

MPA NEWS



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Innovative ideas in enforcement: What the future of MPA surveillance could look (and even sound) like

In April 2014, the technology company Google hosted a unique meeting at its headquarters in California. Involving several dozen scientists, technology engineers, conservationists, and politicians, it was a two-day discussion on the future of ocean surveillance. Presentations covered such technologies as drones and satellite-tracking systems for vessels, and included occasional nods to Google's own enterprises. The latter included futuristic concepts like Project Loon, Google's proposed global network of high-altitude balloons for collecting and relaying data. (The website for the meeting is www.oceanagenda.org/home. A blog post by an attendee, Mimi D'lorio of the US National MPA Center, is at <https://www.openchannels.org/node/6571>.)

MPA News attended the meeting, where there was a real sense that technological surveillance of the ocean, including for MPAs, may be approaching a tipping point. Sensors are becoming smaller, cheaper, and more sophisticated. The use of drones for surveillance, by air or water, is becoming more common. We may soon see a future in which an abundance of inexpensive tech tools shifts the effective balance of enforcement in many MPAs from the offenders to the defenders.

That being said, enforcement is not always about technology to detect violations. Strategy and policy are often just as important: deciding how to fine or otherwise penalize violators, for example, can play a crucial role in encouraging better behavior. In this issue, MPA News hears from experts on several innovative approaches to MPA surveillance and enforcement - technological and otherwise.

A. Using sound to detect the presence of violators in an MPA

By Margo Edwards

Editor's note: Margo Edwards is director of the Center for Island, Maritime, and Extreme Environment Security (CIMES) - one of 12 Centers of Excellence funded by the US Department of Homeland Security. It is based at the University of Hawaii (www.cimes.hawaii.edu).

On passive acoustics as a surveillance tool

Passive acoustics is the act of listening for, and analyzing, particular sounds. It has been around since Leonardo da Vinci, who put a tube in seawater and listened for vessels. Our listening tools today are obviously more sophisticated than his but the intent is the same: we can monitor sound to detect when a vessel is nearby, as well as what kind of vessel it is and whether it is doing something it should not be doing.

The main challenge of passive acoustics, even with today's advanced tools, is the signal-to-noise ratio. How do you detect the difference between the signal you are looking for - such as the presence of an illegal fishing vessel - and the noise of the surrounding ecosystem? MPAs have a lot of noise, with waves and various animal sounds. Snapping shrimp, for example, are a common noisemaker in the ocean, generating a crackling sound at an acoustic frequency of 12 kHz. However, researchers at CIMES have discovered that snapping shrimp actually make different sounds when a vessel travels nearby. So what we had thought was just noise can actually be a signal. Knowing this: if we are looking for, say, the presence of a 25-foot fishing vessel in an MPA, we can listen not only for a frequency at which we know 25-foot boats operate, but also for reactions of the shrimp and the ecosystem in general.

On how soon passive acoustics systems could be used by MPAs

Passive acoustics systems aren't perfect at this point, but I expect they will be a valuable part of MPA surveillance in the future. Think of them as the sentinels of MPAs. They will listen, compare their data to other sources (such as data from automatic identification systems on ships), and raise red flags when someone is somewhere he or she should not be. To protect these systems, it will be important to make the devices mobile and camouflaged so violators can't tamper with them.

There does need to be more investment in determining how effective these systems are in various environmental conditions, like rain or crashing waves. And because the acoustic profile of each area of the ocean is unique, each system will need to be tailored to its specific place. You can't simply take what you learn in Hawaii and apply it to Kiribati or Palau, for example. There will also be a time lag as the prosecution side of passive acoustics - basing a conviction on a vessel's acoustic "thumbprint" - will need to catch up to the science side.

But I think that in the next five to ten years, we could have a workable system tailored to an area, even a very large MPA. The fact is, you don't have to be on the lookout across every meter of a site. Look at historical vessel traffic patterns, and at ship tracks from vessels' automatic identification systems. Then set up your listening posts in the areas you expect people to visit.

For more information:

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B. Global monitoring of fishing vessels, and outsourcing your MPA's surveillance needs

By Tony Long

Editor's note: Tony Long is director of the Ending Illegal Fishing Project, an initiative of The Pew Charitable Trusts (www.pewtrusts.org/en/projects/ending-illegal-fishing-project). Long describes the project as "a system that would enable even the most resource-poor fisheries enforcement official to have access to accurate information from a central reliable source, such as to permit or deny port entry or begin legal proceedings." Previously Long served 27 years in the British Royal Navy, where he reached the rank of commander.

