



NOAA SCIENTIFIC PUBLICATIONS REPORT

SEPTEMBER 2, 2014

HIGHLIGHTED ARTICLES

[The US Repeat Hydrography CO₂/Tracer Program \(GO-SHIP\): accomplishments from the first decadal survey](#)

US CLIVAR and Ocean Carbon Biogeochemistry (OCB) Report

[Whatever happened to the wreckfish fishery? An evaluation of the oldest finfish ITQ program in the United States](#)

Marine Resource Economics

[Zebrafish and clean water technology: assessing bioinfiltration as a protective treatment for toxic urban runoff](#)

Science of the Total Environment

ADDITIONAL ARTICLES

[Distribution of Soviet catches of sperm whales \(*Physeter macrocephalus*\) in the North Pacific](#)

Endangered Species Research

[An evaluation of background levels and sources of polycyclic aromatic hydrocarbons in naturally spawned eggs of Pacific herring \(*Clupea pallasii*\) from Puget Sound, Washington, USA](#)

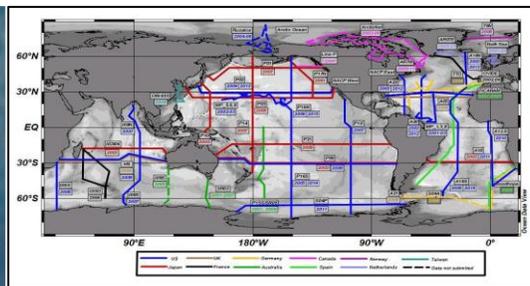
Science of the Total Environment

[Infections by *Renibacterium salmoninarum* and *Nanophyetus salmincola* Chapin are associated with reduced growth of juvenile Chinook salmon, *Oncorhynchus tshawytscha* \(Walbaum\), in the Northeast Pacific Ocean](#)

Journal of Fish Diseases

[Living in the fast lane: rapid development of the locomotor muscle in immature harbor porpoises \(*Phocoena phocoena*\)](#)

Journal of Comparative Physiology B





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[Evidence for selective mortality in marine environments: the role of fish migration size, timing, and production type](#)

Marine Ecology Progress Series

[A method for calculating a meta-analytical prior for the natural mortality rate using multiple life history correlates](#)

ICES Journal of Marine Science

[Cytochrome P4501A1 expression in blubber biopsies of endangered false killer whales \(*Pseudorca crassidens*\) and nine other odontocete species from Hawaii](#)

Ecotoxicology

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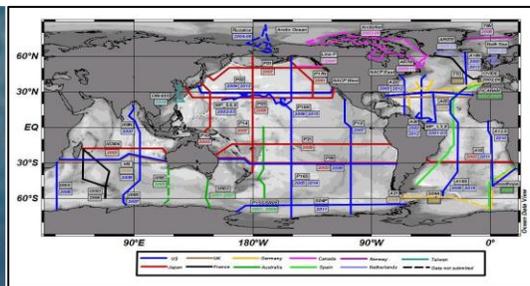
Bulletin of the American Meteorology Society

[Out of sight but not out of mind: harmful effects of derelict traps in selected U.S. coastal waters](#)

Marine Pollution Bulletin

[Using procedural blanks to generate analyte-specific limits of detection for persistent organic pollutants based on GC-MS analysis](#)

Analytical Chemistry





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Chemical Research in Toxicology

[Cyclone center: can citizen scientists improve tropical cyclone intensity records?](#)

Bulletin of the American Meteorological Society

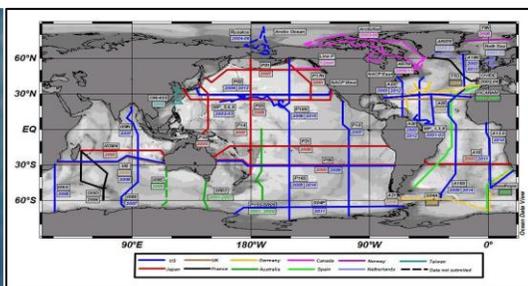
[Fetal survival of common bottlenose dolphins, *Tursiops truncatus*, in Sarasota Bay, Florida](#)

Aquatic Mammals

OTHER REPORTS, BOOK CHAPTERS, AND INTERNAL PUBLICATIONS

[Linking marine mammal and ocean health in the ‘new normal’ Arctic](#)

Ocean and Coastal Management





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HIGHLIGHTED ARTICLES

The US Repeat Hydrography CO₂/Tracer Program (GO-SHIP): accomplishments from the first decadal survey

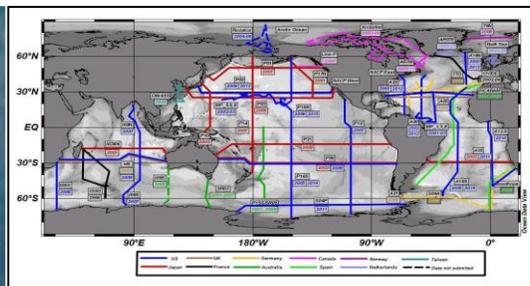
US CLIVAR and Ocean Carbon and Biogeochemistry (OCB) Report

R.A. Feely (OAR/PMEL), L.D. Talley, **J.L. Bullister (OAR/PMEL)**, C. A. Carlson, S.C. Doney, R.A. Fine, E. Firing, N. Gruber, D.A. Hansell, **G.C. Johnson (OAR/PMEL)**, R.M. Key, C. Langdon, **A. Macdonald (OAR/ESRL)**, **J.T. Mathis (OAR/PMEL)**, S. Mecking, F.J. Millero, **C.W. Mordy (OAR/PMEL)**, **C.L. Sabine (OAR/PMEL)**, W.M. Smethie, J.H. Swift, A.M. Thurnherr, **R. Wanninkhof (OAR/AOML)**, and M.J. Warner

- This is the second decadal survey of the world's oceans conducted allowing scientists, for the first time, to see changes compared to the first decadal survey conducted in the 1990s.
- The abyssal ocean is warming, taking up to 30% of the excess heat in the entire Earth system, and the oceans are acidifying.
- Oxygen concentrations are declining in the thermocline, and tropical oxygen zones are expanding.

The US Climate Variability and Predictability (CLIVAR) Repeat Hydrography CO₂/Tracker Program is a systematic re-occupation of global hydrographic sections that began in 2003, designed to monitor the ocean's response to climate change. The hydrographic sections span all ocean basins are full-depth, with physical and chemical measurements of the highest "reference standard" accuracy, attainable only with research ships. The US program is a major contributor to the international Global Ocean Ship-based Hydrographic Investigations Program (GO-SHIP), which is part of both the US Ocean Carbon and Biogeochemistry Program and US CLIVAR. Over the last decade results from the various research cruises have led to major scientific discoveries that have significantly advanced our understanding of the roles of the ocean in climate change, carbon cycling, and biogeochemical processes. Ocean ventilation and circulation are variable and changing over timescales from several years to decades. Anthropogenic carbon uptake has been mapped and its impact on global carbon budgets quantified. These discoveries have been described in over 200 peer-reviewed journal publications and global syntheses, including the Regional Carbon Cycle Assessment and Processes (RECCAP) and the IPCC 5th Assessment Report.

Published online: <http://www.us-ocb.org/publications/USRepeatHydrographyReport-Final.pdf>





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Whatever happened to the wreckfish fishery? An evaluation of the oldest finfish ITQ program in the United States

Marine Resource Economics (1.26)

T. Yandle and S. Crosson (NMFS/SEFSC)

- This study is the first peer-reviewed analysis of the oldest finfish ITQ in the United States in twenty years - historically an extremely understudied program.
- This is a comprehensive and holistic analysis including social, economic, biological and regulatory factors.
- Although this ITQ had been considered a failure, the authors show a much more complex reality.

The wreckfish individual transferable quota (ITQ) program started in 1992 and is the oldest finfish ITQ program in the United States. Initially, the program appeared to be a success, bringing order to the previous years' derbies. Ex-vessel prices rose, harvest stabilized, and there was an orderly shrinking of the fleet to an economically appropriate size. The subsequent history of the fishery is more complex. ITQ sales dwindled in 1995, then ceased for 13 years. Harvest plummeted to barely a tenth of the eligible quota, and in 2010 the fleet's quota was reduced 88%. Was the wreckfish ITQ program a failure? The authors provide the first published analysis of the program in two decades. They examine the decisions of former participants to leave the fishery, and examine the program's current economic, biological, and regulatory performance compared to the program's original stated goals, including the goals associated with ITQs in the literature.

