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**John B. Davis**  
MEAM Editor / OpenChannels Supervisor

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## Are catch shares compatible with ecosystem-based management? Experts respond

Governments around the world are striving to implement ecosystem-based management (EBM) for their marine environments. At the same time, there is a trend toward applying catch shares to manage fisheries. Catch shares are systems in which the privilege to harvest a specific area or portion of a fishery's total catch is assigned to particular individuals or groups. (More details are in the box on page 2.) According to one study, 20-25% of global landings by volume and 15-20% by value are now managed under catch shares (<http://bit.ly/EDFcatchshares>).

With the growing popularity of catch shares as a management tool, questions on how well this tool combines with others — like EBM — have emerged. EBM, for example, moves away from single-species or single-sector management and toward approaches that consider ecosystems as a whole. Catch shares, meanwhile, have primarily focused on allocation of single species — although there are increasing examples of multi-species fisheries, too, that have used catch-share programs.

In this issue of MEAM, we examine what opportuni-

ties exist for EBM and catch shares to complement one another. We posed the question:

### “Can catch shares promote EBM?”

...to a diverse panel of experts including fishers, fisheries managers, social scientists, ecologists, and conservation professionals. What emerged was a wide variety of responses, reported below.

To MEAM, their responses suggest that one answer to the question is, “It depends.” The devil is in the details. A well-designed and well-implemented catch share system may indeed be able to play an important role in fisheries management in an EBM system. On the other hand, an ill-designed and -implemented system may be an obstacle to achieving EBM goals.

Furthermore, we recognize that the wording of our poll question could be flipped. As suggested by some of the responses below, it may be just as important to consider how EBM (and its tenets of ecological and human sustainability) can be used to promote good catch share programs as vice versa.

continued on next page



**Tim Essington** — [essing@uw.edu](mailto:essing@uw.edu)

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Catch shares can indirectly support some goals of EBM. In my view, two of the biggest benefits of catch shares are reducing the “race to fish” and fostering collaboration among fishing participants. This has led to quite a bit of innovation on bycatch and discard reduction. For instance, the real-time monitoring of bycatch that is currently happening in the US and Canadian trawl fisheries is possible only because of the catch share system. The ability to conduct “test tows” to minimize unwanted bycatch is a direct consequence of ending the race to fish. Finally, the ability and incentives to invest in research to avoid interactions with threatened/endangered species are enhanced in catch shares. In fact, I see few successful examples on this score outside of catch share fisheries.

That being said, I don't see catch shares assisting with other goals of EBM, such as managing trade-offs and dealing with cumulative effects of anthropogenic stressors.

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**Mark Gibbs** — [Mark.Gibbs@aecom.com](mailto:Mark.Gibbs@aecom.com)

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In my view, it's all about incentives. Therefore the question becomes, do catch shares incentivize good

environmental stewardship? In theory, allocating rights incentivizes good resource stewardship. However, in the case of catch rights, the incentives apply to stewardship of the targeted stock, and not necessarily the greater ecosystem. By contrast, fishers and catch share owners often see an incentive to degrade the greater environment in order to maximize catches, and hence maximize value of the catch right.

Perhaps the best example of this is shellfish or demersal fisheries in which fishers in the past have

been incentivized to clear complex benthic habitat to reduce the likelihood of net fouling and provide greater soft sediment habitat for target species. Hence, unless right-holders perceive that protecting aspects of the greater environment will increase the productivity of target stocks and hence catch-rates, or somehow add value or minimize loss of value to the allocated right, then there is no obvious incentive through which the allocation of catch rights will lead to better overall environmental outcomes.

The challenge therefore becomes how to create these economic incentives. Ideas that have been put forward include economic penalties or effective taxes for fishing over high value habitat [and potentially damaging that habitat]. This would incentivize fishers not to fish in particular spatial areas that have been deemed worthy of more protection. Economic penalties for bycatch are also common, although these can create the perverse incentive of dumping bycatch.

