

In this review:

A. Recent articles with abstracts

O/A denotes an open access article or journal

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Lavery, J.V., Tinadana, P.O., Scott, T.W., Harrington, L.C., Ramsey, J.M., Ytuarte-Núñez, C., and James, A.A. **Towards a framework for community engagement in global health research.** *Trends in Parasitology* 26(6): 279-283, 2010.

Notes: New technologies for global public health are spurring critical evaluations of the role of communities in research and what they receive in exchange for their participation. Community engagement activities resulting from these evaluations are most challenging for novel scientific ventures, particularly those involving controversial strategies and those in which some risks are poorly understood or determined. Remarkably, there is no explicit body of community engagement knowledge to which researchers can turn for guidance about approaches that are most likely to be effective in different contexts, and why. We describe here a framework that provides a starting point for broader discussions of community engagement in global health research, particularly as it relates to the development, evaluation and application of new technologies.

Yanagisawa, H., Koshimura, S., Miyagi, T., and Imamura, F. **Tsunami damage reduction performance of a mangrove forest in Banda Aceh, Indonesia inferred from field data and a numerical model.** *Journal of Geophysical Research* 115(6): art. C06032, 2010.

Notes: Since the 26 December 2004 Indian Ocean tsunami, the role of mangrove forests as natural defenses protecting coastal communities from tsunami disaster has been highlighted. However, some mangrove forests were destroyed by that tsunami. They are expected to have lost their protective functions. In this study, we develop a fragility function to assess the mangrove trees' vulnerability, expressed as the damage probability of mangrove trees, based on field surveys and numerical modeling of the 2004 Indian Ocean tsunami in Banda Aceh, Indonesia. Based on the fragility function, we reconstruct a numerical model of tsunami inundation including the performance of mangrove forests in terms of reducing tsunami damage. The model reveals that a 10 year old mangrove forest in a 500 m wide area can reduce a tsunami's hydrodynamic force by approximately 70% for an incident wave of 3.0 m inundation depth and a wave period of 40 min at the shoreline. The model also shows, for a tsunami inundation depth of greater than 4 m, that a 10 year old mangrove forest would be mostly destroyed and that it would lose its force reduction capacity. Moreover, approximately 80% of a 30 year old mangrove forest would survive a 5 m tsunami and absorb 50% of the tsunami's hydrodynamic force.

Bonds, M.H., Keenan, D.C., Rohani, R., and Sachs, J.D. **Poverty trap formed by the ecology of infectious diseases.** *Proceedings of the Royal Society of London [B]* 277(1685): 1185-1192, 2010.

Notes: While most of the world has enjoyed exponential economic growth, more than one-sixth of the world is today roughly as poor as their ancestors were many generations ago. Widely accepted general explanations for the persistence of such poverty have been elusive and are needed by the international development community. Building on a well-established model

of human infectious diseases, we show how formally integrating simple economic and disease ecology models can naturally give rise to poverty traps, where initial economic and epidemiological conditions determine the long-term trajectory of the health and economic development of a society. This poverty trap may therefore be broken by improving health conditions of the population. More generally, we demonstrate that simple human ecological models can help explain broad patterns of modern economic organization.

Bauer, M., Hoagland, P., Leschine, T.M., Blount, B.G., Pomeroy, C.M., Lampl, L.L., Scherer, C.W., Ayres, D.L., Tester, P.A., Sengco, M.R., Sellner, K.G., and Schumacker, J. **The importance of human dimensions research in managing harmful algal blooms.** *Frontiers in Ecology and Environment* 8(2): 75-83, 2010.

Notes: Harmful algal blooms (HABs) are natural freshwater and marine hazards that impose substantial adverse impacts on the human use of coastal and marine resources. The socioeconomic and health impacts of HABs can be considerable, thereby making a case for "human dimensions" research to support HAB response. Human dimensions research is multidisciplinary, integrating social science, humanities, and other fields with natural science to enhance resource management by addressing human causes, consequences, and responses to coastal environmental problems. Case studies reported here illustrate the importance of human dimensions research. Incorporating such research into the scientific agenda — as well as into management decisions of public agencies concerned with natural resource management, environmental protection, and public health and welfare — requires the development of both strategic guidance and institutional capacity. The recent development of a multi-agency research strategy for HAB response and a strategic plan for human dimensions research represent two important steps in this direction.

Torres-Escribano, S., Velez, D., and Montoro, R. **Mercury and methylmercury bioaccessibility in swordfish.** *Food Additives and Contaminants: Part A* 27(3): 327-337, 2010.