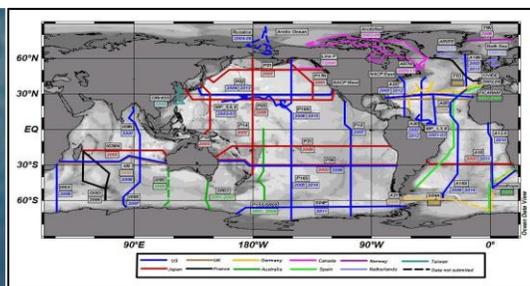
Accepted: 24 August 2014

Zebrafish and clean water technology: assessing bioinfiltration as a protective treatment for toxic urban runoff

Science of the Total Environment (3.163)

J.K. McIntyre, J.W. Davis, J.P. Incardona, J.D. Stark, and N.L. Scholz (NMFS/NWFSC)

- Despite an often-stated goal of protecting the health of aquatic species, green stormwater infrastructure methods are not typically assessed using biological indicators.
- This study demonstrated that green stormwater infrastructure can effectively reverse the considerable harmful effects of urban runoff to fish early life stages.
- This is the first in a series of studies conducted by the NWFSC Ecotoxicology Program in collaboration with the U.S. Fish and Wildlife Service and a new stormwater research





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facility at Washington State University's Puyallup campus.

Urban stormwater contains a complex mixture of contaminants that can be acutely toxic to aquatic biota. Green stormwater infrastructure (GSI) is a set of evolving technologies intended to reduce impacts on natural systems by slowing and filtering runoff. The extent to which GSI methods work as intended is usually assessed in terms of water quantity (hydrology) and quality (chemistry). Biological indicators of GSI effectiveness have received less attention, despite an overarching goal of protecting the health of aquatic species. Here we use the zebrafish (*Danio rerio*) experimental model to evaluate bioinfiltration as a relatively inexpensive technology for treating runoff from an urban highway with dense motor vehicle traffic. Zebrafish embryos exposed to untreated runoff (48-96 h; six separate storm events) displayed an array of developmental abnormalities, including delayed hatching, reduced growth, pericardial edema, microphthalmia (small eyes), and reduced swim bladder inflation. Two of the six storms were acutely lethal, and sublethal toxicity was evident across all storms, even when the stormwater was diluted by as much as 95% in clean water. As anticipated from exposure to cardiotoxic polycyclic aromatic hydrocarbons (PAHs), untreated runoff also caused heart failure, as indicated by circulatory stasis, pericardial edema, and looping defects. Bioretention treatment dramatically improved stormwater quality and reversed nearly all forms of developmental toxicity. The zebrafish model therefore provides a versatile experimental platform for rapidly assessing GSI effectiveness.

Expected Publication Date: Fall 2014

ADDITIONAL ARTICLES

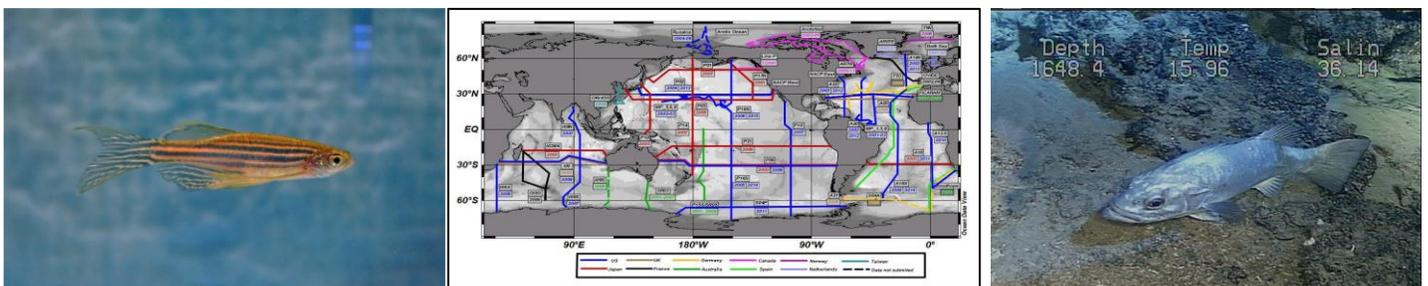
NMFS Publications

Distribution of Soviet catches of sperm whales (Physeter macrocephalus) in the North Pacific
Endangered Species Research (2.259)

Y. Ivashchenko (NMFS/AKFSC), R. Brownell (NMFS/SWFSC), and P. Clapham (NMFS/AKFSC)

- Corrects falsified International Whaling Commission catch records for North Pacific sperm whales.
- Provides new information on sperm whale distribution.

From 1948 to 1979, the USSR conducted extensive illegal whaling worldwide. Data from the North Pacific (NP) were analyzed to correct falsified International Whaling Commission catch





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records, and to investigate the distribution of sperm whales (NP catch = 157,680). Information was available on the distribution of 123,264 sperm whale catches. Among a number of areas defined by the Soviet whalers the largest catches were in the three main regions: 31,395 in the Eastern Region (ER), 29,518 in the Central Region (CR), 19,313 in the Western Region (WR); an additional 23,090 catches were made at the Kuril land stations. Other areas with substantial catches included the Aleutians (5,945) and Commander Islands (1,448), Bering Sea (3,170), Oleutorskiy Bay (3,094), and other parts of the pelagic NP (6,049). Four main areas of concentration included: a large pelagic area (30-50°N) in the ER, including the Gulf of Alaska and western coast of North America; the northeastern and southwestern CR; and the southern Kurils. Some of the distribution was similar to 19th century catches, notably in the “Japan Ground” (in the pelagic western Pacific) and the “Coast of Japan Ground”. Many females were caught in Oleutorskiy Bay and around the Commander Islands. There was also a division in catch composition at Amchitka Pass (Aleutians), with family groups to the west and mature males to the east. The extensive illegal catches of females removed a significant portion of the reproductively mature population, which likely continues to impact recovery of NP sperm whales today.

Accepted: 7 August 2014

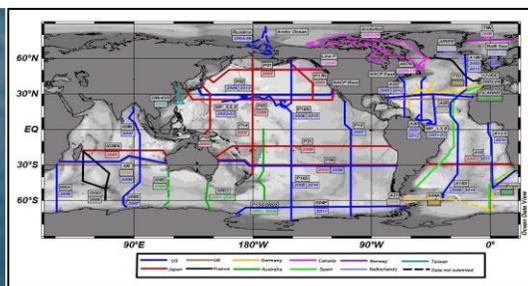
An evaluation of background levels and sources of polycyclic aromatic hydrocarbons in naturally spawned eggs of Pacific herring (Clupea pallasii) from Puget Sound, Washington, USA
Science of the Total Environment (3.163)

J. E. West, S. M. O'Neill, D. C. Doty, **G. M. Ylitalo**, M. Dutch, and **J. P. Incardona**
(NMFS/NWFSC)

- Through assessments of the extent and magnitude of PAH accumulation in naturally spawned herring embryos from a wide range of shore types in Puget Sound, WA, this study demonstrated that herring populations spawning in residential and industrial bays are exposed to and accumulate PAHs at levels that could affect embryo survival.

Pacific herring embryos spawned in nearshore habitats may be exposed to toxic contaminants as they develop, from exogenous sources in spawning habitats and from maternal transfer.

Determining baseline concentrations of these toxic contaminants is important for evaluating the health of this species, especially during this sensitive life stage. In this study we compared concentrations of polycyclic aromatic hydrocarbons, or PAHs, in naturally spawned herring embryos from five spawning areas across Puget Sound. The summed values of 31 PAH analytes





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(Σ 31PAH) in early- to late-stage development embryos ranged from 1.1 to 140 ng/g, wet weight. Σ 31PAH concentrations increased with development time in embryos from one spawning area where the greatest concentrations were observed, and the relative abundance of PAH chemicals in late-stage embryos was similar to those in nearby sediments, suggesting accumulation from local environmental sources. PAHs in both sediments and late-stage embryos appeared to exhibit a pyrogenic pattern. Although maternal transfer of PAHs appeared to be a negligible source to embryos in spawning areas with the greatest embryo PAH concentrations, maternal transfer may have been the dominant source in embryos from spawning areas where the lowest levels of embryo-PAHs occurred. Chronic embryo mortality has been reported in spawning habitats where we observed the greatest concentration of PAHs in embryos, and necrotic tissue in herring embryos from one such location was similar in description to phototoxic PAH necrosis reported elsewhere for embryonic zebrafish.