It is not difficult to argue that catch rights on their own do not directly incentivize good environmental stewardship. However, there are possible ways to add incentives into the rights that drive the desired stewardship outcomes (<http://bit.ly/BeyondITQs>).

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**Scott Edwards** — [sedwards@edf.org](mailto:sedwards@edf.org)

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Catch shares support EBM by aligning fishermen's incentives with the protection of marine ecosystems through a system of rights, responsibilities, and rewards. By giving fishermen the privilege or right to harvest a secure area or share of the catch, fishermen are responsible for protecting fish stocks and marine ecosystems and are rewarded by stable and healthy populations.

Area-based catch shares, or Territorial Use Rights for Fishing (TURFs), allocate secure, exclusive fishing areas to fishermen. Because TURF participants benefit directly from a healthy ocean within their area, they are motivated to conserve and protect it. Several TURFs around the world were even developed and implemented with specific environmental goals in mind. The Os Miñarzos Marine Reserve of Fishing Interest, a TURF located off the coast of Galicia, Spain, was implemented to help recover fish stocks and protect biodiversity. Within the TURF lie two no-take reserves designed to protect highly productive spawning and breeding grounds. Since implementation, fishermen have reported increased and larger catches. In Japan, fishermen have voluntarily established more than 1000 marine protected areas along the coast and many have specifically been designated to support fish stocks in their TURFs.

## Common types of catch shares

The term *catch shares* refers to fisheries management systems that allocate a secure privilege to harvest a specific area or portion of a fishery's total catch to individuals, groups, or communities. Catch shares come in many forms with many acronyms. Some of the most common types and terms are:

**Individual Quotas (IQs):** programs that allocate the right to harvest a portion of a fishery's total allowable catch (TAC) to an individual. Individual Transferable Quotas (ITQs) are IQs that can be bought, sold, or transferred to other individuals.

**Community Quotas:** programs that allocate the right to harvest a portion of the fishery's total allowable catch (TAC) to a community.

**Territorial Use Rights for Fisheries (TURFs):** programs that allocate the right to harvest a secure area to an individual, group, or community.

Well-designed catch share programs are increasing catch limit compliance and driving reductions in bycatch and discarded fish. In addition they are protecting and restoring marine habitats, while also meeting socio-economic goals like increasing revenues, stabilizing jobs, and reducing fishing expenses for fishermen. These programs not only support EBM but are vital to preserving the health and sustainability of our oceans and marine habitats.

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Social Scientist, NOAA Fisheries

Implementing EBM involves defining policy goals and recognizing trade-offs. In fisheries, catch shares can be used as a distributional tool once trade-offs are determined. Given clear policy goals, thoughtfully designed programs where outcomes are monitored and evaluated, and management approaches that can be modified to mitigate undesirable outcomes, catch shares can support EBM.

Regrettably, goal setting in fisheries has often been an afterthought, with monitoring of socio-economic outcomes rare. Choices about what ecosystem services should be sustained, what tradeoffs must be made, and how services are best distributed across communities should inform EBM implementation. Otherwise, it is unlikely that EBM will succeed. These issues become more complex at broader marine planning scales where multiple jurisdictions come into play over a broader set of interests.

In the Northeast USA, social scientists have developed socio-economic fishery performance measures that track outcomes of firms and fishery-dependent communities. In two catch share fisheries (the Northeast groundfish “sectors” and the Mid-Atlantic ITQ tilefish fishery), these measures connect socio-economic performance to ecosystem performance, allowing evaluations of the efficacy of management programs in achieving objectives. Ultimately, while catch shares can be an integral part of EBM in some fisheries, successful implementation of EBM depends on many other factors, including the distribution of benefits and costs.