On his goal of unique identification for all large fishing vessels (greater than 79 feet in length)

This goal is very likely achievable within 5-10 years. We have already seen six regional fisheries management organizations (WCPFC, CCAMLR, IOTC, SPRMO, ICCAT and IATTC) adopt the IMO number as mandatory in their regions, and we are encouraging other RFMOs to adopt this measure. Being able to identify fishing vessels through their IMO numbers is a vital first component to any system of effective monitoring, both inside and outside of MPAs. [Editor's note: IMO stands for International Maritime Organization, the UN agency for the safety and security of shipping. An IMO number is an ID number unique to each ship.]

On the project's progress and what it means for MPAs

We are seeing success in several areas, beyond just the adoption of IMO numbers. There has been acceleration in the number of countries ratifying or pledging to ratify the UN Port State Measures Agreement (www.fao.org/fishery/psm/en). This is a cost-effective way of stopping illegal fish entering the market; the more countries ratify it, the better the effect of the regulation. Add to this better tracking of fishing vessel activity and you have three key elements in place: the vessel is properly identified, its track can be verified, and it offloads in a "responsible port".

The important fact here for MPA managers is that, as retailers demand more transparency in the purchase of fish from net to plate, where a vessel cannot show an 'honest track' then the catch from that vessel will not be accepted by the retailer. This means vessels that enter an MPA and turn off their vessel tracking system will be seen as 'suspicious' when they are unable to show their activity in full. And

on the flip side, the good vessels will be able to show their activity in full and make their catch of premium interest to the buyers [because it is legitimately caught, recorded, and transferred] - the net result being fewer vessels abusing MPAs.

On a new service for MPAs that lack surveillance capacity

Many MPA managers do not have the capacity or expertise to monitor the vessel activity in their MPA. This is why Pew is working on a Virtual Watchroom service, which will provide customers with a regular report of fishing and related vessel activity in their marine protected areas. This will draw on any tracking systems made available to it, and the systems can be customized to each site. Knowing the specifics of where and when illegal fishing might be occurring in their MPAs will enable managers to better focus patrol and enforcement resources on vessels and areas of greatest interest.

For more information:

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C. Applying economics to the enforcement of your MPA

By Linwood Pendleton

Editor's note: Linwood Pendleton is an environmental economist and a senior scholar of Ocean and Coastal Policy at Duke University's Nicholas Institute for Environmental Policy Solutions. He is also International Chair of Excellence at the European Institute for Marine Studies.

On why the concept of optimality should apply to MPA size and enforcement

We should apply more thought to the costs and benefits of increasing or decreasing the size of each MPA - finding the MPA's optimal size and shape. We tend to use jurisdictional boundaries, social boundaries, or biological boundaries for MPAs. But we don't apply the careful economics needed to see whether there is a best size that fits the site's enforcement goals. Managers should ask themselves, what is the optimal level of enforcement? How many patrol boats do I want to have out there? What is the optimal fine for offenses? These questions are inter-related. You can't put a ranger in every square kilometer of the ocean, for example, but if the fine is big enough you don't have to.

On how to determine the optimal fine for an MPA

First you need to know how large the fine has to be so that the cost of the fine is greater than the benefit from fishing within the MPA. Then, since the probability of getting caught is less than 100%, you need to try to make some assumptions about the probability of getting caught under different enforcement scenarios. As the probability of getting caught goes down, the fine needs to go up. We call the probability of getting caught multiplied by the fine the 'expected fine'. So the expected fine needs to be greater than the benefit.

Of course, the other tradeoff the MPA manager has to consider is the cost of enforcement. The costs of enforcement depend on the size and shape of the MPA as well as the seasonality of illegal activity. Enforcement that yields a higher probability of getting caught usually costs more. So lower cost enforcement would mean lower probability of getting caught, which would mean a higher fine.

On the social impact of fines

While there is an economic optimum for setting fines, I think it is even more important to recognize that: a) a draconian fine would alienate the fishing community and might be seen as unjust (unless, say, the illegal fishers are foreign fishing vessels) and b) there are non-enforcement reasons to have rangers and park personnel on the water.

I think the social impact of the fines can be managed by having a rapidly increasing scale for fines for repeat offenses. You also can have fines that vary within an MPA - say, highest fines for strict no-take areas and lower fines elsewhere. Because of the increased costs of enforcement near the boundaries of MPAs, I think one could also increase the fines in these areas.

So, to wrap up, the MPA manager can adjust the where/when/how much of fines, the probability of being caught, and the factors that affect the effectiveness and cost of enforcement. Because these factors also have to be weighed in a social context, it is good to discuss the tradeoffs publicly and to consider an adaptive approach to finding the schedule of fines that work best.

