I’ve accomplished what I was supposed to do."

Do you have any advice for scientists trying to communicate at a high level with non-scientists?
What we scientists talk about as just everyday conversation, to lots of other people is jargon. And if you look at my testimony, one of the things I was asked was are these my words and ideas, and I said these are all my ideas, but I would get editorial help from the Australians because I would write things that I thought were absolutely perfect and clear, but they had no idea what it was saying. So, we need to remember to be patient, careful, and thoughtful in what we say.

Did the experience give you more trust that the world is listening to scientists?
I wouldn’t use the word trust, I would use the word optimism. I have great optimism that if we put the time in to communicating great ideas to the people who need to hear them, they will put those ideas to work. I don’ think it’s a matter of trusting them, it’s a matter of putting in the time on both sides.

If one wants to work in Pasteur’s quadrant, which is what Lenfest is all about, this is a great example of what can be accomplished.

Antarctic Krill, Whales, Penguins and Climate

With support from the Program, Dr. Mangel undertook a project titled “The Implications of Climate Change for Antarctic Krill, Whales and Penguins.” It examined how anticipated changes in both the climate and commercial fishing in the Southern Ocean may impact the production of krill, and modeled how these changes are likely to affect whales and penguins in that area. The project was intended to provide information for the Commission for the Conservation of Antarctic
Marine Resources (CCAMLR) as it developed fisheries management models to allocate krill fishing on a smaller spatial scales. This approach was intended to prevent potential local depletions of krill in areas where penguins and whales forage.

The project led to 10 papers. The following list of citations has links in the journal titles and a very brief description of the main findings:

Cresswell, K.A., Wiedenmann, J.R., Mangel, M. 2012. A model of parental conflict: Predicting provisioning behavior of penguin partners in response to local changes in krill. Ecological Modelling 246: 68-78. This paper found that the relationship between chick survival and krill availability approximates a Holling Type III functional response. In addition, measuring quality of prey environment, rather than total quantity, was a useful and relatively simple way to test changes in krill availability.


Carlson, S.M., A. Kottas and M. Mangel. 2010. Bayesian analysis of size-dependent overwinter mortality from size-frequency distributions. Ecology 91(4): 1016-1024. Introduces a novel Bayesian method that can be used to quantify this relationship when the only data available are size-frequency distributions of unmarked individuals measured at two successive time periods.

Brown, V., Gutknect, J., Harden, L., Harrison, C., Hively, D., Jorensen, C., Levi, T., Pflugeisen, B., Rovengo, P., Want, Y., Wiedenmann, J., and M. Mangel. 2010. Understanding and engaging values in policy relevant science. Bulletin of the British Ecological Society 41:48-56. Link to PDF. When engaging in the practice of science, we invest much of our time in technical and academic details. If we expand the field of view and examine the underlying values that drive us, asking what impact our research has on a larger scale, we can discover a world of rich interconnections between science, society, and their function in the natural world.

Richerson, K., P.S. Levin and M. Mangel. 2010. Accounting for Indirect Effects and Non-Commensurate Values in Ecosystem Based Fishery Management (EBFM). Marine Policy 34(1):114-119. A simple method is developed showing that a reduction of only about 20 percent in yield of sandeel in the Shetland Islands can nearly double the breeding performance of Arctic terns.

state-dependent life history model. The model predicts that proximity to predator colonies has a distinct effect on behavior, particularly on depth choice when food-availability is low. The prediction is in line with observation.

Cresswell, K. A., J. Wiedenmann, et al. 2008. Can macaroni penguins keep up with climate- and fishing-induced changes in krill? Polar Biology 31(5): 641-649. Predicts that rapid changes in the mean supply of prey will have more of an effect on the condition of the female and chick than changes in prey patchiness, and that changes in foraging behavior compensate for changes in prey up to a threshold point, beyond which breeding success is likely impacted.

Cresswell, K. A., G. A. Tarling, et al. 2007. Weight loss during breeding is adaptive for female macaroni penguins, Eudyptes chrysolophus. Evolutionary Ecology Research 9(7): 1053-1076. Conclusions: Natural selection should produce females that sacrifice their own condition to meet the increasing demands of their chicks. We predict a weight loss of 10 to 20 percent, which is comparable to the empirical average of 14 percent. We also predict that females will endure the cost of travelling further from the nest to obtain a more predictable meal of krill, even if the mean reward does not change with distance from the nest.

Cresswell, K. A., G. A. Tarling, et al. 2007. Behaviour affects local-scale distributions of Antarctic krill around South Georgia. Marine Ecology Progress Series 343: 193-206. This paper predicts significantly higher concentrations of krill will result at the shelf-break region from krill choosing to swim slower and turn more often in a favorable zone. In addition, it predicts a diel pattern in swarm density in most conditions of the model, with small krill generally forming lower density swarms than large krill, particularly on-shelf. This work is the first prediction of the effects of krill swarming and swimming behavior on local-scale distribution.

Dr. Mangel, his Ph.D. student Kate Richerson, and collaborator Jarrod Santora (Research Scientist at UCSC and Lenfest grantee) continue to work on Southern Ocean krill.
Ecosystem Role of Gulf Menhaden

Gulf menhaden plays a substantial role in the structure and functioning of the Gulf of Mexico ecosystem, according to a paper published in Deep Sea Research Part II: Topical Studies in Oceanography and supported by the Lenfest Ocean Program. Using a comprehensive ecosystem model, the researchers found that an increase in menhaden fishing above 2009 levels would result in a decline in the biomass supported per unit of energy flow in the food web, a reduction in the diversity of channels through which that energy flows, and a decrease in the proportion of energy that is reused within the system. These metrics indicate that such fishing pressure on the ecosystem could reduce overall system biomass, species diversity, and efficiency, which in turn may reduce the ability of the system to respond to disturbances such as oil spills and climate change.