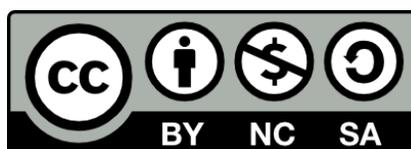

This case is authored by Dr. William Cochlan (Estuarine & Ocean Science Center, San Francisco State University) and Dr. Charles Trick (Department of Biology, University of Saskatchewan). This case was created as part of the SESYNC case workshop and is being offered as a class-tested exercise on social-ecosystem change and the responsibility of scientists – in this case ocean scientists. Users of this material must acknowledge the sources of the material and the funders of the case writing education program: “This work was supported by the National Socio-Environmental Synthesis Center (SESYNC).”

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Katie reflected deeply as the Pacific Coastal Airways flight circled Masset¹, British Columbia in an attempt to land in the coastal fog. Living in Haida Gwaii² was just what was needed for Katie to escape the turmoil of her recent life at San Francisco State University (SFSU). No one but Katie fully understood her need to be in an area where she wouldn't constantly feel challenged by questions, concerns and demands of the changing global environmental landscape. She had chosen graduate studies at SFSU with the belief that she would have an Ed Rickett's style of life – where each day she would walk down to the seashore with a bucket and grab some marine creatures, spending long days in the lab learning their secrets and mysteries. That was the life she learned from her favorite book "The Log from the Sea of Cortez." But, as she learned at the Estuary & Ocean Science Center (EOS Center), there's no money for that type of life. The future of marine sciences comes from decision making and actions – and she was overwhelmed and needed to escape.

Now that she had just completed her Master's degree from SFSU, Katie has accepted two, part-time positions of "Greenskeeper" at Canada's most western golf course (Dixon Entrance) and Biology Interpreter at the Dixon Entrance Maritime Museum³ ["The grandest museum in town – and only five bucks for admission"]. This was not her parent's dream, but for Katie a very remarkable marine adventure. And with a calmer daily pace, potentially a great post-graduate career choice. She even brought her "Ed Ricketts" bucket and looked forward to filling it with marine life.

As the new "biologist" in town, Katie garnered considerable attention. The town was energized by the claim of some mainland scientists that they could fertilize the ocean with iron,

and bring back the “missing” salmon fisheries^{4,5,6}; revitalize the sea into something productive again! As one member of the tribal council (Old Massett Village Council of Haida Gwaii) shared with her while she was sorting through some old biology displays at the museum – “It’s simple, they just add fertilizer, the algae (phytoplankton) grow, the fish eat the algae, the fish get fat and return to our streams to spawn. It’s just so simple – what could go wrong?” Katie just looked carefully at the Elder – was she supposed to say something, or was he just sharing a biology story with her?

It seems this story was the talk of the town. “You’re a greenskeeper. You know you can fertilize the grass and it will grow so you can trim it to just the right height. Isn’t that what you do?” Katie responds that it is not that simple. If she adds the wrong fertilizer or adds it at the wrong time, the natural turfgrasses will not grow, but will be replaced with smooth crabgrass and signalgrass. These look like grasses but are serious persistent weeds that become rough and dry – patches that golfers hate, and groundskeepers hate even more since they have an expansive root system and can seemingly sprout anywhere.

Katie found herself being swept up daily in the discussion of the community. She knew from her studies that a few years after the 2008 eruption of Mt. Kasatshi there was a massive sockeye salmon run in the Pacific Northwest^{8,10,11,12}; could that be the same thing, but with humankind enriching the seas to ensure more phytoplankton and hence more food for fish? “It only costs around \$2.5 million dollars, and they guarantee that the salmon will return!” was the most repeated statement she heard around this First Nation’s village. “Russ⁷ is a good guy. He married into the Haida community. If we can’t trust him who can we trust?” And as those scientists from down south kept saying, ‘Fish is plankton, and plankton need iron. The more iron, the more fish.’”

