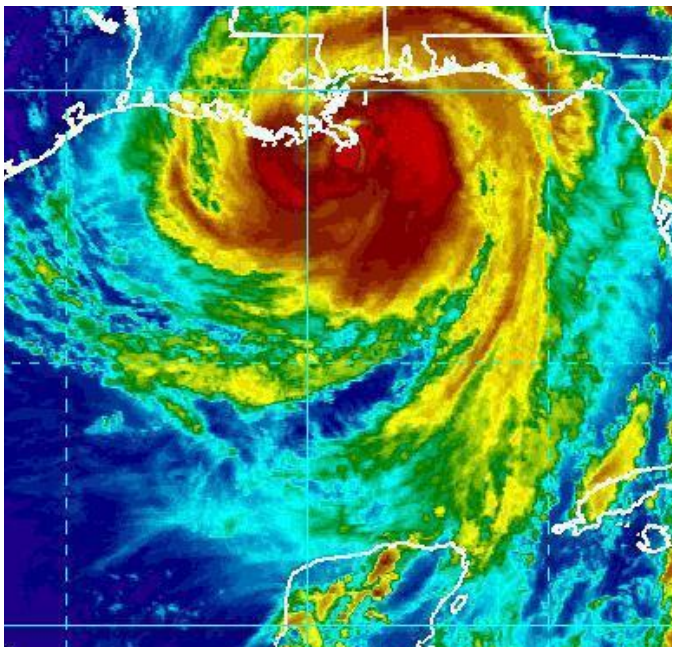


NOAA Scientific Publications Report

SEPTEMBER 20, 2013

HIGHLIGHTED ARTICLE

Incorporating climate science in applications of the U.S. Endangered Species Act for aquatic species

Incorporating climate and ocean change into extinction risk assessments for 82 coral species

Strong maternal fidelity and natal philopatry shape genetic structure in North Pacific humpback whales

Inter-population movements of Steller sea lions in Alaska with implications for population separation

Genetic stock composition of loggerhead turtles (Caretta caretta) bycaught in the oceanic waters of the North Atlantic

Molecular typing of environmental and clinical strains of Vibrio vulnificus isolated in the northeastern USA

Floodplain rehabilitation as a hedge against hydro-climatic uncertainty in a migration corridor of threatened steelhead

Post-release mortality estimates of loggerhead sea turtles (Caretta caretta) caught in pelagic longline fisheries based on archived satellite data and hooking location

Individual, population, and ecosystem effects of hypoxia on a dominant benthic bivalve in Chesapeake Bay

Marine taxa track local climate velocities

Humpback whale song on the Southern Ocean feeding grounds: implications for cultural transmission

The genetic network and breeding patterns of a tropical shark population reveal its vulnerability to inbreeding

Tropical cyclones cause $CaCO_3$ undersaturation of coral reef seawater in a high-CO_2 world

Opposite latitudinal gradients in projected ocean acidification and bleaching impacts on coral reefs

ADDITIONAL ARTICLES

Cannibalism in red king crab: Habitat, ontogeny, and the predator functional response

Coded wire tag expansion factors for chinook salmon carcass surveys in California: Properly estimating numbers and proportions of hatchery-origin fish

Modeling solar proton access to geostationary spacecraft with geomagnetic cutoff

Use of genetic stock identification data for comparison of the ocean spatial distribution, size-at-age, and fishery exposure of an untagged stock and its indicator: California Coastal versus Klamath River Chinook

The Distributed Model Intercomparison Project - Phase 2: experiment design and summary results of the Western Basin experiments

Validated age and growth estimates for Carcharhinus obscurus in the northwestern Atlantic Ocean, with pre- and post management growth comparisons

Incorporating herbivorous sea urchins in ramet culture of staghorn coral, Acropora cervicornis

Complementary skeletochronology and stable isotope analyses offer new insight into juvenile loggerhead sea turtle oceanic stage duration and growth dynamics

Hydrodynamic regulation of salt marsh contributions to aquatic food webs

Characterization and conservation concern of green turtles (Chelonia mydas) nesting in Hong Kong, China

Mapping the world's tropical cyclone rainfall contribution over land using the TRMM Multi-satellite Precipitation Analysis

Associations between North Pacific right whales and their zooplanktonic prey in the southeastern Bering Sea

Levels of persistent organic pollutants in eastern North Atlantic humpback whales

Preparing for and managing change: climate adaptation for biodiversity and ecosystems

Soviet whaling in the North Pacific: revised catch totals

Spatial and temporal resolution considerations in evaluating and utilizing radar QPE estimates

Validating and improving life history data in FishBase

Pregnancy patterns of pantropical spotted dolphins (Stenella attenuata) in the eastern tropical Pacific determined from hormonal analysis of blubber biopsies and correlations with the purse-seine tuna fishery

Phytoplankton assemblage changes during decadal decreases in nitrogen loadings to the urbanized Long Island Sound estuary

Maximum age and missing time in the vertebrae of sand tiger shark (Carcharias taurus): validated lifespan from bomb radiocarbon dating in the western North Atlantic and southwestern Indian Oceans

Assessing and addressing the re-eutrophication of Lake Erie: Central basin hypoxia

Status and the potential for extinction of the largetooth sawfish Pristis pristis in the Atlantic Ocean

Geodia starki sp. Nov. (Porifera: Demospongiae: Geodiidae) from the Aleutian Islands, Alaska, USA

Multiscale analysis of factors that affect the distribution of sharks throughout the northern Gulf of Mexico

Effects of reduced hydrological connectivity on the nursery use of shallow estuarine habitats within a river delta

Feeding ecology of age-0 Lake Whitefish in Saginaw Bay, Lake Huron

Energy content of young yellow perch and walleye in Saginaw Bay

A review of common bottlenose dolphins (Tursiops truncatus truncatus) in the Northern Gulf of Mexico: population biology, potential threats, and management

Precipitation and temperature forecast performance at the Weather Prediction Center

Octocoral gardens in the Gulf of Maine (NW Atlantic)

Predicting the oscillating bi-directional exchange flow in the Straits of Mackinac

Modeling the implications of multiple hatching sites for larval dynamics in the resurgent Saginaw Bay walleye population

Methodological approaches to projecting the hydrologic impacts of climate change

A modeling study of the effects of river runoff, tides, and surface wind-wave mixing on the eastern and western Hainan upwelling systems of the South China Sea, China

Rigorous evaluation of a fraternal twin ocean OSSE system for the open Gulf of Mexico

Comparing autonomous underwater vehicle (AUV) and vessel-based tracking performance for locating acoustically tagged fish

Time-varying biases in U.S. total cloud cover data

Rigorous evaluation of a fraternal twin ocean OSSE system for the open Gulf of Mexico

OTHER REPORTS, BOOK CHAPTERS, & INTERNAL PUBLICATIONS

Marine sanctuaries and marine planning: protecting endangered marine life

HIGHLIGHTED ARTICLE

AUTHORS

M. M. McClure (NMFS/NWFSC), M. Alexander (OAR/ESRL), D. Borggard (NWRO), D. Boughton (NMFS/SWFSC), L. Crozier (NMFS/NWFSC), R. Griffis (NMFS/OST), J. C. Jorgensen (NMFS/NWFSC), S. Lindley (NMFS/SWFSC), J. Nye, **M. J. Rowland (NOAA/OGC), E. E. Seney (NMFS/OST),** A. Snover, **C. Toole (NWRO),** and **K. Van Houtan (NMFS/PIFSC).**

PUBLICATION DATE

Expected: December 2013

TITLE

Incorporating climate science in applications of the U.S. Endangered Species Act for aquatic species

JOURNAL

Conservation Biology

SIGNIFICANCE

- The Endangered Species Act (ESA) offers mechanisms for increasing the overall resilience and resistance of species to climate changes.
- The authors identified key strategies for scientists and managers and outline how climate change considerations can be incorporated into decision making under the ESA.
- The authors recommend scientists conducting analyses supporting ESA decision making develop a conceptual model that links climate, habitat, ecosystem, and species response to changing conditions and use this model to organize analyses and future research.

SUMMARY

Aquatic species are threatened by climate change but have received comparatively less attention than terrestrial species. Authors gleaned key strategies for scientists and managers seeking to address climate change in aquatic conservation planning from the literature and existing knowledge. They address three categories of conservation efforts that rely on scientific analysis and have particular application under the U.S. Endangered Species Act (ESA): assessment of overall risk to a species; long-term recovery planning (is planning "conservation analysis"?); and evaluation of effects of specific actions or perturbations. Fewer data are available for aquatic species to support these analyses, and climate effects on aquatic systems are poorly characterized. Thus, the authors recommend scientists conducting analyses supporting ESA decision making develop a conceptual model that links climate, habitat, ecosystem, and species response to changing conditions and use this model to organize analyses and future research. They recommend that current climate conditions are not appropriate for projections used in ESA analyses and that long-term projections of climate-change effects provide temporal context as a species-wide assessment provides spatial context. In these projections, climate change should not be discounted solely because the magnitude of projected change at a particular time is uncertain; directionality of climate change is clear. Identifying likely future habitat at the species scale will indicate key refuges and potential range shifts. However, the risks and benefits associated with errors in modeling habitat that is likely to exist in the future are not equivalent. The ESA offers mechanisms for increasing the overall resilience and resistance of species to climate changes, including establishing recovery goals requiring increased genetic and phenotypic diversity, specifying critical habitat in areas not currently occupied but likely to become important, and using adaptive management.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

HIGHLIGHTED ARTICLE

AUTHORS

R. E. Brainard (NMFS/PIFSC), M. Weijerman, **C. M. Eakin (NESDIS/STAR)**, **Paul McElhany (NMFS/NWFSC)**, **M. W. Miller (NMFS/SERFSC)**, M. Patterson, **G. A. Piniak (NOS/NCCOS)**, M. J. Dunlap, and C. Birkeland

PUBLICATION DATE

Expected: October 2013

TITLE

Incorporating climate and ocean change into extinction risk assessments for 82 coral species

JOURNAL

Conservation Biology

SIGNIFICANCE

- The Endangered Species Act (ESA) mandates conservation management decisions founded on extinction risk based on the best available scientific information. However, many marine invertebrate species have uncertain taxonomies and poorly known demographic and ecological traits making quantitatively assessing extinction risk challenging.
- The authors developed an expert-opinion threat-based approach using a structured voting system to assess extinction risk from climate and ocean changes and other threats to 82 coral species for which population status and threat response information was limited.
- The authors offer guidance in approaches for future biological extinction risk assessments, particularly in cases of data-limited species likely to be impacted by global-scale threats.

Healthy coral

SUMMARY

Many marine invertebrate species facing potential extinction have uncertain taxonomies and poorly known demographic and ecological traits. Uncertainties are compounded when potential extinction drivers are climate and ocean changes whose effects on even widespread and abundant species are only partially understood. The U.S. Endangered Species Act mandates conservation management decisions founded on the extinction risk to species based on the best available science at the time of consideration – requiring prompt action rather than awaiting better information. The authors developed an expert-opinion threat-based approach using a structured voting system to assess extinction risk from climate and ocean changes and other threats to 82 coral species for which population status and threat response information was limited. Such methods are urgently needed because constrained budgets and manpower will continue to hinder the availability of desired data for many potentially vulnerable marine species. Significant species-specific information gaps and uncertainties precluded quantitative assessments of habitat loss or population declines and necessitated increased reliance on demographic characteristics and threat vulnerabilities at genus or family levels. Adapting some methods (e.g., a structured voting system) used during other assessments and developing some new approaches (e.g., integrated assessment of threats and demographic characteristics), authors rated the importance of threats contributing to coral extinction risk and assessed those threats against available population status and trend information to evaluate each species' extinction risk over the 21st century. This qualitative assessment resulted in a ranking with an uncertainty range for each species according to their estimated likelihood of extinction.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

HIGHLIGHTED ARTICLE

AUTHORS

C. S. Baker, D. Steel, J. Calambokidis, E. Falcone, U. González-Peral, **J. Barlow**, A.M.Burdin, P.J.Clapham, J.K.B.Ford, C.M. Gabriele, D. Mattila, L. Rojas-Bracho, J.M. Straley, **B.L.Taylor**, J. Urbán R., P.R.Wade, **D. Weller**, B.H. Witteveen, and M. Yamaguchi **(NMFS/SWFSC)**

PUBLICATION DATE

Expected: November 2013

TITLE

Strong maternal fidelity and natal philopatry shape genetic structure in North Pacific humpback whales

JOURNAL

Marine Ecology Progress Series

SIGNIFICANCE

- Molecular genetic techniques were employed to assess the relative influence of both maternal fidelity (i.e., information on feeding/breeding grounds passed from mother) and natal fidelity (i.e., returning to birthplace) on feeding and breeding activities of North Pacific humpback whales.
- The authors found substantial population structure in these whales, both between breeding areas (strong influence of natal fidelity) and between feeding areas (strong influence of maternal fidelity).
- The authors also concluded that the influence of migratory fidelity seems to operate independently on feeding and breeding grounds over an evolutionary time scale.

Humpback mother and calf

SUMMARY

We quantified the relative influence of maternal fidelity to feeding grounds and natal fidelity to breeding grounds in humpback whales based on an ocean-wide survey of mitochondrial (mt) DNA diversity in the North Pacific. For 2,193 biopsy samples collected from whales in 10 feeding regions and 8 breeding regions during the winter and summer of 2004 to 2006, we first used microsatellite genotyping (average, 9.5 loci) to identify replicate samples. From sequences of the mtDNA control region (500 bp) we identified 28 unique haplotypes from 30 variable sites. Haplotype frequencies differed markedly among feeding regions (overall FST = 0.121, ΦST = 0.178, $p < 0.0001$), supporting previous evidence of strong maternal fidelity. Haplotype frequencies also differed markedly among breeding regions (overall FST = 0.093, ΦST = 0.106, $p < 0.0001$), providing evidence of strong natal fidelity. Although sex-biased dispersal was not evident, differentiation of microsatellite allele frequencies was weak compared to differentiation of mtDNA haplotypes, suggesting male-biased gene flow. Feeding and breeding regions showed significant differences in haplotype frequencies, even for regions known to be strongly connected by patterns of individual migration. Thus, the influence of migratory fidelity seems to operate somewhat independently on feeding and breeding grounds over an evolutionary time scale. This results in a complex population structure and the potential to define multiple units to conserve in either seasonal habitat.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

HIGHLIGHTED ARTICLE

AUTHORS

L. A. Jemison, G. W. Pendleton, **L. W. Fritz**, K. K. Hastings, J. M. Maniscalco, A. W. Trites, and **T. S. Gelatt (NMFS/AKFSC)**

PUBLICATION DATE

Expected: 5 August 2013

TITLE

Inter-population movements of Steller sea lions in Alaska with implications for population separation

JOURNAL

PLOS one

SIGNIFICANCE

- This study provides analysis and empirical data for Steller sea lion movements at the stock boundary based on observations of marked animals.
- The authors observed that male and female sea lions have traveled across previously established dividing lines that distinguish different populations; a western distinct population segment (WDPS) and an eastern DPS (EDPS).
- These movements have led to permanent migrations of individuals into different populations, as well as the development of rookeries between these zones (i.e., mixing zones)

Steller Sea Liions

SUMMARY

Genetic studies and differing population trends support the separation of Steller sea lions (*Eumetopias jubatus*) into a western distinct population segment (WDPS) and an eastern DPS (EDPS) with the dividing line between populations at 144° W. Despite little exchange for thousands of years, the gap between the breeding ranges narrowed during the past 15–30 years with the formation of new rookeries near the DPS boundary. We analyzed >22,000 sightings of 4,172 sea lions branded as pups in each DPS from 2000–2010 to estimate probabilities of a sea lion born in one DPS being seen within the range of the other DPS (either 'West' or 'East'). Males from both populations regularly traveled across the DPS boundary; probabilities were highest at ages 2–5 and for males born in Prince William Sound and southern Southeast Alaska. The probability of WDPS females being in the East at age 5 was 0.067 but 0 for EDPS females which rarely traveled to the West. Prince William Sound-born females had high probabilities of being in the East during breeding and non-breeding seasons. We present strong evidence that WDPS females have permanently emigrated to the East, reproducing at two 'mixing zone' rookeries. We documented breeding bulls that traveled >6,500 km round trip from their natal rookery in southern Alaska to the northern Bering Sea and central Aleutian Islands and back within one year. WDPS animals began moving East in the 1990s, following steep population declines in the central Gulf of Alaska. Results of our study, and others documenting high survival and rapid population growth in northern Southeast Alaska suggest that conditions in this mixing zone region have been optimal for sea lions. It is unclear whether eastward movement across the DPS boundary is due to less-optimal conditions in the West or a reflection of favorable conditions in the East.

