/10/13897/2013/bgd-10-13897-2013.pdf

Retrieval of tropical cyclone statistics with a high-resolution coupled model and data
Geophysical Research Letters
S. Zhang, M. Zhao**, S. -J. Lin**, X. Yang, and **W. Anderson (OAR/GFDL)**

- The authors constructed a novel high-resolution model initialization that improves prediction of historic tropical cyclone statistics compared to existing models.
- The new method reduces forecast errors by allowing continuous coupling of small-scale tropical cyclone events and large-scale background climate variables.
- This new model will facilitate seamless weather-climate predictions and improve our ability to make seasonal-interannual climate predictions.

When observations are assimilated into a high-resolution coupled model, a traditional scheme that preferably projects observations to correct large-scale background tends to filter out small-scale cyclones. Here we separately process the large-scale background and the small-scale perturbations with low-resolution observations for reconstructing historical cyclone statistics in a cyclone-permitting model. We show that by maintaining the interactions between small-scale perturbations and successively corrected large-scale background, a model can successfully retrieve the observed cyclone statistics that in return improve estimated ocean states. The improved ocean initial conditions together with the continuous interactions of cyclones and background flows are expected to reduce model forecast errors. Combined with convection-permitting cyclone initialization, the new high-resolution model initialization along with the progressively advanced coupled models should contribute significantly to the ongoing research on seamless weather-climate predictions.
Published Online: January 2014
http://onlinelibrary.wiley.com/doi/10.1002/2013GL058879/pdf

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Water loss from Great Lakes
Science
A. Gronewold and **C. Stow (OAR/GLERL)**

- The coarse spatiotemporal resolution of the Great Lakes hydrometeorological monitoring network represent a source of uncertainty for managers
- Significant spatiotemporal heterogeneity in meteorological and climatological conditions presents a source of bias and uncertainty in anticipation of the Great Lakes water budget
- Monitoring of evaporation and other hydrometeorological conditions may answer some questions on these uncertainty and serve as a basis for more rational attribution of water loss from the Great Lakes

As marine coastal populations experience and plan for rising ocean levels, residents along the coasts of Earth's largest lake system are adapting to the opposite issue: chronic low water levels and a receding shoreline. The Great Lakes constitute the largest surfaces of freshwater on Earth, and low water levels on the Great Lakes have a profound impact on the region and the North American economy. The low water levels have catalyzed demands to regulate outflows from Lake Michigan-Huron and raise questions about drivers behind low water levels. These questions, and policy decisions, underscore the need for maintenance and expansion of hydrometeorological monitoring network.
Expected Publication Date: March 2014

A novel approach for estimating location and scale specific fishing exploitation rates of eastern Bering Sea walleye pollock (Theragra chalcogramma)
Fisheries Research
S. J. Barbeaux, J. K. Horne, and **J. N. Ianelli (NMFS/AFSC)**

- Researchers estimated local pollock (*Theragra chalcogramma*) biomass across a range of spatial scales using catch data and depletion models that were fit to opportunistic acoustic data collected from commercial fishing vessels in the eastern Bering Sea.
- At large scales, exploitation rates of pollock were consistent with population-wide targets. But at smaller scales, rates varied relative to the target.

- In 2002 through 2005, higher exploitation rates occurred within the area identified as Steller sea lion *(Eumetopias jubatus)* critical habitat.

The authors analyzed acoustic data on walleye pollock collected opportunistically on fishing vessels and develop spatially explicit Leslie depletion models to estimate local pollock exploitation rates in eastern Bering Sea (EBS). There has been concern that local fishing rates on pollock may impact forage opportunities needed for the recovery of the endangered Steller sea lion (SSL). Results from this study indicate that, between 2002 and 2005, winter fishing exploitation of pollock was higher inside SSL critical habitat than outside. This study provide a highly resolved quantitative assessment of location-specific fishing impacts that helps to determine a rational approach to monitoring and managing fishing activities potentially affecting the recovery of endangered species and take into account ecosystem concerns.
Expected Publication Date: May 2014