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**Tom Dempsey** — [tom@capecodfishermen.org](mailto:tom@capecodfishermen.org)  
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The value and promise of transitioning to a management approach that recognizes the complex interac-

tions between and among ecosystem components is that it allows for more effective evaluation of tradeoffs and better-informed decisions when setting harvest levels. The EBM approach does not eliminate the need to set and strictly enforce science-based catch limits for individual stocks. In fact, doing this is a prerequisite for effective EBM.

So the question becomes how best to effect these individual catch limits within an EBM context. Clearly, open-access directed fisheries often result in enormous inter-annual variability in fishing effort and instability for commercial harvesters, which makes this approach incompatible with effective EBM. Once a fishery operates under a well-informed, responsible catch cap and has transitioned to a limited access program to allow for better management, then allocation or catch shares are the most effective way to allow harvesters and fishing businesses the stability and flexibility to operate successfully within the system.

Catch share management does not, by itself, promote or encourage EBM. It can serve as a key component of a comprehensive EBM approach, by facilitating the adherence to a catch limit — which can both help to end overfishing and support rebuilding depleted resources. The critical catch share design elements necessary to achieve this are: 1) comprehensive catch accountability; 2) annual quota-setting including real-time information and explicit consideration of ecosystem relationships; and 3) measures to provide fishing businesses and communities opportunities to build stability and resilience by securing diverse fisheries access.

## Designing ecologically sound catch share programs

**By Kate Bonzon**

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Environmental Defense Fund (EDF) recently released a toolkit with an updated Catch Share Design Manual that gives fishery managers and fishers the resources they need to design fishery management programs that support the health and sustainability of marine ecosystems.

One of the most important steps in designing a catch share program that meets ecological goals is to *define and quantify the available resource*. This is the case whether the management goal is rebuilding depleted fish stocks or reducing bycatch of non-target species. For this step, the manual outlines key questions that help users select species and stocks to include in the program, identify the appropriate spatial range of the program, and set appropriate mortality controls. These actions prevent overfishing and help maintain marine ecosystem balance by ensuring that catch is appropriately limited and all sources of fishing mortality are included.

Since many fisheries managers and stakeholders do not have access to the resources needed to fully assess fish stocks, particularly in developing countries, the toolkit also includes a guide to science-based management of data-limited fisheries. This supplement to the Catch Share Design Manual outlines a systematic approach that fishery managers can use to conduct quick and relatively inexpensive science-based assessments — enabling fisheries around the world to take an important step toward effective, ecologically sound management.

The guide, along with the entire toolkit, is available at <http://catchshares.edf.org/resources/toolkit>

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Threatened and Migratory Species Adviser, Secretariat for the Pacific Regional Environment Programme (SPREP), and owner of recreational charter fishing vessel *MV Te Wairoa*

Twenty-five years ago, I started out as a commercial fisher in the Hauraki Gulf of New Zealand. I paid \$35 for my license to fish for snapper (*Pagrus auratus*) by demersal longline and joined a fleet of about 20 vessels working out of the town of Coromandel. There was a Total Allowable Catch for the fishery, and in theory, the fishery would be closed when this limit was reached. In practice, however, this never happened, and snapper stocks in the Gulf were grossly over-fished for years.

Five years into my fishing career, the NZ Government introduced Individual Transferable Quotas for recognized commercial fishers, defined as those who held a valid license and landed more than five tons of fish per year. This definition had the effect of disenfranchising the majority of Maori fishers, most of whom caught more than five tons but distributed their catch around their local community before selling the surplus.

Fast-forward to 2013. Snapper stocks have (to an extent) recovered, but the local commercial fishing industry has all but collapsed. No more than half-a-dozen vessels work out of Coromandel, and the local processing plant has closed. The fundamental reason for this is that any fisher who does not own quota now has to rent catch entitlement from a quota owner at 30-40% of the value of the fish caught. Quota ownership has steadily moved from individual fishers to large companies, which use more environmentally damaging fishing methods such as Danish seining and bottom trawling. Owner-operators are now a rarity in the Hauraki Gulf. This experience demonstrates that ITQs do not necessarily promote EBM and can have harmful social and ecological consequences even if the target stock shows signs of recovery.

