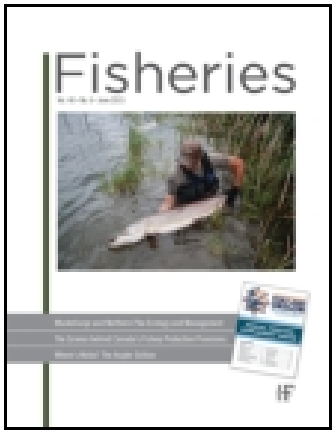

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Finding the Path to a Successful Graduate and Research Career: Advice for Early Career Researchers

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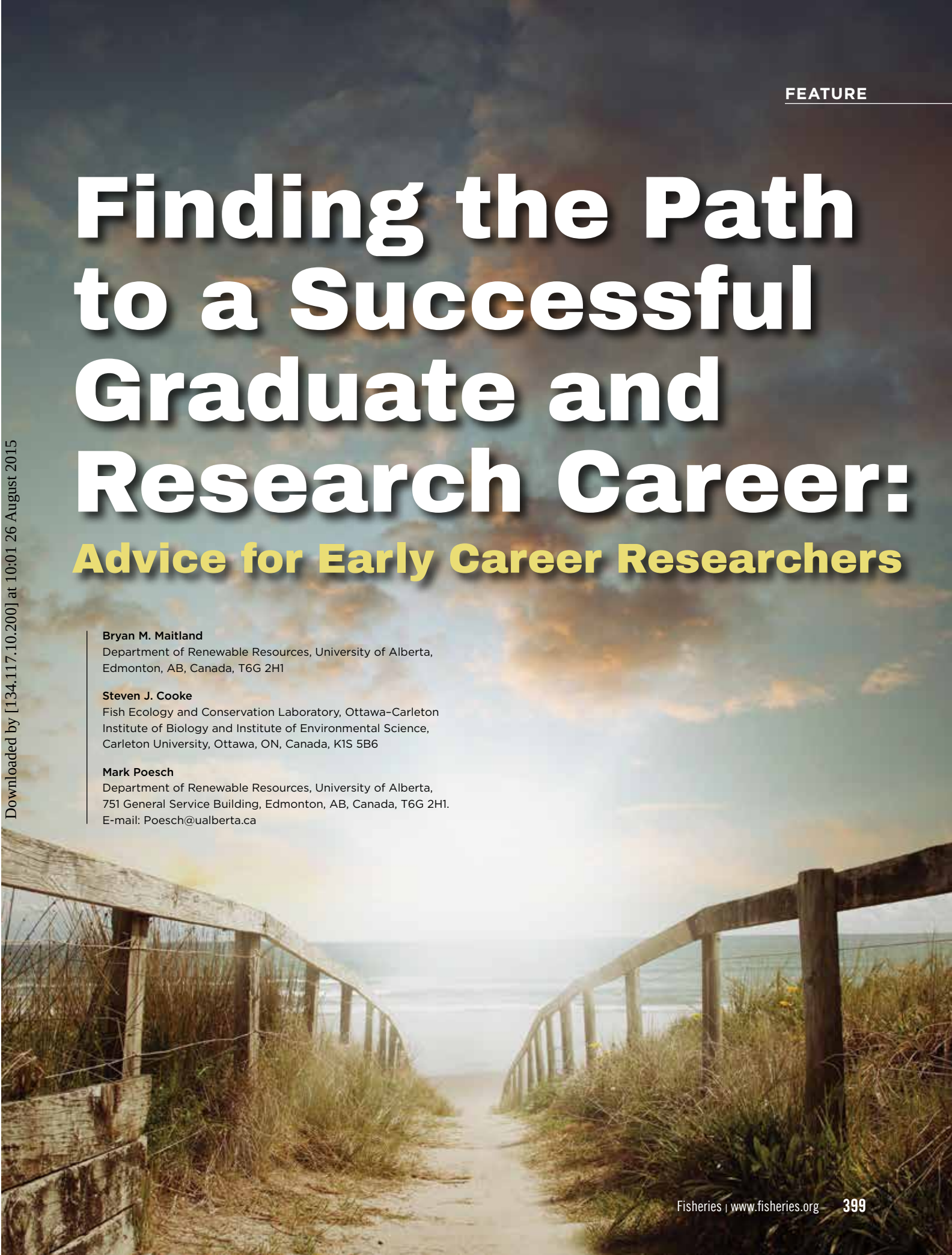

The path to a successful graduate and research career is a complex and difficult one. Early career researchers (ECRs) have myriad choices and tasks to prioritize and complete as they build their CV but are often confronted with unfamiliar situations in which advice from more senior researchers can be extremely valuable. Here, we summarize a recent workshop held for ECRs by the Canadian Aquatic Resource Section of the American Fisheries Society (AFS) with support from the Education Section. Sessions touched on (1) getting published, (2) science communication and outreach, (3) scoring a job or grad school position, and (4) working within the science–policy interface. The decades of collective experience brought to the table should be shared with the broader readership of AFS because it may prove useful to ECRs as well as stimulate meaningful conversations on these important and timely issues.

