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The list of women in fisheries who are making an impact is vast and ever growing. Fisheries recently interviewed six of the best – a collection of women involved at all levels in AFS: Diane Elliott (Research Microbiologist at the Western Fisheries Research Center), Lori Martin (Aquatic Biologist with Colorado Parks and Wildlife), Christine Moffitt (Professor at the University of Idaho), Sarah O'Neal (Aquatic Ecology and Water Ecology at Dr. Carol Ann Woody Fisheries Research and Consulting), Jesse Trushenski (Assistant Professor at Southern Illinois University Carbondale), and Melissa Wuellner (Assistant Professor at South Dakota State University). Together, these accomplished women make up just a fraction of the female dynamo demographics in the world of fisheries – but oh what a fraction it is!

Diane G. Elliott

Lori M. Martin

Christine M. Moffitt

1. Do you still feel that fisheries science is a male-dominated world—and, if so, what would you like see happen to bring more women into the arena?

Diane G. Elliott: When I walked into my first undergraduate fisheries class at the University of Washington in the late 1960's, I was the only woman student there. By studying hard and demonstrating that I could hold up my end of a beach seine or handle a spawning Chinook salmon, I was accepted as an equal with the male students. The fish health field, unlike some other areas of fisheries science, no longer seems male-dominated. Several women, including myself, have served as presidents of the AFS Fish Health Section. Further broadening of recruiting efforts to include an increasing variety of disciplines could benefit fisheries science and help to recruit even more women into the field. In addition, offering employment opportunities that allow combination of a rewarding professional career with a fulfilling personal and family life will also be attractive to women.

Lori M. Martin: I have noticed that careers in natural resources have been primarily occupied by our male counterparts. Over time, this "norm" or trend has started shifting in the other direction, as we begin to see more women enter the work force. Today, women can have the best of both worlds: as successful fishery scientists, and as mothers with families. Our job as a professional society is to promote this notion, by reinforcing with women that they can have it all, and by providing them the tools they may need to achieve this success.

Christine M. Moffitt: I have been studying in aquatic & fisheries biology for more than 45 years, and did a short stint in terrestrial ecology in between my masters and Ph.D. study. My start in science was in a very white male dominated world. Biology has changed during that time, but fisheries has remained male dominated. In the US, the demographics of fisheries management is especially white male – if you don't believe me, just attend the fisheries management section meeting at the AFS. And the issue is not just about women—if you look around the world, the white people are a minority. In general, attitudes embracing diversity have changed, and the state agencies are looking at demographic changes affecting their future. However, if we don't have an educated public that embraces the importance of aquatic natural resources, we are in trouble.

Sarah O'Neal: My mother is an elementary school science teacher who begins her classes in the fall asking students to draw a picture of a scientist. Without fail, they illustrate a white man in a lab

coat wearing glasses. Then she shows them a picture of her daughter on the Alaskan tundra in waders, wielding an electrofisher. She says it blows their minds. So, in short, yes. Fisheries science is still male-dominated, as evidenced by the upper echelons of academia, agencies, and even the officers of the American Fisheries Society. More female mentors in the field are slowly engendering more female participation.

Jesse Trushenski: There are still more men involved in the field than women, but I wouldn't consider it to be "male-dominated." I've only had one negative experience in the field regarding my gender...and that guff came from another female scientist! Bizarre! The demographic is becoming increasingly balanced. At SIUC, I'm one of six full-time fisheries faculty, and the only woman. But our graduate student pool has included many women for quite a few years; right now, it's actually greater than 50% female. It will likely take a few more professional generations for this to equalize, but based on what I see in my program, at AFS meetings, etc. I fully expect the field to be gender-balanced in the future.

Melissa R. Wuellner: The number of women in fisheries has definitely increased compared to previous decades, and I love it when one of my female undergraduate students or advisees decides to go into fisheries. Each of us – male or female – came to our profession out of passion for the resource and of nature. We have all taken different paths to realize this passion. Perhaps the best way to get more women involved is to simply get them exposed to the idea of fisheries as a profession. Connect with Girl Scout troops or local elementary and high schools. Take college women to the field for some sampling. Exposure is key.

2. Who are your heroes in fisheries science and why?

Elliott: I would like to acknowledge the contributions that Dr. Marsha Landolt, my major professor for my Ph.D. degree, made toward increasing the visibility and status of women in fisheries science. Specializing in research on fish health with an emphasis on toxicology at the University of Washington, Dr. Landolt gained the respect of her colleagues and rose through the ranks to become the director of the College of Ocean and Fisheries Sciences. She was instrumental in revitalizing one of the largest fisheries schools in the nation and re-establishing its position as a magnet for fisheries students throughout the world. She was the embodiment of self-confident professionalism, such that her status as a woman in a male-dominated scientific field never seemed to be questioned. Those of us (both women and men) who knew her as a mentor and a colleague only hope that some of her fine qualities will continue to be perpetuated in us.

