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Peril in the Ponds: Deformed Frogs, Politics, and a Biologist's Quest

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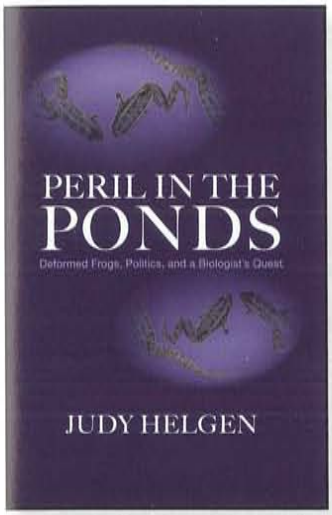

Combat veterans, reflecting back on their lives decades later, often realize that they never felt more alive than when they were in action, surrounded by death. You get the same sense of this from Judy Helgen as she describes in *Peril in the Ponds* what it was like to be at ground zero when, in the mid-1990s, a local malformed frog problem got big fast, and exploded into the global malformed frog phenomenon. By this time, Helgen, in her 50s, had already raised a family and was a successful soft-money employee with the Minnesota Pollution Control Agency (MPCA), a state government unit that, based on its battles with 3M, had a reputation for being scrappy and persistent.

In the interest of full disclosure, I was a part of this story. I first met Judy Helgen and her MPCA colleague Mark Gernes before there were malformed frogs to discuss—in 1993, in Jamestown, North Dakota, at a Wetlands Symposium hosted by biologists at the USGS's Northern Prairie Science Center. We had dinner and talked about amphibians as aquatic bioindicators. A couple years later, when the malformed frog phenomenon began, Helgen and I talked more frequently. As the investigation proceeded, I was mostly in the background (Dave Hoppe and Bob McKinnell, in the University of Minnesota system, were in the field; biologists at the National Wildlife Health Center in Madison were doing necropsies and making diagnoses). Mid-investigation, I recommended that Helgen bring on the classically trained parasitologist, Dan Sutherland, who was then on the faculty in the University of Wisconsin system. I also radiographed MPCA-collected frogs. In 2001, Sutherland, his student Josh Kapfer, and I re-sampled the hottest of the Minnesota hotspots. Having been a part of Helgen's story, I can assure readers that she tells the truth. She does not play herself up, and when she calls out folks it's for things they actually did; no straw men populate Helgen's stories.

Helgen discovered in the late 1990s what many others have so painfully learned—that you will not find instructions anywhere on how to proceed when day-to-day reality blows up and metastasizes into uncertainty and malevolence. Dogged by cameras and microphones, politicians, bosses, and scientists, Helgen and Gernes sought to discover what was causing the apparent epidemic of malformed frogs across much of Minnesota, and—true to the MPCA mission—determine whether or not humans, especially the school kids who first found those funny looking frogs, were in harm's way. Helgen describes how National Institutes of Environmental Health Science (NIEHS) scientists came onboard and immediately found themselves in competition for answers with Environmental Protection Agency (EPA) scientists. Her MPCA bosses were bipolar—sometimes supportive, more often distanced—she rarely knew where she stood within her agency, a big concern for a soft-money employee. Willard Munger, the legendary progressive politician, was consistently supportive; so was Bob McKinnell, the biologist who pioneered the idea (from studying leopard frogs) that viruses can cause cancer. Dave Hoppe was a steady, stabilizing presence in the field, as was Dan Sutherland, who helped separate parasite fact from fiction.

Helgen faced many problems, including: the need for immediate answers to unanswerable questions (should the State deliver bottled water to families deemed in harm's way?); the pressure of the press; the need to build a team of scientists; the need to simultaneously collect data and discuss results at state and national forums; competition among federal government agencies; smokescreens set by distant scientists with a deep need to be the center of attention; and the simple biological fact, as we now know, that there was more than one cause for the malformations that were being observed.

Perhaps the most fundamental problem Helgen faced was that the MPCA had no contingency plans for what might happen should an environmental concern blow up into an emergency (or public relations nightmare). The U.S. Forest Service, for example, having lost several smokejumpers by placing them in the wrong place at the wrong time, developed an Incident Command Structure (ICS). This model provides a mechanism for populating a disaster response team that includes adding administrative overhead appropriate to the task. (Imagine an organization as a pyramid, with bosses on top. An ICS model adds personnel to one side, including more experienced people, recognizing that a fire boss capable of handling a 10-acre fire may not be capable of handling the same fire after it blows up to 10,000-acres). Because MPCA (despite the implications of the name "pollution control") never adopted anything like an ICS contingency plan, once Helgen initially took charge of the malformed frog investigation, she became, de facto, always in charge of the malformed frog investigation. When she needed assistance, MPCA added a layer to the base of the organizational pyramid (i.e., technicians—less experienced people). Under such a system, no one in her position could have possibly succeeded; the fact Helgen did so well is a credit to her and her primary team.