El camino hacia una graduación exitosa y una carrera en la investigación: consejos para los investigadores incipientes

El camino hacia una graduación exitosa y una carrera en la investigación es complejo y difícil. Los investigadores incipientes (II; aquellos que se encuentran en las primeras etapas de su carrera) tienen ante sí una miríada de opciones y retos que deben priorizar y completar a medida que construyen su CV, sin embargo suelen enfrentarse a situaciones poco familiares en las cuales el consejo de investigadores más experimentados puede resultar muy valioso. En este artículo se resume un taller de trabajo llevado a cabo recientemente para los II por parte de la sección de Recursos Acuáticos de Canadá, de la Sociedad Americana de Pesquerías (SAP), con la colaboración de la Sección de Educación. Las sesiones trataron de 1) publicación; 2) extensión y comunicación de la ciencia; 3) conseguir un trabajo o una posición en una escuela; y 4) trabajar en la interface ciencia-políticas públicas. Las décadas de experiencia colectiva puestas sobre la mesa de discusión debieran compartirse con un público más amplio de la SAP, dado que pudiera ser útil para los II así como también para estimular conversaciones productivas en estos temas de actualidad.

INTRODUCTION

The path to a successful graduate and research career is, for many people, a complex and difficult experience. Many early career researchers (ECRs; graduate students, postdocs, pretenured academics) must decide how best to prioritize their many tasks, such as writing scientific publications, building social networks, interacting with stakeholders, being relevant to knowledge users, learning new skills, or getting international experience. Few ECRs have a clear picture of how these experiences may help or hinder their future career paths and effectiveness as scientists. Here, we summarize a recent workshop held for ECRs by the Canadian Aquatic Resource Section of the American Fisheries Society (AFS) with support from the Education Section. Bringing together experts from fisheries and aquatic sciences, the workshop consisted of four panel discussions followed by a question-and-answer session. Each session touched on timely and relevant topics to ECRs, including (1) getting published, (2) science communication and outreach, (3) scoring a job or grad school position, and (4) working within the science–policy interface. Given the decades of collective experience brought to the table, we felt it pertinent to share the outcomes of this event with the broader readership of AFS in the hope that this knowledge may prove useful to ECRs as well as to stimulate meaningful conversations on these important issues. In the following sections, we summarize the major motifs.

Publishing is the Best Form of Demonstrating Success, Inside and Outside Academia

"Success" is a loaded word. What is actually meant when we speak of "scientific success"? Particularly in academia, success is defined in terms of one's publication output—that is, more is better (Fischer et al. 2012). Though this metric may not be the perfect indicator in that it fails to consider the quality of individual contributions, it nevertheless appears to be coarsely correlated with success. Publications can be seen as the "currency of the field," a concept most would likely agree with. This notion was highlighted in the discussion, emphasizing how publishing research papers shows ability, commitment, and a capacity to follow-through. This is of particular importance for ECRs, who have to prove their worth in their fields in order to secure a job (Schäfer et al. 2011). For example, a recent study by Laurance et al. (2013) highlights the importance of the idea that "early to press is best for success." They asked the question, "Can one foresee whether young scientists will publish successfully during their careers?" They found that pre-Ph.D. publication success was the strongest correlate of long-term success, suggesting that "early to press" is best for success for young scientists, too. Early career researchers should ensure that their research finds a home in a scientific journal, because "if you don't publish, it never happened" (John Smol, Queens University). Scientific publication in a peer-reviewed outlet is indeed part of the scientific process.

"Publishing is hard … don't give up … write often … become familiar with your inner writing voice."—Donna Parrish, President of the American Fisheries Society

Everyone gets writer's block. Dante's description of his own writer's block illustrates well what all writers have felt at one time or another: "It seemed to me that I had undertaken too lofty a theme for my powers, so much so that I was afraid to enter upon it; and so I remained for several days desiring to write and afraid to begin" (Flaherty 2005:8). Two simple methods to combat such troubles were highlighted in the workshop. The first being that one should take the time to write every day. This can include keeping a personal journal or a work journal or even writing letters to friends and family. However, we would take that piece of advice one step further and advise directed writing on a daily basis. This necessarily requires you to add focus and depth to your writing. For instance, pick an event or topic that piques your interest—something that interests you when reading the paper or watching the news—and then jot down a paragraph or two about the subject. As Donna Parish explains, this allows you to become more familiar with your "inner writing voice" and fosters confidence in your own writing skills. The second piece of advice is to write something—anything—down when faced with a blank page. As Mike Donaldson noted, "No matter how bad the experiences I've had, the most stressful experience I have is sitting down in front of a blank Word document. …" Just write something down, and before your know it, words will begin flowing. Start with a clear outline and objectives, then keep an eye on the target (e.g., watch for mission creep), and add structure. Make sure to add comments to keep an understanding of where you left off once you have stepped away from writing for a day, a week, or longer.