Expected Publication Date: Fall 2014

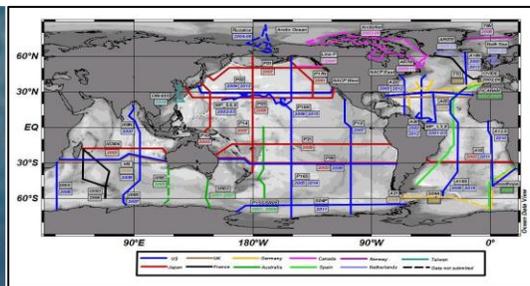
Infections by Renibacterium salmoninarum and Nanophyetus salmincola Chapin are associated with reduced growth of juvenile Chinook salmon, Oncorhynchus tshawytscha (Walbaum), in the Northeast Pacific Ocean

Journal of Fish Diseases (1.507)

T. A. Sandell, **D. J. Teel**, J. Fisher, **B. R. Beckman**, and **K. C. Jacobson (NMFS/NWFSC)**

- Juvenile Chinook salmon in nearshore waters off the coasts of Washington and Oregon infected by *Renibacterium salmoninarum*, *Nanophyetus salmincola*, and skin metacercariae were associated with reduced juvenile Chinook salmon growth.
- Because growth in the first year at sea has been linked to survival, these infections may play a role in regulating Chinook salmon populations in the northeast Pacific Ocean.

The authors of this study examined 1,454 juvenile Chinook salmon captured in nearshore waters off the coasts of Washington and Oregon (U.S.A.) from 1999-2004 for infection by *Renibacterium salmoninarum*, *Nanophyetus salmincola*, and skin metacercariae. The prevalences and intensities for each of these infections were established for both yearling and subyearling Chinook salmon. Two metrics of salmon growth, weight residuals and plasma levels of insulin-like growth factor-1, were determined for salmon infected with these pathogens/parasites, both individually and in combination. One stock of subyearlings infected by *N. salmincola* had significantly reduced weight residuals compared to uninfected fish; yearling stocks showed no effect. Yearling Chinook salmon infected with *R. salmoninarum* had





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significantly reduced weight residuals. Chinook salmon infected with skin metacercariae alone did not have significantly reduced growth metrics. Dual infections were not associated with significantly more severe effects on the growth metrics than single infections; the number of triple infections was very low and precluded statistical comparison. Overall, these data suggest that infection by these organisms is associated with reduced juvenile Chinook salmon growth. Because growth in the first year at sea has been linked to survival, the infections may play a role in regulating Chinook salmon populations in the northeast Pacific Ocean.

Expected Publication Date: Fall 2014

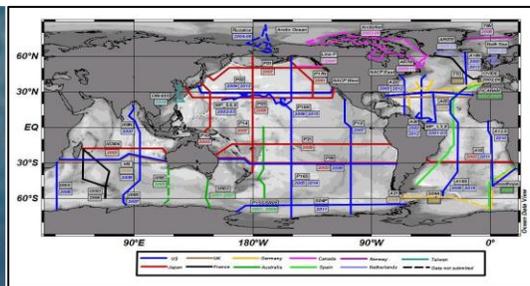
Living in the fast lane: rapid development of the locomotor muscle in immature harbor porpoises (Phocoena phocoena)

Journal of Comparative Physiology, B (2.530)

S. R. Noren, **D. P. Noren (NMFS/NWFSC)**, and J. K. Gaydos

- Given their habitat and requirements at birth, cetaceans should rapidly develop the muscle biochemistry necessary for diving; however, some odontocete species have protracted postnatal development corresponding to longer periods of maternal dependency.
- The authors found that variability in muscular development is associated with different life history traits, not just environmental conditions.
- This study provides information on diving limitations of young harbor porpoises which could lead to habitat and foraging partitioning across different segments of the population.

Cetaceans (dolphins and whales) are born into the aquatic environment and are immediately challenged by the demands of hypoxia and exercise. This should promote rapid development of the muscle biochemistry that supports diving, but previous research on two odontocete (toothed whales and dolphins) species showed protracted postnatal development for myoglobin content and buffering capacity. A minimum of 1 and 1.5 years were required for Fraser's (*Lagenodelphis hosei*) and bottlenose (*Tursiops truncatus*) dolphins, respectively, to obtain mature myoglobin contents. This corresponded to their lengthy 2 and 2.5-year calving intervals (a proxy for the dependency period of cetacean calves). To determine if the duration of muscle maturation in odontocetes corresponds with the maternal dependency interval, we measured myoglobin content and buffering capacity in the main locomotor muscle (longissimus dorsi) of harbor porpoises (*Phocoena phocoena*), a species with a comparatively short calving interval





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(1.5 years). We found that at birth, porpoises had 51% and 69% of adult levels for myoglobin and buffering capacity, respectively, demonstrating greater muscle maturity at birth than that found for neonatal dolphins (10% and 65%, respectively). Porpoises achieved adult levels for myoglobin and buffering capacity by 9-10 months and 2-3 years postpartum. This muscle maturation occurred at an earlier age than that found previously for dolphins. Variability in the duration of muscular development appears to be associated with disparate life history patterns across odontocetes, suggesting that the pace of muscle maturation is not solely influenced by exposure to hypoxia and exercise. Though the mechanism that drives this variability remains unknown. Nonetheless, these results highlight the importance of documenting the species-specific physiological development that limits diving capabilities and ultimately defines habitat utilization patterns across age classes.

Available online: <http://link.springer.com/article/10.1007%2Fs00360-014-0854-8>

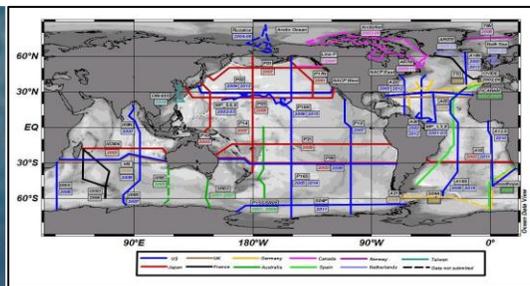
Evidence for selective mortality in marine environments: the role of fish migration size, timing, and production type

Marine Ecology Progress Series (2.64)

A. M. Claiborne, J. A. Miller, **L. Weitkamp**, **D. J. Teel**, and **R. L. Emmett** (NMFS/NWFSC)

- It is necessary to better understand the causes of mortality during critical life stages of fish, and whether this differs for natural and artificially propagated individuals.
- The authors investigated the life history transition of marine entry for juvenile Chinook salmon and found no evidence of selective mortality of smaller juveniles in hatchery or natural fish, but did find an indication that hatchery fish may have reduced survival at certain life stages.
- Results from this study highlight the need to understand the effects of hatchery rearing and how hatchery-propagation may influence survival during later critical life-history transitions.

The underlying causes of mortality during the critical life stages of fish are not well-understood, nor is it clear if these causes are similar for naturally and artificially propagated individuals. To assess the importance of selective mortality related to production type (hatchery vs. natural) and size at and timing of marine entry, we compared attributes of juvenile Chinook salmon (*Oncorhynchus tshawytscha*) from the upper Columbia River summer- and fall-run genetic stock group captured in the Columbia River estuary with back-calculated attributes of survivors captured later in marine waters. We used genetic stock identification, otolith chemistry and





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structure, and physical tags to determine stock of origin, size at and timing of marine entry, and production type. Fish emigrated from fresh water in May-September and the majority of fish collected in the estuary (83%) had arrived within 3 days of capture. In one of two years, timing of marine entry for both production types differed between the estuary and ocean: the ocean catch included a greater proportion of juveniles that emigrated in late July than the estuary catch. There was no evidence of selective mortality of smaller juveniles during early marine residence in hatchery or natural juveniles, but the mean percentage of hatchery fish in ocean collections was 16% (± 5.8 SE) less than in the estuary, which could indicate reduced survival of hatchery versus natural fish.

Expected Publication Date: Fall 2014

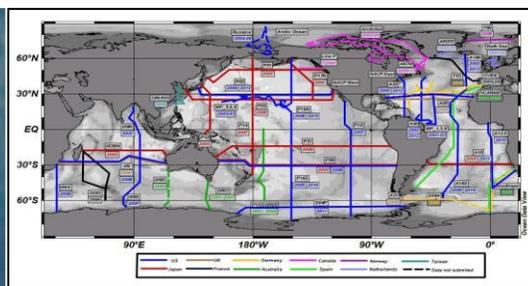
A method for calculating a meta-analytical prior for the natural mortality rate using multiple life history correlates

ICES Journal of Marine Science (2.525)

O. S. Hamel (NMFS/NWFSC)

- This paper provides a Bayesian prior and prediction interval for the natural mortality rate (M).
- The method allows for estimating M within stock assessments or providing sensitivity analysis across the range of the prediction interval.
- Ultimately this work allows for improvements in the estimation of productivity, natural mortality, and uncertainty.