Martin: My heroes in fisheries science are all of those "founding figures" who, through simple interest and curiosity of fishes and science, and recognizing the importance of both, created a "profession" out of a labor of love. Fishery scientists are passionate in ways hard to describe, and this enthusiasm and obsession have been contagious for all who have followed. I can only hope that all of us, as professionals in this field, can continue to carry on this tradition and create legacies of our own for others to share, learn, and benefit from, as we all have done from those that preceded us.


Sarah O'Neal


Jesse Trushenski


Melissa R. Wuellner

Moffitt: The writings of Rachael Carson were really a pivotal influence on me. Her books on the ocean – as well as *Silent Spring* – were very ecosystem oriented.

O'Neal: Given the nature of this article, I'd like to highlight two women I've had the extraordinary opportunity to work for, and who were extremely influential in shaping my career. Jennifer Parsons – an aquatic botanist for the Washington State Department of Ecology, the foremost expert on aquatic plants in Washington State, and an important resource on aquatic plant issues nationwide – is fighting to keep the state's waterways free and clear of (or at least relatively unaffected by) aquatic invasive plants. Carol Ann Woody owns and operates Fisheries Research

and Consulting in a region she knows inside and out. She has over twenty years of experience in Bristol Bay where she's been building relationships with local communities, running jet boats up glacial rivers, fending off brown bears, chasing fish, and generally kicking ass.

Trushenski: There are a lot of people I've interacted with who've challenged me and helped me to be a better fisheries professional. Chris Kohler (Southern Illinois University, retired) had a significant impact on my professional development and career; he took a big chance on me as a student, which I'll always be grateful for, but the single most important thing he did as my mentor was to mandate that as his student, I would join AFS and get involved in the society. My involvement in AFS has changed so much about my career.

Wuellner: I admire those like E.O. Wilson and Rachel Carson who have written popular literature about some very serious and often contentious environmental or science issues but yet do so in such a way as to illustrate to the public why they should care about the issue. As scientists, we often forget how to break down the great work we do so that it's easier for the public to understand. Closer to home, my undergraduate advisor Dr. Tom Lauer gave me my first exposure to being a fisheries scientist and continues to support and encourage me even though I haven't been his student for almost a decade. Dr. Dave Willis has been such a wonderful example of a dedicated fisheries professional and administrator. Finally, there are countless people who have aided in my development as a professional by allowing me to be an active member in AFS; Dr. Don Jackson is certainly on the top of that list.

3. What is one of the most important events that affected/changed the way you think about fisheries science?

Elliott: While I was an undergraduate student in fisheries science, I worked weekends and summers as an assistant in a small animal veterinary clinic to help with college expenses. This sparked my interest in animal medicine in general, and an undergraduate fish disease course helped to highlight the possibilities and opportunities of a career in the fish health field. I was subsequently able to combine graduate studies in Fisheries with pertinent coursework from the schools of Medicine, Dentistry, and Public Health. The rest is, as they say, history.

Martin: I attended my first AFS function as an entry level aquatic biologist for the State of Colorado. This was my first exposure to the Society, participating in an annual meeting of the Colorado-Wyoming AFS Chapter. Naive and young (like a kid in a candy shop), I found myself surrounded by lots of cool fish people sharing their experiences and findings in an open, interactive, and interdisciplinary forum. This was my kind of a deal, and I knew immediately AFS had hooked me for life – both professionally and personally. I don't think I ever knew what fishery science truly encompassed until I became more engaged in AFS.

Moffit: I was able to have a mentor with a few good people who helped me build on my strengths. I was not a good factual test taker, but could really take off with independent projects in which I had more time, and could use experiential learning. Experiential learning has been my asset, and I use that in training students. I was told by one of the undergraduate instructors that he did not train women to become Ph.D.s because they were just going to go get married and have a family. Fortunately, I had an advisor who intervened, and helped get me into the next level to be able to realize the potential opportunities. The pivotal point was how he helped me get to Smith College, as it was all women, and I was surrounded by outstanding women in science and art and everywhere.

O'Neal: Simply doing it. Until I had the opportunity to work on truly wild salmon rivers (as opposed to impaired rivers to which I was accustomed in my home state of Washington), I had a very different impression of salmon ecosystems. My experience in Bristol Bay, as well as on wild salmon rivers in the Flathead Lake Biological Station's Salmonid Rivers Observatory Network, changed my entire worldview. I can now comprehend the possibility that the Columbia River may once have been so thick with salmon, one could almost cross it on the backs of the fish.

Trushenski: The most important thing – really what drew me and brought me to a fisheries career in the first place – was the interdisciplinarity of it all. I can't think of another field where being a jack-of-all-trades is more important. That's what I am, so it's really great to have found a field where that's a help, not a hindrance.

Wuellner: My very first experience was my most important because it really changed my career path. When I got to college, I thought I was going to be a marine biologist, dealing more with mammals. I didn't really know about fisheries at all. Thankfully, my introductory biology teacher, Dr. Lauer picked me out of a large lecture class and asked if I wanted a job in the lab. That's where I started my journey. The more I got into my major and the more internships and lab jobs I took, the more convinced I was that I was on the right career path. So, in all, I think just being exposed to fisheries was my most important event.