Notes: Concentrations of mercury (Hg) in swordfish (*Xiphias gladius*) present a food safety problem for many countries. This study analyses total Hg (t-Hg) concentrations in 27 samples of swordfish marketed in Spain in 2005 and in their bioaccessible fractions (soluble concentration in gastrointestinal medium), obtained after applying an *in vitro* digestion method. Methylmercury (MeHg) was also determined in the bioaccessible fractions. T-Hg concentrations in the samples were 0.41-2.11 mg kg⁻¹ wet weight, with a mean of 0.96 ± 0.47 mg kg⁻¹ wet weight. A total of 37% of the samples exceeded the Hg limit set by Spanish legislation (1.0 mg kg⁻¹ wet weight). Bioaccessible t-Hg concentrations were 0.17-1.72 mg kg⁻¹ wet weight (0.63 ± 0.4 mg kg⁻¹ wet weight), corresponding to 38-83% (64% ± 14%) of t-Hg. Bioaccessible MeHg concentrations, representing 94% of the bioaccessible t-Hg concentrations, were 0.16-1.53 mg kg⁻¹ wet weight, with a mean of 0.49 ± 0.32 mg kg⁻¹ wet weight. Children and adults who regularly consume this product in Spain have Hg and MeHg intakes that exceed the tolerable daily intake limits recommended by the Food and Agricultural Organization/World Health Organization (FAO/WHO) and US Environmental Protection Agency (USEPA). These results show the need for recommendations about swordfish consumption by population groups at risk in Spain.

Boucher, O., Bastien, C.H., Saint-Amour, D., Dewailly, E., Ayotte, P., Jacobson, J.L., Jacobson, S.W., and Muckle, G. **Prenatal exposure to methylmercury and PCBs affects distinct stages of information processing: An event-related potential study with Inuit children.** *NeuroToxicology* 31(4): 373-384, 2010.

Notes: Methylmercury (MeHg) and polychlorinated biphenyls (PCBs) are seafood contaminants known for their adverse effects on neurodevelopment. This study examines the relation of developmental exposure to these contaminants to information processing assessed with event-related potentials (ERPs) in school-aged Inuit children from Nunavik (Arctic Québec). In a prospective longitudinal study on child development, exposure to contaminants was measured at birth and 11 years of age. An auditory oddball protocol was administered at 11 years to measure ERP components N1 and P3b. Multiple regression analyses were performed to examine the associations of levels of the contaminants to auditory oddball performance (mean reaction time, omission errors and false alarms) and ERP parameters (latency and amplitude) after control for potential confounding variables. A total of 118 children provided useable ERP data. Prenatal MeHg exposure was associated with slower reaction times and fewer false alarms during the oddball task. Analyses of the ERP parameters revealed that prenatal

MeHg exposure was related to greater amplitude and delayed latency of the N1 wave in the target condition but not to the P3b component. MeHg effects on the N1 were stronger after control for seafood nutrients. Prenatal PCB exposure was not related to any endpoint for sample as a whole but was associated with a decrease in P3b amplitude in the subgroup of children who had been breast-fed for less than 3 months. Body burdens of MeHg and PCBs at 11 years were not related to any of the behavioural or ERP measures. These data suggest that prenatal MeHg exposure alters attentional mechanisms modulating early processing of sensory information. By contrast, prenatal PCB exposure appears to affect information processing at later stages, when the information is being consciously evaluated. These effects seem to be mitigated in children who are breast-fed for a more extended period.

Sundseth, K., Pacyna, J.M., Pacyna, E.G., Munthe, J., Belhaj, M., and Astrom, S. **Economic benefits from decreased mercury emissions: Projections for 2020.** *Journal of Cleaner Production* 18(4): 386-394, 2010.

Notes: Anthropogenic processes have increased the exposure of humans and wildlife to toxic methyl mercury (MeHg). Mercury emissions will increase by about 25% between 2005 and 2020, if the present trajectory is maintained. A global assessment of societal damages caused by the ingestion of methyl mercury, based merely on loss of IQ (intelligence quotient), suggests that the annual cost will be approximately US\$3.7 billion (2005 dollars) in 2020. The corresponding cost of damages resulting from the inhalation of methyl mercury is estimated at US\$2.9 million (2005 dollars). Under a higher degree of emission control such as in the case of the Extended Emission Control (EXEC) and the Maximum Feasible Technological Reduction (MFTR) scenarios, total emissions could decrease in the period 2005-2020 by about 50-60%. The corresponding annual benefits in 2020 are estimated to be about US\$1.8-2.2 billion (2005 dollars). Large economic benefits can be achieved by reducing global mercury emissions.

Haug, L.S., Thomsen, C., Brantsæter, A.L., Kvaem, H.E., Haugen, M., Becher, G., Alexander, J., Meltzer, H.M., and Knutsen, H.K. **Diet and particularly seafood are major sources of perfluorinated compounds in humans.** *Environment International* 36(7): 772-778, 2010.

Notes: Commercially used perfluorinated compounds (PFCs) have been widely detected in wildlife and humans, but the sources of human exposure are not fully characterized. The objectives of this study were to explore possible associations between concentrations of PFCs in serum and consumption of food with particular focus on seafood, and to compare estimated dietary intakes with determined serum PFC concentrations. Concentrations of 19 PFCs were determined in serum from 175 participants in the Norwegian Fish and Game Study and evaluated with respect to food consumption using multiple linear regression analysis. Associations between estimated individual total dietary intakes of PFCs and serum concentrations were also explored. PFC concentrations in serum were significantly associated ($p < 0.05$) with the consumption of lean fish, fish liver, shrimps and meat, as well as age, breastfeeding history and area of residence (R^2 0.35-0.63). The estimated dietary intakes of perfluorooctanoic acid (PFOA), perfluoro-undecanoic acid (PFUnDA) and perfluorooctane sulfonic acid (PFOS) were 0.60, 0.34 and 1.5 ng/kg body weight/day, respectively. Seafood (fish and shellfish) was the major dietary source contributing 38% of the estimated dietary intakes of PFOA, 93% of PFUnDA and 81% of PFOS. The estimated dietary intakes of these three selected PFCs were significantly associated with the corresponding serum PFC concentrations ($p < 0.05$). In conclusion, our results show that consumption of fish and shellfish is a major determinant of serum PFC concentrations. Further, significant relationships between estimated dietary intakes and serum concentrations have been demonstrated for the first time.