After a few weeks, Katie could no longer sleep soundly. Her new hometown was awash in stress and anguish; it was splitting the town; into warring factions. There was so much turmoil and argument about spending all this money to bring the salmon home. Was this a real sound plan to save the community and by extension their salmon fisheries and Haida culture? Or, was it an ill-conceived plan to gather a few million dollars prior to the fish returning naturally on their own? But most important, there was a deep-down responsibility for Katie to use her SFSU skills to move this problem from emotional jibber jabber to evidence-based decision making. The purpose for her working so hard at university has now been brought to the surface. Her inner soul kept repeating a line from her comic book reading past:

“... remember that, in a world of ordinary mortals, you are a Wonder Woman.”

Directions for the Learning Teams: Place yourself into the situation of Katie. Start with these questions. It is unlikely that you will have the complete answer to any of these questions at this stage. As the exercise progresses your confidence in achieving an answer will improve. Think of these as guideposts to discussion in your Learning Teams.

1. Katie needs to contribute to the island discussion. It is part of the competencies that have been instilled by her graduate studies: Professionalism, Intellectualism, Communication, Leadership and Gatekeeper.
2. Katie has vowed to contribute evidence-based, decision-making to the community.
3. Katie needs to know whether following an actual iron fertilization experiment is the only way to obtain evidence-based environmental decisions?
4. What data or information does Katie need to collect now to make an informed decision?
5. What information does Katie need to assess and communicate to the community?
6. How should Katie go about expressing her evidence-based decisions?

References:

Selected Web links (from superscripts)

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<http://www.cbc.ca/news/canada/british-columbia/haida-gwaii-ocean-fertilizing-chile-1.3550783>
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<http://www.scientificamerican.com/article/fertilizing-ocean-with-iron-to-save-salmon-and-earn-money/>
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<http://www.etcgroup.org/content/case-study-ocean-fertilization-near-haida-gwaii>

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Background:

This is a real case based on activities by a founder and former chief executive of Planktos, Inc., Russell George, (<http://www.planktos.com>). This is one of several companies that Mr. George has created, and it seems to be alive and well, in spite of media reports (<https://www.nature.com/articles/news.2008.604>).

The expertise and promises of Planktos are presented in the company website and may have a bearing on the classroom discussion. There are other 'green fertilization' companies proposing to make money through the ocean seeding of the ocean (e.g., Oceaneos; <http://oceans.org>), but the activities of Russ George and the Haida Salmon Restoration Company (HSRC) are the best known and the Haida Gwaii experiments conducted in 2012 come with a full array of comments and discussion from "greatest idea since slide bread" to "this will kill the earth."

The case challenges the key competencies of students and scientists in general: professionalism, intellectual enquiry, communication, and gatekeeping (i.e., promoting the responsible use scientific knowledge).

Here we will consider the scientific foundation of the proposal that Mr. George sold to the Haida Salmon Restoration Corporation and the Haida Gwaii First Nations community (Old Masset Economic Development Corporation). Be aware that there are many commercial names in this narrative (Planktos, Haida Salmon Restoration Corporation, Ocean Pastures, Haida Climate, etc.), but the common link is Mr. George and his economic promises or ocean seeding.

Specific Problem

There are several ways to consider this narrative. All are important, and all will be needed to achieve a final, individual understanding. The word 'individual' is key. There is no right answer even when we share the same class discussion and data set. This leads us to

wonder if perhaps we all have a unique location on the science-community-economics spectrum.

We start with the scientific promise – does the promise make sense given the foundational knowledge we bring into the narrative?

What information is provided to the community? What level of knowledge and certainty does the scientist have to provide the community?

What sort of experience do we require our leaders to have in order to be credible? Do scientist leaders need a PhD? Russ George claimed to have a PhD from the California Institute of Technology (Ranked #1 or #2 of the technological universities in the world). Recent reports state he attended a mid-western university for a couple years without graduating. Does that matter or are good ideas just good ideas no matter the pedigree?

Is “ocean seeding” a fancy form of ocean polluting or an advancement on environmental progression?