The natural mortality rate M is an important parameter for understanding population dynamics, and is extraordinarily difficult to estimate for many fish species. The uncertainty associated with M translates into increased uncertainty in fishery stock assessments. Estimation of M within a stock assessment model is complicated by its confounding with other life history and fishery parameters which are also uncertain, some of which are typically estimated within the model. Ageing error and variation in growth, which may not be fully modelled, can also affect estimation of M, as can various assumptions, including the form of the stock–recruitment function (e.g. Beverton–Holt, Ricker) and the level of compensation (or steepness), which may be fixed (or limited by a prior) in the model. To avoid these difficulties, stock assessors often assume point estimates for M derived from meta-analytical relationships between M and more easily measured life history characteristics, such as growth rate or longevity. However, these relationships depend on estimates of M for a great number of species, and those estimates are





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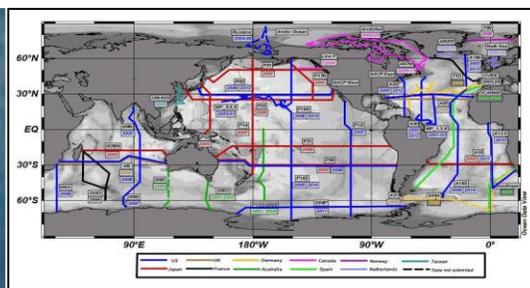
also subject to errors and biases (as are, to a lesser extent, the other life history parameters). Therefore, at the very least, some measure of uncertainty in M should be calculated and used for evaluating uncertainty in stock assessments and management strategy evaluations. Given error-free data on M and the covariate(s) for a meta-analysis, prediction intervals would provide the appropriate measure of uncertainty in M . In contrast, if the relationship between the covariate(s) and M is exact and the only error is in the estimates of M used for the meta-analysis, confidence intervals would be appropriate. Using multiple published meta-analyses of M 's relationship with various life history correlates, and beginning with the uncertainty interval calculations, the author developed a method for creating combined priors for M for use in stock assessment. Expected Publication Date: Fall 2014

Cytochrome P4501A1 expression in blubber biopsies of endangered false killer whales (Pseudorca crassidens) and nine other odontocete species from Hawaii
Ecotoxicology (2.500)

K. Foltz, R. W. Baird, **G. M. Ylitalo (NMFS/NWFSC)**, and B. A. Jensen

- Fisheries interactions and high levels of POPs are critical anthropogenic stressors to ESA-listed Hawaiian false killer whales.
- This study presents further evidence for contaminant-related health impacts on this population by confirming and extending observations that PCB burdens exceed proposed threshold levels for health effects, and by showing that CYP1A1 expression levels correlated with \sum PCBs, and were higher relative to other cetacean species.

Odontocetes (toothed whales) are considered sentinel species in the marine environment because of their high trophic position, long life spans, and blubber that accumulates lipophilic contaminants. Cytochrome P4501A1 (CYP1A1) is a biomarker of exposure and molecular effects of certain persistent organic pollutants. Immunohistochemistry was used to visualize CYP1A1 expression in blubber biopsies collected by non-lethal sampling methods from 10 species of free-ranging Hawaiian odontocetes: short-finned pilot whale, melon-headed whale, pygmy killer whale, common bottlenose dolphin, rough-toothed dolphin, pantropical spotted dolphin, Blainville's beaked whale, Cuvier's beaked whale, sperm whale, and endangered main Hawaiian Islands insular false killer whale. Significantly higher levels of CYP1A1 were observed in false killer whales and rough-toothed dolphins compared to melon-headed whales, and in general, trophic position appears to influence CYP1A1 expression patterns in particular species groups. No significant differences in CYP1A1 were found based on age class or sex





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across all samples. However, within male false killer whales, juveniles expressed significantly higher levels of CYP1A1 when compared to adults. Total polychlorinated biphenyl (Σ PCBs) concentrations in 84% of false killer whales exceeded proposed threshold levels for health effects, and Σ PCBs correlated with CYP1A1 expression. There was no significant relationship between PCB toxic equivalent quotient (TEQ) and CYP1A1 expression, suggesting that this response may be influenced by agonists other than the dioxin-like PCBs measured in this study. No significant differences were found for CYP1A1 expression among social clusters of false killer whales. This work provides a foundation for future health monitoring of the endangered stock of false killer whales and other Hawaiian odontocetes.

Expected Publication Date: Fall 2014

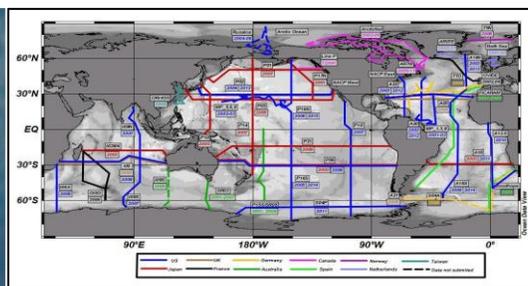
Chronic low-level domoic acid exposure alters gene transcription and impairs mitochondrial function in the central nervous system

Aquatic Toxicology (3.513)

E. Hiolski, **P. Kendrick**, **E. R. Frame**, **M. S. Myers**, T. K. Bammler, R. P. Beyer, F. M. Farin, D. Smith, D. J. Marcinek, and **K. A. Lefebvre (NMFS/NWFSC)**

- The algal toxin domoic acid is known to impact the central nervous system due to the disruption of glutamate receptors. However, the effects of chronic low-level asymptomatic exposure are not well understood.
- This study demonstrates that low-level exposure to this common seafood toxin causes changes in genes and impairs cellular function that may contribute to chronic health consequences in humans and other animals.

Domoic acid is an algal-derived seafood toxin that functions as a glutamate agonist and exerts excitotoxicity via overstimulation of glutamate receptors (AMPA, NMDA) in the central nervous system (CNS). At high (symptomatic) doses, domoic acid is well-known to cause seizures, brain lesions and memory loss; however, a significant knowledge gap exists regarding the health impacts of repeated low-level (asymptomatic) exposure. Here, we investigated the impacts of low-level repetitive domoic acid exposure on gene expression and mitochondrial function in the vertebrate CNS using a zebrafish model in order to: 1) identify transcriptional biomarkers of exposure; and 2) examine potential pathophysiology that may occur in the absence of overt excitotoxic symptoms. We found that genes and biological functions related to neurological function and development were significantly altered, and that asymptomatic exposure impaired mitochondrial function. Interestingly, the transcriptome response was





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highly-variable across the exposure duration (36 weeks), with little to no overlap of specific genes across the six exposure time points (2, 6, 12, 18, 24, and 36 weeks). Moreover, there were no apparent similarities at any time point with the gene expression profile exhibited by the *glud1* mouse model of chronic moderate excess glutamate release. These results suggest that although the fundamental mechanisms of toxicity may be similar, gene responses to domoic acid exposure do not extrapolate well between different exposure durations. However, the observed impairment of mitochondrial function suggests that repetitive low-level exposure does have fundamental cellular level impacts that could contribute to chronic health consequences. Expected Publication Date: October 2014

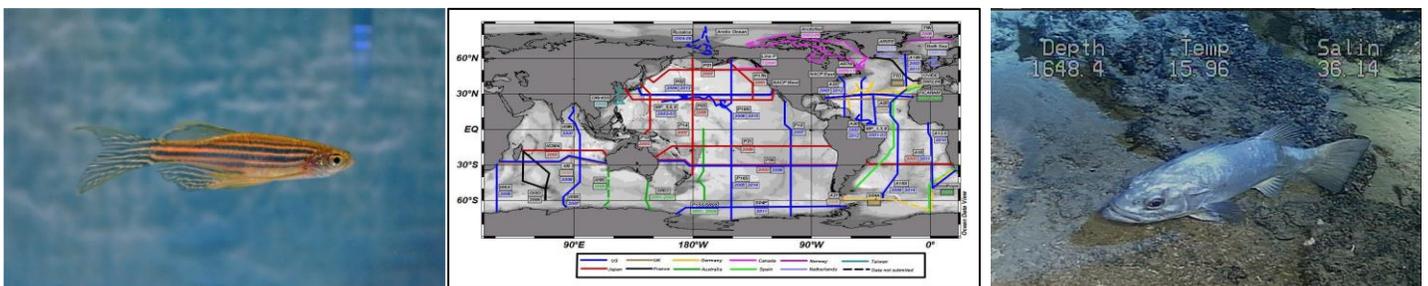
OAR Publications

Storm-scale ensemble Kalman filter assimilation of total lightning flash extent data
Monthly Weather Review (2.76)

E. R. Mansell (OAR/NSSL)

- Synthetic lightning data were generated in an observing systems simulation experiment (OSSE) to mimic flash extent data from Geostationary Lightning Mapper (GLM) instrument that is planned for the Geostationary Operational Environmental Satellite R-series (GOES-R) platform.
- This set of observing systems simulation experiments demonstrates the potential benefit from ensemble Kalman filter (EnKF) assimilation of total lightning flash extent data.
- This work represents a first formal demonstration of effective use of lightning data for storm-scale EnKF assimilation.