Contribution of sea surface carbon pool to organic matter enrichment in sea spray aerosol
Nature Geoscience
P. K. Quinn, T. S. Bates, K. S. Schulz, D. J. Coffman, A. A. Frossard, L. M. Russell, W. C. Keens, and D. J. Kieber **(OAR/PMEL)**

- This study assessed the relationship between the organic carbon content of sea water and freshly-emitted sea spray aerosol in the presence and absence of plankton blooms in the North Atlantic Ocean and the coastal waters of California.
- The chemical composition of freshly emitted sea spray aerosol is similar for high and low-chlorophyll-a regions.
- These are the first reported measurements able to assess chlorophyll-a as a proxy for the enrichment of organic carbon in sea spray aerosol.

Breaking waves on the ocean surface generate air bubbles that scavenge organic matter from the surrounding sea water. When injected into the atmosphere, these bubbles, burst, yielding sea spray aerosols enriched in organic matter, relative to the sea water. Downwind of plankton blooms, the organic carbon content of sea spray aerosol is weakly correlated with satellite-derived measurements of chlorophyll-*a* levels, a measure of phytoplankton biomass. There is a large reservoir of organic matter in surface seawater that results in the enrichment of organic

matter in sea spray aerosol relative to seawater. This source of organic matter is uncoupled from and overwhelms any influence of local biological activity as measured by chlorophyll-*a* over large ocean regions. The fraction of sea spray aerosol that takes up water and nucleates to form cloud droplets is similar for high and low-chlorophyll-*a* regions. The authors show that the enrichment of organic matter in sea spray aerosol is relatively constant regardless of chlorophyll-a concentration. To date, all large scale climate models have used chlorophyll-*a* to parameterize the organic content of sea spray aerosol. This study shows that this approach under predicts organic enrichment in freshly emitted sea spray aerosol in oligotrophic regions and over predicts organic enrichment in high chlorophyll regions. Accurate parameterization of organic enrichment in sea spray aerosol as a function of particle size is required for accurate calculations of radiative forcing by sea spray aerosol.
Expected Publication Date: March 2014
http://www.nature.com/ngeo/journal/v7/n3/full/ngeo2092.html

Impact of hypoxia on habitat quality of pelagic planktivorous fishes in the northern Gulf of Mexico
Marine Ecology Progress Series
H. Zhang, D. Mason, C. Stow, A. Adamack, S. Brandt, X. Zhang, D. Kimmel, M. Roman,W. Boicourt, and S. Ludsin **(OAR/GLERL)**

- Hypoxic zones in the northern Gulf of Mexico have generally been considered low quality habitat with correspondingly low fish biomass.
- This study indicates that when the entire water column is considered, hypoxia has only a minor impact on overall habitat quality.
- Habitat quality in the entire water column is driven primarily by prey availability and secondarily by water temperature.

To evaluate the impact of hypoxia (<2 mg O2 l–1) on pelagic habitat quality of pelagic prey fishes in the northern Gulf of Mexico, the authors used a spatially-explicit, bioenergetics-based growth rate potential (GRP) modeling approach to develop an index of habitat quality. Positive GRP was equated to high quality habitat (HQH) and negative GRP was equated to low quality habitat (LQH). Bay anchovy *(Anchoa mitchilli)* and Gulf menhaden *(Brevoortia patronus)* were

used as indicator species. Water temperature, dissolved oxygen (DO), zooplankton, and phytoplankton data collected during peak periods of hypoxia in 2003, 2004, and 2005 were used as inputs to the model. The results indicate that hypoxic zones are always LQH. However, when the entire water column was considered, hypoxia had only a minor impact on overall habitat quality, with habitat quality being driven primarily by prey availability and then by water temperature. This finding stands in contrast to other ecosystems, such as the Chesapeake Bay, where hypoxia affects a large fraction of the water column and has a significant impact on overall habitat quality. Such differences in the effect of hypoxia on habitat quality between these two ecosystems point to the need to consider the vertical extent of hypoxia relative to water column depth, and may help to explain why obvious impacts of hypoxia on pelagic fish production are generally lacking.
Expected Publication Date: Unknown

ADDITIONAL ARTICLES

Resilience and water governance: addressing fragmentation and uncertainty in water allocation and water quality law
Resilience and Law
B. Cosens and **C. A. Stow (OAR/GLERL)**

- A review of water quality and water supply lows finds that the inability to be adaptive and offer updates based on monitoring is a limitation to resilience.

