

Guest Director's Column
**Information Flow in Fisheries Management:
 Systemic distortion within hierarchies**

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INTRODUCTION

The early to mid-1970s provided the best coho salmon (*Oncorhynchus kisutch*) fishing of the last century in Oregon, in large part a function of productive ocean conditions and a booming hatchery system. However, a shift in ocean productivity caused wild coho populations to precipitously decline and harvest rates were subsequently reduced by over 75% (Martin 2009). Even after the Oregon Department of Fish and Wildlife (ODFW) implemented what was deemed at the time to be scientifically defensible harvest reductions, biologists in the field could see that the number of returning adults continued to decline. Yet no additional changes to the harvest rates were made until coho stocks were severely depleted in Oregon. *How could an environmental catastrophe of this magnitude happen under the guardianship of a group of people who cared deeply for the public trust they managed and who were committed to using the best science available to properly manage these fish?*

The history of Oregon coho provides a prototypic case study of fishery mismanagement due to barriers in information flow through the hierarchy of a highly renowned fisheries

governance institution. Natural resource agencies are generally complex, multi-tiered institutions which depend on information flowing vertically through the hierarchy of the organization to make decisions and implement management actions. As information moves between the layers of an organization, there is always opportunity for the message to become distorted by the way individuals interpret and communicate information. Making decisions using fully informed and accurate information becomes more difficult the higher up the system one goes.

Systemic distortion of information can be defined as the process of altering information as it moves through the layers of a hierarchical system. In general, it is a function of organizational pressures (to be right) and people's social tendencies (to be liked) that perceived good news often travels quickly and unverified upward through the hierarchy of an agency while bad news is often late, misinterpreted, and understated; the result of which is that the people at the top of the hierarchy tend to receive information that is favorably biased. Such favorably biased information supports the status quo and groupthink within an organizational system rather than challenges it (Bella 1996). The fundamental pitfall with systemic distortion is that problems are not identified internally and external forces or system collapse are required for change to occur in an organization: clearly to the detriment of the public trust resource when related to fisheries management agencies. The goal of this article is to create awareness of the systemic distortion of information within natural resource organizations and provide tools to counteract this phenomenon in the decision-making process. Distortion of information is well documented in hierarchical systems (Liberti and Mian 2009, Roberts and O'Reilly 1974, Rosen and Tesser 1970) and it is therefore imperative that professionals in our field understand that the effects influence the functioning, productivity, and sustainability of our fisheries and their ecosystems.

Dr. Dave Bella, a professor of engineering at Oregon State University, began investigating systemic distortion of information preceding major engineering disasters of the late 20th century. His work focused on the disparity in risk perception between lower and higher levels of decision-making in organizations such as the National Aeronautics and Space Administration (NASA). Following the Space Shuttle *Challenger* explosion in 1986, a Presidential Commission Report found a joint in the solid rocket booster was identified as a significant risk feature of the shuttle by NASA engineers familiar with the mechanics of the rocket long before this disaster occurred. This information, however, was filtered and diluted, the perception of risk systematically minimized as it moved up the chain of command (Bella 1987). An independent study estimated that the upper level managers perceived the risk to be about one thousand times less than the risk perceived by on-the-ground, working engineers (Feynman 1986). From our historical viewpoint, the system of reporting within NASA was clearly dysfunctional, with top level administrators somehow not receiving needed information to make rational decisions. Nonetheless, people within the system at the time perceived their actions to be responsible, reasonable, and justified (Bella 1987); the reason for this stems from how and why information was distorted as it moved from the field personnel to the upper levels of the administration within this highly respected organization.

Good news tends to travel quickly

People want to talk about their successes and a positive attitude is valued in organizations. The majority of people seek the approval of their peers and organizations. Through both formal and informal communication channels, perceived good news tends to travel quickly and unquestioned up the hierarchy of an agency. Positive reinforcement is often granted to the purveyors of good news, causing information to move through the system ever

more quickly, unchecked and increasingly exaggerated. Competition for funding and recognition can cause project forecasting to be overly positive, as the proposals and actions that promise the most economic value to the organization are chosen for implementation (Lovallo and Kahneman 2003).

Hierarchies tend to inhibit the development of the types of relationships needed to communicate openly due to an imbalance of power between individuals within the decision-making chain (Chaleff 2010). Both fear and love of an employer can cause people to distort information. Most people want to be supportive of their superiors and the organizations they are a part of. What better currency to pay back a good employer than by highlighting the positive results of their decisions? This blind devotion can encourage employees to seek out information that verifies their leader's decisions are right and protect them from complaints or negative feedback. At the extreme, a supervisor can build an insular layer around themselves through their hiring and firing practices, surrounding themselves with "yes-men," people who will support their decisions no matter what. This organizational ethos creates a barrier of gatekeepers who filter or minimize any bad news from ever reaching the decision-maker and thus puts this person and the organization ultimately in jeopardy due to lack of fully informed and accurate information on which to base decisions.