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Catch shares may not be the best management option for every fishery, but where appropriate and properly implemented, they are expected to promote EBM. The granting of limited access privileges and individual fishing quotas (IFQs) associated with catch shares can eliminate the “race for fish”, reduce overinvestment and overcapacity, reduce or eliminate overfishing, improve profits, and improve fishermen’s safety. These achievements are well in line with EBM objectives.

However, catch shares can also have significant negative effects that can be detrimental for ecosystem health and

the socioeconomic wellbeing of fishing communities. High grading (bringing only the highest quality fish to shore and throwing away the rest) is one of the damaging ecosystem effects usually associated with IFQs. Also, IFQs are typically single-species oriented, making multi-species or ecosystem approaches difficult or unviable.

The initial allocation of IFQs is usually the most difficult socioeconomic aspect in the implementation of catch shares. It involves the privatization of an otherwise public resource and its transfer to a few selected initial recipients, frequently without proper consultation or sharing of economic returns and benefits with society. Other problems to be avoided are the concentration of shares in few hands, the impoverishment and eventual displacement of traditional local fishing communities, and the transfer of the wealth generated by the fishery to the newly created catch shares owners sector, which may be outside the fishery sector and even outside the fishing country when shares are transferable. To retain this wealth, some countries limit transferability of shares to nationals or national fisheries entrepreneurs, boat owners, or fishermen.

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If (i) healthy and (ii) sustainable eco- and human systems are understood to be those that exhibit a strong tendency to persist in a fairly unchanged form, I have found in my research that catch shares in fisheries generally promote such healthy and sustainable eco- and human systems compared to many (perhaps most) alternatives.

With secure, long-lasting catch shares, the holders of these shares have a vested interest as well as some power to manipulate the aquatic ecosystem to maximize the value of their catch shares. This generally implies restoring the stock sizes of species that have been negatively affected by previous fishing activity (under most alternative management systems), reducing stock fluctuations, and reducing the risk of serious shocks to the ecosystem, thus promoting ecosystem health and sustainability.

Catch shares also increase the flow of sustainable economic benefits from the fishery (be it recreational or commercial) and thus promote (in a certain sense) healthier and more sustainable human societies. Note that catch shares may in many cases substantially alter the human fishing societies that developed under the previous fisheries management system (as they will the aquatic ecosystem). The previous human system (as well as the ecosystem) was probably not healthy and sustainable in the above sense anyway for a number of reasons including excessive fishing and the attraction of (and possibly environmental impact from) other human economic activities not subject to the same environmental constraints. ■

To comment on this article: <http://openchannels.org/node/5306>

# Tundi's Take: Can anything as narrow as catch shares propel us toward EBM?

I find myself hopelessly adrift in appraising whether catch shares and ITQs work or not. As in Shakespeare's *Julius Caesar*, the last person to speak is the one I find most convincing. In theory the idea of catch shares is the kind of paradigm-shifting management measure that we need. But in practice we have seen how transferable rights have led to market consolidation, empowering the already powerful, and sometimes pushing small-scale fishers into oblivion.

Admittedly there are success stories, all of which rest on the premise that any users will protect what they own (or have limited access to). Instead of the amorphous free-for-all that exists in most fisheries — which not only puts pressure on the fish stocks but also tests the mettle of the management authorities that are charged with ensuring that use is sustainable — tradable rights lay the groundwork for rational control. There are at least three features of catch share fisheries that seem to predispose them to be inherently better forms of fisheries management than other effort controls:

- 1) They require a solid understanding of stocks and population dynamics, without which the limited entry scheme cannot be designed;
- 2) They are based on a widely recognized value of the fisheries — made even more valuable by perception that is enhanced by the limited entry; and
- 3) The fishing pressure is inherently bounded by the limited entry scheme, instead of spiraling out of control in a race to catch the last fish.