The U.S. EPA reports that almost half of the nation's rivers and two thirds of its lakes are use-impaired due to poor water quality (U.S. EPA 1998, 2002, 2010; Houck 2002). The Western Water Policy Review Advisory Commission identified both poor water quality and unhealthy aquatic systems among the water challenges facing the West (Western Water Policy Review Advisory Commission 1998). The water quality impairment is caused both by chemical pollution and physical alteration of streams. Nutrients and excess sediment impair water quality in 30 percent of the nation's streams (U.S. EPA 2011). In the Great Basin nearly two-thirds of the native fish are either listed under the Endangered Species Act (ESA) or considered of

concern by the U.S. Fish and Wildlife Service (USFWS). Water development is considered second only to the introduction of nonnative fish in causing these problems (Doremus 2001).
Pubished: February 2014

Contribution of local and remote anthropogenic aerosols to the 20th century weakening of the South Asian monsoon
Geophysical Research Letters
M. A. Bollasina, **Y. Ming, V. Ramaswamy, M. D. Schwarzkopf,** and V. Naik **(OAR/GFDL)**

- Predominant precipitation changes over India are associated with local aerosols, but remote aerosols contribute as well, especially in favoring an earlier monsoon onset in June and enhancing summertime rainfall over the northwestern regions.
- Unlike precipitation, temperature and near-surface circulation changes over South Asia are more effectively driven by remote aerosols.
- This study underlines the complex interactions between local and remote aerosols and their different dominance on South Asian climate.

The late twentieth century response of the South Asian monsoon to changes in anthropogenic aerosols from local (i.e., South Asia) and remote (i.e., outside South Asia) sources was investigated using historical simulations with a state-of-the-art climate model. The observed summertime drying over India is replaced by widespread wettening once local aerosol emissions are kept at preindustrial levels while all the other forcings evolve. Constant remote aerosol emissions partially suppress the precipitation decrease. While predominant precipitation changes over India are thus associated with local aerosols, remote aerosols contribute as well, especially in favoring an earlier monsoon onset in June and enhancing summertime rainfall over the northwestern regions. Conversely, temperature and near-surface circulation changes over South Asia are more effectively driven by remote aerosols. These changes are reflected into northward cross-equatorial anomalies in the atmospheric energy transport induced by both local and, to a greater extent, remote aerosols.
Expected Publication Date: March 2014

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Accounting for subgroup structure in line-transect abundance estimates of false killer whales (Pseudorca crassidens) *in Hawaiian waters*

PLoS One

A. Bradford (NMFS/PIFSC), K. Forney (NMFS/SWFSC), E. Oleson (NMFS/PIFSC), and **J. Barlow (NMFS/SWFSC)**

- The highly variable nature of false killer whale behavior and grouping patterns creates the potential for a number of biases and uncertainties in line-transect abundance estimation.
- Explicitly accounting for subgroup structure is recommended for future false killer whale line-transect data collection and abundance estimation.
- Using subgroups as the detection and analysis unit is also likely applicable to other cetaceans with multi-level social organization and can also be considered for non-cetacean populations with subgroup structure.

For biological populations that form aggregations (or clusters) of individuals, cluster size is an important parameter in line-transect abundance estimation and should be accurately measured. Cluster size in cetaceans has traditionally been represented as the total number of individuals in a group, but group size may be underestimated if group members are spatially diffuse. Groups of false killer whales (*Pseudorca crassidens*) can comprise numerous subgroups that are dispersed over tens of kilometers, leading to a spatial mismatch between a detected group and the theoretical framework of line-transect analysis. Three stocks of false killer whales are found within the U.S. Exclusive Economic Zone of the Hawaiian Islands (Hawaiian EEZ): an insular main Hawaiian Islands stock, a pelagic stock, and a Northwestern Hawaiian Islands (NWHI) stock. A ship-based line-transect survey of the Hawaiian EEZ was conducted in the summer and fall of 2010, resulting in six systematic-effort visual sightings of pelagic (n=5) and NWHI (n=1) false killer whale groups. The maximum number and spatial extent of subgroups per sighting was 18 subgroups and 35 km, respectively. These sightings were combined with data from similar previous surveys and analyzed within the conventional line-transect estimation framework. Unlike previous line-transect analyses of cetaceans, subgroups were treated as the analytical cluster instead of groups because subgroups better conform to the specifications of line-transect theory. Bootstrap values (n=5,000) of the line-transect parameters were randomly