Brant, S.V., Cohen, A.N., James, D., Hui, L., Hom, A., and Loker, E.S. **Cercarial dermatitis transmitted by exotic marine snail.** *Emerging Infectious Diseases* 16(9): 1357-1365, 2010. **O/A**

Notes: Cercarial dermatitis (swimmer's itch) is caused by the penetration of human skin by cercariae of schistosome parasites that develop in and are released from snail hosts. Cercarial dermatitis is frequently acquired in freshwater habitats, and less commonly in marine or estuarine waters. To investigate reports of a dermatitis outbreak in San Francisco Bay, California, we surveyed local snails for schistosome infections during 2005-2008. We found schistosomes only in *Haminoea japonica*, an Asian snail first reported in San Francisco Bay in 1999. Genetic markers place this schistosome within a large clade of avian

schistosomes, but do not match any species for which there are genetic data. It is the second known schistosome species to cause dermatitis in western North American coastal waters; these species are transmitted by exotic snails. Introduction of exotic hosts can support unexpected emergence of an unknown parasite with serious medical or veterinary implications.

James, K.J., Carey, B., O'Halloran, J., van Pelt, F.N.A.M., and Škrabáková, Z. **Shellfish toxicity: human health implications of marine algal toxins.** *Epidemiology and Infection* 138(7): 927-940, 2010.

Notes: Five major human toxic syndromes caused by the consumption of shellfish contaminated by algal toxins are presented. The increased risks to humans of shellfish toxicity from the prevalence of harmful algal blooms (HABs) may be a consequence of large-scale ecological changes from anthropogenic activities, especially increased eutrophication, marine transport and aquaculture, and global climate change. Improvements in toxin detection methods and increased toxin surveillance programmes are positive developments in limiting human exposure to shellfish toxins.

Sowman, M. and Cardoso, P. **Small-scale fisheries and food security strategies in countries in the Benguela Current Large Marine Ecosystem (BCLME) region: Angola, Namibia and South Africa.** *Marine Policy* 34(6): 1163-1170, 2010.

Notes: This paper provides an overview of the small-scale fisheries sector in countries within the Benguela Current Large Marine Ecosystem (BCLME), one of the most productive large marine ecosystems in the world. The study revealed that Angola, Namibia and South Africa have very different legal and policy frameworks, show different levels of compliance with international and regional agreements to protect the livelihoods and food security of small-scale fishers, as well as of integration of fisheries into food security objectives. Angolan law recognises and protects small-scale fishers through legal and institutional mechanisms. In Namibia, this sector of fishers is not legally recognised, while in South Africa traditional fishers have been largely excluded from the new fisheries management framework. Trends in national and regional fish consumption and in the extent of export orientation in fisheries are explored, as well as the potential threats to small-scale producers and food security in the region posed by ongoing drives to incorporate fisheries in the World Trade Organisation (WTO) agreements.

Fabinyi, M. **The intensification of fishing and the rise of tourism: Competing coastal livelihoods in the Calamianes Islands, Philippines.** *Human Ecology* 38(3): 415-427, 2010.

Notes: Research on agrarian changes in Southeast Asia has paid comparatively less attention to the processes of livelihood change in coastal regions. In the context of declining profitability in the fishing industry due to environmental degradation and overfishing, governments at multiple levels are heavily promoting tourism in the Philippines. This paper considers the ways in which coastal residents in the Calamianes Islands, Palawan province, negotiate these changes in the fishing and tourism industries. Despite the push for tourism as a more sustainable alternative to fishing, the experiences and priorities of coastal residents complicate this shift. The paper demonstrates that fishing is marked by increasing levels of intensification, and that tourism has the potential to exclude fishers from many of its purported benefits. These are two important trends that need to be taken into account when analysing livelihood change in coastal regions of Southeast Asia.

Ford, J. D. and Pearce, T. **What we know, do not know, and need to know about climate change vulnerability in the western Canadian Arctic: a systematic literature review.** *Environmental Research Letters* 5(1): art. 014008, 2010. [O/A](#)

Notes: This letter systematically reviews and synthesizes scientific and gray literature publications ($n = 420$) to identify and characterize the nature of climate change vulnerability in the Inuvialuit Settlement Region of the western Canadian Arctic and identify gaps in understanding. The literature documents widespread evidence of climate change, with implications for human and biophysical systems. Adaptations are being employed to manage changing conditions and are indicative of a high adaptive capacity. However, barriers to adaptation are evident and are expected to constrain adaptive capacity to future climate change. Continued climate change is predicted for the region, with differential exposure sensitivity for communities, groups and

sectors: a function of social-economic-biophysical characteristics and projected future climatic conditions. Existing climate risks are expected to increase in magnitude and frequency, although the interaction between projected changes and socio-economic-demographic trends has not been assessed. The capacity for adapting to future climate change has also not been studied. The review identifies the importance of targeted vulnerability research that works closely with community members and other stakeholders to address research needs. Importantly, the fully categorized list of reviewed references accompanying this letter will be a valuable resource for those working or planning to work in the region, capturing climate change research published since 1990. At a broader level, the systematic review methodology offers a promising tool for climate/environmental change studies in general where there is a large and emerging body of research but limited understanding of research gaps and needs.