LINK TO PAPER

http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0070167

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

HIGHLIGHTED ARTICLE

AUTHORS

E. L. LaCasella (NMFS/SWFSC), S. P. Epperly (NMFS/SEFSC), M. P. Jensen (NMFS/SWFSC), L. Stokes (NMFS/SEFSC), P. H. Dutton (NMFS/SWFSC)

PUBLICATION DATE

Expected: November 2013

TITLE

Genetic stock composition of loggerhead turtles (Caretta caretta) *bycaught in the oceanic waters of the North Atlantic*

JOURNAL

Endangered Species Research

SIGNIFICANCE

- This study utilizes mtDNA that incorporates newly published rookery data from 23 source MUs that have been identified to date and represent 4 loggerhead DPSs to estimate the proportions of each MU that were represented in the NED bycatch
- Our results demonstrate that immature loggerheads utilizing the oceanic habitats in the central North Atlantic are almost exclusively of Northwest Atlantic DPS origin (mean = 99.2%), with the majority coming from the eastern Florida rookeries (mean = 84.0%)
- Contributions from the western Florida rookeries (mean = 11.7%) and Mexico (mean = 3.5%) were also detected, but we found little evidence to suggest any significant contributions from the rookeries of the South Atlantic, Northeast Atlantic or Mediterranean DPSs

Loggerhead turtle escaping Turtle Excluder Device (TED)

SUMMARY

Sea turtle populations disperse widely across oceans and migrate between terrestrial nesting habitat and distant feeding and developmental habitats. Understanding population stock structure is important for accurately assessing threats such as mortality from fishery bycatch and for defining specific demographic units of conservation concern. We compared 776-bp mtDNA control region haplotypes from 389 juvenile loggerhead turtles sampled as bycatch in the U.S. pelagic longline fishery in the western North Atlantic Northeast Distant (NED) region to haplotype frequencies observed in 23 genetically distinct nesting stocks representing the 4 Distinct Population Segments (DPS) that have been identified throughout the Atlantic Ocean and Mediterranean Sea. We used Bayesian mixed-stock analysis to produce stock composition estimates for juvenile loggerhead turtles that use pelagic habitat in the central North Atlantic. We found that nearly all of the loggerheads caught in NED waters belonged to the Northwest Atlantic DPS (mean = 99.2%), with the majority coming from the large eastern Florida rookeries (mean = 84.0%). We also detected contributions from the western Florida rookeries (mean = 11.7%) and Mexico (mean = 3.5%) but found little evidence of contributions from the rookeries of the South Atlantic, Northeast Atlantic or Mediterranean DPSs. These results will help improve specific threats assessments and are relevant to ongoing development of conservation plans that are aligned to the recent DPS listings for loggerheads.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

HIGHLIGHTED ARTICLE

AUTHORS

Y. Reynaud, S. Pitchford, S. DeDecker, G. Wikfors, and **C. Brown (NMFS/NEFSC)**

PUBLICATION DATE

Accepted: 5 September 2013

TITLE

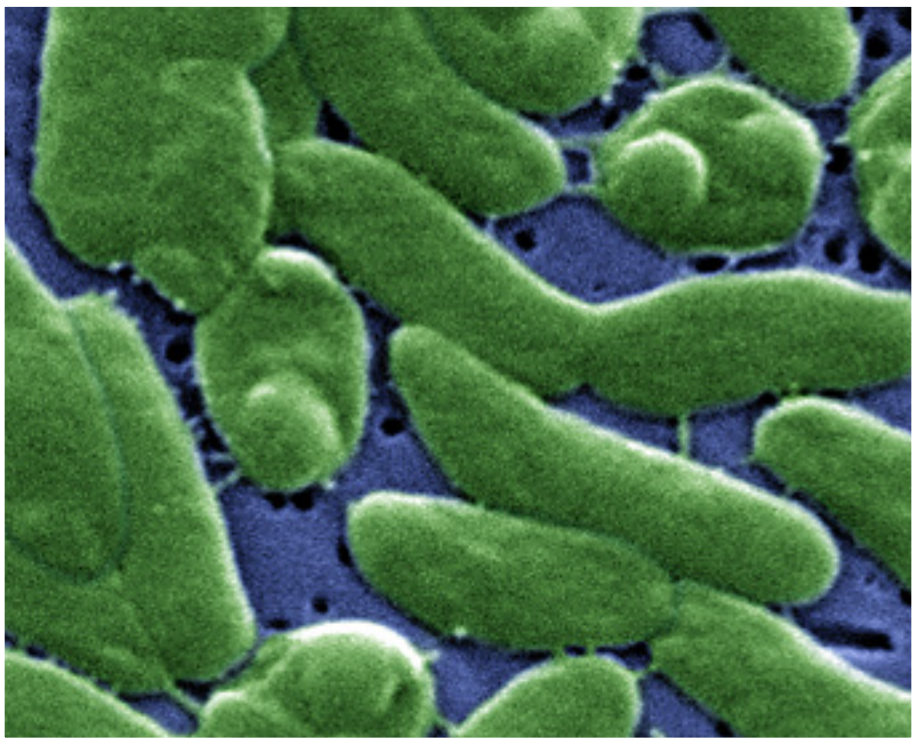
Molecular typing of environmental and clinical strains of Vibrio vulnificus *isolated in the northeastern USA*

JOURNAL

PLoS One

SIGNIFICANCE

- *Vibrio vulnificus* is ubiquitous but not always pathogenic
- DNA sequence analysis suggests that northern strains are closely related to established pathogens provided by the Centers for Disease Control
- Careful handling of harvested oysters (ice, chilling) could prevent disease outbreaks should instances of pathogenic *Vibrio vulnificus* bacterium occur in these waters.



Vibrio vulnificus

SUMMARY

Vibrio vulnificus is a ubiquitous marine bacterium that is responsible for infections and some seafood-related illnesses and deaths in the United States, mainly in individuals with compromised health status in the Gulf of Mexico region. Most phylogenetic studies focus on *V. vulnificus* strains isolated in the southern United States, but almost no genetic data are available on northeastern bacterial isolates of clinical or environmental origin. Our goal in this study was to examine the genetic diversity of environmental strains isolated from commercially-produced oysters and of clinical strains in Northeastern United States. We conducted analyses of a total of eighty-three strains of *Vibrio vulnificus*, including 18 clinical strains known to be pathogernic. A polyphasic, molecular-typing approach was carried out, based upon established biotypes, vcg, CPS, 16SrRNA types and three other genes possibly associated with virulence (arylsulfatase A, *mtlABC*, and *nanA*). An established Multi Locus Sequence Typing (MLST) method was also performed. Phylogenetic analyses of these markers and MLST results produced similar patterns of clustering of strains into two main lineages (we categorized as 'LI' and 'LII'), with clinical and environmental strains clustering together in both lineages. Lineage LII was comprised primarily but not entirely of clinical bacterial isolates. Putative virulence markers were present in both clinical and environmental strains. These results suggest that some northeastern environmental strains of *V. vulnificus* are phylogenetically close to clinical strains and probably are capable of virulence. Further studies are necessary to assess the risk of human illness from consuming raw oysters harvested in the northeastern US.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

HIGHLIGHTED ARTICLE

AUTHORS

D. A. Boughton and A. S. Pike **(NMFS/SWFSC)**

PUBLICATION DATE

Expected: December 2013

TITLE

Floodplain rehabilitation as a hedge against hydro-climatic uncertainty in a migration corridor of threatened steelhead

JOURNAL

Conservation Biology

SIGNIFICANCE

- The paper identifies a general strategy for ecosystem restoration (floodplain rehabilitation) that supports recovery of ESA-listed salmonids and is robust to uncertainty about future climate change.
- Fewer storms appeared to pose a bigger threat to migrating steelhead than warmer or smaller storms.

Steelhead trout

SUMMARY

A strategy for recovering endangered species during climate change is to restore ecosystem processes that moderate effects of climate shifts. In mid-latitudes, storm patterns may shift their intensity, duration, and frequency. These shifts threaten flooding in human communities and reduce migration windows (conditions suitable for migration after a storm) for fish. Rehabilitation of historic floodplains can in principle reduce these threats via transient storage of storm water, but no one has quantified the benefit of floodplain rehabilitation for migrating fish, a widespread biota with conservation and economic value. We used simple models to quantify migration opportunity for a threatened migratory fish, steelhead (*Oncorhynchus mykiss*), in an episodic rain-fed river system, the Pajaro River in central California. We combined flow models, bioenergetic models, and existing climate projections to estimate the sensitivity of migration windows to altered storm patterns under alternate scenarios of floodplain rehabilitation. Generally, migration opportunities were insensitive to warming, weakly sensitive to duration or intensity of storms, and proportionately sensitive to frequency of storms. The rehabilitation strategy expanded migration windows by 16-28% regardless of climate outcomes. Warmer conditions raised the energy cost of migrating, but not enough to matter biologically. Novel findings were that fewer storms appeared to pose a bigger threat to migrating steelhead than warmer or smaller storms and that floodplain rehabilitation lessened the risk from fewer or smaller storms across all plausible hydroclimatic outcomes. It follows that statistical downscaling methods may mis-characterize risk, depending on how they resolve overall precipitation shifts into changes of storm frequency as opposed to storm size. Moreover, anticipating effects of climate shifts that are irreducibly uncertain (here, rainfall) may be more important than anticipating effects of relatively predictable changes such as warming. This highlights a need to credibly identify strategies of ecosystem rehabilitation that are robust to uncertainty.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

HIGHLIGHTED ARTICLE

AUTHORS

Y. Swimmer (NMFS/PIFSC) C. Empey Campora, L. McNaughton, M. Musyl, and M. Parga.

PUBLICATION DATE

Expected: October - November 2013

TITLE

Post-release mortality estimates of loggerhead sea turtles (Caretta caretta) *caught in pelagic longline fisheries based on archived satellite data and hooking location*

JOURNAL

Aquatic Conservation: Marine and Freshwater Ecosystems

SIGNIFICANCE

- In this study, the likelihood of sea turtle mortality as a result of interactions with longline fishing gear was estimated based on satellite telemetry data as well as anatomical hooking locations.
- Managers can help reduce post-release mortality by implementing regional observer programs and by requiring that vessels are equipped with safe-handling gear like dip nets, line cutters, and de-hooking tools and captains and crew are trained in their use.
- Uncertainty in estimates of post-release mortality can be reduced by increased sample size of satellite-tagged turtles, improved tag reliability and incorporation of other covariates like measures of physiological stress.

Hooked Loggerheads

SUMMARY

There are few reliable estimates of post-release mortality for sea turtle species because of the many challenges and costs associated with tracking animals released at sea. In this study, the likelihood of sea turtle mortality as a result of interactions with longline fishing gear was estimated based on satellite telemetry data, such as the number of days an animal was successfully tracked, or days at liberty (DAL) and dive depth data, as well as anatomical hooking locations. Pop-up satellite archival tags were deployed on 29 loggerhead sea turtles (*Caretta caretta*) caught by the North Pacific U.S.-based pelagic longline fishery operating from California and Hawaii between 2002 and 2006. Loggerhead turtles were termed by observers as shallow-hooked (55%) if the animal was entangled in the line or the hook was in the flipper, jaw or mouth and could be removed, or deep-hooked (45%) if the hook was ingested and could not be removed. The vertical movements of turtles were used to infer potential mortalities. Of the 25 tags that reported data, the DAL ranged from 3 to 243 days (mean =68 days). The observed DAL was shorter (by nearly 50%) for shallow-hooked (mean=48 days, range: 3 to 127) compared to deep-hooked turtles (mean=94 days, range: 5 to 243), but this difference was not statistically significant (P =0.0658). Although aspects of these analyses may be considered speculative, these data provide empirical evidence to indicate that deep-hooking is not linked to shorter DAL. DAL, anatomical hooking location, and gear removal were evaluated with inferences about the extent of injuries and rates of infection to estimate an overall post-release mortality rate of 28% (95% bootstrap CI: 16–52%) for loggerhead turtles caught by longline gear in the North Pacific. This range of estimates is consistent with those used to shape some U.S. fisheries management plans, suggesting that conservation goals are being achieved at the expected level and ideally striking a balance between the interests of industry and those of protected species.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

HIGHLIGHTED ARTICLE

AUTHORS

W. C. Long (NMFS/AKFSC), R. D. Seitz, B. J. Brylawski, and R. N. Lipcius

PUBLICATION DATE

Expected: Early 2014

TITLE

Individual, population, and ecosystem effects of hypoxia on a dominant benthic bivalve in Chesapeake Bay

JOURNAL

Ecological Monographs

SIGNIFICANCE

- Hypoxia in Chesapeake Bay has negative effects on the *Macoma balthica* population.
- Hypoxia can also affect trophic dynamics and community productivity.
- The effect of hypoxia are dependent on the severity and the temporal and spatial extent of hypoxia.