While the political difficulties Helgen describes with her agency—being a state entity in a region dominated by agriculture—are predictable, the political difficulties created by a handful of then-respected scientists are deeply disturbing. As Helgen notes, there is nothing quite like a catastrophe to bring out the best and the worst in people. And, whether we acknowledge it or not, among our fellow scientists there are a lot of ambulance chasers looking for ways to fund their labs or get their names in the papers. Helgen treats most of these folks with kindness, or not at all (many were transient; my favorite was a USDA biologist who claimed to have found a new life form at the CWB site). However, Helgen does not hold back when it comes to her feelings for proponents of the parasite theory—the idea that amphibian malformations are caused by tissue disruption during

development by metacercarial cysts of the trematode *Ribeiroia ondatrae* (Rib). It's not that the parasite theory was wrong; the problem was that it could not—despite the deepest wishes of its loudest proponents—be generalized to all hotspots. People were confusing "a" cause for malformed frogs with "the" cause for malformed frogs. The parasite theory for frog malformations was always the best story, but as Helgen points out, in Minnesota it was never the best science.

A short elaboration from someone who was there. As a field biologist, imagine that you have a set of observations where you see a clear pattern "X," but that someone half a continent away who has never seen your study sites or your animals is telling both you and the press that it is pattern "Y." That's the way the parasite hypothesis played out in Minnesota. First the facts: using data assembled by Dan Sutherland, we found every possible combination of Rib/malformation hotspot interaction (Rib/hotspot; Rib/no hotspot; no Rib/hotspot; no Rib/no hotspot). We then concluded that the distribution of Rib and the distribution of hotspots were independent. Where Rib and hotspots co-occurred, Rib was the likely cause of malformations. However, one big and simple factor worked against Rib as a general explanation for frog malformations: in hotspots where Rib did not occur, Rib could not have been the cause (Lannoo et al. 2002).

But the parasite hypothesis is beautiful, and paraphrasing Thomas Henry Huxley, none of us really enjoys destroying beautiful hypotheses with nasty, ugly little facts. Helgen describes how the parasite hypothesis was transformed from idea—something that grows and expands a discipline—to ideology—something that constrains and dictates. With contrary data in hand, we reminded ourselves of Aldo Leopold's observation that the fundamental weakness of conservation biology is that many of its proponents, although unaware of it, come to value personal prestige over real conservation (Meine 1988). We were also reminded of the marine biologist W. K. Fisher, who, as Ed Ricketts described, had too much integrity to fit for convenience what wouldn't fit in fact (Rodger 2006). One clear pattern that did emerge from our field observations, something Helgen notes, was that most malformed frog hotspots were either wetlands recently constructed or highly altered (usually through runoff which could contain nutrients and/or contaminants). These oddball wetlands disproportionately produced Minnesota's oddball frogs.

Helgen's book completes a trilogy of volumes on the Minnesota's malformed frog phenomenon. The first was Bill Souder's *A Plague of Frogs* (Souder 2000), which covered the investigation from a reporter's perspective—from all angles while looking for answers. The second was my own *Malformed Frogs* (Lannoo 2008), which laid out the science of amphibian malformations and put global and historical perspectives on the Minnesota issue. Helgen's new book is by far the most personal, but they all tell the same story—that had we spent the same amount of money differently and considered each site independently, we would have likely solved the malformed frog phenomenon. And that much of the trouble was that the special needs or wants of people and agencies got in the way and added complexities that were expensive to consider and impossible to overcome. *Peril in the Ponds* will make a major contribution to the field of investigative science if, during the next environmental train wreck, some smart, mid-level professional who finds themself in the middle of either a scientific or public relations meltdown, says: "This will not be another punching Judy show; what happened to Helgen in Minnesota will not happen to us. Let's set up an organization with clear lines of responsibility and accountability, then assemble the resources to get the job done." It's a strategy that may not (given human foibles) always work, but as combat veterans also know, the way through a minefield is often laid out by those who went before and didn't make it.

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