Maybe where ITQs run amok is in their methods of allocation. But the real question for MEAM is, even when catch shares succeed in making fisheries sustainable — do they help us achieve EBM? Here again, I'm of two minds.

On the one hand, fisheries management remains one of the highest priorities for marine EBM, and getting it right can only contribute to a more effective management regime. In our UNEP EBM Manual ([www.unep.org/pdf/EBM\\_Manual\\_r15\\_Final.pdf](http://www.unep.org/pdf/EBM_Manual_r15_Final.pdf)), we point to fisheries management as one of five approaches that EBM must embrace (the other four being watershed management, integrated coastal management, marine protected area designation, and marine spatial planning). But that's the crux of the matter: fisheries is but one use of marine resources and space. Tackling fisheries extraction does not help us with controlling pollution, stemming habitat loss, limiting the impact of invasive species, maintaining system resilience in the face of climate change, and other equally pressing management issues.

And — importantly — designing and implementing catch shares rarely if ever involves the kind of broad stakeholder engagement that true EBM requires. Instead, catch share methods focus the discussion and negotiation to the narrowest group of special interests. So perhaps there is no yes or no answer. Let's accept that catch shares can improve some situations, when appropriate to a particular fishery and society. But let's also remember that EBM will almost inevitably require much more. ■

**To comment on this article:**

<http://openchannels.org/node/5307>

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## Letters to the Editor

### More responses on whether marine conservation and food production are on a collision course

The letters below are responses to a piece by Jake Rice, Chief Scientist with Fisheries and Oceans Canada, which appeared in the August-September 2013 issue of MEAM. Titled "Marine conservation and sustainable food production are on a collision course", Rice's piece already elicited responses from several readers, which appeared in our October-November 2013 issue ([meam.net/MEAM33.html](http://meam.net/MEAM33.html)).

#### Dear MEAM:

In his recent Letter to the Editor, Jake Rice did not say that conservation and food security are incompatible. He stressed that the two governance streams are

on a collision route because they were not talking enough to each other and acting in harmony. He was not referring to the governance rhetoric (which is generally correct and similar in both streams) but to the global reality and resulting outcomes. I share his conclusion that, without a radical institutional change for closer interaction, both systems may fail to meet their respective goals.

Most of the responses to Jake's letter recognized his point of view. Many stressed what is being done or advocated in each governance stream to address both sets of issues, and the similarities in the prescriptions are strikingly similar. Among the issues that are highlighted, equity, social impacts, good governance, and social and economic costs of economic reforms are important as they affect political will, legitimacy,

**To comment on these letters:**

<http://openchannels.org/node/5308>

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willingness to pay, and compliance in both streams. Technological fixes have also been proposed in the responses — the real social, economic, and environmental impacts of which need careful examination. Marine spatial planning is offered as a reconciliation platform and needs more consideration.

There is probably good agreement on the need to finding compromise solutions, minimizing risks and costs to both streams, tackling the difficult issue of allocation of short- and long-term costs and benefits, and developing ecological and social resilience. The resistance stems from the respective perceptions of risks and their relative allocation to humans or Nature; the level of tolerance for misses and false alarms; and the level of impact deemed "acceptable".

My response to the question in the title is YES: marine conservation and sustainable food production are on a collision course. While progress is being made in some areas, in others the collision is already hitting the poorest people. Moreover, in a context of increasing economic, financial, and social distress, States are already shelving some of their former environmental commitments with important social and environmental implications. To avoid further social and environmental degradations, affordable solutions need to be elaborated urgently and jointly, not separately and in competition.

### Serge M. Garcia

Serge Garcia is Chair of the Fisheries Expert Group of the IUCN Commission on Ecosystem Management

### Dear MEAM:

Thank you to Jake Rice for raising this fundamental conflict and for prompting some good discussion. The responses generated by his letter are interesting and informative.