combined to estimate the variance of stock-specific abundance estimates. Hawai‘i pelagic and NWHI false killer whales were estimated to number 1,552 (CV=0.66; 95% CI=479-5,030) and 552 (CV=1.09; 95% CI=97-3,123) individuals, respectively. Subgroup structure is an important factor to consider in line-transect analyses of false killer whales and other species with complex grouping patterns.
Expected Publication Date: Early 2014

Individual calling behavior and movements of North Atlantic minke whales (Balaenoptera acutorostrata)
Behaviour
D. Risch, U. Siebert, and **S. Van Parijs (NMFS/NEFSC)**

- The study provides new data on the calling behavior and source levels for a little studied baleen whale – the minke whale.
- The results will be important for the interpretation of and the development of passive acoustic monitoring for this species.

Information on individual calling behavior and source levels are important for understanding social interactions of marine mammals, for which visual observations are difficult to obtain. Our study, conducted in the Stellwagen Bank National Marine Sanctuary (SBNMS), located in the Gulf of Maine, USA, used passive acoustic arrays to track North Atlantic minke whales and assess the sound production behavior of individuals. A total of 18 minke whales were acoustically tracked in this study. Individual calling rates were variable, with a median Intercall Interval (ICI) of 60.3 seconds. Average source levels (SLrms) for minke whales pulse trains ranged between 164 and 168 dB re 1 µPa, resulting in a minimum detection range of 0.4-10.2 km for these calls in this urban, coastal environment. All tracked animals were actively swimming at a speed of 5.0 ± 1.2 km/h, which matches swimming speeds of migrating minke whales from other areas and confirms SBNMS as part of the migration route of this species in the Western North Atlantic. Tracked minke whales produced 7 discrete call types belonging to 3 main categories, yet no individual produced all call types. Instead, minke whales produced 2 multisyllabic call sequences ('A' and 'B'), by combining 3-4 different call types in a nonrandom order. While 7 of the tracked individuals produced calling pattern 'A', 10 whales used calling

pattern 'B', and only 1 animal combined call types differently. Animals producing different call sequences were in acoustic range of one another on several occasions, suggesting they may use these sequences for mediating social interactions. The fact that the same calling patterns were shared by several individuals suggests that these patterns may contain information related to sex, age or behavioral context.
Accepted: 3 February 2014

Patterns of age-0 yellow perch growth, diets, and mortality in Saginaw Bay, Lake Huron
Journal of Great Lakes Research
C. R. Rowell, **S. A. Pothoven**, and T. O. Hook **(OAR/GLERL)**

- Yellow perch in Saginaw Bay did not switch to benthic prey during the first year of life, but instead consumed primarily zooplankton.
- Due to size-selective processes of predation and overwinter survival, juvenile growth and resulting mean size have important implications for survival of Saginaw Bay age-0 yellow perch.
- The results suggest that recruitment dynamics are influenced by the interplay of size-selective mortality and potential diet-induced reductions in growth.