Villa, F.A. and Gerwick, L. **Marine natural product drug discovery: Leads for treatment of inflammation, cancer, infections, and neurological disorders.** *Immunopharmacology and Immunotoxicology* 32(2): 228-237, 2010.

Notes: Natural products, secondary metabolites, isolated from plants, animals and microbes are important sources for bioactive molecules that in many cases have been developed into treatments for diseases. This review will focus on describing the potential for finding new treatments from marine natural products for inflammation, cancer, infections, and neurological disorders. Historically terrestrial natural products have been studied to a greater extent and such classic drugs as aspirin, vincristine and many of the antibiotics are derived from terrestrial natural products. The need for new therapeutics in the four areas mentioned is dire. Within the last 30 years marine natural products, with their unique structures and high level of halogenation, have shown many promising activities against the inflammatory response, cancer, infections and neurological disorders. The review will outline examples of such compounds and activities.

McNamara, R.K. et al. **Docosahexaenoic acid supplementation increases prefrontal cortex activation during sustained attention in healthy boys: a placebo-controlled, dose-ranging, functional magnetic resonance imaging study.** *American Journal of Clinical Nutrition* 91(4): 1060-1067, 2010.

Notes: Background: Emerging evidence suggests that docosahexaenoic acid (DHA, 22:6n-3), the principal omega-3 (n-3) fatty acid in brain gray matter, positively regulates cortical metabolic function and cognitive development. However, the effects of DHA supplementation on functional cortical activity in human subjects are unknown. Objective: The objective was to determine the effects of DHA supplementation on functional cortical activity during sustained attention in human subjects. Design: Healthy boys aged 8-10 y (n = 33) were randomly assigned to receive placebo or 1 of 2 doses of DHA (400 or 1200 mg/d) for 8 wk. Relative changes in cortical activation patterns during sustained attention at baseline and endpoint were determined by functional magnetic resonance imaging. Results: At 8 wk, erythrocyte membrane DHA composition increased significantly from baseline in subjects who received low dose (by 47%) or high-dose (by 70%) DHA but not in those who received placebo (-11%). During sustained attention, both DHA dose groups had significantly greater changes from baseline in activation of the dorsolateral prefrontal cortex than did the placebo group, and the low-dose and high-dose DHA groups had greater decreases in the occipital cortex and cerebellar cortex, respectively. Relative to low-dose DHA, high-dose DHA resulted in greater decreases in activation of bilateral cerebellum. The erythrocyte DHA composition was positively correlated with dorsolateral prefrontal cortex activation and was inversely correlated with reaction time, at baseline and endpoint. Conclusion: Dietary DHA intake and associated elevations in erythrocyte DHA composition are associated with alterations in functional activity in cortical attention networks during sustained attention in healthy boys.

Wall, R., Ross, R.P., Fitzgerald, G.F., and Stanton, C. **Fatty acids from fish: the anti-inflammatory potential of long-chain omega-3 fatty acids.** *Nutrition Reviews* 68(5): 280-289, 2010.

Notes: Omega-6 (n-6) and omega-3 (n-3) polyunsaturated fatty acids (PUFA) are precursors of potent lipid mediators, termed eicosanoids, which play an important role in the regulation of inflammation. Eicosanoids derived from n-6 PUFAs (e.g., arachidonic acid) have proinflammatory and immunoactive functions, whereas eicosanoids derived from n-3 PUFAs [e.g.,

eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA)] have anti-inflammatory properties, traditionally attributed to their ability to inhibit the formation of n-6 PUFA-derived eicosanoids. While the typical Western diet has a much greater ratio of n-6 PUFAs compared with n-3 PUFAs, research has shown that by increasing the ratio of n-3 to n-6 fatty acids in the diet, and consequently favoring the production of EPA in the body, or by increasing the dietary intake of EPA and DHA through consumption of fatty fish or fish-oil supplements, reductions may be achieved in the incidence of many chronic diseases that involve inflammatory processes; most notably, these include cardiovascular diseases, inflammatory bowel disease (IBD), cancer, and rheumatoid arthritis, but psychiatric and neurodegenerative illnesses are other examples.

Saravanan, P., Davidson, N.C., Schmidt, E.B., and Calder, P.C. **Cardiovascular effects of marine omega-3 fatty acids.** *The Lancet* 376(9740): 540-550, 2010.