Based on the published replies (which I recognize may be abridged in some cases), I would categorize those responses into two broad groups. The first and larger group is made up of those who have replied with off-the-shelf solutions: participation, fish aggregation devices, aquaculture, and marine protected areas. In my view, each of these tools has a potential role to play in fisheries governance and management, but none provides even close to the total solution and, with the exception of participation, none will be an appropriate tool in every case. I am not suggesting it was the intention of the respondents, but pushed too hard and too blindly, this single-measure approach easily becomes a case of a solution looking for a problem. Advocacy of specific "solutions" as a cure has been an all-too-common feature of the scientific and management advice that has characterized so much of the fisheries debate for at least the last century. If one looks at the

history of fisheries science, the roll-out of successive wonder solutions is clearly evident: single species stock assessment methods, MSY and TACs, TURFs, ITQs and MPAs are some examples in more or less chronological order of modern emergence. Each has an important role to play in the right environment and context, but, as is clearly evident today, none on its own made the big break-through or has come close to solving the basic problems on its own.

Together with Rolf Willmann and William Emerson, I wrote a paper on the topic entitled "Sustainable fisheries: the importance of the bigger picture". [Editor's note: this paper is at [www.fisheriessociety.org/proofs/sf/cochrane.pdf](http://www.fisheriessociety.org/proofs/sf/cochrane.pdf).] In it, we expressed the view that "ensuring effective, sustainable, and responsible fisheries is neither simple nor are there any quick fixes to the problems being experienced." In my view, the common tendency for scientists, conservationists, development agencies, and others to promote magic bullets as the solution has done at least as much to distract governments, decision-makers, funding agencies, and other potential change-agents from finding the true, holistic solutions to the world's sustainable use problems as they have helped to solve the problems. Individual management measures are essential for day-to-day management. Even in the most stressed fisheries they may provide some protection against total collapse. But in the absence of broad, robust solutions to underlying conflicts and desperate needs, they will remain little more than superficial bandages for deep-seated problems.

The second category of responses was the big-picture perspectives of Meryl Williams, Chris Béné, and Jake's initial letter. These pointed to the importance of the underlying drivers of the problems, the need to consider the human system as a whole, and the recognition that there will only rarely be options for win-win solutions. I side firmly with the big picture advocates.

If one considers my own country, South Africa, as an example, it has a well-developed and fully subscribed fisheries sector that makes important contributions to livelihoods and employment for approximately 25,000 people and their dependents living on the coast — frequently in areas where there are only limited alternative employment opportunities. These fisheries are taking place in a country with approximately 25% unemployment, with over a third of the population living on less than US \$2.50 per day, and ongoing efforts to achieve equality in fisheries after the injustices of apartheid. Within this context, the offshore fisheries, which are inaccessible without high capital investments, are generally well-managed for sustainable use and the resources are in reasonable condition or recovering. However, the inshore fisheries are much more accessible and many of the

resources — particularly the valuable and easily accessed abalone and West Coast rock lobster — are badly over-exploited and are subjected to high levels of illegal fishing that is proving very difficult to control. The drivers of the illegal fishing include “greed” to use Meryl’s terminology, particularly in the case of abalone, but I think there would be little disagreement that “need” is the much stronger and less tractable driver.

Various management measures have been and are being tried to bring these fisheries under better control but they have proven insufficient. The only long-term solution must be to resolve the high levels of poverty and unemployment in the adjacent coastal areas. Aquaculture is certainly one potential contributor to this, but the harsh coastline and scarcity of inland waters in most of the area will limit this option. Comparable situations exist in most, if not all, developing countries and in some fisheries-dependent developed countries around the world. There will be no simple fixes for most of these.