A set of observing systems simulation experiments (OSSEs) demonstrates the potential benefit from ensemble Kalman filter (EnKF) assimilation of total lightning flash mapping data. Synthetic lightning data were generated to mimic the Geostationary Lightning Mapper (GLM) instrument that is planned for the Geostationary Operational Environmental Satellite R-series (GOES-R) platform. The truth simulation was conducted using multi-moment bulk microphysics, explicit electrification mechanisms, and a branched lightning parameterization to produce 2-minute averaged synthetic pseudo-GLM observations at 8 km GLM resolution and at a hypothetical 1 km resolution. The OSSEs use either perfect (two-moment bulk) or imperfect (single-moment, graupel only) microphysics. One OSSE with perfect microphysics included the same electrification physics as the truth simulation to generate lightning flash rates and flash extent densities (FED). The other OSSEs used linear relationships between flash rate and





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graupel echo volume as the observation operator. The assimilation of FED at 8 km horizontal resolution can effectively modulate the convection simulated at 1 km horizontal resolution by sharpening the location of reflectivity echoes and the spatial location probability of convective updrafts. Tests with zero flash rates show that the lightning assimilation can help to limit spurious deep convection, as well. Pseudo-GLM observations at 1 km further sharpen the analyses of location (updraft and reflectivity) of the relatively simple storm structure.

Publication Date (early online): 24 July 2014

Link to full text paper: <http://journals.ametsoc.org/doi/abs/10.1175/MWR-D-14-00061.1?af=R&>

Global view of real-time TRMM Multi-Satellite Precipitation Analysis: implication to its successor Global Precipitation Measurement mission

Bulletin of the American Meteorology Society (11.57)

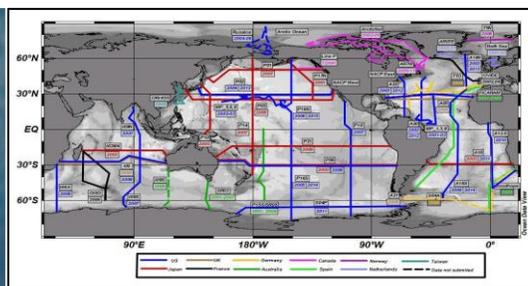
B. Yong, D. Liu, **J. J. Gourley (OAR/NSSL)**, Y. Tian, G. J. Huffman, L. Ren, and Y. Hong

- Biases of high-quality precipitation datasets are analyzed on a global scale.
- These global error characteristics and their regional and seasonal variations revealed in this paper are expected to serve as the benchmark for the upcoming GPM mission.

Accurate estimation of high-resolution precipitation on the global scale is extremely challenging. The operational Tropical Rainfall Measuring Mission (TRMM) Multi-satellite Precipitation Analysis (TMPA) has created over 16 years of high-resolution quantitative precipitation estimation (QPE), and has built the foundation for improved measurements in the Global Precipitation Measurement (GPM) mission. TMPA is intended to produce the “best-effort” estimates of quasi-global precipitation from almost all available satellite-borne precipitation-related sensors by consistently calibrating them with the high-quality measurements from the core instrument platform aboard TRMM. In this study, efforts are focused on a systematic evaluation of four sets of mainstream TMPA-RT estimates on the global scale. Our analysis indicates that the latest Version-7 TMPA-RT with the monthly climatological calibration had the lowest daily systematic biases of approximately 9% over land and -11% over ocean (relative to the gauge-adjusted research product). However, there still exists some unresolved issues in mountainous areas (especially Tibetan Plateau), high-latitude belts, and for estimating extreme rainfall rates with high variability at small scales.

Publication Date (early online): 30 July 2014

Link to full text paper: <http://journals.ametsoc.org/doi/pdf/10.1175/BAMS-D-14-00017.1>





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NOS Publications

Out of sight but not out of mind: harmful effects of derelict traps in selected U.S. coastal waters
Marine Pollution Bulletin (2.63)

C. Arthur, A. Sutton-Grier, P. Murphy, and H. Bamford (NOS)

- There is a paucity of data in the published literature on the ecological and economic impacts of derelict fishing traps (DFTs) in coastal ecosystems.
- The authors synthesized results from seven NOAA-funded trap fisheries studies around the United States and determined that DFT-caused losses to habitat and harvestable annual catch are pervasive, persistent, and largely preventable.
- The study concludes with suggestions for developing a U.S. DFT management strategy including: (1) targeting studies to estimate mortality of fishery stocks, (2) assessing the economic impacts of DFTs on fisheries, (3) collaborating with the fishing industry to develop solutions to ghost fishing, and (4) examining the regional context and challenges resulting in DFTs to find effective policy solutions to manage, reduce, and prevent gear loss.

Based on this synthesis, the authors identified key gaps to fill in order to better manage and prevent DFTs. Tackling the challenge of derelict fishing traps effectively will involve a mixed-methods approach, including increased spatial planning to reduce accidental loss, expanded discard options to incentivize proper disposal, more efforts to educate communities about the widespread nature and harmful effects of derelict traps, and regular removal operations that follow standard techniques to minimize habitat damage. Integrated research with fishing communities should develop trap construction options that reduce ghost fishing without reducing catch, and fisheries research should develop a better understanding of the population impacts of ghost fishing to include this information in stock assessments.

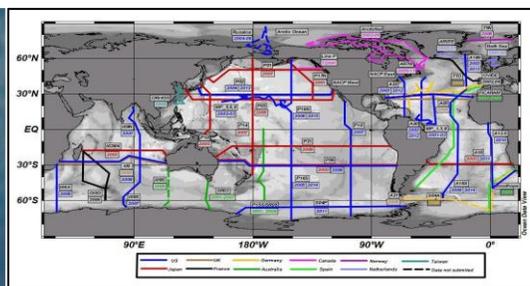
Accepted: 26 June 2014

Using procedural blanks to generate analyte-specific limits of detection for persistent organic pollutants based on GC-MS analysis

Analytical Chemistry (5.825)

J. Ragland (NOS/NCCOS), D. Liebert, E. Wirth

- A new method of calculating the limit of detection for measurement of environmental organic contaminants was proposed, compared with existing methods, and appears





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superior to those examined because it provides improvement in measurement science and in instrument and process performance monitoring.

- The proposed method provides a simple, flexible platform to apply project-specific quality criteria goals (e.g. false positive/negative risk acceptance rates) to detectability of environmental organic contaminants.

Several methods are used to generate a limit of detection for organic pollutants measured by gas chromatography-mass spectroscopy (GC-MS); all have theoretical and practical drawbacks. The current project investigated two common existing methods (statistical and empirical) for applicability to chromatographic properties from real samples, comparing these with a new proposed method using procedural blanks to estimate a minimum detectable peak area.

Weaknesses of all three methods are discussed. The proposed method was superior to other examined methods in that it provided analyte-specific limits of detection linked to the recovery of mass-labeled internal standards for every analyte within every sample. Other identified quality assurance benefits included: providing a sensitivity performance metric across batch, analyst, and instrument; enabling chemists with discretionary decisions specific to every analyte regarding detectability and interferences; and some strengths of both statistical and empirical techniques without major drawbacks of either. In marine sediment samples, the proposed method of calculating the limit of detection increased reporting of trace level (low-to sub-ppb) GC-MS data for polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), organochlorine pesticides (OCPs), and polycyclic aromatic hydrocarbons (PAHs) by up to 400% compared with the statistical method.