Notes: Much evidence shows that the marine omega-3 fatty acids eicosapentaenoic acid and docosahexaenoic acid have beneficial effects in various cardiac disorders, and their use is recommended in guidelines for management of patients after myocardial infarction. However, questions have been raised about their usefulness alongside optimum medical therapies with agents proven to reduce risk of cardiac events in high-risk patients. Additionally, there is some evidence for a possible pro-arrhythmic effect in subsets of cardiac patients. Some uncertainty exists about the optimum dose needed to obtain beneficial effects and the relative merit of dietary intake of omega-3 polyunsaturated fatty acids versus supplements. We review evidence for the effects of omega-3 polyunsaturated fatty acids on various cardiac disorders and the risk factors for cardiac disease. We also assess areas of uncertainty needing further research.

Ramos, V. and Vasconcelos, V. **Palytoxin and analogs: biological and ecological effects.** *Marine Drugs* 8(7): 2021-2037, 2010. **O/A**

Notes: Palytoxin (PTX) is a potent marine toxin that was originally found in soft corals from tropical areas of the Pacific Ocean. Soon after, its occurrence was observed in numerous other marine organisms from the same ecological region. More recently, several analogs of PTX were discovered, remarkably all from species of the dinoflagellate genus **Ostreopsis**. Since these dinoflagellates are also found in other tropical and even in temperate regions, the formerly unsuspected broad distribution of these toxins was revealed. Toxicological studies with these compounds shows repeatedly low LD₅₀ values in different mammals, revealing an acute toxic effect on several organs, as demonstrated by different routes of exposure. Bioassays tested for some marine invertebrates and evidences from environmental populations exposed to the toxins also give indications of the high impact that these compounds may have on natural food webs. The recognition of its wide distribution coupled with the poisoning effects that these toxins can have on animals and especially on humans have concerned the scientific community. In this paper, we review the current knowledge on the effects of PTX and its analogs on different organisms, exposing the impact that these toxins may have in coastal ecosystems.

O'Sullivan, L., Murphy, B., McLoughlin, P., Duggan, P., Lawlor, P.G., Hughes, H., and Gardiner, G.E. **Prebiotics from marine macroalgae for human and animal health applications.** *Marine Drugs* 8(7): 2038-2064, 2010. **O/A**

Notes: The marine environment is an untapped source of bioactive compounds. Specifically, marine macroalgae (seaweeds) are rich in polysaccharides that could potentially be exploited as prebiotic functional ingredients for both human and animal health applications. Prebiotics are non-digestible, selectively fermented compounds that stimulate the growth and/or activity of beneficial gut microbiota which, in turn, confer health benefits on the host. This review will introduce the concept and potential applications of prebiotics, followed by an outline of the chemistry of seaweed polysaccharides. Their potential for use as prebiotics for both humans and animals will be highlighted by reviewing data from both **in vitro** and **in vivo** studies conducted to date.

Jonasson, S., Eriksson, J., Berntzon, L., Spáčil, Z., Ilag, L.L., Ronnevi, L.-O., Rasmussen, U., and Bergman, B. **Transfer of a cyanobacterial neurotoxin within a temperate aquatic ecosystem suggests pathways for human exposure.** *Proceedings of the National Academy of Sciences [USA]* 107(20): 9252-9257, 2010.

Notes: β -methylamino-L-alanine (BMAA), a neurotoxic nonprotein amino acid produced by most cyanobacteria, has been proposed to be the causative agent of devastating neurodegenerative diseases on the island of Guam in the Pacific Ocean. Because cyanobacteria are widespread globally, we hypothesized that BMAA might occur and bioaccumulate in other ecosystems. Here we demonstrate, based on a recently developed extraction and HPLC-MS/MS method and long-term monitoring of BMAA in cyanobacterial populations of a temperate aquatic ecosystem (Baltic Sea, 2007-2008), that BMAA is biosynthesized by cyanobacterial genera dominating the massive surface blooms of this water body. BMAA also was found at higher concentrations in organisms of higher trophic levels that directly or indirectly feed on cyanobacteria, such as zooplankton and various vertebrates (fish) and invertebrates (mussels, oysters). Pelagic and benthic fish species used for human consumption were included. The highest BMAA levels were detected in the muscle and brain of bottom-dwelling fishes. The discovery of regular biosynthesis of the neurotoxin BMAA in a large temperate aquatic ecosystem combined with its possible transfer and bioaccumulation within major food webs, some ending in human consumption, is alarming and requires attention.

Andam, K.S., Ferraro, P.J., Sims, K.R.E., Healy, A., and Holland, M.B. **Protected areas reduced poverty in Costa Rica and Thailand.** *Proceedings of the National Academy of Sciences [USA]* 107(22): 9996-10001, 2010.

Notes: As global efforts to protect ecosystems expand, the socioeconomic impact of protected areas on neighboring human communities continues to be a source of intense debate. The debate persists because previous studies do not directly measure socioeconomic outcomes and do not use appropriate comparison groups to account for potential confounders. We illustrate an approach using comprehensive national datasets and quasi-experimental matching methods. We estimate impacts of protected area systems on poverty in Costa Rica and Thailand and find that although communities near protected areas are indeed substantially poorer than national averages, an analysis based on comparison with appropriate controls does not support the hypothesis that these differences can be attributed to protected areas. In contrast, the results indicate that the net impact of ecosystem protection was to alleviate poverty.