Chesapeake Bay's dead zone

SUMMARY

Hypoxia is an environmental stressor that affects abundance, biomass, diversity, and ecosystem function of benthic assemblages worldwide, yet its collective impact at individual, population, and ecosystem levels has rarely been investigated. We examined the effects of hypoxia on the biomass-dominant clam, *Macoma balthica*, in the York and Rappahannock Rivers (Chesapeake Bay, USA). We (i) surveyed the *M. balthica* populations in both rivers in 2003 and 2004, (ii) determined the effects of low DO on *M. balthica* fecundity in a laboratory experiment, and (iii) employed a predator-exclusion field experiment to establish the effects of hypoxia and prey density on predation upon *M. balthica*. The resultant data were used to parameterize a matrix model, which was analyzed to define potential effects of hypoxia at the population level. In both rivers, hypoxia decreased individual clam growth and caused local extinction of populations. Hypoxia reduced egg production of *M. balthica* by 40% and increased protein investment per egg. In the predator-exclusion field experiment, hypoxia magnified predation rates three-fold and altered the functional response of predators to *M. balthica* from a stabilizing type III functional response to a destabilizing type II functional response. In a density-independent matrix model, hypoxia resulted in coupled source-sink metapopulation dynamics, with hypoxic areas acting as black-hole sinks. Increases in the spatial and temporal extent of hypoxia caused the populations to decline toward extinction. In a second model that incorporated density-dependence, under mild hypoxic conditions trophic transfer from *M. balthica* to predators increased, but at increased spatial or temporal extent of hypoxia trophic transfer decreased. The major decline in trophic transfer to predators under severe hypoxia resulted from diversion of *M. balthica* biomass into the microbial loop. Our model predicted that there are multiple stable states for *M. balthica* populations (high and very low densities), such that the saddle point (threshold at which the population switches from one state to the other) increased and resilience decreased with the spatial extent of hypoxia. We underscore how effects of a stressor at the individual level can combine to have substantial population and ecosystem-level effects.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

HIGHLIGHTED ARTICLE

AUTHORS

M. L. Pinsky, B. Worm, **M. J. Fogarty (NMFS/NEFSC)**, J. L. Sarmiento, and S. A. Levin

PUBLICATION DATE

Acceptance date: 12 August 2013

TITLE

Marine taxa track local climate velocities

JOURNAL

Science

SIGNIFICANCE

- Significant shifts in marine fish population distribution off North America in response to climate velocity are demonstrated.
- Distribution shifts may require re-evaluation of stock boundaries, recovery and rebuilding times, and possible changes in biological reference points used for fishery management.

SUMMARY

Organisms are expected to adapt or move in response to climate change, but observed distribution shifts span a wide range of directions and rates. Explanations often emphasize biological distinctions among species, but general mechanisms have been elusive. Here we test an alternative hypothesis: that differences in climate velocity – the rate and direction that climate shifts across the landscape – can explain observed species shifts. We compiled a database of coastal surveys around North America from 1968-2011 sampling 128 million individuals across 360 marine taxa. Climate velocity explained the magnitude and direction of shifts in latitude and depth much more effectively than species characteristics. Our results demonstrate that marine species shift at different rates and directions because they closely track the complex mosaic of local climate velocities.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

HIGHLIGHTED ARTICLE

AUTHORS

E. Garland (NMFS/AKFSC), J. Gedamke (NMFS/OST), M. L. Rekdahl, M. J. Noad, C. Garrigue, and N. Gales

PUBLICATION DATE

Acceptance date: 24 September 2013

TITLE

Humpback whale song on the Southern Ocean feeding grounds: implications for cultural transmission

JOURNAL

PLOS One

SIGNIFICANCE

- This is the first example of humpback whale feeding ground song from this region of the Antarctic.
- Demonstrates song behavior on Antarctic feeding grounds where animals from different populations mix (a behavior typically seen on breeding grounds where populations are separated).
- Provides a potential explanation for shared song characteristics between stocks, and a pathway through which this might occur.

SUMMARY

Male humpback whales produce a long, complex, and stereotyped song on low-latitude breeding grounds; they also sing while migrating to and from these locations, and occasionally in high-latitude summer feeding areas. All males in a population sing the current version of the constantly evolving display and, within an ocean basin, populations sing similar songs; however, this sharing can be complex. In the western and central South Pacific region there is repeated cultural transmission of song types from eastern Australia to other populations eastward. Song sharing is hypothesized to occur through several possible mechanisms. Here, we present the first example of feeding ground song from the Southern Ocean Antarctic Area V and compare it to song from the two closest breeding populations. The early 2010 song contained at least four distinct themes; these matched four themes from the eastern Australian 2009 song, and the same four themes from the New Caledonian 2010 song recorded later in the year. This provides evidence for at least one of the hypothesized mechanisms of song transmission between these two populations, singing while on shared summer feeding grounds. In addition, the feeding grounds may provide a point of acoustic contact to allow the rapid horizontal cultural transmission of song within the western and central South Pacific region and the wider Southern Ocean.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

HIGHLIGHTED ARTICLE

AUTHORS

J. Mourier, N. Buray, **J. K. Schultz (NOAA Fisheries)**, E. Clua, S. Planes

PUBLICATION DATE

Expected: January 2014

TITLE

The genetic network and breeding patterns of a tropical shark population reveal its vulnerability to inbreeding

JOURNAL

PLOS One

SIGNIFICANCE

- As large, apex predators, sharks exist in naturally small population sizes that leave them prone to inbreeding
- These small, inbred populations exhibit reduced resilience and are especially vulnerable to overfishing

SUMMARY

Human pressures have fragmented the range of many top-predators leading to population declines or extinction. Recent years have seen alarming declines in shark populations worldwide, while their resilience remains poorly understood. Studying the ecology of small populations of marine predators is important to better understand their ability to withstand actual anthropogenic and environmental stressors. In the present study, we monitored a small island population of 40 wild, adult sicklefin lemon sharks in Moorea (French Polynesia) over 5 years. We reconstructed the genetic relationships among individuals and determined the species' mating system. This population demonstrates significant inbreeding and signs of inbreeding depression despite connectivity and dispersal among island populations. Dispersal, migration and breeding behaviour appear insufficient to lower the inbreeding risk increased by the small population size, low number of breeders and the fragmented environment characterizing these tropical islands. Our results highlight that the genetic consequences of fishing such fragile populations may weaken their ability to withstand the increasing anthropogenic and environmental pressures, especially in this insular environment.

Tropical shark

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

HIGHLIGHTED ARTICLE

AUTHORS

D. Manzello, I. Enochs, and R. Carlton (OAR/AOML/CIMAS)

PUBLICATION DATE

Publication date: 15 October, 2013

TITLE

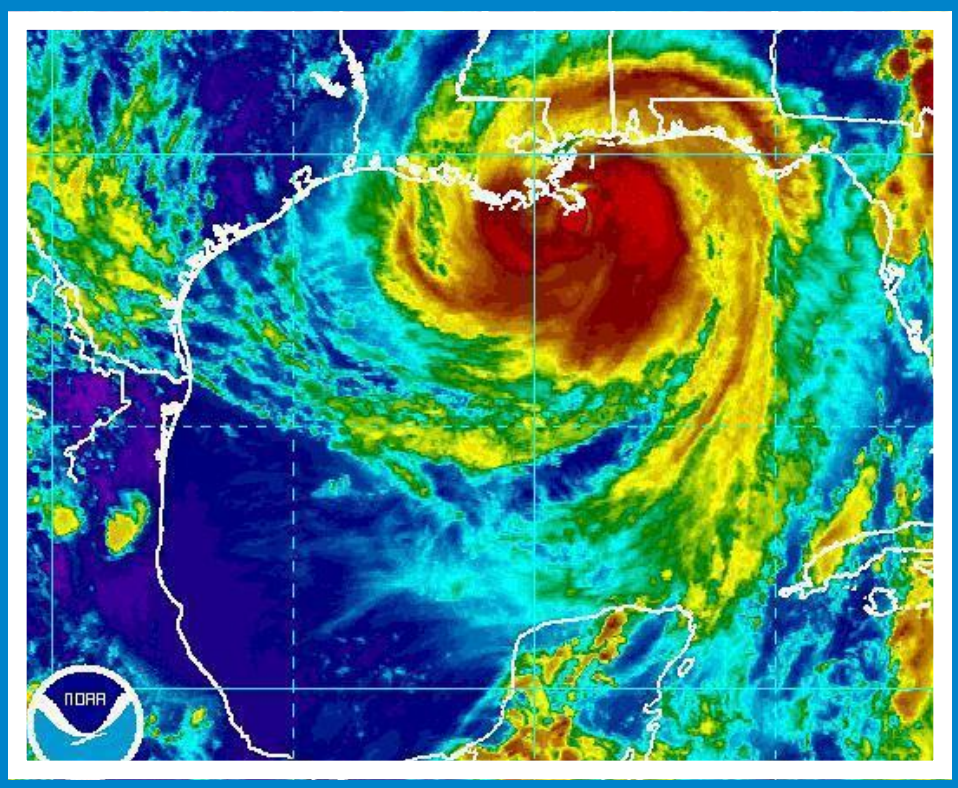
Tropical cyclones cause $CaCO_3$ undersaturation of coral reef seawater in a high-CO_2 world

JOURNAL

Journal of Geophysical Research - Oceans

SIGNIFICANCE

- This novel study identified a previously unknown secondary impact of hurricanes on coral reefs already stressed by the effects of ocean acidification.
- Undersaturation of $CaCO_3$ leads to abiotic dissolution of solid phase minerals, like coral skeletons and reef framework.
- Thus, during and after tropical cyclones in a high-CO_2 world, coral reefs will undergo periods of dissolution, negatively impacting their structural persistence



Hurricane Isaac

SUMMARY

Based on data collected on the Florida Reef Tract during Tropical Storm Isaac in August 2012, the authors determined that CaCO3 undersaturation of coral reef seawater will occur by the end of the century as a result of even modest tropical cyclones when combined with ocean acidification. The expected increase in the strength, frequency, and rainfall of the most severe tropical cyclones with climate change in combination with ocean acidification will negatively impact the structural persistence of coral reefs over this century. Based on current 'business-as-usual' CO2 emissions scenarios, before the end of this century tropical cyclones with high rainfall and runoff can cause periods of undersaturation for the dominant carbonate mineral phases that make up coral reefs at acidification levels. All prior concerns regarding ocean acidification assumed that aragonite undersaturation would not occur on coral reefs within the foreseeable future due to their location within the highly supersaturated tropical oceans.

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HIGHLIGHTED ARTICLE

AUTHORS

R. van Hooidonk, J.A. Maynard, **D. Manzello**, S. Planes.
(OAR AOML/CIMAS)

PUBLICATION DATE

Publication date: 22 October 2013

TITLE

Opposite latitudinal gradients in projected ocean acidification and bleaching impacts on coral reefs

JOURNAL

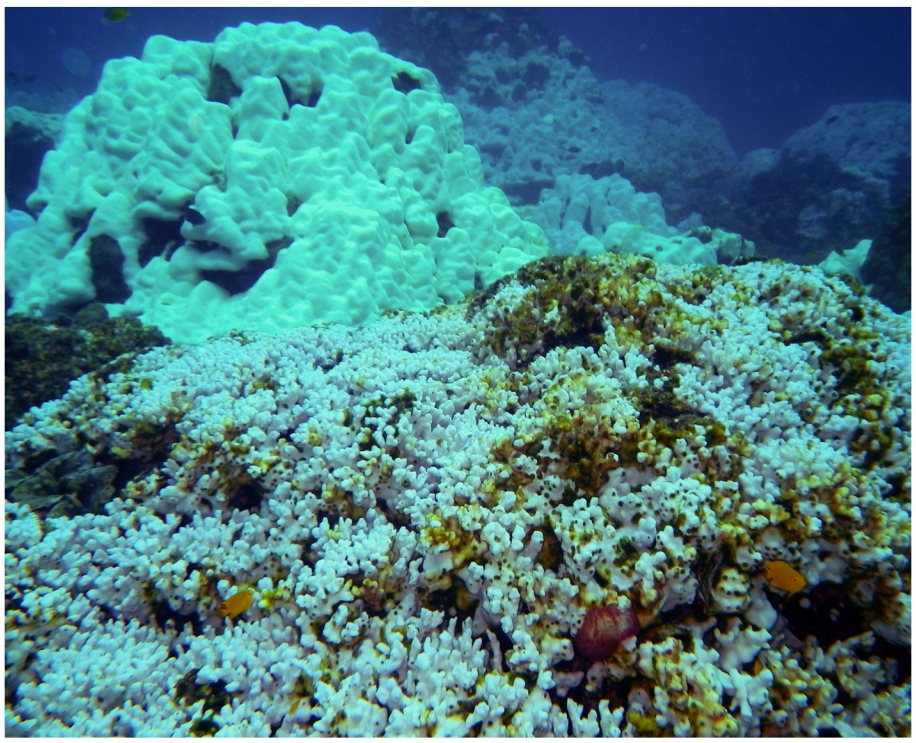
Global Change Biology

SIGNIFICANCE

- The Authors used an ensemble of climate models derived from the Fifth Assessment Report of the Intergovernmental Panel on Climate Change to examine future scenarios posed by the dual threat of ocean acidification and coral bleaching.
- A Google Earth™ will be launched in early November allowing viewers to see the projections of the combined impacts for all coral reef regions at different future dates.
- The study concludes that coral reefs will suffer severe impacts from both ocean acidification and bleaching events in the coming years.

SUMMARY

The opposing latitudinal gradients found for the two threats mean that locations experiencing bleaching stress later are exposed for longer periods to the effects of ocean acidification. By 2055, 90% of all reef locations are projected to experience severe bleaching events on an annual basis. As greenhouse gas emissions are currently tracking above worst-case scenario projections, these results indicate that there are no long-term refugia for coral reefs from both the threat of ocean acidification and global warming.



Bleached coral

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

ADDITIONAL ARTICLE

AUTHORS

W. C. Long and **L. Whitefleet-Smith (NMFS/AKFSC)**

PUBLICATION DATE

Expected: December 2013-January 2014

TITLE

Cannibalism in red king crab: Habitat, ontogeny, and the predator functional response

JOURNAL

Journal of Experimental Marine Biology and Ecology

SIGNIFICANCE

- We determined how habitat and ontogeny changed the red king crab cannibalistic function response
- Small predators had a type II functional response in sand and a type I in macroalgae mimic; large predators had a type I functional response in sand and a type III in macroalgae mimic
- Habitat and predator size interact to determine the functional response in this system

SUMMARY

The red king crab, *Paralithodes camtschaticus*, stock in the Gulf of Alaska crashed in the early 1980s. Stock enhancement has been proposed as a potential means of restoration. As predation is likely the most important source of mortality for juvenile crabs, understanding the predator-prey dynamics of the system is an essential consideration when designing release strategies to maximize survival. In this study, we determined the predator functional response of year-1 and year-2 juvenile red king crabs feeding on newly settled year-0 crabs in sand habitat and macroalgae mimic habitat. The predator functional response describes how the predation rate varies with prey density and can be linear and partially destabilizing (Type I), inversely density-dependent and destabilizing (Type II), or density-dependent and stabilizing (Type III). Year-1 predators exhibited a Type II functional response in sand and Type I in macroalgae mimic. Year-2 predators exhibited a Type I functional response in sand and Type III in macroalgae mimic. Predation rates were generally lower for year-1 predators and lower in macroalgae mimic habitats. Year-2 crabs were highly efficient predators in sand, but the reduction in predation with the addition of structure was much greater than for year-1 crabs, indicating that the smaller predators are less inhibited than larger crabs by structured habitat when foraging. Prey crabs in the macroalgae mimic habitat exhibit no net movement from sand onto macroalgae in response to predation pressure. Prey use of macroalgae mimic was highest at intermediate prey densities. This work shows that the functional response can vary both quantitatively and qualitatively, with habitat type and predator size indicating ontogenetic changes in foraging efficiency in different habitats. Further, it suggests that stock-enhancement releases should be at low densities in complex habitat, and possibly should occur every other year to minimize loss to predation.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

ADDITIONAL ARTICLE

AUTHORS

M. S. Mohr and **W. H. Satterthwaite (NMFS/SWFSC):**

PUBLICATION DATE

Accepted: August 5, 2013

TITLE

Coded wire tag expansion factors for chinook salmon carcass surveys in California: Properly estimating numbers and proportions of hatchery-origin fish

JOURNAL

San Franscisco Estuary and Watershed Science

SIGNIFICANCE

- Current methods may underestimate the hatchery-origin component of Central Valley escapement.
- Sampling protocols should clearly document and separately track fresh versus non-fresh carcasses, either collecting only definitively adipose fin-clipped (adc) fish, or with care taken to track non-fresh carcasses that are definitively adc versus those that are possibly adc.