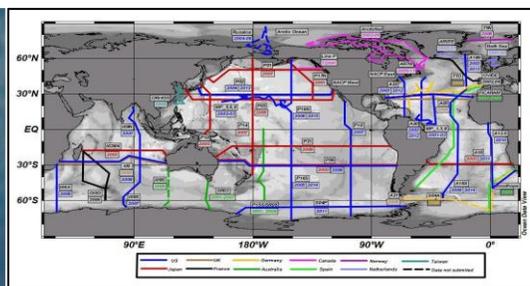
Expected Publication Date: July 9, 2014 (online); August 5, 2014 (hardcopy)

Link to full text paper: <http://pubs.acs.org/doi/pdf/10.1021/ac501615n>

Environmental effects and fate of the insecticide bifenthrin in a salt-marsh mesocosm
Chemosphere (3.499)

P. L. Pennington, H. Harper-Laux, Y. Sapozhnikova, and M. H. Fulton (NOS/NCCOS)

- This study found bifenthrin, a widely used insecticide, to be lethal to the grass shrimp (*P. pugio*) at concentrations below the identified acute estimated environmental concentration (EEC) value ($0.1 \mu\text{g L}^{-1}$ – (USEPA, 2000))
- Bifenthrin readily and rapidly accumulates in sediments and thus presents a significant hazard to infaunal invertebrate species





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- These findings support the importance for pesticide applicators, both licensed and unlicensed (Home and garden use) to read and follow the label instructions carefully to protect sensitive aquatic life

Bifenthrin is a widely used synthetic pyrethroid insecticide that is often applied to crops, turf, and residential structures for the control of insects. Like other insecticides, bifenthrin has the potential to contaminate bodies of water that are adjacent to the application site via spray drift and runoff during storm events. The objective of this study was to examine the lethal and sublethal effects of bifenthrin on grass shrimp, *Palaemonetes pugio*, and sheepshead minnow, *Cyprinodon variegatus*, in a 28 d mesocosm experiment under estuarine conditions. Endpoints included mortality and growth and the oxidative stress biomarkers of lipid peroxidation, glutathione, and catalase. In the mesocosm experiment, 24 h and 96 h caged shrimp LC50s were 0.061 and 1.51 $\mu\text{g L}^{-1}$, respectively. The uncaged grass shrimp 28 d LC50 was 0.062 $\mu\text{g L}^{-1}$. Fifty percent mortality was not reached in the uncaged sheepshead minnow. Bifenthrin did not have a significant effect on the growth of the shrimp, but there was an increasing impact on fish growth. However, it is uncertain as to whether this pattern is a direct effect of the chemical or if it is due to increased food availability resulting from mortality in prey species. The oxidative stress assays were largely inconclusive. Bifenthrin was eliminated rapidly from the water column and readily partitioned to sediments. The LC50s for adult and larval *P. pugio* were below published estimated environmental concentration (EEC) values and were within the range of bifenthrin concentrations that have been measured in rivers, channels, and creeks. Publication Date: 21 April 2014

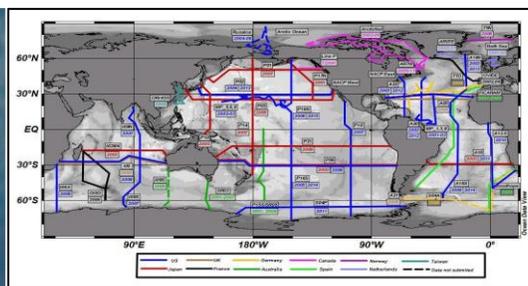
Individual and mixture effects of caffeine and sulfamethoxazole on the daggerblade grass shrimp Palaemonetes pugio following maternal exposure

Environmental Toxicology (2.562)

R. N. Garcia, K. W. Chung, **M. E. DeLorenzo (NOS/NCCOS)**, and M. C. Curran

- Caffeine and SMX in mixture significantly reduced embryo survival.
- Exposure to caffeine and SMX separately led to significantly smaller length of juvenile shrimp.
- Maternal exposure to caffeine and SMX, individually and in mixture, resulted in negative effects on *P. pugio* offspring survival and development; however, the concentrations tested in the present study were well above maximum detected field concentrations.

Pharmaceuticals and personal care products (PPCPs) such as caffeine and sulfamethoxazole





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(SMX) are detected in the estuarine environment. The present study characterized effects of a maternal exposure of these compounds on the development of the daggerblade grass shrimp *Palaemonetes pugio* from embryo to juvenile life stage. Ovigerous females were exposed to either caffeine (20 mg/L), SMX (60 mg/L), or a mixture (20 mg/L caffeine and 60 mg/L SMX). Embryos were then removed from the females and the effects of the PPCPs on hatching, metamorphosis, juvenile growth, and overall mortality were determined. There was no significant effect on gravid female survival after 5 days of exposure to caffeine, SMX, or the mixture; however, development of the embryos on the female shrimp was delayed in the mixture. Caffeine and SMX in mixture significantly reduced embryo survival. There was a significant effect of caffeine, SMX, and the mixture on embryo hatching time. Exposure to SMX alone significantly delayed larval metamorphosis. Exposure to caffeine and SMX separately led to significantly smaller length of juvenile shrimp. Maternal exposure to caffeine and SMX, individually and in mixture, resulted in negative effects on *P. pugio* offspring survival and development; however, the concentrations tested in the present study were well above maximum detected field concentrations.

Expected Publication Date: 12 September 2014

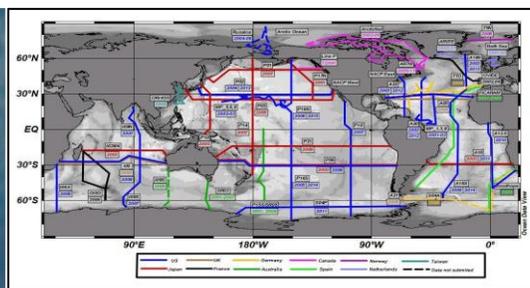
Transcriptome sequencing reveals single domain Type I-like polyketide synthases in the toxic dinoflagellate Gambierdiscus polynesiensis

Harmful Algae (3.34)

J. Morey, and F. Van Dolah (NOS/NCCOS)

- Several transcripts putatively involved in toxin biosynthesis genes were identified.
- The lack of fatty acid synthases identified supports the hypothesis that fatty acid synthesis may be carried out by polyketide synthases in dinoflagellates. Further, the identification of 22 polyketide synthases provide essential background for future research into the complex mechanism of toxin production in this mechanism.
- This dataset provides important background to future research in order to understand the complex mechanism of toxin production in this dinoflagellate.

Ciguatoxins (CTXs) are potent neurotoxins responsible for the food-borne illness known as ciguatera that occurs after consumption of contaminated fish. Benthic dinoflagellates of the genus *Gambierdiscus spp.* are known as the main producers of CTXs. CTXs are polycyclic polyethers, presumed to be synthesized by polyketide synthase (PKS) complexes; however, the mechanisms of CTX biosynthesis remain unresolved. Here, we investigated a *de novo*





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transcriptome assembly of *G. polynesiensis* TB-92 clone, a highly toxic producer of Pacific ciguatoxins, and focused on the identification of PKS transcripts. A cDNA library generated using a spliced leader (SL) priming approach, which specifically targets the dinoflagellate nuclear transcriptome, was sequenced by Roche 454. This strategy produced 1,221,335 raw reads, assembled into 16,336 unique contigs. Contigs were subjected to BLAST search, annotated with Gene Ontology (GO) terms and enriched with enzyme codes (EC) from Kyoto Encyclopedia of Genes and Genomes (KEGG) database. Thirty-three PKS-related sequences were thus identified. Twenty-two contigs encoded single domain β -ketoacyl synthases (KS) with sequence similarity to Type I PKSs, as reported in other dinoflagellates. A conserved motif previously observed near the 5' end of dinoflagellate KS domain transcripts was present in *G. polynesiensis*, and distinguished two groups of KS domain sequences. Ketoreductase (KR), acyltransferase (AT), and acyl carrier protein (ACP) domains were also found on single domain containing transcripts. KEGG pathway mapping placed three of the KS sequences containing the PKS conserved domain (cd00833) in the fatty acid biosynthesis pathway. No contigs were found encoding the conserved domains typically found in elongating ketosynthase domains of fatty acid synthases (cd00832, Type I or cd00834, Type II). Contigs mapping to other parts of the fatty acid biosynthesis pathway similarly encoded individual domains, suggesting that fatty acid synthesis takes place in multiprotein complexes. Other than the three KS domains, none of the sequences mapping to the fatty acid biosynthesis pathway overlapped with those annotated as PKSs. These data lend support to the idea that PKSs may contribute to both polyketide and fatty acid synthesis in dinoflagellates.