Mechanisms influencing early-life survival may allow insight into the recruitment variability of fish populations. Yellow perch (*Perca flavescens*) are economically and ecologically important in Saginaw Bay, Lake Huron, but have recently experienced low recruitment despite strong production of age-0 fish. Recent year classes have been characterized by slow first-year growth; however, seasonal growth patterns and accompanying diet and survivorship patterns have not been documented for age-0 yellow perch in Saginaw Bay. Age-0 yellow perch were collected weekly (larvae) and monthly (juveniles) throughout the first year of life during 2009 and 2010 to track changes in growth and diet composition. Additionally, predation and over-winter energy-loss were evaluated as potential mechanisms of size-selective mortality, and growth, energy accumulation and size-specific condition decreased during late summer and fall. During larval and juvenile stages, predominant components of yellow perch diets transitioned from copepods to *Daphnia* and other zooplankton with only weak shifts toward benthic prey as individuals grew. Smaller yellow perch were preferentially preyed upon by walleye (the bay's

main fish eating predator) and displayed lower mass-specific energy content, potentially increasing overwinter starvation risk, and reconfirming that slow growth increases mortality risk.
Expected Publication Date: March 2014

Sexual reproduction and seasonality of the Alaskan Red Tree Coral, Primnoa pacifica
PLoS One
R. Waller, **R. Stone (NMFS/AKFSC)**, J. Johnstone, and **J. Mondragon (NMFS/AKRO)**

- Red tree corals are the most important corals in the North Pacific Ocean, providing important habitat for managed fish species.
- Red tree corals are subjected to relatively high disturbance from fisheries.

The red tree coral *Primnoa pacifica* is an important habitat forming octocoral in North Pacific waters. Given the prominence of this species in shelf and upper slope areas of the Gulf of Alaska where fishing disturbance can be high, it may be able to sustain healthy populations through adaptive reproductive processes. This study was designed to test this hypothesis, examining reproductive mode, seasonality and fecundity in both undamaged and simulated damaged colonies over the course of 16 months using a deepwater-emerged population in Tracy Arm Fjord. Females within the population developed asynchronously, though males showed trends of synchronicity, with production of immature spermatocysts heightened in December/January and maturation of gametes in the fall months. Periodicity of individuals varied from a single year reproductive event to some individuals taking more than the 16 months sampled to produce viable gametes. Multiple stages of gametes occurred in polyps of the same colony during most sampling periods. Mean oocyte size ranged from 50 to 200 µm in any season, and maximum oocyte size (802 µm) suggests a lecithotrophic larva. No brooding larvae were found during this study, though unfertilized oocytes were found adhered to the outside of polyps, where they are presumably fertilized. This species demonstrated size-dependent reproduction, with gametes first forming in colonies over 42-cm length, and steady oocyte sizes being achieved after reaching 80-cm in length. The average fecundity was 86 (±12) total oocytes per polyp, and 17 (±12) potential per polyp fecundity. Sub-lethal injury by removing 21–40% of colony tissue had no significant reproductive response in males or females

over the course of this study, except for a corresponding loss in overall colony fecundity. The reproductive patterns and long gamete generation times observed in this study indicate that recruitment events are likely to be highly sporadic in this species increasing its vulnerability to anthropogenic disturbances.
Expected Publication Date: 1 March 2014 (online)

On the drag and heat of Washington, DC, and New York City
Journal of Applied Meteorology and Climatology
B. B. Hicks, **W. R. Pendergrass, III, C. A. Vogel,** and **R. S. Artz (OAR/ARL)**

- Researchers derived average values and spatial differences of normalized local friction velocity and temperature covariance from micrometeorological instrument data collected in Washington, DC and New York City.
- Averaged values of local friction velocity were best associated with the standard deviation of local building heights with little dependence on other components of the modern building morphology indices.
- The findings of this paper raise into question the application of modern building morphology indices for modern weather prediction models.

Researchers derived average values and spatial differences of normalized local friction velocity and temperature covariance from data from a network of micrometeorological instruments mounted 10 m above the roofs of twelve buildings in Washington, DC, and two in New York City. Averaged values of normalized local friction velocity were best associated with the standard deviation of local building heights, with little evidence of a dependence on other components of the modern building morphology indices. Temperature covariance data show a large effect of nearby activities, with the consequences of air conditioning systems being obvious (especially at night) in some situations. The Washington data show that older buildings, built largely of native limestone, show the greatest effects of air conditioning systems. The assumption that the nighttime surface boundary layer is stable is likely to be most often incorrect for both Washington and New York City – the sensible heat flux resulting from heating and cooling of building work spaces most often appears to dominate.
Expected Publication Date: Early 2014