SUMMARY

Recovery of fish with adipose fin clips (adc) and coded wire tags (cwt) in escapement surveys allows calculation of expansion factors used in estimation of the total number of fish from each adc,cwt release group, allowing escapement to be resolved by age and stock of origin. Expanded recoveries are used to derive important estimates such as the total number and proportion of hatchery-origin fish present. The standard estimation scheme assumes accurate visual classification of adc status, which can be problematic for decomposing carcasses. Failure to account for this potential misclassification can lead to significant estimation bias. Sample expansion factors used for the California Central Valley Chinook salmon 2010 carcass surveys were reviewed in this context. For Upper Sacramento fall- and late fall-run carcass surveys, there were substantial differences in the estimated proportions of adc,cwt fish for fresh and non-fresh carcasses, likely due to the under-recognition of adc fish in non-fresh carcasses. The resulting estimated proportions of hatchery-origin fish in the Upper Sacramento fall- and late fall-run were 2.33–2.89 times higher if only fresh carcasses are considered. Similar biases can be avoided by consideration of only fresh carcasses for which determination of adc status is relatively straightforward; however, restricting the analysis entirely to fresh carcasses may limit precision due to reduced sample size, and is only possible if protocols for sampling and recording data are such that the sample data and results for fresh carcasses can be extracted. We thus recommend sampling protocols that are clearly documented and separately track fresh versus non-fresh carcasses, either collecting only definitively adc fish or with care taken to track non-fresh carcasses that are definitively adc versus those that are possibly adc. This would allow judicious use of non-fresh carcass data when sample sizes are otherwise inadequate.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

ADDITIONAL ARTICLE

AUTHORS

B. T. Kress, **J. V. Rodriguez (NESDIS/NGDC)**, and J. E. Mazur, M. Engel

PUBLICATION DATE

Accepted: August 17, 2013

TITLE

Modeling solar proton access to geostationary spacecraft with geomagnetic cutoff

JOURNAL

Advances in Space Research

SIGNIFICANCE

- This is the first paper to model observed differences between eastward and westward GOES observations of solar protons.
- The westward observations are currently used for operational Solar Radiation Storm alerts by SWPC; this research is an important step in the direction of understanding whether the eastward observations could be developed into an operational product.

SUMMARY

Solar energetic particle (SEP) cutoffs at geosynchronous are sensitive to moderate geomagnetic activity and undergo daily variations due to the day-night asymmetry of the magnetosphere. The sensitivity of geomagnetic cutoffs to the dynamics of the outer magnetosphere poses difficulties for modeling SEP access to geostationary spacecraft. At geosynchronous orbit, cutoff rigidity also has a large directional dependence, with the highest cutoff rigidity corresponding to ions arriving from magnetic east and lowest cutoff rigidity corresponding to ions incident from the west. Consequently, during geomagnetically quiet periods, the SEP flux observed by an eastward facing particle detector is significantly lower than observed by a westward facing particle detector. During geomagnetically disturbed periods the cutoff is suppressed allowing SEPs access well inside of geosynchronous, so that the east-west SEP flux ratio approaches unity. Variations in the east-west SEP flux ratio observed by GOES Energetic Particle Sensors (EPS) have recently been reported by Rodriguez et al. [2010]. In NOAA's operational processing of EPS count rates into differential fluxes, the differential flux is treated as isotropic and flat over the energy width of the channel. To compare modeled SEP flux with GOES EPS observations, the anisotropy of the flux over the EPS energy range and field of view must be taken into account. A technique for making direct comparisons between GOES EPS observations and SEP flux modeled using numerically computed geomagnetic cutoffs is presented. Initial results from a comparison between modeled and observed flux during the 6-11 December 2006 SEP event are also presented. The modeled cutoffs reproduce the observed flux variations well but are in general too high.

ADDITIONAL ARTICLE

AUTHORS

W. H. Satterthwaite (NMFS/SWFSC), M. S. Mohr (NMFS/SWFSC), M. R. O'Farrell (NMFS/SWFSC), E. C. Anderson (NMFS/SWFSC), M. A. Banks, S. J. Bates, M. R. Bellinger, L. A. Borgerson, **E. D. Crandall (NMFS/SWFSC), J. C. Garza (NMFS/SWFSC),** B. J. Kormos, **P. W. Lawson (NMFS/NWFSC),** and M. L. Palmer-Zwahlen

PUBLICATION DATE

Accepted: August 14, 2013

TITLE

Use of genetic stock identification data for comparison of the ocean spatial distribution, size-at-age, and fishery exposure of an untagged stock and its indicator: California Coastal versus Klamath River Chinook

JOURNAL

Transactions of the American Fisheries Society

SIGNIFICANCE

- California Coastal Chinook (untagged, threatened stock) and Klamath River Chinook (tagged, indicator stock) may be more similar in their exposure to the fishery early in the year than late in the year.
- Later in the year California Coastal Chinook may have higher interactions with fisheries around Fort Bragg and Klamath Chinook may have higher interactions with fisheries around Eureka.
- Genetic stock identification enabled this evaluation of the suitability of a tagged indicator stock for an untagged stock of conservation concern.

SUMMARY

Managing weak stocks in mixed-stock fisheries often relies on proxies derived from data-rich indicator stocks, although there have been limited tests of the appropriateness of such proxies. For example, full cohort reconstruction of tagged Klamath River fall run Chinook salmon *Oncorhynchus tshawytscha* of northern California, USA, enables the use of detailed models to inform management. Information gained from this stock is also used in the management of the untagged, threatened California Coastal Chinook (CCC) salmon stock, where it is assumed that a cap on Klamath harvest rates effectively constrains impacts on CCC to acceptable levels. To evaluate use of this proxy, we used a novel approach based on genetic stock identification (GSI) data to compare the two stocks' size-at-age and ocean distribution (as inferred from spatial variation in CPUE), two key factors influencing fishery exposure. We developed broadly-applicable methods to account for both sampling and genetic assignment uncertainty in estimating total stock-specific catch from GSI data, and propagated this uncertainty into models quantifying variation in CPUE across space and time. We found that, in 2010, the stocks were similar in size-at-age early in the year (age-3 and age-4), but CCC fish were larger later in the year. The stocks appeared similarly distributed early in the year (2010), but more concentrated near their respective source rivers later in the year (2010 and 2011). If these results are representative, relative fishery impacts on the two stocks might scale similarly early in the year but management changes later in the year could have differing impacts on the two stocks. This novel modeling approach is suited to evaluating the concordance between other data-limited stocks and their proxies, and can be broadly applied to estimate stock-specific harvest, and the uncertainty therein, using GSI in other systems.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

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PUBLICATION DATE

Accepted: August 28, 2013

TITLE

The Distributed Model Intercomparison Project - Phase 2: experiment design and summary results of the Western Basin experiments

JOURNAL

Journal of Hydrology

SIGNIFICANCE

- Spatially distributed hydrologic models are realizing gains over the spatially lumped models currently used for operational river forecasting.
- National Weather Service field offices should consider the implementation of distributed models alongside the current lumped models.

SUMMARY

The National Weather Service's (NWS) Office of Hydrologic Development (OHD) conducted two phases of the Distributed Model Intercomparison Project (DMIP) as cost-effective studies to guide the transition to spatially distributed hydrologic modeling for operational forecasting at NWS River Forecast Centers (RFCs). Phase 2 of the Distributed Model Intercomparison Project (DMIP 2) was formulated primarily as a mechanism to help guide the U.S. NWS as it expands its use of spatially distributed watershed models for operational river, flash flood, and water resources forecasting. The overall purpose of DMIP 2 was to test many distributed models forced by high quality operational data with a view towards meeting NWS operational forecasting needs. At the same time, DMIP 2 was formulated as an experiment that could be leveraged by the broader scientific community as a platform for the testing, evaluation, and improvement of distributed models. This paper presents the overview and results of the DMIP 2 experiments conducted for two Sierra Nevada basins. Results indicate that in the two study basins, no single model performed best in all cases. In addition, no distributed model was able to consistently outperform the lumped model benchmark. However, one or more distributed models were able to outperform the lumped model benchmark in many of the analyses. Taken together, calibrated distributed models provided specific improvements over the lumped benchmark in 24% of the model-basin pairs for peak flow, 12% of the model-basin pairs for event runoff volume, and 41% of the model-basin pairs for peak timing. Model calibration improved the performance statistics of nearly all models (lumped and distributed). Analysis of several precipitation/runoff events indicates that distributed models may more accurately model the dynamics of the rain/snow line (and resulting hydrologic conditions) compared to the lumped benchmark model. Although the performance of distributed models was mixed compared to the lumped benchmark, all calibrated models performed well in the Sierra Nevada basins compared to results in the DMIP 2 Oklahoma basins in terms of run period correlation and %Bias, and event-averaged peak and runoff error. This finding is noteworthy considering that these Sierra Nevada basins have complications such as orographically-enhanced precipitation, snow accumulation and melt, rain on snow events, and highly variable topography. Looking at these findings and those from the previous DMIP experiments, it is clear that at this point in their evolution, distributed models have the potential to provide valuable information on specific flood events that could complement lumped model simulations.

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ADDITIONAL ARTICLE

AUTHORS

L. J. Natanson (NMFS/NEFSC), B. J. Gervelis (NMFS/NEFSC), M. V. Winton (NMFS/NEFSC), L. L. Hamady, S. J. B. Gulak, and **J. K. Carlson (NMFS/SEFSC)**

PUBLICATION DATE

Accepted: September 5, 2013

TITLE

Validated age and growth estimates for Carcharhinus obscurus *in the northwestern Atlantic Ocean, with pre- and post management growth comparisons*

JOURNAL

Environmental Biology of Fishes

SIGNIFICANCE

- Revised methods reported provide improved estimates of maturity, of ages in older fish

SUMMARY

Age and growth estimates for the dusky shark, *Carcharhinus obscurus*, were derived from vertebral centra collected in the northwestern Atlantic Ocean. Sample collection spanned the years prior to and following the implementation of management measures (1963 - 2010). Growth was compared pre- and post-population depletion and pre- and post-management to investigate the possibility of density-mediated shifts in age and growth parameters over time. There was no evidence of difference between periods for either sex. Additionally, bomb radiocarbon dating was used to determine the periodicity of band pair formation. Results support the traditional interpretation of annual band pairs up to approximately 11 years of age. After this time, vertebral counts considerably underestimate true age. Maximum validated ages were estimated to be between 38 and 42 years of age (an increase of 15 to 19 years over the band count estimates), confirming longevity to at least 42 years of age. Growth curves estimated using only validated data were compared to those generated using band pair counts. Using the validated data, there was no evidence of difference in growth between the sexes; the logistic model provided the best fit to these data. Logistic growth parameters derived from validated vertebral length-at-age data were *L*¥ = 261.5 cm FL, *Lo* = 85.5 cm, *to* = 4.89 yr and *g* = 0.15 yr-1 for the sexes combined. Revised estimates of age at maturity were 17.4 years for males and 17.6 years for females.

ADDITIONAL ARTICLE

AUTHORS

J.E. Serafy, P. Gillette, **M.W. Miller**, D. Lirman, and T.R. Capo **(NMFS/SEFSC)**

PUBLICATION DATE

Accepted: September 9, 2013

TITLE

Incorporating herbivorous sea urchins in ramet culture of staghorn coral, Acropora cervicornis

JOURNAL

Endangered Species Research

SIGNIFICANCE

- Ramets of *Acropora cervicornis*, a threatened scleractinian coral species, were cultured in tanks in the presence of laboratory-reared, juvenile, variegated sea urchins and in the presence of algal turfs that were scraped from the tile substrate on a weekly basis.
- Over the course of the study, these corals grew better in the scraped and urchin-containing treatments.
- This study suggests there may be benefits to removing certain algal turf competitors, and to including a seagrass-associated urchin in coral culture operations.

SUMMARY

Since the 2006 listing of the staghorn coral, *Acropora cervicornis*, as threatened under the U.S. Endangered Species Act, interest has increased in its culture for laboratory studies, restoration and ex-situ conservation efforts. A pervasive problem in coral culture is substrate overgrowth by algae and other spatial competitors. We conducted a laboratory study to examine the utility of introducing herbivores, juvenile variegated sea urchins (*Lytechinus variegatus*), to tanks containing small (< 1 cm2) *A. cervicornis* ramets. Growth of coral ramets on ceramic tile substrates was monitored in recirculating seawater tanks over 210 days and measured in terms of area change under three treatment conditions: (1) presence of laboratory-reared, juvenile, variegated sea urchins; (2) weekly scraping of algal turfs from the tile substrate by means of a razor blade; and (3) absence of both urchins and manual turf removal (i.e., control). Over the course of the study, coral area decreased in the control treatment, but increased in the scraped and urchin-containing treatments. All three treatments differed significantly from one another, with the highest growth rate (3.1 mm2 d-1) associated with manual removal of algal competitors, followed by the urchin (1.9 mm2 d-1) and control treatments (-0.8 mm2 d-1). Given the relative ease of *L. variegatus* culture, the incorporation of variegated sea urchins in the coral ramet production process appears to provide at least a partial substitute for manual algal removal. Although coral growth in the pesence of urchins was slower than with manual removal, human labor costs associated with the latter may outweigh any production rate improvements in large-scale operations.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

ADDITIONAL ARTICLE

AUTHORS

L. Avens (NMFS/SEFSC), **L. R. Goshe (NMFS/SEFSC)**, M. Pajuelo, K. A. Bjorndal, B. D. MacDonald, G. E. Lemons, A. B. Bolten, and J. A. **Seminoff (NMFS/SWFSC)**

PUBLICATION DATE

Expected: December 2013

TITLE

Complementary skeletochronology and stable isotope analyses offer new insight into juvenile loggerhead sea turtle oceanic stage duration and growth dynamics

JOURNAL

Marine Ecology Progress Series

SIGNIFICANCE

- Knowledge of the duration of different life stages are integral to the development of the population models that inform species management.
- Authors analyzed banding patterns within bones (skeletochronology) and stable isotopes to refine estimates of the duration of time juvenile North Atlantic loggerhead sea turtles spend in oceanic habitat prior to recruiting to neritic habitat.