For more information:

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D. Progress on developing the International Centre for Compliance Management in MPAs

By John Knott

Editor's note: John Knott is a Canberra-based consultant who over the past 15 years has worked closely with the Great Barrier Reef Marine Park Authority (GBRMPA) to develop all aspects of the park's compliance management model. In partnership with GBRMPA Compliance Manager Reg Parsons, Knott is now establishing an International Centre for Compliance Management in MPAs (profiled in [MPA News 14.5](#), "Advances in MPA enforcement and compliance"). Among the Centre's first programs is a free, four-day compliance management workshop this November.

On the successful GBRMPA compliance management model

In the GBRMPA, the business processes, theoretical models, templates, systems, manuals, standard operating procedures, guidelines, and a comprehensive training framework - all specific to the needs of the MPA - have been developed and continuously improved over a period 15 years. We have developed an outstanding intelligence unit and refined our measurement regime, and we produce comprehensive reports on weekly, monthly, and quarterly bases. The unit has been externally reviewed and evaluated by a number of national and international bodies and has been recognized as best practice.

On the International Centre for Compliance Management

What we aim to offer MPAs through the Centre is an effective blueprint for building compliance management capacity. As part of the training, participants will be provided with a full set of documentation that they will modify to suit the particular context of their MPA. All tasks in the training will be grounded in the practical work of planning, setup, management, operations, evaluation, and continuous improvement of a compliance management unit. Graduates will also have access to ongoing mentoring afterward as needed.

In our experience, an effective compliance management unit requires first-class leadership and a range of other skills in addition to the technical compliance management skills. To this end we are also developing a framework of dedicated competencies with supporting training and qualifications - on everything from risk management and governance to stakeholder management and communications.

On the free compliance management workshop this November

Prior to the World Parks Congress this November, the Centre is providing a four-day compliance management workshop in Townsville, Queensland, Australia. We will offer selected managers (representing all global regions) an informative, hands-on experience. Each participant will return to country with a detailed capacity-building plan for his or her MPA, as well as a thorough grounding in the principles of compliance management.

There is no fee for the workshop. The only cost will be for participants to cover their travel and accommodation costs. Workshop participants will be able to continue on to the World Parks Congress in Sydney if they wish. We have already received expressions of interest from 12 people from various countries, and can accept a total of 25. A flyer on the workshop is available [here as a PDF](#). For further on the workshop, please contact Reg Parsons at reg.parsons@gbmpa.gov.au.

For more information:

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BOX: Burning the gear of MPA offenders

Carl Gustaf Lundin is director of the IUCN Global Marine Programme. At the Third International MPA Congress last October, Lundin described a community-managed no-take MPA in Mozambique that takes immediate action against violators:

"I had the opportunity to visit a marine protected area in Mozambique called Vamizi Island. The local community has set aside a no-take fisheries reserve around the tourism area, and the reef is very healthy and the fish populations are doing very well. The no-take zone is policed by the community itself and there is only a small amount of illegal fishing.

"When the MPA rangers have caught someone, they burn the offender's gear publicly in the village and make a show of it. This serves two purposes: it shames the offender in front of the local community, and of course keeps the offender from using the fishing gear again. In addition, if anyone is caught three times, he is sent off the island and can't come back. This applies both to migrant fisherfolk and to Vamizi Island residents.

"So even though the enforcement is all done by the community itself, there is a certain amount of sanction associated with it. It's an interesting model."

For more information:

Carl Gustaf Lundin, IUCN, Gland, Switzerland. Email: James.Oliver@iucn.org

BOX: Other sources of information on MPA enforcement and surveillance

- "Maritime domain awareness: How technology is improving compliance and enforcement of MPAs", a blog post by Mimi D'Iorio, NOAA National MPA Center. May 2014. <https://www.openchannels.org/node/6571>
 - "Is a vast marine sanctuary any use if you can't police it?", a discussion among OpenChannels readers on MPA enforcement capacity, particularly for very large MPAs. <https://www.openchannels.org/comment/4523>
 - "Efficient enforcement for effective MPA management", May 2014 issue of MedPAN's Science for MPA Management newsletter <http://bit.ly/MedPANenforcement>
 - "Advances in MPA enforcement and compliance: Practitioners describe cutting-edge techniques and tools", [MPA News 14:5](#)
 - "MPA enforcement: How practitioners are developing new tools, strategies, and partnerships", [MPA News 11:5](#)
 - "Experiences in MPA enforcement, part II: More tools and strategies", [MPA News 11:6](#)
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