Holloman, E.L. and Newman, M.C. **A community-based assessment of seafood consumption along the lower James River, Virginia, USA: Potential sources of dietary mercury exposure.** *Environmental Research* 110(3): 213-219, 2010.

Notes: The use of community-based participatory research (CBPR) methods to conduct environmental exposure assessments provides valuable insight about disparities in seafood consumption and contaminant exposure. Ninety-five community-specific seafood consumption surveys were administered to low-income African-American women (ages 16-49) residing in the Southeast community of Newport News, VA, USA, for the purpose of assessing potential dietary mercury exposure. Only the results of the seafood consumption surveys are presented in this manuscript. Approximately 65% of the women surveyed do not fish; however, 83% had consumed seafood within the last 7 days. Whiting, shrimp, and canned tuna were the three items most frequently consumed. Ninety-three percent of the women surveyed stated that grocery/seafood markets were the main sources of the seafood items generally consumed. The mean seafood consumption rate for the women surveyed was 147.8 g/day (95% CI: 117.6-185.8), a rate substantially higher than the mean seafood consumption rate reported for US women (1.8 g/day 95% CI: 1.51-2.04). Shrimp, croaker, and blue crab were the top three seafood items with the highest summed amount (g/day) consumed. There was no significant association between demographic variables (age, income, education, and weight) and total number of seafood items listed, ingestion rate (g/meal), exposure frequency (meals/year), and seafood consumption rate (g/day). By using CBPR to assess seafood consumption in this community, we learned that even though women in Southeast Newport News, Virginia are not subsistence fishers, they consume seafood at a subsistence fisher rate. Of the three seafood items most frequently consumed, canned tuna potentially plays a significant role in dietary mercury exposure for women in this community. Future work includes determining mercury concentrations in seafood items consumed and generating community-specific statements of dietary mercury risks.

Groth, E. **Ranking the contributions of commercial fish and shellfish varieties to mercury exposure in the United States: Implications for risk communication.** *Environmental Research* 110(3): 226-236, 2010.

Notes: Fish and shellfish have important nutritional benefits, and US per capita seafood consumption has increased substantially since 2002. Recent research has reinforced concerns about adverse effects of methylmercury exposure, suggesting that methylmercury doses associated with typical US rates of fish consumption may pose measurable risks, with no threshold. These converging trends create a need to improve risk communication about fish consumption and mercury. The analysis performed here identifies the relative importance of different fish and shellfish as sources of mercury in the US seafood supply and proposes improved consumer advice, so that the public can benefit from fish consumption while minimizing mercury exposure. I have quantified contributions to total mercury in the US seafood supply by 51 different varieties of fish and shellfish, then ranked and sorted the 51 varieties in terms of relative impact. Except for swordfish, most fish with the highest mercury levels are relatively minor contributors to total inputs. Tuna (canned light, canned albacore and fresh/frozen varieties) accounts for 37.4 percent of total mercury inputs, while two-thirds of the seafood supply and nine of the 11 most heavily consumed fish and shellfish are low or very low in mercury. Substantial improvement in risk communication about mercury in fish and seafood is needed; in particular, several population subsets need better guidance to base their seafood choices more explicitly on mercury content. I have sorted the 51 seafood varieties into six categories based on mercury levels, as a framework for improving risk communication in this regard.

Gershwin, L.-A., De Nardi, M., Winkel, K.D., and Fenner, P.J. **Marine stingers: Review of an under-recognized global coastal management issue.** *Coastal Management* 38(1): 22-41, 2010.

Notes: Dangerous marine stingers (jellyfish) are an emotive issue in tropical Australia, where they are widely regarded as the number one marine health threat. However, numerous severe and fatal stings have been reported throughout the tropical and temperate seas of the world, indicating that marine stingers are a global health problem. Further, life-threatening jellyfish stings are more frequently reported globally now compared to earlier decades, possibly as a result of improved recognition and reporting, or increased spatial and/or temporal distribution or densities. As stinging incidents may also have significant financial implications (lost tourism revenues and liability settlements), and the treatment of envenomed patients comes at high cost to the taxpayer, this issue is also a management challenge. This article outlines suggested approaches, based largely on Australian experience, for dealing with this under-recognized global coastal management issue.

Torell, E., Crawford, B., Kotowicz, D., Herrera, M.D., and Tobey, J. **Moderating our expectations on livelihoods in ICM: Experiences from Thailand, Nicaragua, and Tanzania.** *Coastal Management* 38(3): 216-237, 2010.

Notes: Livelihood development is often integrated into coastal management projects as a strategy for increasing project success. This strategy is taken because it is known that livelihood development increases the interest, support, and trust of the community in coastal and marine ecosystem conservation. The research described in this article explores what factors contribute to enterprise success and whether livelihood interventions lead to other benefits in addition to employment and income generation. A learning portfolio approach was used that draws on the field sites and projects supported by the USAID-funded Sustainable Coastal Communities and Ecosystem (SUCCESS) Program. Our experience suggests that key factors that influence livelihood enterprise success (revenue generation) include: the type of enterprise supported, the form of extension support provided, community context, and enterprise ownership (i.e., group or individual). The results also confirm the idea that there are important benefits from livelihood development not related to profitability, which can improve the impact of coastal management programs. We found benefits that include increased resilience, community and gender empowerment, stronger social ties, and improved coordination with local government.