Bad news tends to arrive late and understated

Hierarchical social systems inherently do not support perceived bad news because bad news is viewed as disloyalty and challenges the functioning of the organization (Bella 1987). People who challenge the established protocols within an organization are often ostracized for not being "team players," especially if they cut through the chain of command and report above their immediate supervisors. Team projects are often heavily laden with social pressure toward

consensus and groupthink (Whyte 1956): not many people want to relay bad news or challenge the decisions of their colleagues because dissent can be taken personally and working relationships weakened. Thus, information that reflects poorly on coworkers or the agency will be diluted and softened as it moves through the layers of an institution. To do otherwise is to risk being tuned out, reorganized, or fired. Within multi-tiered organizations such as natural resource agencies, the mentality is to “keep the system going” (Bella 1997). Every level depends on the others and bad news has the potential to cause chaos throughout the organization, making the entire system impotent.

STEPS TO CORRECT FOR DISTORTION

Distortion cannot be eliminated from hierarchical social systems. Rather, people in an organization must be prepared to recognize and mitigate the effects of this phenomenon. Good leaders will acknowledge and account for distortion and not ignore or punish the people who report bad news to them but rather see them as purveyors of information that needs to be considered in the decision-making process. The following are management processes that can help individuals within agencies increase the accuracy of information flowing through their organization. These steps are meant to enhance the effective and efficient management of our public trust fisheries resources.

Be aware

Distortion of information is endemic to human communication systems and studies have found that managerial perceptions are often inaccurate (Mezias and Starbuck 2003). Therefore, the first step in minimizing these counterproductive forces is for leaders to be aware that the information they receive has already been subject to some level of distortion. Be cautious when receiving only good news and seek out attrition errors- realize that people want to take credit for

positive outcomes and attribute negative outcomes to others and especially to external factors (Lovallo & Kahneman 2003). Know what bad news looks like and question what the ramifications would be if you are only seeing a piece of the whole problem. Numerous factors affect how information is reported: contextual factors such as the extremity of the news, social factors such as hierarchical power and distance, and individual factors such as personality and past experiences (Lee 1993). Leaders should strive to build a holistic communication network and healthy relationships within the organization so they know what information is likely to be understated and who tends to be overly positive or overly negative. Investigating every piece of information hinders a leader's ability to make decisions, therefore promoting an organizational culture prepared to minimize distortion of information will make day-to-day decisions more effective and productive.

Being aware of systemic distortion challenges leaders to examine their own biases. We can point to many cases where arrogance and blind acceptance in science has kept managers from recognizing distorted information. In reaction to the coho salmon declines in the 1970s, for example, ODFW fisheries researchers implemented the best science available at the time to reestablish harvest quotas. Managers were confident that the new Ricker stock-recruitment curves would give them the accurate predictions needed to conserve the fishery. Despite the political unpopularity of the initial decision to reduce harvest rates, they were positive that the science was sound and credible. For years the salmon populations continued to decline; this bad news was attributed to ocean conditions or sampling error and sent back for reanalysis before it was ever passed on to the upper levels of the agency's hierarchy. It took the dogged investigation and courageous dissent of a small group of ODFW employees to discover that the root of the problem was in the spawning index streams used as input in to the stock-recruitment curves,

which while believed to be unbiased were actually non-random and not representative of the spatial heterogeneity of natal coho streams in Oregon (Emlen et al. 1990, McGie 1981). In fact, the index sites that were being used in the scientific assessment of coho stocks were the most productive streams on the Oregon coast, chosen by highly respected agency employees long retired from the organization. These streams were never intended for evaluating the entire population. Thus, the productivity of the overall Oregon coho stocks was over-estimated year after year before the problem was even recognized. No one dared to question the way things were being done or the integrity of earlier fisheries professionals, and as a result, the scientific examination of the problem was delayed. Intense political and public pressure amplified the internal distortion as employees defended the decisions of the agency, causing the organization to be even slower to recognize the problem and ultimately delayed the action necessary to protect all but the most resilient stocks in Oregon.

Cut through the layers

In order to evaluate the amount of distortion within a system, it is necessary to tunnel through the multiple layers of a hierarchy. Also known as diagonal communication (Wilson 1992), leaders must seek out the problems in their organization from all levels of the hierarchy. For Jim Martin as the Chief of Fisheries at ODFW, this meant spending time with every district biologist in the state, usually riding on a one-on-one field tour for two days a year in each region. Jim's goal was to engage in a personalized, two-way, confidential conversation, devoid as much as possible of power differentials and middlemen. He knew that if he wanted honest answers about the problems within the agency he was going to have to answer honestly for decisions he was making back at the state headquarters. The breadth of knowledge he had from the more global view at the top of the agency met the depth of knowledge from the on-the-ground

biologists. By cutting through the layers within the organization, Jim felt better prepared to understand the information he was receiving at the local and regional scale while employees had a better understanding of the forces affecting statewide decisions.