NOAA SCIENTIFIC PUBLICATIONS REPORT
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Estimating point and nonpoint sources of pollution loadings in the Saginaw Bay watershed
Journal of Great Lakes Research
C. He, L. Zhang, C. DeMarchi, and **T. E. Croley II (OAR/GLERL)**

- Point source input was determined and nonpoint source loading potential estimated, and animal manure production and fertilizer applications were calculated for different years in the Saginaw Bay Basin, Michigan.
- Twenty-five percent of the total phosphorus load to Saginaw Bay was attributed to point sources and the rest to nonpoint sources, and non-farmland fertilizer application increased over time.
- Water quality programs should be expanded in both rural and urban areas to minimize nutrient loadings from increasing nonfarm applications of N and P fertilizers.

Databases of point sources including combined sewer overflows (CSOs) were acquired from the governmental agencies to map the occurrences and magnitude of the CSOs. Multiple databases of land use, topography, hydrography, soils, and agricultural statistics were used to estimate nonpoint source loading potential in the Saginaw Bay Basin, Michigan. Animal manure production was computed from tabulations of animals by 5-digit zip code area for the census years of 1987, 1992, 1997, and 2002. Fertilizer applications for both urban and agricultural land uses were calculated from county fertilizer estimates for the same periods. Results indicate that point sources from municipalities, industrial sectors and business entities contribute approximately 25% of the total phosphorus load to Saginaw Bay, with the remainder being accounted for by nonpoint source contributions. While the total amount of nutrients (N and P) from animal manure and fertilizer applications and atmospheric deposition declined in the Saginaw Bay Basin, fertilizer applications in non-farmland increased significantly. Estimation of nutrient loading potential at 5-digit zip code level reveals more detailed spatial variation and critical areas of nutrient loading than county level data for implementation of targeted water quality programs. Water quality programs need to be expanded in both rural and urban areas to minimize nutrient loadings from increasing nonfarm applications of N and P fertilizers.
Accepted: 19 February 2014

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A role for shellfish aquaculture in coastal nitrogen management
Environmental Science and Technology
J. M. Rose (NMFS/NEFSC), S. B. Bricker (NOS/NCCOS), M. Tedesco, and **G. H. Wikfors (NMFS/NEFSC)**

- Current nitrogen management strategies based on reducing nitrogen loading will not be enough to eliminate eutrophication of coastal waters
- Shellfish aquaculture compares favorably to existing nitrogen management practices in terms of cost and nitrogen removal efficiency
- To use shellfish aquaculture as a complement to existing nitrogen source control efforts, 1) social constraints on aquaculture in nearshore waters must be overcome, 2) improvements are needed to the site selection process for farms, and 3) markets must be developed for alternative species that are not for human consumption

Excess nutrients in the coastal environment have been linked to a host of environmental problems, and nitrogen reduction efforts have been a top priority of resource managers for decades. The use of shellfish for coastal nitrogen remediation has been proposed, but formal incorporation into nitrogen management programs is lagging. Including shellfish aquaculture in existing nitrogen management programs makes sense from environmental, economic, and social perspectives, but challenges must be overcome for large-scale implementation to be possible.
Accepted: 7 February 2014

Managing a marine stock portfolio: stock identification, structure, and management of 25 fishery species along the Atlantic coast of the United States
North American Journal of Fisheries Management
R. S. McBride (NMFS/NEFSC)

- Reviews the best practices (life history traits, phenotypic traits, genetic traits, natural marks, and applied marks), summarizes the patterns and processes structuring stocks, and makes recommendations by considering all 25 species managed by the Atlantic States Marine Fisheries Commission (ASMFC).
- Establishes importance of larval dispersal or mixing of adults in the marine environment when identifying stocks. Proposes to characterize marine and catadromous spawners as:

1) unit stock; 2) a metapopulation; or 3) two stocks, north and south of Cape Hatteras. Estuarine and anadromous spawners were structured and managed at a finer spatial scale.

- Suggests adopting finer-scale identification methods, among which: experiments or reaction norms to separate phenotypes from genotypes; genetic surveys at a seascape scale; demonstration of contingent (non-genetic) structure and its implications for management; and simulation modeling.