Oshiro, N., Yogi, K., Asato, S., Sasaki, T., Tamanaha, K., Hiram, M., Yasumoto, T., and Inafuku, Y. **Ciguatera incidence and fish toxicity in Okinawa, Japan.** *Toxicon* 56(5): 656-661, 2010.

Notes: Okinawa being located in the subtropical region has the highest incidence of ciguatera in Japan. Officially, 33 outbreaks involving 103 patients have been reported between 1997 and 2006. The implicated species were *Variola louti*,

Lutjanus bohar, *Lutjanus monostigma*, *Epinephelus fuscoguttatus*, unidentified *Lutjanus* sp., *Plectropomus areolatus*, *Oplegnathus punctatus*, *Epinephelus polyphekadion*, *Caranx ignobilis* and moray eel. Toxicities of the leftover meals, as determined by mouse bioassays, ranged from 0.025 to 0.8 MU/g or above (equivalent to 0.175 - 5.6 ng CTX1B/g). We collected 612 specimens of fish belonging to *L. monostigma*, *L. bohar*, *Lutjanus argentimaculatus*, *Lutjanus russellii*, *V. louti*, *Variola albimarginata*, and *E. fuscoguttatus* from the coasts around Okinawa and examined the toxicity of the flesh by the mouse bioassay. The rate of toxic fish was as follows: *L. monostigma*: 32.3%, *L. bohar*: 11.9%, *V. louti*: 14.3%, *E. fuscoguttatus*: 20.8%. Only one out of 36 samples of *V. albimarginata* and two of 74 samples of *L. russellii* were found toxic. None of the 35 samples of *L. argentimaculatus* was toxic. Nor the *L. bohar* samples weighing less than 4 kg were toxic. In all toxic samples, CTX1B was detected by LC/MS analysis but CTX3C and 51-hydroxyCTX3C were not.

Baumann, F., Bourrat, M.-B., and Pauillac, S. **Prevalence, symptoms and chronicity of ciguatera in New Caledonia: Results from an adult population survey conducted in Noumea during 2005.** *Toxicon* 56(5): 662-667, 2010.

Notes: Ciguatera is a widespread ichthyosarcotoxism which causes gastrointestinal, neurological and cardiovascular disturbances. Investigations conducted by ORSTOM in 1992 highlighted a prevalence of 25% in the adult population of Noumea, New Caledonia. The main objective of our study was to estimate the prevalence of ciguatera and the persistence of symptoms by sex and by ethnicity among adult patients of a nurse clinic in Noumea in 2005. Investigations were conducted from 1st January to 15th June 2005. During this period, 559 patients were included: 165 males and 394 females. Among them, 37.8% were poisoned at least once in their life. This rate was independent of gender and ethnicity, but was significantly higher in age groups above 40 years. Neurological signs were more frequent (>80%) than gastrointestinal (<50%) and cardiac signs (<15%). Symptoms presented no difference between ethnic or gender groups, even for subjective signs. Most poisonings were due to carnivorous fishes, but quite all species living in the lagoon were quoted. Symptoms persisted more than one year for 34% of the population, in both Melanesians and Caucasians. This study shows a significant increase of ciguatera prevalence, and its chronicity for 1/5 of European cases.

Hamilton, B., Whittle, N., Shaw, G., Eaglesham, G., Moore, M.R., and Lewis, R.J. **Human fatality associated with Pacific ciguatoxin contaminated fish.** *Toxicon* 56(5): 668-673, 2010.

Notes: Ciguatera is a food poisoning identified as the principal risk factor in the consumption of tropical fish in Oceania. The syndrome, which follows ingestion of ciguatoxin-contaminated ciguateric fishes, is characterised by an array of gastrointestinal and neurological features. In this report we examine forensic samples associated with a human fatality using a 3H-brevetoxin binding assay and reversed-phase HPLC/MS and HPLC/MS/MS. Three Pacific ciguatoxins (P-CTX) were detected in the implicated fish flesh sample by LC-MS/MS, implicating multiple P-CTXs in the fatal case. Additionally, ciguatoxin was identified in a liver sample obtained at post-mortem. The level of ciguatoxin detected (0.14 ppb P-CTX-1 equivalents by binding assay) indicated that at least 10% of the ingested P-CTX-1 remained in the human liver 6 days after the toxic fish was consumed. This study confirms the potential of tropical reef fish to accumulate sufficient P-CTX to be lethal to humans, especially if the liver and viscera are consumed as part of the meal.

Chinain, M., Darius, H.T., Ung, A., Fouc, M.T., Revel, T., Cruchet, P., Pauillac, S., and Laurent, D. **Ciguatera risk management in French Polynesia: The case study of Raivavae Island (Australes Archipelago).** *Toxicon* 56(5): 674-690, 2010.