SUMMARY

Stage durations are integral to wildlife population models that can inform management, as they influence age at maturation and stage-specific survival rates. To refine oceanic stage duration estimates for western North Atlantic loggerhead sea turtles (*Caretta caretta*) skeletochronological analysis was conducted on humeri collected in the Azores Islands and along the US Atlantic coast. Complementary skeletal growth increment-specific stable isotope analysis was also performed for a sub-set of the humeri, to identify the skeletal growth mark associated with the shift from oceanic to neritic habitat through δ15N and presence of turtles in inshore waters. Although the transitional growth mark in this sub-sample corresponded to a range of sizes similar to those described in prior studies, mean size at recruitment (55.3 cm straightline carapace length (SCL)) for these turtles was larger than previously estimated. Similarly, while the range of ages at recruitment corresponding both with the transitional growth mark and those yielded by fitting smoothing splines to SCL-at-age data overlapped almost fully with earlier estimates, the mean age estimate (12.4 yr) differed from previous studies. Validated back-calculation of somatic growth rates from skeletal growth marks yielded means and ranges that encompassed those of previous loggerhead growth studies in this geographic area. Generalized additive models and generalized additive mixed models used to assess the potential influence of discrete and continuous covariates on back-calculated growth rates spanning 1984 to 2009 indicated significant effects of age, SCL, calendar year, and δ15N, but none for sex or location.

ADDITIONAL ARTICLE

AUTHORS

R. Baker, B. Fry, **L. P. Rozas**, and **T. J. Minello (NMFS/SEFSC)**

PUBLICATION DATE

Expected: November 2013

TITLE

Hydrodynamic regulation of salt marsh contributions to aquatic food webs

JOURNAL

Marine Ecology Progress Series

SIGNIFICANCE

- Vegetated salt marsh habitats are widely considered critical for supporting many species of nekton.
- This study documents the value of marsh flooding in the trophic link between marsh vegetation and nekton.

SUMMARY

Vegetated salt marsh habitats are widely considered critical for supporting many species of nekton, yet direct evidence of the processes controlling marsh habitat use for most species remains elusive. We related salt marsh flooding patterns and nekton trophic dynamics among 14 sites spanning 2500 km across the northern Gulf of Mexico (GoM) and southern Atlantic coasts of the USA. Functional access for nekton to marsh vegetation (edge flooded to ≥5 cm depth) ranged from <40% of the time at some central GoM sites to >90% access in the western GoM and Pamlico Sound. Food web mixing models based on stable isotope analysis show that the importance of *Spartina* trophic support for common nekton may be regulated by the duration of marsh surface flooding. In particular, the potential contribution of *Spartina* production was positively related to indices of marsh surface flooding for brown shrimp *Farfantepenaeus aztecus*, white shrimp *Litopenaeus setiferus*, small (<60 mm carapace width) blue crabs *Callinectes sapidus*, grass shrimp *Palaemonetes pugio*, and killifish *Fundulus heteroclitus/grandis*. The value of *Spartina* salt marsh production to several common species of nekton appears to depend, at least in part, on direct access to the vegetated marsh surface, which is regulated by hydrodynamics. Hence, the substantial geographic and temporal variability in marsh flooding regulates the functional roles and value of these tidal wetlands for aquatic organisms.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

ADDITIONAL ARTICLE

AUTHORS

C. K. Ng, **P. H. Dutton**, S. K. Chan, K. Cheung , J. Qiu, and Y. Sun **(NMFS/SWFSC)**

PUBLICATION DATE

Expected: November 2013

TITLE

Characterization and conservation concern of green turtles (Chelonia mydas) *nesting in Hong Kong, China*

JOURNAL

Pacific Science

SIGNIFICANCE

- This study describes nesting population census for one of the last remaining nesting sites in South China and concludes this is a remnant of an already depleted population.
- Genetic analysis demonstrates that this population is demographically isolated and contains unique diversity.
- Loss of these populations would result in loss of genetic diversity for this species in the region.

SUMMARY

Hong Kong holds one of the last remaining nesting populations of endangered green turtles (*Chelonia mydas*) in southern China. Bearing in mind that nesting individuals are vital to sustain populations, this study characterizes and reports essential baseline information about the nesting pattern, post-nesting movement, and genetic composition of green turtles nesting in Hong Kong in order to provide a basis for effective scientific-based management of this migratory species. While the number of nesters observed in Hong Kong was relatively low compared with other rookeries in southern China, the nesting pattern in terms of clutch size and inter-nesting interval was comparable to that of other nearby rookeries. These nesters are likely a remnant of the small population previously depleted as a result of the historical harvesting of eggs in Hong Kong. Based on the available DNA sequences and literature, we identified two mtDNA haplotypes: CmP18 which is also common in the rookery in Taiwan and a novel endemic haplotype (CmP116), and found significant differentiation based on haplotype frequencies between Hong Kong and Lanyu, Taiwan (F_{ST}=0.90, $p<0.001$), indicating that these nesting populations are demographically isolated. Loss of these populations would therefore result in loss of genetic diversity for this species in the region. Satellite tracking of the local nesters revealed post-nesting movement to foraging habitats in Vietnam and Hainan Island. International cooperation and consistent dedicated research are of paramount importance to the conservation and recovery of the green turtle assemblages in the region.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

ADDITIONAL ARTICLE

AUTHORS

O. P. Prat and **B. R. Nelson (NESDIS/NCDC)**

PUBLICATION DATE

Acceptance: September 12, 2013

TITLE

Mapping the world's tropical cyclone rainfall contribution over land using the TRMM Multi-satellite Precipitation Analysis

JOURNAL

Water Resources Research

SIGNIFICANCE

- This work examines the over-land rainfall contribution originating from tropical cyclones for basins around the world for the period of 1998-2009.
- While previous studies have focused mainly on North America or East Asia, this work investigates the tropical cyclone rainfall contribution on an annual basis for all the main basins around the world.
- A focus on coastal areas (<200 km from the coast) and 50 selected cities around the world provides valuable information relative to coastal area vulnerabilities when it comes to extreme events such as tropical cyclones.

SUMMARY

A study was performed to characterize over land precipitation associated with tropical cyclones (TCs) for basins around the world based upon the International Best Track Archive for Climate Stewardship (IBTrACS). From 1998 to 2009, data from the Tropical Rainfall Measuring Mission (TRMM) Multi-satellite Precipitation Analysis (TMPA) product 3B42, showed that TCs accounted for 5.5%, 7.5%, 6%, 9.5%, and 8.9% of the annual precipitation for impacted over land areas of the Americas, East Asia, South and West Asia, Oceania, and East Africa respectively, and that TC contribution decreased significantly within the first 150-km from the coast. Locally, TCs contributed on average to more than 25% and up to 61% of the annual precipitation budget over very different climatic areas with arid or tropical characteristics. East Asia represented the higher and most constant TC rain (118±19% mm y-1) normalized over the area impacted, while East Africa presented the highest variability (108±60% mm y-1), and the Americas displayed the lowest average TC rain (65±24% mm y-1) despite a higher TC activity. Furthermore, the maximum monthly TC contribution (8-11%) was found later in the TC season and depended on the peak of TC activity, TC rainfall, and the domain transition between dry and wet regimes if any. Finally, because of their importance in terms of rainfall amount, the contribution of TCs was provided for a selection of 50 urban areas experiencing cyclonic activity. Results showed that for particularly intense years, urban areas prone to cyclonic activity received more than half of their annual rainfall from TCs.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

ADDITIONAL ARTICLE

AUTHORS

M. F. Baumgartner, N. S. J. Lysiak, H. C. Esch, **A. N. Zerbini, C. L. Berchok,** and **P. J. Clapham (NMFS/AKFSC)**

PUBLICATION DATE

Published online: 17 September 2013

TITLE

Associations between North Pacific right whales and their zooplanktonic prey in the southeastern Bering Sea

JOURNAL

Marine Ecology Progress Series

SIGNIFICANCE

- The authors documented associations between North Pacific right whales and their copepod prey in the Southeastern Bering Sea.
- An improved understanding of the environmental factors that influence the species' distribution, such as the type and location of preferred prey described in this study, will help managers to better assess the effects of climate change and industrial activities on the population.

SUMMARY

Due to the seriously endangered status of North Pacific right whales, *Eubalaena japonica*, an improved understanding of the environmental factors that influence the species' distribution and occurrence is needed to better assess the effects of climate change and industrial activities on the population. Associations among right whales, zooplankton, and the physical environment were examined in the southeastern Bering Sea during the summers of 2008 and 2009. Sampling with nets, an optical plankton counter, and a video plankton recorder in proximity to whales as well as along cross-isobath surveys indicated that the copepod *Calanus marshallae* is the primary prey of right whales in this region. Acoustic detections of right whales from sonobuoys deployed during the cross-isobath surveys were strongly associated with *C. marshallae* abundance, and peak abundance estimates of *C. marshallae* in 2.5 m depth strata near a tagged right whale ranged as high as 106 copepods m-3. The smaller *Pseudocalanus* spp. was higher in abundance than *C. marshallae* in proximity to right whales, but significantly lower in biomass. High concentrations of *C. marshallae* occurred in both the surface and bottom layers of the highly stratified water column, but there was no evidence of diel vertical migration. Instead, occurrence of *C. marshallae* in the bottom layer was associated with elevated near-bottom light attenuance and chlorophyll fluorescence, suggesting *C. marshallae* may aggregate at depth while feeding on resuspended phytodetritus. Despite the occasional presence of strong horizontal gradients in hydrographic properties, no association was found between *C. marshallae* and either fronts or phytoplankton distribution.

LINK TO PAPER

http://www.int-res.com/abstracts/meps/v490/p267-284/

ADDITIONAL ARTICLE

AUTHORS

C. Ryan, B. McHugh, B. Boyle, E. McGovern, M. Bérubé, P. Lopez-Suárez, C. T. Elfes, D. T. Boyd, **G. M. Ylitalo (NMFS/NWFSC)**, G. R. Van Blaricom, **P. J. Clapham (NMFS/AKFSC)**, J. Robbins, P. J. Palsbøll, I. O'Connor, and S. D. Berrow

PUBLICATION DATE

Accepted: September 10, 2013

TITLE

Levels of persistent organic pollutants in eastern North Atlantic humpback whales

JOURNAL

Endangered Species Research

SIGNIFICANCE

- The authors investigated the blubber lipid concentrations of 14 organochlorine compounds and 10 polychlorinated biphenyls in eastern North Atlantic humpback whales *Megaptera novaeangliae* from Cape Verde and Ireland and compared these to previous samples taken from the Gulf of Maine.
- Differences were found in the POPs between whales that fed at high latitudes vs those that fed at lower latitudes, and those that fed in areas with more agricultural versus industrial pollutants.
- The authors demonstrate potential for POPs as tracers to determine foraging ground provenance for samples collected on breeding grounds in the North Atlantic.

SUMMARY

Blubber lipid concentrations of 14 organochlorine compounds (OCCs) and 10 polychlorinated biphenyls (PCBs) were measured by gas chromatography with electron-capture detection (GC-ECD) in eastern North Atlantic humpback whales *Megaptera novaeangliae* from Cape Verde (n = 20) and Ireland (n = 4). Concentrations were statistically compared to those from 20 samples collected from the Gulf of Maine in the western North Atlantic. Pollutant burdens were compared using males only to circumvent biases associated with reproductive offloading. Lipid-normalized PCB concentrations were below the estimated threshold toxicity value of 17000 ng g-1 for blubber in marine mammals. Dichlorodiphenyltrichloroethane (DDT), PCB and chlordane concentrations were an order of magnitude lower than those previously reported for Gulf of Maine humpback whales, and higher than those reported from the North Pacific Ocean. Higher concentrations of lower-chlorinated PCB congeners (28, 31 and 52), hexachlorocyclohexanes (HCHs) and hexachlorobenzene (HCB) in males in eastern North Atlantic sites is consistent with higher latitude feeding grounds. Lower p,p'-DDE/Σ DDT suggest that whales from the eastern North Atlantic harbour more recent inputs of DDT. Σ DDTs/Σ PCBs was higher for males from Cape Verde (1.69) and Ireland (1.44), indicating proportionately greater sources of agricultural rather than industrial sources of pollutants than for the Gulf of Maine whales (0.75). We demonstrate potential for POPs as tracers to determine foraging ground provenance for samples collected on breeding grounds in the North Atlantic. Low concentrations suggest that POPs are unlikely to be a factor in the poor recovery rate of humpback whales in Cape Verde.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

ADDITIONAL ARTICLE

AUTHORS

B. A. Stein, A. Staudt, M. S. Cross, N. S. Dubois, C. Enquist, **R. Griffis (NMFS/OST),** L. J. Hansen, J. J. Hellmann, J. J. Lawler, E. J. Nelson, and A. Pairis.

PUBLICATION DATE

Expected: November 2013

TITLE

Preparing for and managing change: climate adaptation for biodiversity and ecosystems

JOURNAL

Frontiers in Ecology and the Environment

SIGNIFICANCE

- Increasingly, adaptation is understood as a way of managing change rather than maintaining existing conditions, and viewed as an on-going process rather than a fixed endpoint.
- Major advances in the development of adaptation principles, strategies, and planning processes have occurred over the past few years, although implementation of adaptation efforts continues to lag.
- Depending on the rate, magnitude, and character of future climatic change, even the most aggressive adaptation may be unable to prevent losses of biodiversity or serious degradation of ecosystems and their services.

SUMMARY

The emerging field of climate change adaptation has experienced a dramatic increase in attention as climate impacts on biodiversity and ecosystems have become more evident. Preparing for and addressing the impacts of climate change now constitute a major emphasis in conservation and natural resource policy and practice. Adaptation increasingly is understood as a way of managing change, rather than maintaining existing conditions. There also is an increasing recognition of the need to not only adjust management strategies in light of climate shifts, but to reassess and, as needed, modify underlying conservation goals. Major advances in the development of adaptation principles, strategies, and planning processes have occurred over the past few years, although implementation of adaptation strategies and actions continue to lag. With ecosystems expected to undergo continuing climate-mediated changes for years to come, adaptation can best be thought of as an on-going process, rather than as a fixed endpoint.

ADDITIONAL ARTICLE

AUTHORS

Y. V. Ivashchenko (NMFS/AKFSC), R. L. Brownell Jr. (NMFS/SWFSC), and **P. J. Clapham (NMFS/AKFSC)**

PUBLICATION DATE

Acceptance Date: September 2013

TITLE

Soviet whaling in the North Pacific: revised catch totals

JOURNAL

Journal of Cetacean Research and Management

SIGNIFICANCE

- Provides revised catch totals for Soviet whaling in the North Pacific, replacing the falsified catch data submitted to the International Whaling Commission by the USSR.

SUMMARY

The USSR conducted a global campaign of illegal whaling beginning in 1948. Catch records for Soviet pelagic operations in the Southern Hemisphere (and the northern Indian Ocean) have been largely corrected, but major gaps have remained for the North Pacific. Here, using newly discovered whaling industry reports, we provide corrected figures for Soviet catches in this ocean. During the period 1948-1979, a minimum of 190,183 whales were killed by the USSR in the North Pacific (195,783 if one includes an estimate for sperm whales taken in years for which there are no true data); of these, only 169,638 were reported to the IWC, a difference of 20,568 whales (26,168 including the sperm whale estimate). Figures were falsified for 8 of 12 hunted species, with some catches over-reported to camouflage takes of illegal species. Revised catch totals (caught vs. reported) are as follows: blue whale - 1,621 vs. 858; fin whale - 14,167 vs. 15,445; humpback whale - 7,334 vs. 4,680; sperm whale - 153,686 vs. 132,505; sei whale - 7,698 vs. 11,363; North Pacific right whale - 681 vs. 11; bowhead whale - 145 vs. 0; gray whale - 172 vs. 24. Bryde's, minke, killer, and Baird's beaked whale catches were reported correctly. Of all the hunted species, sperm and North Pacific right whales were the most heavily impacted. Major falsifications for sperm whales involved figures for both total catch and sex ratio.