4. What are the biggest contributions that women have brought to fisheries science?

Elliott: The influx of women into fisheries science has also brought an acknowledgment from both genders that women can combine successful careers and family life, and has probably contributed to increased flexibility in the workplace that has benefited women and men alike. In part because of this increased workplace flexibility, women are no longer forced to choose between a career in fisheries and raising a family.

Martin: Our passion, our drive to be challenged and produce the best, and our persistent work ethic are traits we possess and aspire to as fishery scientists, women and men alike. All of

these characteristics packaged together could be considered as one of the biggest contributions to fisheries science.

Moffitt: Women bring compassion, excellent communication, and embrace the big picture, and interdisciplinary work. It is natural for us. We integrate, we are good teachers, and good leaders.

O'Neal: Rosalind Franklin, "The Dark Lady of DNA," played a critical role in the discovery of DNA structure, but was given essentially no credit. Dr. Kate Myers is a pioneer for women in fisheries as the Principal Investigator of the High Seas Salmon Research Program at the School of Aquatic and Fishery Sciences, University of Washington. Her extraordinary work documents the movements of salmon once they enter the "black box" that is the Pacific Ocean. I imagine sailing the high seas in the 1980's in pursuit of salmon as a female (or male) fisheries scientist takes some serious guts. The increasing numbers of female fisheries scientists has led to some progress in the reshaping of waders to fit women… although there is still a long way to go!

Trushenski: This is a tough one. I'm hoping some of the others gals can fill in the blanks here. One of my flaws is a short-term memory for stuff like this, so hopefully the others can provide better insight.

Wuellner: I agree with Jesse – this is a tough one. I know that those who came before me laid a path that allowed me to be a fisheries scientist without fearing I'd be judged as a woman first and a biologist second. But it's often difficult to appreciate the struggle fully when you haven't been in that situation. And some of the work to overcome the limitations and struggles is done more quietly (no publications, no awards named after a particular person). Of course, both genders have to work together in order for real progress to be made; no person is an island.

5. What is your best contribution to fishery science, and/or what is your goal in regards to what you hope to have brought to fisheries science, when all is said and done?

Elliott: To date, perhaps my most significant contribution has been as a collaborator in the development and application of rapid immunological methods to screen spawning salmonids for bacterial kidney disease (BKD) caused by *Renibacterium salmoninarum*, a serious disease that can be transmitted from the female parent to progeny via the eggs. Brood stock testing by these methods, followed by segregated rearing or culling of egg lots based on the results, have become standard procedures for many public resource agencies and private aquaculture companies (both nationally and internationally) that culture salmonid stocks impacted by BKD. A recently completed multiyear study at three Idaho Department of Fish and Game hatcheries underscores the profound positive impacts that these procedures can have in improving fish health and survival.

Martin: I hope to say I made a positive difference by increasing social awareness and appreciation of our aquatic resources, so that future generations can enjoy as much as I have. This difference could be in the form of any of the following contributions: recovery of Endangered fishes, conservation of native fishes, production of self-sustaining sport fisheries, preservation of aquatic resources experiencing anthropogenic encroachment, promotion of sound science to drive management decisions, and successful recruitment and retention of future aquatic biologists as a mentor.

Moffitt: My training of the next generation is my best contribution. I work to make the next generation of scientists aware of the past, of our shortfalls, and to understand and embrace the history of our profession and our cultures, so we recognize that we have made mistakes, and to learn from these. To work to recognize the many viewpoints of others, and respect for all our indigenous peoples that survived on the natural resources for centuries before the Europeans came to dominate. We need to make our science solid and insure that we address aspects of management relevant questions.

O'Neal: I once discovered Eurasian milfoil shortly (most likely) after its introduction in a beautiful lake on the Olympic Peninsula. We mobilized the community, and the milfoil never took hold. More recently, I worked with my boss, Dr. Woody, and several other colleagues to document salmon for the first time in over a hundred miles of Bristol Bay headwater streams. That data will play an important role in the decision-making and permitting process for the largest current threat to Bristol Bay fisheries: Pebble Mine. It's hard to say what the future will bring, but I'm hopeful that my work will continue to be relevant to on-the-ground conservation of both fisheries and their waning freshwater habitat.

Trushenski: I hope I've yet to make my most significant contribution, but to-date, I would say that helping to develop the AFS policy statement on sedatives was one of the more significant contributions I've made to the discipline as a whole. We're just now getting to the point where we can use this document to (hopefully) leverage change, and later I'll be able to say that I helped put tools in the hands of the fisheries scientists who needed them. The whole issue comes down to reconciling regulation with reality and what's best for the resource – in general, I hope reconciling to make change that matters is what I will do with my career.

Wuellner: My answer to this question is a moving target. There's always more that can and should be done; this keeps us "fresh" as fisheries professionals. I guess if I had to summarize briefly what my overall goals are in the profession, I would say that I'm striving to be an excellent educator, a quality researcher who provides good science to the profession and the public, and someone who gives back to the profession that has already given me such a great career.