It goes without saying that I cannot offer a solution to reconciling the tripod of poverty alleviation, sustainable fisheries and biodiversity conservation, but I can put forward a first step. That is that anyone or any agency aiming to improve the performance of fisheries anywhere in the world should:

- 1) approach the task with a completely open mind;
- 2) work closely with and be guided by all the major stakeholders;
- 3) think of no solutions until they have understood the full set of objectives and analyzed the problems and the big picture of which they are a part; and
- 4) recognize that holistic, multi-faceted, and multi-stakeholder solutions will almost invariably be required for long-term, sustainable solutions. ■

#### **Kevern Cochrane**

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## **Perspective: Reducing non-climate stresses — not always a good idea?**

**By Jennie Hoffman**

[For titles and web links to the journal articles referenced in this piece, go to [www.meam.net/Hoffman.html](http://www.meam.net/Hoffman.html) .]

In the climate change adaptation world, as elsewhere, some big ideas that are assumed to rest on the best of scientific practice actually draw a significant portion of their support from “Well, it just makes sense.” In these cases, a few well-documented examples are taken to indicate larger truths. But what if these assumptions are not always true?

One adaptation truism is, “Reduce non-climate stressors.” Who could argue against this? Images of massive oil spills and thick blooms of non-native jellies chomping larval fish in the Mediterranean leap to mind. Still, as we advocate evidence-based conservation, we ought to take a thoughtful look at the actual evidence.

A recent set of papers brought home to me the importance of considering not just synergistic interactions — where the combined effects of two stressors are greater than the sum of their independent effects — but also antagonistic effects, where the combined effects are less than the sum of independent effects.

Brown et al. (2013) modeled additive, synergistic, and antagonistic interactions between climate change and local stressors in seagrass and fish communities. Reducing local stressors did indeed lead to big wins when interactions with climate change were syner-

gistic, but had no effect or even increased harm when interactions were antagonistic.

Do antagonistic effects really occur in the real world? Research in the northeastern US (and published in a pair of papers by Coverdale et al. and Bertness and Coverdale) suggests they do.

In many Cape Cod salt marshes, loss of predators on an herbivorous crab (*Sesarma reticulatum*) has led to significant cordgrass die-off, which in turn has led to more rapid erosion and greater vulnerability to sea level rise. In heavily damaged marshes that have been invaded by non-native green crabs (*Carcinus maenas*), cordgrass is recovering, apparently because *Carcinus* reduces *Sesarma* consumption of cordgrass. So if the goal is to reduce the vulnerability of salt marshes and increase protection from erosion for local communities, getting rid of the invading crabs could be the wrong thing to do.

Is this an isolated, bizarre case of a local stressor decreasing vulnerability to climate change? Unlikely. There are other examples of non-climate stressors likely reducing vulnerability to climate change (e.g., Norkko et al. 2012 on the effects of invasive polychaetes on hypoxia in the North Sea). Recent meta-analyses of interactive and cumulative effects of anthropogenic stressors found that antagonistic interactions accounted for roughly a third of interactions at the population and community level (Crain et al. 2008; Darling and Cote 2008). This suggests that we should not assume that reducing non-

#### **Editor’s note:**


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climate stressors will always mitigate climate change effects.

Rules of thumb can be quite useful when available evidence is limited. But when new evidence is available, we need to re-examine our assumptions. It may

be that some unconventional thinking is now needed around the idea that all reduction of non-climate stressors is a good thing. This means heading into uncomfortable territory for adaptationists — but isn't that what makes this such an interesting line of work? 

**Editor's note:** The goal of The EBM Toolbox is to promote awareness of tools for facilitating EBM.

## The EBM Toolbox **By Ruby Gates**

### From Paper to Digital – The Mobile App Revolution in Fisheries

It's 3 a.m. and Ernest Quetel, Jr., and his brother Derek, third generation fishermen from the Caribbean island of St. Thomas, are sorting their catch. With only a few hours left before morning customers arrive, they still have to fill out their catch report — a lengthy paper form required by the Division of Fish and Wildlife for fisheries management. Once a week, Ernest and Derek carve out time to drive over to the east end of the island to deliver their stack of finished reports.