ADDITIONAL ARTICLE

AUTHORS

D. Miller (NWS/OHD), D. Kitzmiller (NWS/OHD), and **S. Wu (NWS/NCEP)**

PUBLICATION DATE

Expected: Fall 2013

TITLE

Spatial and temporal resolution considerations in evaluating and utilizing radar QPE estimates

JOURNAL

Journal of Operational Meteorology

SIGNIFICANCE

- Any hoped-for benefits in better QPE from WSR-88D systems arising from their recent upgrade to finer spatial sampling resolution have not yet been demonstrated.
- Consequently, more accurate allocation of precipitation into delineated stream basins, and improvement in the performance of high-resolution hydrologic models, may not be achievable from an upgrade in radar spatial sampling resolution, alone.
- Commensurate operational changes such as increase in sampling frequency, and/or algorithmic changes such as employing extrapolation techniques to estimate precipitation rates between volume scans (not to mention the introduction of dual polar-based QPE) may be necessary in order to realize hoped-for benefits from recent WSR-88D upgrades in NWS hydrologic operations.

SUMMARY

In recent years, WSR-88D base data have become available at significantly finer spatial resolution – i.e., .25 km x 0.5° (.25 km x 1.0° for use in precipitation processing) vs. the legacy 1.0 km x 1.0°. Quantitative precipitation estimates (QPE) at this higher resolution may yield greater accuracy in the discretization of precipitation to delineated stream and river basins, in turn resulting in operational benefit in improved performance of hydrologic models and forecasting tools. To assess this potential, we determined one-hour radar QPEs from two experimental, S-band radar systems across several spatial resolutions, starting with base reflectivity data at or near the newly available, fine resolution, and recombining them up to and including the legacy. We then determined one-hour QPEs at these various resolutions, based on the traditional Z-R relationship, and matched them against one-hour rain gauge accumulations from dense gauge networks. After performing several steps of manual quality control, our dataset contained over 9,500 warm season gauge-radar pairs, which we assessed in various sub-groups and configurations including stratified by precipitation intensity and range from the radar, and in simulated small stream basins. In various statistical analyses, however, we found error differences between the fine- and legacy-resolutions to be *not* statistically significant. We go on to investigate several possible causes for this perhaps counter-intuitive result, including increased sampling error/noisiness in smaller vs. larger sample bins, sub-beam factors acting on falling hydrometeors, and the matter that temporal sampling frequencies employed operationally were not increased commensurately with the increase in spatial sampling resolution.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

ADDITIONAL ARTICLE

AUTHORS

W. Patrick (NMFS/OSF), J. Cope (NMFS/NWFSC), and **J. Thorson (NMFS/NWFSC)**

PUBLICATION DATE

Expected: Fall 2013

TITLE

Validating and improving life history data in FishBase

JOURNAL

Fisheries

SIGNIFICANCE

- Addresses the skepticism that stakeholders and fellow scientists have in the accuracy of stock assessment models, risk assessments, and other related fisheries management actions that rely on life history data from global databases.
- Describes the actual bias in life history data reported in FishBase, how these biases can be easily accounted for, and how such biases can be reduced overtime through advocacy.
- In particular, it posits that the American Fisheries Society (AFS) could improve the accuracy of FishBase over time if it required authors to submit relevant life history data to FishBase when publishing in an AFS journal.

SUMMARY

In the late 1980s, FishBase began cataloging key life-history parameters of the world's fish species. FishBase has become an important online resource which now contains information on over 30,000 fish species, and receives approximately 1 million "hits" and half a million visitors per month. The success of FishBase can be attributed to its ability to fill a critical gap in fisheries science - the need of life history information on individual species to contribute to items such as vulnerability assessments, stock assessments, and large marine ecosystem modeling. Despite the large number of published articles citing FishBase, skepticism remains when a scientist mentions their research relies on life history values reported in FishBase, which could be due in part to confusion regarding the two ways information is offered. FishBase offers two ways to access basic life history information: 1) existing values, and 2) generated values. Existing values contains a variety of life history traits whose values are from published species-specific studies. Generated values allow scientists to estimate the life history characteristics of species when entered values are lacking. To test the validity of FishBase data, Thorson et al. (in press) recently assessed the precision and accuracy of "entered" and "generated" FishBase data against life history parameters they obtained from regional experts who maintained independent databases of life history parameter estimates for their fisheries research. Values entered into FishBase proved more accurate and precise than values generated by the life history tool. The range of median percent errors varied from -18% to 25% for entered values versus -45% to 195% for generated values, for both Teleost and Chondrichthyan species. For entered FishBase values, LMAX, LINF and LMAT were generally the most accurate (i.e., unbiased) and precise (i.e., low variance) estimates, while other life history parameters were either accurate but not precise (i.e., K, AMAT) or neither accurate nor precise (i.e., AMAX, M).

ADDITIONAL ARTICLE

AUTHORS

N. M. Kellar, M. L. Trego, S. J. Chivers, and F. I. Archer (NMFS/SWFSC)

PUBLICATION DATE

Expected: Fall 2013

TITLE

*Pregnancy patterns of pantropical spotted dolphins (*Stenella attenuata*) in the eastern tropical Pacific determined from hormonal analysis of blubber biopsies and correlations with the purse-seine tuna fishery*

JOURNAL

Marine Biology

SIGNIFICANCE

- There's an inverse relationship between 1) purse-seine fishing for tuna via dolphin chase and encirclement and 2) spotted dolphin pregnancy rates.
- This study suggests that continued chase and encirclement of dolphins has a an inhibitive impact on reproduction. The tuna – dolphin issues is a long-standing controversy that continues to prevent the importation of tuna caught by encircling dolphins into the U.S.

SUMMARY

The northeastern offshore population of the pantropical spotted dolphin (*Stenella attenuata*) in the eastern tropical Pacific remains listed as depleted under the Marine Mammal Protection Act, and recent estimates of abundance show that recovery has been slow. One hypothesis for the slow recovery is that continued chase and encirclement by the tuna fishery negatively affects reproduction. Insufficient life-history sampling in this region over the last two decades makes traditional estimates of reproductive rates impossible. Here, we examine the current reproductive patterns of these dolphins by measuring blubber progesterone concentrations in biopsy samples to assess pregnancy state. Blubber progesterone was quantified in 212 biopsies from female offshore spotted dolphins sampled between 1998 and 2003 in the northeastern tropical Pacific, and we found that 11.5% of the biopsied females (mature and immature) were pregnant. The relationship between pregnancy and fishery exposure was analyzed, and we found that pregnant females were exposed to significantly less fishery activity than non-pregnant ones ($P = 0.022$), suggesting that the fishery may have an inhibitive effect on pregnancy. Spatial analysis indicated that pregnancy was more aggregated than random ($P < 0.05$) at a scale up to 180-nmi, with the highest proportion pregnant in the mouth of the Gulf of California, an area with relatively low reported fishery activity.

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ADDITIONAL ARTICLE

AUTHORS

E. A. Suter, K. M. M. Lwiza, **J. M. Rose** (NMFS/NEFSC), C. Gobler, and G. T. Taylor

PUBLICATION DATE

Accepted: 14 October 2013

TITLE

Phytoplankton assemblage changes during decadal decreases in nitrogen loadings to the urbanized Long Island Sound estuary

JOURNAL

Marine Ecology Progress Series

SIGNIFICANCE

- Decreases in inorganic nitrogen in Long Island Sound were detected within a 15-year time series, concomitant with implementation of nitrogen control programs (particularly wastewater treatment plant upgrades)
- Dissolved oxygen has not improved and chlorophyll has increased over this same time period
- Policies targeting only inorganic nitrogen loadings may be insufficient to mitigate eutrophication in systems such as Long Island Sound

SUMMARY

Despite reductions in total nitrogen loadings from wastewater treatment plants (WWTP) discharging into Long Island Sound (LIS) over the last 15 years, eutrophication and hypoxia remain a severe problem. Here we use time-series of hydrography, meteorology, nutrients and phytoplankton pigments to explore the relationships between planktonic biomass, nutrient stocks, and physical regimes in LIS. With the exception of the most eutrophied station in the west, dissolved inorganic nitrogen decreased throughout LIS between 1995 and 2009, likely resulting from WWTP plants upgrades. However, total dissolved nitrogen increased during this period, primarily driven by rising dissolved organic nitrogen pools. Simultaneous increases in dissolved inorganic phosphorus and silicate were also observed. Starting in 2002, pigment-based phytoplankton community composition revealed systematic declines in diatom abundances coincident with increases in dinoflagellates and other flagellated groups. Despite this, bottom water DO concentrations did not improve. Monthly fluctuations in diatoms covaried with all inorganic macronutrients, but long-term declines correspond with falling DIN inventories. Surprisingly, chlorophyll *a* (Chl*a*) concentrations increased, especially in western LIS. Particulate elemental ratios suggest that this planktonic system became poorer in nitrogen and silica relative to carbon and phosphorus during these 15 years. The apparent paradox between increasing DIN-limitation and escalating Chl*a* concentrations in LIS suggests a shifting nutrient stoichiometry and an altered phytoplankton community in which phytoflagellates have increased in abundance relative to diatoms. Despite these changes, diatoms remained the most abundant algal group by the end of the study. In addition, a shift in Chl*a* stocks in the year 2000 coincided with decreases in temperature, increases in salinity, and the proliferation of several microalgal groups. These results reveal the complex nature of eutrophied estuaries and indicate that policies targeting only inorganic nitrogen loadings may be insufficient to mitigate eutrophication in systems such as LIS.

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ADDITIONAL ARTICLE

AUTHORS

L. J. Natanson (NMFS/NEFSC), **J. Carlson** (NMFS/SEFSC), **A. Andrews** (NMFS/PIFSC)

PUBLICATION DATE

Accepted: 8 October 2013

TITLE

*Maximum age and missing time in the vertebrae of sand tiger shark (*Carcharias taurus*): validated lifespan from bomb radiocarbon dating in the western North Atlantic and southwestern Indian Oceans*

JOURNAL

Marine and Freshwater Research

SIGNIFICANCE

- The authors investigated the use of bomb radiocarbon analysis on vertebral growth bands in sand tiger sharks
- They found that the current methodologies are not suitable for aging sharks over 12 years old
- Sand tiger shark life spans are longer than previously thought, which has implications for management

SUMMARY

Bomb radiocarbon analysis of vertebral growth bands was used to validate lifespan for sand tiger sharks, *Carcharias taurus*, from the western North Atlantic (WNA) and southwestern Indian Oceans (SIO). Visual counts of vertebral growth bands were used to assign age and estimate year of formation (YOF) for sampled growth bands in eight sharks from the WNA and two sharks from the SIO. Carbon-14 results were plotted relative to YOF for comparison with regional Δ14C reference chronologies to assess the accuracy of age estimates. Results from the WNA validated vertebral age estimates up to 12 years, but indicated ages of large adult sharks were underestimated by 11-12 years. Age was also underestimated for adult sharks from the SIO by 14-18 years. Validated lifespan for *C. taurus* individuals in this study reached at least 40 years for females and 34 years for males. Findings indicate the current age-reading methodology is not suitable for estimating the age of *C. taurus* beyond approximately 12 years. Future work should investigate whether vertebrae of *C. taurus* record age throughout ontogeny, or cease to be a reliable indicator at some point in time.

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ADDITIONAL ARTICLE

AUTHORS

Scavia et al. **D. Beletsky, E. Rutherford, D. Schwab, and H. Zhang (OAR/GLERL)**

PUBLICATION DATE

Expected: December 2013

TITLE

Assessing and addressing the re-eutrophication of Lake Erie: Central basin hypoxia

JOURNAL

Journal of Great Lakes Research

SIGNIFICANCE

- This is a synthesis of recent research addressing the re-eutrophication of Lake Erie, with particular emphasis on central basin hypoxia.
- The authors of this paper document recent trends in key eutrophication-related properties, assess their likely ecological impacts, and develop load response curves to guide revised hypoxia-based loading targets called for in the 2012 protocol amending the Great Lakes Water Quality Agreement.
- They found significant impacts of nutrient loading on hypoxia in the Lake Erie central basin, which has impacts on fish distribution, diet, growth, and survival.

SUMMARY

Relieving excessive phosphorus loading is a key management tool for controlling Lake Erie eutrophication. During the 1960s and 1970s, excessive phosphorus inputs degraded water quality and reduced central basin hypolimnetic oxygen levels, which in turn, eliminated thermal habitat vital to cold-water organisms and contributed to the extirpation of important benthic macroinvertebrate prey species for fishes. In response to load reductions, initiated in 1972, Lake Erie responded quickly with reduced water-column phosphorus concentrations, phytoplankton biomass, and bottom-water hypoxia (dissolved oxygen < 2 mg/l). Since the mid-1990s, cyanobacteria blooms increased and extensive hypoxia and excessive benthic algae returned. The authors synthesize recent research leading to guidance for addressing this re-eutrophication, with particular emphasis on central basin hypoxia. Reducing central basin hypoxic area to levels observed in the early 1990s (ca. 2,000 km2) requires cutting total phosphorus loads by 46% from the 2003-2011 average or reducing dissolved reactive phosphorus loads by 78% from the 2005-2011 average. Reductions to these levels are also protective of fish habitat. This paper also provides potential approaches for achieving those new loading targets, and suggests that recent load reduction recommendations focused on western basin cyanobacteria blooms may not be sufficient to reduce central basin hypoxia to 2,000 km2.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

ADDITIONAL ARTICLE

AUTHORS

J. F. Carvalho, J. Imhoff, V. Faria, **J. K. Carlson (NMFS/SEFSC),** G. H. Burgess

PUBLICATION DATE

Expected: October 2013

TITLE

Status and the potential for extinction of the largetooth sawfish Pristis pristis *in the Atlantic Ocean*

JOURNAL

Aquatic Conservation

SIGNIFICANCE

- Largetooth sawfish range has been drastically reduced in Atlantic Ocean.
- The probability of extinction was highest in the USA, northern South America (Colombia to Guyana), and southern West Africa (Cameroon to Namibia).
- Documentation of extirpation of a large marine animal from large parts of its former range. Further validates listing of this species under US Endangered Species Act.

SUMMARY

Sawfishes currently are among the most threatened elasmobranchs in the world. Only two species inhabit Atlantic waters: the largetooth sawfish (*Pristis pristis*) and the smalltooth sawfish (*Pristis pectinata*), both having suffered dramatic declines in their ranges. The goal of this study was to evaluate the status of *P. pristis* in the Atlantic, and estimate local extinction risk based on historical and recent occurrence records. In order to accomplish these goals, a thorough search for historical and recent records of *P. pristis* in the Atlantic was conducted, by reviewing scientific and popular literature, museum specimens, and contacting regional scientists from the species' historical range. In total, 801 *P. pristis* records (1830–2009) document its occurrence in four major regions in the Atlantic: USA (n=41), Mexico and Central America (n=535), South America (n=162), and West Africa (n=48). Locality data were not available for 15 records. Historical abundance centers were the Colorado-San Juan River system in Nicaragua and Costa Rica (and secondarily Lake Izabal of Guatemala), the Amazon estuary, and coastal Guinea-Bissau.