Celebrate problem identification

The goal of this step is to show employees that it is okay to make mistakes as long as the mistakes are found. This step requires humility and accountability across layers in an agency. Jim Martin observed that ODFW fisheries biologists, himself included, lacked this humility prior to the collapse of the stocks. “We thought we had complete control over the salmon fishery. With our cutting-edge science and our hatchery capacities, we believed we could adjust the population to whatever level the fishermen wanted. No wonder no one saw the crash coming.”

Systemic distortion is not malicious deception and problems can be ignored or distorted for many reasons. Therefore, employees should not fear to report bad news nor that a mistake has been made on their watch. When people trust that their leaders are concerned with ensuring that they receive the correct information and not the just favorable information, productive problem-solving can move forward.

Identify reverse distortion personalities

Within agencies, leaders should seek to build a culture of problem finders as well as problem solvers. Too often, the problem solvers are touted as the most essential components to an institution. In truth, the people who identify problems are equally vital to an agency. In any team environment, supervisors benefit from identifying what we call “reverse distortion personalities.” These are people who are not interested in distorting information for the better and will even go as far as to amplify bad news. Reverse distortion personalities have a psychology built around the identification of problems. Unfortunately, these people are often

negatively labeled as organizational malcontents, cynics, or simply not team players. Like a splinter in the human body, the organization will often attempt to isolate and get rid of the irritant, usually by reorganizing these personalities to positions where they can be, at best, tolerated or ignored. However, a good leader will recognize that reverse distortion personalities are key components to a healthy system, they are not splinters to be removed. Because they are not concerned about going against the groupthink current, reverse distortion personality types serve as an internal warning system that information is being distorted on the way to the top. These individuals beg that the problem be addressed and there is generally value in this consideration. It is important to allow for minority input and respectful disagreement within the structure of the decision-making process (Whyte 1956). For any team environment, leaders should reinforce that “between the extreme of rote compliance and counterproductive undermining of leadership, there is an important place for thoughtful, divergent views.” (Chaleff 2010)

Be prepared to act

Once a problem is identified, the system must be flexible enough to react to the information before negative impacts become irreversible. Too often, it takes socio-political or ecological catastrophes, such as the severe depletion of Oregon coho, for organizations to change their behavior. White (2001) noted that, “management programs often lack adequate evaluation necessary to achieve gains in knowledge from experience.” Managers rely on empirical evidence to defend decisions and this is not possible without consistent monitoring. Recognizing problems before a catastrophe requires constant vigilance and evaluation, which includes creating measureable objectives directly linked to desired impacts of management decisions (Riley et al. 2002). These objectives are “red flags” in the monitoring program and when these flags go up,

the agency must be prepared to take action rather than delay intervention due to incomplete, inconclusive, or distorted information.

CONCLUSION: DISTORTION AND ACCOUNTABILITY

In Oregon, systemic distortion of information allowed aggressive harvest rates to remain unchallenged as the wild coho stocks became severely depleted. It took complete closure of the fishery, coupled with 15 years of concentrated research efforts (e.g. Emlen et al. 1990), to begin to reverse the effects of management decisions based on distorted information. In the end, the ODFW managed to avoid complete collapse of the Oregon stocks. From our perspective, this chapter of Oregon coho history is not a result of scientific failure but rather a failure to question the veracity of scientific information flowing into the management process. The changes in management practice which were necessary to protect the fishery were fueled by courageous individuals who held themselves and the organization accountable for ensuring that information flowing to top agency decision-makers was accurate and timely.

The steps we have here outlined are meant to facilitate critical thinking and trust within management agencies. Studies in organizational behavior have found that trust in the supervisor facilitates a more productive work environment (Scott 1980, Roberts & O'Reilly 1974). However, the responsibility of correcting for distortion falls on all individuals in an organization. Silver and Geller (1978) asserted that “an organization obscures an individual’s relationship to an end state, thus permitting the individual to feel uninvolved and devoid of responsibility.” Effective leadership demands both individual and organizational accountability. As ethical considerations are inherent to almost all management decisions in natural resources (Decker et al. 1991) such decision-making requires a leader to see beyond their organizational role to the role of responsible citizen. Professional societies can support such courageous leadership by

exposing distortions and biases of organizations (Bella 1992): The American Fisheries Society's *Standards of Professional Conduct* speaks to member's responsibility to aquatic resources and the public and furthermore establishes a process for when a member finds employment obligations incongruent with ethical standards (AFS 1997).

As stewards of the public trust, we are fighting huge battles against pollution, habitat loss, invasive species, climate change, and competing stakeholder interests for fisheries resources. This is precisely why leaders should strive to minimize the distortive forces which counteract an organization's best intentions to protect aquatic resources. Recognizing and correcting for systemic distortion keeps information flowing accurately through an organization and therefore reduces bias in management decisions, promoting more effective and sustainable conservation of our fisheries and their ecosystems.

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