Publication Date: June 2014

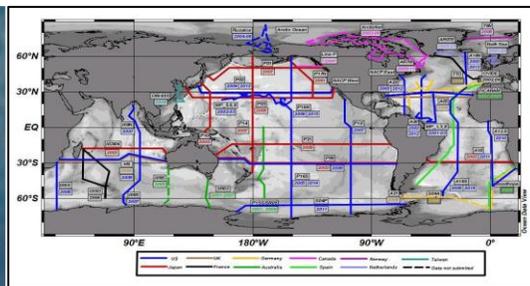
DOI: 10.1016/j.hal.2014.04.013

Stress response of wild bottlenose dolphins (Tursiops truncatus) during capture-release health assessment studies

General Comparative Endocrinology (2.67)

P. A. Fair (NOS/NCCOS), A. M. Schaefer, T. A. Romano, G. D. Bossart, S. V., Lambe, and J. S. Reif

- The stress response in cetaceans is becoming more important as they face a greater array of both anthropogenic and natural threats, thus, stress responses play a critical role in allowing animals to cope with environmental perturbations.
- Wild dolphins exhibited a typical mammalian response to this acute stress.





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There is a growing concern about the impacts of stress in marine mammals as they face a greater array of threats. The stress response of free-ranging dolphins (*Tursiops truncatus*) was examined by measuring their physiologic response to capture and handling. Samples were collected from 168 dolphins during capture– release health assessments 2003–2007 at two study sites: Charleston, SC (CHS) and the Indian River Lagoon, FL (IRL). Adrenocorticotrophic hormone (ACTH), cortisol, aldosterone (ALD) and catecholamines (epinephrine (EPI), norepinephrine (NOR), dopamine (DA)), were measured in blood and cortisol in urine. Mean time to collect pre-examination samples after netting the animals was 22 min; post-examination samples were taken prior to release (mean 1 hour 37 min). EPI and DA concentrations decreased significantly with increased time to blood sampling. ACTH and cortisol levels increased from the initial capture event to the post-examination sample. EPI concentrations increased significantly with increasing time to the pre-examination sample and decreased significantly with time between the pre-and post- examination sample. Cortisol concentrations increased between the pre-and post-examination in CHS dolphins. Age- and sex-adjusted mean pre-examination values of catecholamines were significantly higher in CHS dolphins; ALD was higher in IRL dolphins. Significant differences related to age or sex included higher NOR concentrations in males; higher ALD and urine cortisol levels in juveniles than adults. Wild dolphins exhibited a typical mammalian response to acute stress of capture and restraint. Further studies that relate hormone levels to biological and health endpoints are warranted.

Publication Date: 11 July 2014

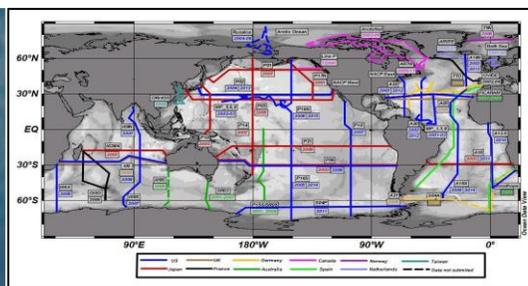
DOI: 10.1016/j.ygcen.2014.07.002

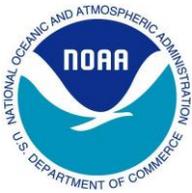
Development of a real-time PCR for the detection of pathogenic Leptospira spp. in California sea lions

Diseases of Aquatic Organisms (1.586)

Q. Wu, K. C. Prager, T. Goldstein, D. P. Alt, R. L. Galloway, R. L. Zuerner, J. L. Lloyd-Smith, and **L. Schwacke (NOS/NCCOS)**

- A Real-time PCR assay was developed for detection of pathogenic *Leptospira spp.* in marine mammals.
- The results of this study demonstrated that the assay is specific and more sensitive than culture for rapid detection of pathogenic *Leptospira spp.* in California sea lions.
- However, it should be noted that a positive real-time PCR result only indicates presence of the *Leptospira* DNA; this does not necessarily indicate an active infection.





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Several real-time PCR assays are currently used for detection of pathogenic *Leptospira spp.*; however, few methods have been described for the successful evaluation of clinical urine samples. This study reports a rapid assay for the detection of pathogenic *Leptospira spp.* in California sea lions (*Zalophus californianus*) using real-time PCR with primers and a probe targeting the lipL32 gene. The PCR assay had high analytic sensitivity—the limit of detection was three genome copies per PCR volume using *L. interrogans* serovar *Pomona* DNA; and 100% analytic specificity—it detected all pathogenic leptospiral serovars tested and none of the non-pathogenic *Leptospira* species *L. biflexa* and *L. meyeri* serovar *Semarang*, the intermediate species *L. inadai*, or the non-*Leptospira* pathogens tested. Our assay had an amplification efficiency of 1.00. Comparisons between the real-time PCR assay and culture isolation for detection of pathogenic *Leptospira spp.* in urine and kidney tissue samples from California sea lions showed that samples were more often positive by real-time PCR than by culture methods. Inclusion of an internal amplification control in the real-time PCR assay showed no inhibitory effects in PCR negative samples. These studies indicated that our real-time PCR assay has high analytic sensitivity and specificity for the rapid detection of pathogenic *Leptospira* species in urine and kidney tissue samples.

Expected Publication Date: August 2014

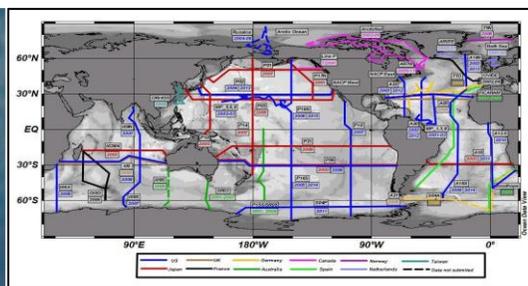
Tissue distribution of amino acid- and lipid- brevetoxins after intravenous administration to C57/BL6 mice

Chemical Research in Toxicology (4.19)

T.A. Leighfield, N. Muha, and J.S. Ramsdell (NOS/NCCOS)

- Brevetoxins are metabolized into different molecules in shellfish. This study shows unparalleled retention in deep internal organs of one metabolite that increases the potency and spectrum of effects beyond current understanding.
- Expanding the knowledge of the toxic properties of brevetoxins will help refine strategies to reduce its risk to humans, improve resiliency of local fishing industries and mitigate economic impacts.
- NCCOS research continues to show that reactivity of brevetoxin produced by algae leads to metabolites in shellfish with properties that can lead to greater toxicity and a spectrum of different effects in seafood consumers.

Brevetoxins produced during algal blooms of the dinoflagellate *Karenia* are metabolized by shellfish into reduction, oxidation, and conjugation products. Brevetoxin metabolites comprised





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of amino acid- and lipid- conjugates account for a large proportion of the toxicity associated with the consumption of toxic shellfish. However, the disposition of these brevetoxin metabolites has not been established. Using intravenous exposure to C57BL/6 mice, we investigated the disposition in the body of three radiolabeled brevetoxin metabolites. Amino acid brevetoxin conjugates represented by S-desoxy-BTX-B2 (cysteine-BTX-B) and lipid brevetoxin conjugates represented by N-palmitoyl-S-desoxy-BTX-B2 were compared to dihydro-BTX-B. Tissue concentration profiles were unique to each of the brevetoxin metabolites tested, with dihydro-BTX-B being widely distributed to all tissues, S-desoxy-BTX-B2 concentrated in kidney, and N-palmitoyl-S-desoxy-BTX-B2 having the highest concentrations in spleen, liver and lung. Elimination patterns were also unique: dihydro-BTX-B had a greater fecal versus urinary elimination, whereas urine was a more important elimination route for S-desoxy-BTX-B2, and N-palmitoyl-S-desoxy-BTX-B2 persisted in tissues and was eliminated equally in both urine and feces. The structures particular to each brevetoxin metabolite resulting from the reduction, amino acid conjugation, or fatty acid addition of BTX-B were likely responsible for these tissue-specific distributions and unique elimination patterns. These observed differences provide further insight into the contribution each brevetoxin metabolite class has on the observed potencies.