Currently, the species faces drastic depletion throughout its entire former range and centers of abundance. It appears to have been extirpated from several areas. The probability of extinction was highest in the USA, northern South America (Colombia to Guyana), and southern West Africa (Cameroon to Namibia). Currently, the Amazon estuary appears to have the highest remaining abundance of *P. pristis* in the Atlantic, followed by the Colorado–San Juan River system in Nicaragua and Costa Rica and the Bissagos Archipelago in Guinea Bissau. Therefore the protection of these populations is crucial for the preservation and recovery of the species.

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ADDITIONAL ARTICLE

AUTHORS

H. Lehnert, **R. P. Stone, D. Drumm (NMFS/AKFSC)**

PUBLICATION DATE

Publication Date: 13 August 2013

TITLE

Geodia starki *sp. Nov. (Porifera: Demospongiae: Geodiidae) from the Aleutian Islands, Alaska, USA*

JOURNAL

Journal of the Marine Biological Association of the United Kingdom

SIGNIFICANCE

- A new species of *Geodia* is described from the North Pacific.
- This paper provides further documentation and increased awareness of the species diversity of benthic ecosystems in the Aleutian Islands region.

SUMMARY

A new species of *Geodia* is described from the North Pacific, collected in the summer of 2012 in the western Aleutian Islands. *Geodia starki* differs from all known species of *Geodia* by the possession of two categories of sterrasters and exceptionally large megascleres. The new species is compared with congeners of the North Pacific Ocean, Bering Sea, Arctic, and the North Atlantic oceans.

ADDITIONAL ARTICLE

AUTHORS

J. M. Drymon, L. Carassou, S. P. Powers, **M. Grace (NMFS/SEFSC)**, J. Dindo, B. Dzwondowski

PUBLICATION DATE

Publication Date: October 2013

TITLE

Multiscale analysis of factors that affect the distribution of sharks throughout the northern Gulf of Mexico

JOURNAL

Fishery Bulletin

SIGNIFICANCE

- Factors that affect the distribution of sharks in the Gulf of Mexico are species dependent but may transcend the spatial boundaries examined.
- The paper elucidates the management-critical importance of understanding and considering abiotic species specific parameters as they relate to species distributions.

SUMMARY

Identification of the spatial scale at which marine communities are organized is critical to proper management, yet this is particularly difficult to determine for highly migratory species like sharks. We used shark catch data collected during 2006–09 from fishery-independent bottom-longline surveys, as well as biotic and abiotic explanatory data to identify the factors that affect the distribution of coastal sharks at 2 spatial scales in the northern Gulf of Mexico. Centered principal component analyses (PCAs) were used to visualize the patterns that characterize shark distributions at small (Alabama and Mississippi coast) and large (northern Gulf of Mexico) spatial scales. Environmental data on temperature, salinity, dissolved oxygen (DO), depth, fish and crustacean biomass, and chlorophyll-*a* (chl-*a*) concentration were analyzed with normed PCAs at both spatial scales. The relationships between values of shark catch per unit of effort (CPUE) and environmental factors were then analyzed at each scale with co-inertia analysis (COIA). Results from COIA indicated that the degree of agreement between the structure of the environmental and shark data sets was relatively higher at the small spatial scale than at the large one. CPUE of Blacktip Shark (*Carcharhinus limbatus*) was related positively with crustacean biomass at both spatial scales. Similarly, CPUE of Atlantic Sharpnose Shark (*Rhizoprionodon terraenovae*) was related positively with chl-*a* concentration and negatively with DO at both spatial scales. Conversely, distribution of Blacknose Shark (*C. acronotus*) displayed a contrasting relationship with depth at the 2 scales considered. Our results indicate that the factors influencing the distribution of sharks in the northern Gulf of Mexico are species specific but generally transcend the spatial boundaries used in our analyses.

ADDITIONAL ARTICLE

AUTHORS

L. P. Rozas (NMFS/SEFSC), C. Martin, J. Valentine

PUBLICATION DATE

Expected: December 2013

TITLE

Effects of reduced hydrological connectivity on the nursery use of shallow estuarine habitats within a river delta

JOURNAL

Marine Ecology Progress Series

SIGNIFICANCE

- The seasonal recruitment of transient fishery species, which is possible only with a hydrologically connected migration corridor, drives the assemblage structure of nekton in estuarine habitats and is necessary to maintain nekton species richness and the integrity of nekton assemblages.
- This study documents the importance of hydrological connectivity for estuarine habitats to achieve their full potential in providing nurseries for the young of fishery species.
- Causeways, storm barriers, and levees that reduce hydrological connectivity between near shore spawning areas and estuarine nursery areas diminish the habitat function of estuarine areas by weakening the life-history connectivity for fishery species.

SUMMARY

We examined the effects of a hydrologically restrictive transportation corridor on the nursery use of various habitats in the Mobile–Tensaw River delta (MTD). We compared nekton assemblage structure in fall 2009 and spring 2010 among 3 locations and 3 major habitat types (marsh, submerged aquatic vegetation [SAV] dominated by *Vallisneria americana*, and shallow non-vegetated bottom [SNB]) commonly found throughout the MTD using 1 m2 drop samplers. Sample locations (Tensaw River [TR], Chocolatta Bay [CB], and Below Causeway [BC]) were selected based on their degree of tidal connectivity with the wider estuary (BC > TR > CB). Nekton assemblages varied among locations and habitat types. Recruitment by the young of transient fishery species appeared to drive the nekton assemblage structure at the least hydrologically restricted locations (BC and TR) in the delta, whereas estuarine-resident species dominated the nekton assemblage at CB. Species richness was greater at BC than at CB. Within locations, mean densities of abundant species were concentrated in SAV and marsh. Delta locations directly connected to Mobile Bay, therefore, likely provide an important nursery for fishery species such as white shrimp, blue crab, gulf menhaden, and southern flounder. Additional studies will be needed, however, to determine whether these fishery species represent strong conduits for cross ecosystem transfer of energy and nutrients between the delta and northern Gulf of Mexico.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

ADDITIONAL ARTICLE

AUTHORS

S. A. Pothoven (OAR, GLERL), T. O. Hook, R.R. Roswell

PUBLICATION DATE

Expected: December 2013

TITLE

Feeding ecology of age-0 Lake Whitefish in Saginaw Bay, Lake Huron

JOURNAL

Journal of Great Lakes Research - Special Section on Saginaw Bay

SIGNIFICANCE

- Whitefish had multiple ontogenetic shifts in diet during their first year of life in Saginaw Bay.
- This study provides vital early life requirement information for a major component of Great Lakes commercial fishery.

SUMMARY

Age-0 lake whitefish *Coregonus clupeaformis* were collected for diet analysis from Saginaw Bay, Lake Huron during April–November 2009 and 2010. Lake whitefish ≤ 50 mm ate mainly zooplankton, after which their diets switched mainly to benthic macroinvertebrates. Cyclopoida were the dominant prey consumed by very small lake whitefish (< 17 mm) and the most frequently selected zooplankton type for individual small fish. Once lake whitefish reached 18–19 mm, Cyclopoida in the diet declined and instead cladocerans emerged as an important diet item. Daphnia were the most common cladoceran in diets, but for fish 31–50 mm, Bosminidae were also relatively important. Although the shift to Daphnia could represent an ontogenetic point when lake whitefish were large enough to effectively handle this prey, it also took place when the relative availability of Daphnia was beginning to increase. The transition to feeding mainly on cladocerans occurred just after the yolk sac had been absorbed and may represent a critical period in the survival of lake whitefish. Once lake whitefish were > 50 mm, Chironomidae larvae became a dominant prey item, and this shift to benthivory coincided with a 55% increase in length–adjusted energy content between June and July. However, as fish grew (around 110–120 mm), Sphaeriidae and the benthic zooplankton Chydoridae became increasingly important in the diet. As these less energetically rich prey were incorporated into the diet, there were corresponding 21 and 15% decreases in length–adjusted energy content from July to August and September, respectively.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

ADDITIONAL ARTICLE

AUTHORS

S. A. Pothoven (OAR, GLERL), T. O. Hook, R.R. Roswell

PUBLICATION DATE

Expected: December 2013

TITLE

Energy content of young yellow perch and walleye in Saginaw Bay

JOURNAL

Journal of Great Lakes Research - Special Section on Saginaw Bay

SIGNIFICANCE

- This study documents how overwinter energy losses might be more critical for yellow perch survival than for walleye survival.
- This study provides vital information to help support sustainable fisheries.

SUMMARY

We evaluated seasonal energy content of age-0 yellow perch Perca flavescens and walleye Sander vitreus in Saginaw Bay, Lake Huron in 2009 and 2010. We also determined the energy content of age–1 fish from the 2009 and 2010 cohorts the following spring (i.e., for fish that had survived 1 winter) to evaluate overwinter energy losses. As expected, larger fish had disproportionately higher energy content (i.e., slope relating length and energy > 3.0) than smaller fish in nearly all months for both species. In 2009, length specific energy content increased from summer to fall for both species. However, for the 2010 cohorts of fish, length specific energy content decreased between July and November for yellow perch, and did not vary between July, September, and November for walleye. There were 13-17% overwinter declines in length specific energy content between the fall (October or November) and the spring (May) with no major differences between cohorts within a species or between species for a given year. For both yellow perch (2009 cohort only) and walleye (2009 and 2010 cohorts), there was a shift towards larger fish between fall and spring. Because young yellow perch and walleye are similar physiologically but differ in size (i.e., yellow perch are smaller), the possibility that overwinter energy losses are more important for yellow perch is consistent with the idea that overwinter energy losses are most important for smaller fish.

ADDITIONAL ARTICLE

AUTHORS

N. L. Vollmer and **P. E. Rosel (NMFS/SEFSC)**

PUBLICATION DATE

Published: October 2013

TITLE

A review of common bottlenose dolphins (Tursiops truncatus truncatus) *in the Northern Gulf of Mexico: population biology, potential threats, and management*

JOURNAL

Southeastern Naturalist

SIGNIFICANCE

- The authors summarize studies of Common Bottlenose dolphins over the past 30 years and identify data gaps.
- This analysis will aid researchers and managers as they assess the short- and long-term impacts of threats in the Gulf of Mexico, and may help direct future research to ensure effective conservation of Bottlenose Dolphins in this environmentally- and economically-important habitat.

SUMMARY

Common Bottlenose Dolphins (*Tursiops truncatus truncatus*) are one of the most abundant marine mammal species in the northern U.S. Gulf of Mexico (GOMx), a region where they are exposed to a variety of man-made and natural threats. In order to assess and minimize the impacts of these threats, it is important to understand how Bottlenose Dolphins live within and utilize their habitat in the GOMx. Much of what is understood regarding the biology, ecology, genetic, and life history characteristics of Bottlenose Dolphins in the GOMx has been gathered from small-scale research projects conducted within inshore waters, and much less is understood about dolphins inhabiting coastal and offshore waters. Over thirty years ago, Shane et al. (1982) reviewed the literature on Bottlenose Dolphin research in the GOMx. The 2010 Deepwater Horizon oil spill has highlighted the environmental risks to wildlife in the GOMx and the need for an updated, comprehensive review of the current knowledge base and status of Bottlenose Dolphins. Here we summarize research conducted on Bottlenose Dolphins within U.S. waters (inshore, coastal, and offshore) of the GOMx, building on the work presented in Shane et al. (1982) with work published since. The authors highlight what is currently known about Bottlenose Dolphin biology, ecology, and demographics, emphasize where knowledge is still lacking concerning Bottlenose Dolphins in this region, and summarize the major stressors faced by populations in the GOMx. The authors hope this review will aid researchers as they try to assess both the short- and long-term impacts from threats in the GOMx and may help direct future avenues of research to ensure effective conservation of Bottlenose Dolphins in this environmentally- and economically-important habitat.

LINK TO PAPER

http://www.bioone.org/doi/abs/10.1656/058.012.m601?journalCode=sena

ADDITIONAL ARTICLE

AUTHORS

D. Novak, C. Bailey, K. Brill, P. Burke, W. Hogsett, R. Rausch, and **M. Schichtel (NWS/NCEP)**

PUBLICATION DATE

Expected: April 2014

TITLE

Precipitation and temperature forecast performance at the Weather Prediction Center

JOURNAL

Weather and Forecasting

SIGNIFICANCE

- Human-generated forecasts improve over raw deterministic model guidance, however human-generated forecasts failed to outperform the most skillful downscaled, bias-corrected ensemble guidance for precipitation and maximum temperature available near the same time as the human-modified forecasts.
- Authors provide evidence for elevating the role of the forecaster in the forecast process given sufficient guidance, near-real time verification, forecaster training, and tools to guide forecaster interventions.

SUMMARY

The role of the human forecaster in improving upon the accuracy of numerical weather prediction is explored using multi-year verification of human-generated short-range precipitation forecasts and medium-range maximum temperature forecasts from the Weather Prediction Center (WPC). Results show that human-generated forecasts improve over raw deterministic model guidance. Over the past two decades, WPC human forecasters achieved a 20–40% improvement over the NAM and GFS models for the 1-in (25.4-mm) 24 h^{-1} threshold for the day 1 precipitation forecast, with a smaller, but statistically significant, 5–15% improvement over the deterministic ECMWF model. Medium-range maximum temperature forecasts also exhibit statistically significant improvement over GFS Model Output Statistics (MOS), and the improvement has been increasing over the past five years. The quality added by humans for forecasts of high-impact events varies by element and forecast projection, with generally large improvements when the forecaster makes changes ≥8°F (4.4°C) to MOS temperatures. Human improvement over guidance for extreme rainfall events [3-in (76.2-mm) 24 h^{-1}] is largest in the short-range forecast. However, human-generated forecasts failed to outperform the most skillful downscaled, bias-corrected ensemble guidance for precipitation and maximum temperature available near the same time as the human-modified forecasts. Thus, as additional downscaled and bias-corrected sensible weather element guidance becomes operationally available, and with the support of near-real time verification, forecaster training, and tools to guide forecaster interventions, a key test is whether forecasters can learn to make statistically significant improvements over the most skillful of this guidance. Such a test can inform to what degree, and just how quickly the role of the forecaster changes.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

ADDITIONAL ARTICLE

AUTHORS

P. J. Auster, M. Kilgour, **D. Packer (NMFS/NEFSC)**, R. Waller, S. Auscavitch, and L. Watling

PUBLICATION DATE

Published: 16 October 2013

TITLE

Octocoral gardens in the Gulf of Maine (NW Atlantic)

JOURNAL

Biodiversity

SIGNIFICANCE

- The paper describes impressive octocoral gardens at two sites observed during July 2013 on an expedition to western Jordan Basin and the Schoodic Ridge regions of the Gulf of Maine.
- These octocoral garden communities are now spatially rare in the Gulf and should be considered for greater conservation attention.
- The supplemental paper discusses the possible reasons for deep-sea coral declines in the Gulf of Maine and suggests conservation measures and strategies.

SUMMARY

Octocorals had been considered a common component of the seafloor fauna in the Gulf of Maine, but it appears a century of impacts have reduced coral distribution to small refugia. Here we provide a preliminary report of a recent expedition that discovered dense coral garden communities at two sites >200 m depth. The supplemental paper suggests that bottom fishing reduced the distribution of deep-sea corals to a select few refugia in the Gulf of Maine and calls for conservation measures.