A broad suite of stock identification methods have been applied to ASMFC species. An interdisciplinary mix of methods has been achieved for a few species (striped bass, winter flounder) but only a few or no stock identification methods have been applied to others (spiny dogfish, hickory shad, spot, Spanish mackerel). Clinal phenotypic variation has contributed to several long-standing debates about stock structure; some of these have been recently reevaluated as a unit stock (Atlantic croaker, weakfish) and others are still debated. For some ASMFC species, other priorities (e.g., bycatch) dominate uncertainty of the assessment or management process. Otherwise, stock identification remains a research priority for most of these species. Continued research of this subject should consider: 1) research priorities tabulated by ASMFC review panels; 2) strategic use of interdisciplinary stock identification methods; 3) use of experiments or reaction norms to separate phenotypes from genotypes; 4) genetic surveys at a seascape scale; 5) demonstration of contingent (non-genetic) structure and its implications for management; and 6) simulation modeling. Obstacles to adopting finer-scale structure into assessments or management of ASMFC fisheries include: 1) multiple stock units are apparent but boundaries are not clear, 2) monitoring requirements for smaller areas or for mixed-stock catches are not cost effective, or 3) mixing rates within a metapopulation or across biogeographic boundaries are poorly described.

Expected Publication Date: April 2014

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MARCH 4, 2014

Foraging site fidelity and stable isotope values of loggerhead turtles tracked in the Gulf of Mexico and northwest Caribbean

Marine Ecology Progress Series

T. T. Tucker, B. MacDonald, and **J. A. Seminoff (NMFS/SWFSC)**

- Loggerhead turtles in the wider Caribbean region demonstrate foraging area fidelity after nesting seasons
- The isoscape patters in the wider caribbean are insufficient for tracking turtles using the 'stable isotope tracking' technique

The authors used stable isotope (δ13C, δ15N, δ34S) analysis in combination with satellite telemetry to evaluate the foraging areas chosen by 88 loggerhead turtles (*Caretta caretta*) nesting in southwestern Florida. Nine turtles were tracked and skin-sampled in more than one nesting season to evaluate within-individual consistency in foraging sites and stable isotope values. Turtles migrated to five regions: Caribbean, Florida Keys, Western Florida Shelf, Northern Gulf of Mexico, and Yucatan Peninsula. The stable isotope ratios across these foraging grounds ranged from –21.16 ‰ to –7.69 ‰ for δ13C, 3.27 ‰ to 13.99 ‰ for δ15N, and 1.91 ‰ to 20.64 ‰ for δ34S. Bulk skin tissue stable isotope values were compared for all turtles by bioregion, year, body size, depth of putative foraging area, and linear distance from the closest shore. Among these factors only bioregion showed a significant effect on isotope values. There were subtle regional differences in mean δ13C, δ15N, and δ34S, and an apparent north-south isotopic shift aligning strongly with ocean currents adjacent to the Florida Keys. The influence of coastal topography and the shifting biogeographic boundaries such as the Loop Current may cause strong ocean water mixing that results in the observed similarities in SI values among regions. These results indicate that stable isotopes alone may be an inadequate tool for identifying fine-scale (<100 km) residency of sea turtles within this ocean region.

Expected Publication Date: Summer 2014

NOAA SCIENTIFIC PUBLICATIONS REPORT
MARCH 4, 2014

Assessing real-time tornado information disseminated through NWS products
Weather and Forecasting
S. F. Blair and **J. Leighton (NWS/CR)**

- Advances in technology are allowing greater opportunity to include real-time tornado information in warnings.
- Fewer than half of the tornadoes in this study were included in NWS warning products in real time. More intense and long-tracked tornadoes, such as High Plans tornadoes and nighttime tornadoes, are more likely to be included in warnings in real time.