The good news for the Quetel brothers is that, thanks to new software tools, the hassle and inefficiency of the paper reports is disappearing. With emerging technologies such as Digital Deck, eCatch, mFisheries, DeckHand, and iAngler, data can now flow seamlessly from the Quetels' boat after their harvest to fisheries management databases. Aggregated data are delivered to the agencies to inform decision making, and secure proprietary data are provided back to the brothers through their mobile devices.

These mobile apps not only provide a platform for digitizing time-consuming catch reports; they can upload valuable information on species patterns, ocean demographics, and fishermen's behavior. They ensure that all stakeholders from sea to shore have access to information, leading to data being used in new ways. In the Solomon Islands, the Ministry of Fisheries and Marine Resources is using Digital Deck to collect fishery-landing data from vendors in the market so they can begin to evaluate how they will meet their future food security needs. And in Morro Bay, California, the automated reporting system eCatch has been used to create an innovative, shared risk pool system to reduce catch of sensitive species (<http://conservationmagazine.org/2013/09/ecatch>).

Back in the US Virgin Islands, use of Digital Deck by fishermen like the Quetel brothers has led to increased incorporation of fishermen's perspectives and in-the-field insights into natural resource decision making. Greater use of such technologies will provide a layer of feedback not previously leveraged in the resource management process and help level the playing field between fishermen and resource managers.

- **Digital Deck:** [http://pointnineseven.com/news/downloads/CaseStudy\\_USVI\\_FINAL.pdf](http://pointnineseven.com/news/downloads/CaseStudy_USVI_FINAL.pdf)
- **eCatch:** [www.ecatch.org](http://www.ecatch.org)
- **mFisheries:** <http://cirp.org.tt/mfisheries>
- **Deckhand:** <http://deckhandapp.com>
- **iAngler:** <http://angleraction.org>

[Ruby Gates is CEO of Point 97, which provides tech solutions and engagement strategies for the marine planning sector — [www.pointnineseven.com](http://www.pointnineseven.com).]

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## Notes & news

### New guide to MSP for maritime professionals

The Nautical Institute and World Ocean Council have jointly released a guide, "The Shipping Industry and Marine Spatial Planning: A Professional Approach", to help maritime professions understand and engage in MSP. The guide identifies the steps in a typical MSP process and highlights how the shipping community can participate. It also helps others involved in MSP processes to understand the industry's requirements for ocean management. The document is available at [www.nautinst.org/en/forums/msp](http://www.nautinst.org/en/forums/msp)

### MSP film *Ocean Frontiers II* launches

A new film documents the creation of a marine spatial plan for the US state of Rhode Island. Produced by Green Fire Productions, *Ocean Frontiers II* features interviews with government officials, stakeholders, academics, and others who were involved in the planning process. It is the sequel to a film (*Ocean Frontiers*) that showed how US stakeholders are joining together to ensure sustainable ocean economies. To view a trailer of *Ocean Frontiers II* or to find or host a screening of it, go to [www.ocean-frontiers.org](http://www.ocean-frontiers.org)

### Proposal to initiate pan-Arctic MSP

Most Arctic governments have been slow to pursue comprehensive MSP. A new book, *Arctic Marine Governance*, proposes that networks and partnerships of non-governmental actors in the region could initiate MSP across the Arctic. The book's MSP content is contained in a chapter titled "Pan-Arctic Marine Spatial Planning: An Idea Whose Time Has Come", authored by Charles Ehler. The chapter and the full book are available for purchase separately or together at [http://link.springer.com/chapter/10.1007/978-3-642-38595-7\\_9](http://link.springer.com/chapter/10.1007/978-3-642-38595-7_9)

### Canadian government purges fisheries libraries

Fisheries and Oceans Canada has closed seven of its eleven fisheries libraries in a move aimed at saving the government Cdn \$430,000 (US \$395,000) annually. The closures involved giving away or throwing out the libraries' publications, which had provided decades of baseline records of the nation's marine and freshwater resources, from long before the digitization of information. For more on this move, go to <http://bit.ly/DFOLibraries>