Publication Date: 21 July 2014

NESDIS Publications

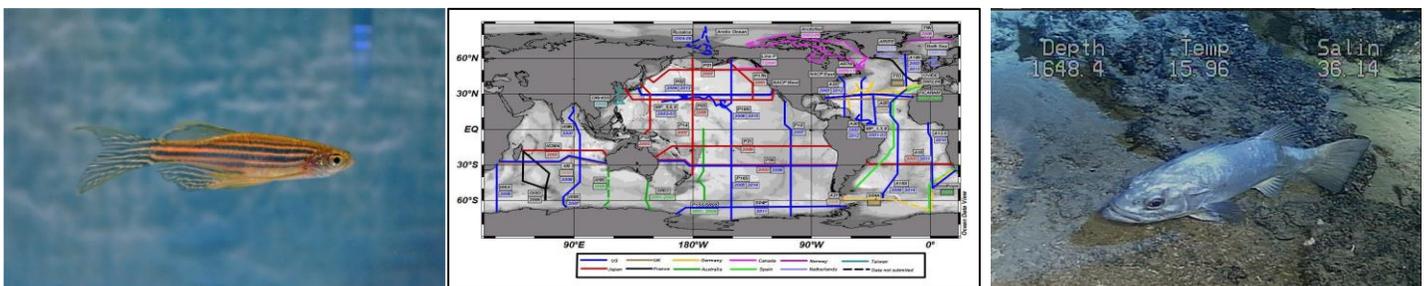
Cyclone center: can citizen scientists improve tropical cyclone intensity records?

Bulletin of the American Meteorological Society (11.57)

C. C. Hennon, **K. R. Knapp (NESDIS/NCDC)**, **C. J. Schreck III (CICS-NC)**, **S. E. Stevens (CICS-NC)**, **J. P. Kossin (NESDIS/NCDC)**, P. W. Thorne, P. A. Hennon (CICS-NC), **M. C. Kruk (NESDIS/NCDC)**, **J. Rennie (CICS-NC)**, J. Gadéa, M. Striegl, and I. Carley

- This paper is the first peer-reviewed manuscript of the CycloneCenter.org project. It appears that CycloneCenter.org classifications can be used to resolve gross discrepancies in best-track data and the approach provides valuable information on uncertainty.
- The paper introduces a scientific undertaking to better understand historical tropical cyclones through crowd sourcing of image analysis.
- The initial results are promising and show a capability to use citizen scientists to improve our understanding of weather and climate.

The global tropical cyclone intensity record, even in modern times, is uncertain because the





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vast majority of storms are only remotely observed. Forecasters determine the maximum wind speed using a patchwork of sporadic observations and remotely sensed data. A popular tool that aids forecasters is the Dvorak technique, a procedural system that estimates the maximum wind based on cloud features in IR and/or Visible satellite imagery. Inherently, the application of the Dvorak procedure is open to subjectivity. Heterogeneities are also introduced into the historical record with the evolution of operational procedures, personnel, and observing platforms. These uncertainties impede our ability to identify the relationship between tropical cyclone intensities and, for example, recent climate change. A global reanalysis of tropical cyclone (TC) intensity using experts is difficult because of the large number of storms. The authors show that it is possible to effectively reanalyze the global record using crowdsourcing. Through modifying the Dvorak technique into a series of simple questions that amateurs (“citizen scientists”) can answer on a website, the authors are working toward developing a new TC dataset that resolves intensity discrepancies in several recent TCs. Preliminary results suggest that the performance of human classifiers in some cases exceeds that of an automated Dvorak technique applied to the same data for times when the storm is transitioning into a hurricane.

Accepted: 1 August 2014

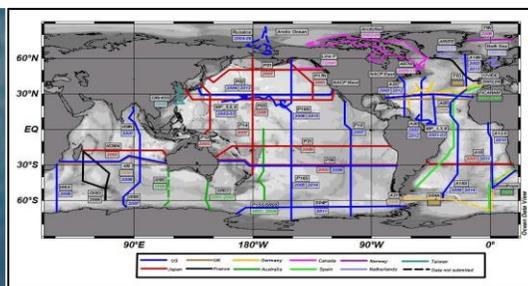
Joint Line Office Publications

*Fetal Survival of Common Bottlenose Dolphins, *Tursiops truncatus*, in Sarasota Bay, Florida* Aquatic Mammals (0.70)

R. Wells, C. Smith, J. Sweeney, F. Townsend, D. Fauquier, R. Stone, J. Langan, **L. Schwacke (NOS/NCCOS)**, and **T. Rowles (NMFS/OPR)**

- Bottlenose dolphins in Sarasota Bay have been used as a reference population for other Gulf populations exposed to oil following the Deepwater Horizon oil spill.
- The authors determined that the success rate of pregnancies for this population is 83%.
- The baseline success rate for this reference population in Sarasota Bay will provide a basis for comparison with other northern Gulf of Mexico dolphin populations exposed to oil following the Deepwater Horizon oil spill, contributing to the assessment of injuries as part of the DWH NRDA.

Reproductive success is an important aspect of dolphin population health, as it is an indicator of the trajectory for the population into the future. Concerns about potential reproductive impacts of environmental contaminants have stimulated increased interest in measuring reproductive success in wild dolphin populations. One measure of reproductive success is the survival of





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fetuses to parturition. Pregnancy determination for wild dolphins, including differentiation of pregnancy stage, is possible during capture-release health assessments through application of diagnostic ultrasound to evaluate fetal development and viability, estimate gestational age, and measure anatomical structures. As a first step toward understanding reproductive success in utero, we combined pregnancy detections during health assessments with subsequent observational population monitoring to examine and evaluate pregnancy outcome for well-known, long-term resident common bottlenose dolphins (*Tursiops truncatus*) in Sarasota Bay, Florida. In total, 0.83 (95% CI = 0.52-0.99) of detected pregnancies were documented as resulting in live births. The use of ultrasound for systematic pregnancy determination provides a useful tool for measuring an important component of reproductive success. Application of this approach for conservation of wild populations benefits from establishment of baseline values, such as the estimates provided here for the reference population of bottlenose dolphins residing in Sarasota Bay, Florida.

Expected Publication Date: December 2014

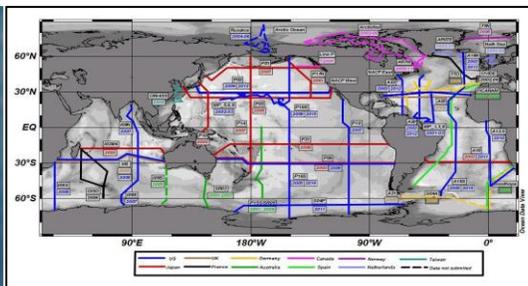
OTHER REPORTS, BOOK CHAPTERS, AND INTERNAL PUBLICATIONS

Linking marine mammal and ocean health in the 'new normal' Arctic
Ocean and Coastal Management (1.769)

S. E. Moore (NMFS/OST) and F. M. D. Gulland

- The piece advocates the development of an Arctic-focused Marine Mammal Health Map (MMHM) framework, via the Alaska Ocean Observing System.
- The MMHM framework, if developed, would support a more holistic understanding of climate change impacts to ocean ecosystems and aid in the prioritization of management efforts to mitigate impacts to marine mammals and the people that rely on them.
- The development of MMHM is especially urgent in the Arctic where rapid ecosystem changes are occurring and where harvesting of marine mammals for consumption by native populations raises potential human health concerns.

The 'New Normal' Arctic ecosystem and the reliance of indigenous people on marine mammals for subsistence makes urgent the need for a comprehensive marine mammal health monitoring program linked to regional ocean observing systems. An Arctic-focused Marine Mammal Health Map (MMHM) framework could be initiated via expansion and coordination between regional Ocean Observing Systems and Community-based Monitoring programs. In the US, this approach would build upon three activities currently supported by the Alaska Ocean Observing





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System (AOOS): ocean data access, community based monitoring and spatial tools for data visualization. The new MMHM framework would support a more holistic understanding of climate change impacts to ocean ecosystems, aid in the prioritization of management efforts to mitigate impacts to marine mammals and complement marine ecosystem monitoring programs fostered by the Arctic Council and UNESCO. Ultimately, we advocate for the inclusion of MMHM products as ‘essential ocean variables’ in the Global Ocean Observing System (GOOS).

Accepted: August 2014