Real-time confirmation of a tornado specified in National Weather Service (NWS) warnings and statements is believed to increase the credibility and urgency of these critical warning messages for the end user, because it represents the greatest degree of certainty that the hazard exists. This timely tornado information disseminated in official NWS products and relayed through multiple sources by private and public partners may help the public believe, personalize, confirm, and respond to the warning message. This study is the first to explicitly assess the frequency of real-time confirmation of ongoing tornadoes within NWS products and explore what unique conditions may facilitate or hinder this process. Tornado reports and their respective NWS warnings and statements during a 5-yr period from 2007-2011 across the central contiguous United States were compiled and examined. Overall, 40% of tornadoes were confirmed in NWS products in real time. Increasing tornado path length, duration, and intensity subsequently resulted in an increasing likelihood of real-time confirmation prior to the tornado dissipating. The time of day was a factor - nighttime tornadoes were 20% less likely to receive real-time confirmation than daytime events. Additionally, increasing tornado forecast risk in products issued by the Storm Prediction Center produced an increasing likelihood of real-time confirmation. Analysis of these data reveals specific scenarios when tornadoes are more or less likely to be reported in real time, providing some guidance for when timely ground-truth information may or may not be available.
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NOAA SCIENTIFIC PUBLICATIONS REPORT
MARCH 4, 2014

Age and growth of the bull shark, Carcharhinus leucas, *in the Western North Atlantic Ocean*
Transactions of the American Fisheries Society
L. J. Natanson (NMFS/NEFSC), D. H. Adams, M. V. Winton, and J. R. Maurer

- This research provides the first age estimates for the bull shark in the Atlantic.

Age and growth estimates for the bull shark *Carcharhinus leucas* were derived from 121 (59.1 – 223.5 cm fork length [FL]) vertebral centra collected between 1966 and 2010 in the western North Atlantic Ocean (WNA). Size at birth was confirmed with an additional 20 embryos (44.2 – 54.4 cm FL). The maximum age based on vertebral band pair counts was 25 (184 cm FL) and 27 (196 cm FL) years for males and females, respectively. The logistic (male: *asymptotic FL* = 204.8 cm, *growth coefficient* = 0.163 yr^{-1}) and Gompertz (female: *asymptotic FL* = 215.1 cm, *growth coefficient* = 0.154 yr^{-1}) growth models fitted the size-at-age data best for males and females, respectively. Based on previously published estimates of length at maturity, males mature at 15-17 years (176 - 185 cm FL) and females at 15 years (189 cm FL). Bull Sharks in the WNA and Gulf of Mexico have similar growth rates and reach similar sizes-at-age.
Accepted: 5 February 2014

Effects of sea surface temperature fluctuations on the occurrence of small cetaceans off southern California: implications for climate change
Fishery Bulletin
E. E. Henderson, **K. A. Forney, J. Barlow**, J. A. Hildebrand, A. B. Douglas, J. Calambokidis, and W. J. Sydeman **(NMFS/SWFSC)**

- This paper examines variation in dolphin occurrence off southern California in relation to sea surface temperature and two climate indices.
- The results are useful for assessing human impacts and potential climate change effects to cetacean distribution in this region.

The authors examine the link between ocean temperature and distribution patterns for eight species of small cetaceans off southern California during 1979-2009. Sea surface temperature (SST) averages and anomalies were examined on three temporal scales: seasonal, El Nino/Southern Oscillations (ENSO), and Pacific Decadal Oscillation (PDO). Using generalized additive models, the hypothesis that cetacean species assemblages would be altered with

periodic changes in SST was tested. Seasonal SST averages were included as a predictor in the models for Dall's porpoise (*Phocoenoides dalli*), and common (*Delphinus* spp.), northern right whale (*Lissodelphis borealis*), and Risso's dolphins (*Grampus griseus*). The PDO index was selected as a predictor for Dall's porpoise, and Pacific white-sided (*Lagenorhynchus obliquidens*), common, and bottlenose (*Tursiops truncatus*) dolphins. Metrics of depth and slope were included in the models, indicating a distinctive spatial distribution for each species that may represent a niche or partitioning of resources in areas where multiple species have overlapping ranges. While temporal responses in distribution are likely a response to changes in prey abundance or grouping dynamics, patterns associated with SST variation may be predictive of future, more permanent range shifts due to global climate change.
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