Notes: Based on epidemiological data available through long-term monitoring surveys conducted by both the Public Health Directorate and the Louis Malardé Institute, ciguatera is highly endemic in French Polynesia, most notably in Raivavae (Australes) which appears as a hot spot of ciguatera with an average incidence rate of 140 cases/10,000 population for the period 2007-2008. In order to document the ciguatera risk associated with Raivavae lagoon, algal and toxin-based field monitoring programs were conducted in this island from April 2007 to May 2008. Practically, the distribution, abundance and toxicity of *Gambierdiscus* populations, along with the toxicity levels in 160 fish distributed within 25 distinct species, were assessed in various sampling locations. Herbivores such as Scarids (parrotfish) and Acanthurids (unicornfish) were rated as high-risk species based on receptor-binding assay toxicity data. A map of the risk stratification within the Raivavae lagoon was

also produced, which indicates that locations where both natural and man-made disturbances have occurred remained the most susceptible to CFP incidents. Our findings also suggest that, locally, the traditional knowledge about ciguatera may not be scientifically complete but is functionally correct. Community education resulted in self-regulating behaviour towards avoidance of high-risk fish species and fishing locations.

Tester, P.A., Feldman, R.L., Nau, A.W., Kibler, S.R., and Wayne, L.R. **Ciguatera fish poisoning and sea surface temperatures in the Caribbean Sea and the West Indies.** *Toxicon* 56(5): 698-710, 2010.

Notes: Ciguatera fish poisoning (CFP) is a circumtropical disease caused by ingestion of a variety of reef fish that bioaccumulate algal toxins. Distribution and abundance of the organisms that produce these toxins, chiefly dinoflagellates of the genus *Gambierdiscus*, are reported to correlate positively with water temperature. Consequently, there is growing concern that increasing temperatures associated with climate change could increase the incidence of CFP. This concern prompted experiments on the growth rates of six *Gambierdiscus* species at temperatures between 18°C and 33°C and the examination of sea surface temperatures in the Caribbean and West Indies for areas that could sustain rapid *Gambierdiscus* growth rates year-round. The thermal optimum for five of six *Gambierdiscus* species tested was $\geq 29^{\circ}\text{C}$. Long-term SST data from the southern Gulf of Mexico indicate the number of days with sea surface temperatures $\geq 29^{\circ}\text{C}$ has nearly doubled (44 to 86) in the last three decades. To determine how the sea surface temperatures and *Gambierdiscus* growth data correlate with CFP incidences in the Caribbean, a literature review and a uniform, region-wide survey (1996-2006) of CFP cases were conducted. The highest CFP incidence rates were in the eastern Caribbean where water temperatures are warmest and least variable.

Aráoz, R., Molgó, J., and Tandeau de Marsac, N. **Neurotoxic cyanobacterial toxins.** *Toxicon* 56(5): 813-828, 2010.

Notes: Worldwide development of cyanobacterial blooms has significantly increased in marine and continental waters in the last century due to water eutrophication. This phenomenon is favoured by the ability of planktonic cyanobacteria to synthesize gas vesicles that allow them to float in the water column. Besides, benthic cyanobacteria that proliferate at the bottom of lakes, rivers and coastal waters form dense mats near the shore. Cyanobacterial massive proliferation is of public concern regarding the capacity of certain cyanobacterial strains to produce hepatotoxic and neurotoxic compounds that can affect public health, human activities and wild and stock animals. The cholinergic synapses and voltage-gated sodium channels constitute the targets of choice of cyanobacterial neurotoxins. Anatoxin-a and homoanatoxin-a are agonists of nicotinic acetylcholine receptors. Anatoxin-a(s) is an irreversible inhibitor of acetylcholinesterase. Saxitoxin, kalkitoxin and jamaicamide are blockers of voltage-gated sodium channels, whereas antillatoxin is an activator of such channels. Moreover the neurotoxic amino acid l-beta-N-methylamino-l-alanine was shown to be produced by diverse cyanobacterial taxa. Although controversial, increasing in vivo and in vitro evidence suggest a link between the ingestion of l-beta-N-methylamino-l-alanine and the development of amyotrophic lateral sclerosis/ Parkinsonism-dementia complex, a neurodegenerative disease. This paper reviews the occurrence of cyanobacterial neurotoxins, their chemical properties, mode of action and biosynthetic pathways.

Méjean, A., Peyraud-Thomas, C., Kerbrat, A.S., Golubic, S., Pauillac, S., Chinain, M., and Laurent, D. **First identification of the neurotoxin homoanatoxin-a from mats of *Hydrocoleum lyngbyaceum* (marine cyanobacterium) possibly linked to giant clam poisoning in New Caledonia.** *Toxicon* 56(5): 829-835, 2010.

Notes: We report the first identification of homoanatoxin-a from benthic marine cyanobacteria (*Hydrocoleum lyngbyaceum*) samples collected in Lifou (Loyalty Islands, New Caledonia), where cases of giant clams (*Tridacna maxima*) intoxications were recorded during a severe ciguatera fish poisoning outbreak. Homoanatoxin-a was also detected in extracts of giant clams harvested in the surroundings of the contaminated area suggesting the possible link between these poisoning events and the occurrence of potentially neurotoxic *Hydrocoleum*.