LINK TO PAPER

http://dx.doi.org/10.1080/14888386.2013.850446

Link to supplemental paper: http://dx.doi.org/10.1080/14888386.2013.850885

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

ADDITIONAL ARTICLE

AUTHORS

E. J. Anderson and **D. J. Schwab (OAR/GLERL)**

PUBLICATION DATE

Published Online: 7 October 2013

TITLE

Predicting the oscillating bi-directional exchange flow in the Straits of Mackinac

JOURNAL

Journal of Great Lakes Research

SIGNIFICANCE

- A hydrodynamic model of the combined Lake Michigan-Huron is able to simulate the effect of the bi-lake seiche and atmospheric conditions to predict currents and flow at the Mackinac Straits.
- Model predictions match the observed oscillations (3 days) and bi-directional currents found during summer stratification.

SUMMARY

The Straits of Mackinac are a unique feature that connect Lake Michigan and Lake Huron into a single hydraulically linked system. With currents up to 1 m/s and oscillating volume transports up to 80,000 m3/s, they play an important role in water quality, contaminant transport, navigation, and ecological processes. We present the first three-dimensional hydrodynamic model of the combined Lake Michigan-Huron, including the Straits of Mackinac at high-resolution, that is able to simulate the three dimensional structure of the oscillating flows at the Straits. In comparison with individual lake models for Michigan and Huron (no connection at the Straits), we are able to isolate the effects of the bi-lake seiche and have found that although the seiche is the dominant forcing mechanism for flow, the flow can be modulated when atmospheric systems are in-phase with water level fluctuations. Furthermore, the area of influence of the Straits is found to extend up to 70 km into each lake, underscoring the need for realistic predictions within the Straits. For the first time, this combined-lake hydrodynamic model provides the capability to investigate and accurately predict flow at the Straits of Mackinac and its effect on Lake Michigan and Huron. This model forms the basis for the next generation of real-time hydrodynamic models being developed for the Great Lakes Coastal Forecasting System, a suite of models designed by the National Oceanic and Atmospheric Administration Great Lakes Environmental Research Laboratory (NOAA/GLERL) that predict hydrodynamic conditions such as currents, temperatures, and water levels in three dimensions.

ADDITIONAL ARTICLE

AUTHORS

Sesterhann, T.M., C.R.Roswell, S.R. Stein, P. Klaver, E. Verhamme, **S.A. POTHOVEN (OAR/GLERL)**, and T.O. Hook

PUBLICATION DATE

Expected: December 2013

TITLE

Modeling the implications of multiple hatching sites for larval dynamics in the resurgent Saginaw Bay walleye population

JOURNAL

Journal of Great Lakes Research

SIGNIFICANCE

- Hatching success and growth of walleye was assessed at multiple locations in Saginaw Bay, using a hydrodynamics model, particle transport model, and an individual-based bioenergetics model.
- Walleye were found to originate from multiple locations within the Bay, and larval growth was dependent on hatch date and seasonal variation in temperature.
- This data can potentially guide spawning habitat restoration and management of Saginaw Bay walleye

SUMMARY

The early life environment experienced by most larval fish is largely dependent on a combination of hatch site and water currents. Until larvae are able to swim fast enough to overcome currents, they are largely passively transported and have limited control over ambient environmental conditions, including temperature and prey availability. These factors strongly influence growth and survival of larvae, with direct consequences for subsequent recruitment. Early life survival of Saginaw Bay walleye was formerly limited by alewife predation on larvae; but following the collapse of Lake Huron alewives, the walleye population has rebounded and recruitment success may now be influenced by other factors including spawning habitat. We sought to assess the implications of successful hatching at multiple locations in Saginaw Bay, using a hydrodynamics model, particle transport model, and an individual-based bioenergetics model in series. Model results were compared to locations of young larvae collected in Saginaw Bay during 2009-2010. Results suggest that larval growth is strongly influenced by hatch date, driven by seasonal variation in temperature between sites. Larvae hatched at any location could be transported extensively within inner Saginaw Bay before reaching a sufficient size to swim independently of currents, and retention within the productive inner bay varied among years and sites. Our results indicate multiple larval walleye origins in the field, augmenting the continued production from the Saginaw River system. Successful hatching at more locations would serve to buffer walleye recruitment variation through portfolio effects, supporting arguments for more emphasis on diverse spawning habitat management and restoration.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

ADDITIONAL ARTICLE

AUTHORS

B. M. Lofgren and **A. D. Gronewold (OAR/GLERL)**

PUBLICATION DATE

Expected: 7 November 2013

TITLE

Methodological approaches to projecting the hydrologic impacts of climate change

JOURNAL

Earth Interactions

SIGNIFICANCE

- Frequently-used methods of projecting evapotranspiration and hydrologic impacts based on air temperature changes are found to be highly suspect when applied to climate change, and energy-budget-based approaches are conceptually superior, although more difficult to use.

SUMMARY

Climate change due to anthropogenic greenhouse gases (GHG) is expected to have important impacts on water resources, with a variety of societal impacts. Recent research has shown that applying different methodologies to assess hydrologic impacts can lead to widely diverging projections of water resources. We classify methods of projecting hydrologic impacts of climate change into those that estimate potential evapotranspiration (PET) based on air temperature, and those that estimate PET based on components of the surface energy budget. In general, air temperature-based methods more frequently show reductions in measures of water resources (e.g. water yield or soil moisture) and greater sensitivity than those using energy budget-based methods. There are significant trade-offs between these two methods in terms of ease of use, input data required, applicability to specific locales, and adherence to fundamental physical constraints, namely conservation of energy at the surface. Issues of uncertainty in climate projections, stemming from imperfectly known future atmospheric GHG concentrations and disagreement in projections of the resultant climate, are compounded by questions of methodology and input data availability for models that connect climate change to accompanying changes in hydrology. As a joint atmospheric-hydrologic research community investigating climate change, we need to develop methods in which the energy and moisture budgets remain consistent when considering their interaction with both the atmosphere and water resources. This approach should yield better results for both atmospheric and hydrologic processes.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

ADDITIONAL ARTICLE

AUTHORS

D. Wang, Y. Yang, **J. Wang**, K. Mizobata, and **X. Ba (OAR/GLERL)**

PUBLICATION DATE

Expected: Spring 2013

TITLE

A modeling study of the effects of river runoff, tides, and surface wind-wave mixing on the eastern and western Hainan upwelling systems of the South China Sea, China

JOURNAL

Ocean Modeling

SIGNIFICANCE

- Improvements in models provide new insight into ocean processes.
- The authors investigated the variation of the eastern Hainan upwelling during the East Asia summer monsoon season using a FVCOM model.
- Results show that river runoff suppresses the upwelling, tidal mixing promotes upwelling, surface wind-wave mixing inhibits upwelling, and the upwelling on the west coast is tidally induced.

SUMMARY

This study investigates the variation of eastern Hainan (or Qiongdong) and western upwelling systems during the East Asia summer monsoon (EASM) season using a state-of-the-art finite volume coastal model and reveals the impacts of tidal mixing, surface wind-wave mixing, and river runoff on the Hainan upwelling in terms of the spatial and temporal variations, intensification, and vertical structure. It is found that 1) river runoff, a stabilizer of the water column, suppresses the upwelling beneath it from reaching the surface, although strong upwelling still occurs in the lower layer of the water column; 2) tidal mixing, a mechanism of forming bottom mixed-layer depth, promotes upwelling, leading to strengthening of the upwelling; 3) surface wind-wave mixing, a major mechanism for formation of the upper mixed layer and a large-gradient thermocline, inhibits the upwelling from crossing the thermocline to reach the surface; and 4) unlike the east coast upwelling, the upwelling on the west coast is tidally induced.

ADDITIONAL ARTICLE

AUTHORS

G. R. Halliwell, Jr., A. Srinivasan, V. Kourafalou, H. Yang, D. Willey, M. L. Henaff, and **R. Atlas (OAR/AOML)**

PUBLICATION DATE

Expected: Fall 2013

TITLE

Rigorous evaluation of a fraternal twin ocean OSSE system for the open Gulf of Mexico

JOURNAL

Journal of Atmospheric and Oceanic Technology

SIGNIFICANCE

- This is the first paper to demonstrate the successful use of rigorous validation techniques for ocean OSSE systems to insure that credible observing system impact assessments are obtained.
- Successfully validated the OSSE system for the open Gulf of Mexico, demonstrating that it is capable of providing realistic observing system impact assessments without calibration.

SUMMARY

A new prototype fraternal twin ocean OSSE (Observing System Simulation Experiment) system designed with two substantially different configurations of the Hybrid Coordinate Ocean Model (HYCOM) as the Nature Run and forecast models was validated for performing observing system impact assessments in the open Gulf of Mexico. The new T-SIS statistical interpolation methodology optimized for assimilation into the hybrid vertical coordinate system of the ocean model is used to assimilate both synthetic and real observations into the forecast model. The novel aspect of this work is development of an ocean OSSE system that incorporates all design criteria and rigorous validation procedures long established for atmospheric OSSE systems but never completely implemented for the ocean.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

ADDITIONAL ARTICLE

AUTHORS

J. H. Eiler, T. M. Grothues, J. A. Dobarro, and **M. M. Masuda (NMFS/AKFSC)**

PUBLICATION DATE

Expected: Fall 2013

TITLE

Comparing autonomous underwater vehicle (AUV) and vessel-based tracking performance for locating acoustically tagged fish

JOURNAL

Marine Fisheries Review

SIGNIFICANCE

- The authors successfully tested surface vessel and AUV tracking capabilities under rigorous conditions in coastal waters near Juneau, Alaska.
- AUV was equally effective or better than the boat at detecting reference transmitters in shallow water, and significantly better at detecting reference transmitters at deeper depths.

SUMMARY

Autonomous underwater vehicles (AUVs) are increasingly used to collect physical, chemical, and biological information in the marine environment. Recent efforts include merging AUV technology with acoustic telemetry to provide information on the distribution and movements of marine fish. We compared surface vessel and AUV tracking capabilities under rigorous conditions in coastal waters near Juneau, Alaska. Tracking surveys were conducted with a REMUS 100 AUV equipped with an integrated acoustic receiver and hydrophone. The AUV was programmed to navigate along predetermined routes to detect both reference transmitters at 20-500 m depths and tagged fish and crabs in situ. Comparable boat surveys were also conducted. Transmitter depth had a major impact on tracking performance. The AUV was equally effective or better than the boat at detecting reference transmitters in shallow water, and significantly better for transmitters at deeper depths. Similar results were observed for tagged animals. Red king crab (*Paralithodes camtschaticus*) at moderate depths were recorded by both tracking methods, while only the AUV detected sablefish (*Anoplopoma fimbria*) at depths exceeding 500 m. Strong currents and deep depths caused problems with AUV navigation, position estimation, and operational performance, but reflect problems encountered by other AUV applications that will likely diminish with future advances, enhanced methods, and increased use.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

ADDITIONAL ARTICLE

AUTHORS

M. Free and **B. Sun (OAR/ARL)**

PUBLICATION DATE

Expected: March 2014 and early online release available

TITLE

Time-varying biases in U.S. total cloud cover data

JOURNAL

Journal of Atmospheric and Oceanic Technology

SIGNIFICANCE

- The U.S. cloud cover data base contains many inhomogeneities in addition to the well-known transition to automated observing systems in the 1990s. These problems mean that trends reported in previous literature are likely to be inaccurate.
- The paper impacts our understanding of past changes in clouds in the U.S.

SUMMARY

This paper presents evidence of significant discontinuities in U. S. cloud cover data from the Integrated Surface Database (ISD) and its predecessor datasets. While long-term U.S. cloud records have some well-known homogeneity problems related to the introduction of the automated surface observing system (ASOS) in the 1990s, the change to the international standard reporting format (METAR) in the U.S. in July 1996 introduces an additional inhomogeneity at many of the stations where humans still make or supplement cloud observations. This change is associated with an upward shift in total cloud of from 0.1% to 10%, statistically significant at 95 of 172 stations. The shift occurs at both National Weather Service and military weather stations, producing a mean increase in total cloud of 2-3%. This suggests that the positive trends in U.S. cloud cover reported by other researchers for recent time periods may be exaggerated, a conclusion that is supported by comparisons with precipitation and diurnal temperature range data. Additional discontinuities exist at other times in the frequency distributions of fractional cloud cover at the majority of stations, many of which may be explained by changes in the sources and types of data included in ISD. Some of these result in noticeable changes in monthly mean total cloud. The current U.S. cloud cover database needs thorough homogeneity testing and adjustment before it can be used with confidence for trend assessment or satellite product validation.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

ADDITIONAL ARTICLE

AUTHORS

G.R. Halliwell, Jr., A. Srinivasan, V. Kourafalou, H. Yang, D. Willey, M. Le Henaff, and **R. Atlas**

PUBLICATION DATE

Expected: 22 October 2013

TITLE

Rigorous evaluation of a fraternal twin ocean OSSE system for the open Gulf of Mexico

JOURNAL

Journal of Atmospheric and Oceanic Technology

SIGNIFICANCE

- This is the first paper to demonstrate the successful use of rigorous validation techniques for ocean OSSE systems to insure that credible observing system impact assessments are obtained.

SUMMARY

A new prototype fraternal twin ocean OSSE (Observing System Simulation Experiment) system designed with two substantially different configurations of the Hybrid Coordinate Ocean Model (HYCOM) as the Nature Run and forecast models was validated for performing observing system impact assessments in the open Gulf of Mexico. The new T-SIS statistical interpolation methodology optimized for assimilation into the hybrid vertical coordinate system of the ocean model is used to assimilate both synthetic and real observations into the forecast model. The novel aspect of this work is development of an ocean OSSE system that incorporates all design criteria and rigorous validation procedures long established for atmospheric OSSE systems but never completely implemented for the ocean.

AUTHORS

D. Wiley (NOS/ONMS), L. Hatch (NOS/ONMS), L. Jonson (OGC), K. Schwehr, **M. Thompson (NOS/ONMS),** and **C. MacDonald (NOS/ONMS)**

PUBLICATION DATE

Expected: Fall 2013

TITLE

Marine sanctuaries and marine planning: protecting endangered marine life

JOURNAL

Proceedings of the Marine Safety and Security Council

SIGNIFICANCE

- This article provides a number of case studies where marine planning was successfully used and the criteria required for success.
- Results will aid practitioners in marine planning and managers seeking to fund projects devoted to policy change in controversial arenas.

SUMMARY

The paper describes marine planning in the Stellwagen Bank National Marine Sanctuary relative to reducing the risk of collisions between endangered whales and large ships and the expansion of those efforts along the eastern seaboard of the US. It provides a number of successful case studies: (1) the shifting of shipping lanes through the sanctuary, (2) the use of AIS to monitor compliance with lane shift, (3) establishment of a year-round acoustic array to detect the presence of North Atlantic right whales, and (4) the development of *Whale Alert*, a mobile software application to inform mariners of the most current right whale conservation and management measures by with they must abide. The paper concluded that marine spatial planning is a valuable tool to protect the marine environment and consists of many components all of which require stakeholder and public involvement. Successful marine planning requires (a) high quality locally produced scientific information, (b) scientific information collected or analyzed in conjunction with stakeholders, (c) data visualized and presented in logical ways that can be understood by all participants, and (d) is aided by a regulatory framework that requires timely action.