Don't Forget, Editors and Reviewers are People, Too!

Editing and peer review is an integral process that gives sustainability and strength to the scientific method. It is a long process that almost feels like a never-ending dance that you, your editor, and the selected peer reviewers take together. The vast majority of editors-in-chief, editorial board members, and reviewers donate their own time to the peer-review process. Therefore, it's important to keep in mind that editors and reviewers are people, too. They have deadlines to meet, meetings to attend, classes to teach, their own students to mentor, etc. In addition, there are myriad challenges to the implementation of the peer-review process, of note being the "tragedy of the reviewer common" (Hochberg et al. 2009)—that is, the increasing difficulty journals have in trying to find reviewers due to the drastic increases in paper submissions combined with static journal acceptance rates. Facilitating the work done on the editorial side of the table will benefit you and offer a greater chance of publication. Four pieces of advice sum up the extent of the discussion around this topic. First, choose the right journal for your research. Aligning the topic of your paper with the scope of the journal is key to a successful peer-review process. A simple tip for those struggling to decide on a journal: take a look at your reference list—what journals do you most often cite in a particular manuscript? Think twice about submitting a paper to a journal that you do not reference once; there is likely a better fit for your work elsewhere. Second, don't skimp on the cover letter. Editors often must decide very quickly about whether a manuscript should go to review. Spending a few extra minutes to present a convincing case in the cover letter will help ensure that your paper gets full consideration. Third, understand the importance of following the author's guidelines. This cannot be overstated. Referencing formatting may seem irrelevant, but for reviewers, it demonstrates your commitment and attention to detail in writing your paper (and by extension, the research itself). Finally, know that editors will be sympathetic to conflicts of interest. If you do not feel that a specific person should review your paper, convey this honestly in your cover letter. Editors will most often heed this request.

"Writing a manuscript is like running a marathon. Criticism is oxygen. Without it, you can't move forward."—John Smol, Queen's University

The above quote gets to the heart of what we do as scientists—we fail. Criticism can cut deep, so keep in mind that reviews are nothing more than opinions and should be treated as such (i.e., taken with a grain of salt). However, learning how to fail and be criticized is arguably the most important lesson students and young professionals can learn as they grow and move through their career; rejection and failure should be viewed as an asset. Criticism is the fuel that drives scientific progress. Always keep in mind that a very small percentage of publications go to print without some revisions, and more often than not, reviewers will bring to light important insights that you may not have considered. Being one's harshest self-critic can help to sharpen your writing, particularly if done to ensure that your work is presented in a transparent manner.

To Truly Reach People, You Must *Learn Their Language*

The communication of science to laypeople can be a challenging but very rewarding experience. To achieve success it is vital to understand the importance of *the language* of the people with whom you are trying to work. This goes not only for having productive interactions with the public but also for working with researchers and managers in scientific disciplines unrelated to yours. For example, imagine that you have two researchers looking at the same river (say, a hydrologist and a fish biologist). Not only will they both see that system differently, but they will also interpret the workings of that system differently. Both languages are needed to fully understand the system in its entirety. Learning the language of others can facilitate meaningful discussions and fruitful collaborations with researches, managers, and the public.

"As scientists, we are trained to argue our point. When communicating with Aboriginal and Indigenous peoples, it's more important to *listen.*"—Louise Chavarie, Michigan State University

It is critical to develop a "presence" in the community in which you are working. Louise Chavarie (Postdoc, Michigan State University) has spent the past eight years working with First Nations in Northern Canada. She stresses the importance of "listening" to the communities. By listening—quite literally, closing your mouth and stopping yourself from speaking—you demonstrate that you care about their wants, needs, and way of life. Without the development of this trust, successful scientific endeavors in indigenous communities can become challenging. Also, when developing a communication plan, take into account the time involved. Schedule monthly or annual meetings where you report on your progress and ask for input on a project's directions. If you can't be present to talk with the community, think about starting a Facebook page where community members can go to ask questions. Collectively, this advice can be extended to other stakeholder groups (e.g., anglers, commercial fishers, etc.) and will facilitate effective communication and involvement by all parties.

Cultivate a Web Presence—Own Your Online Self

The importance of having a web presence must be stressed. This goes for all levels of scientific organization, from individual websites (self-promotion), to project websites (community involvement), to lab groups, and organizational websites. Also, there is a shifting demographic on how individuals utilize social media. Twitter and Facebook have become an important form of electronic word of mouth (Jansen et al. 2009; Parsons et al. 2014), representing a unique opportunity to reach new viewers and gain citations. These social media outlets provide a useful conduit to share your research and promote both an open dialogue with the public and transparency in scientific research.

We find that a common objection to creating an online presence is that too much work is involved. We would suggest that while working with your particular university's or institution's website may be onerous, there is a plethora of easy-to-use alternatives available, most of which are free of charge. A good place to start is by creating a Google Scholar profile. In addition, there are many other sites, including LinkedIn, Academia.edu, and Research Gate, that allow you to build a free web presence. Also consider the possibility of building a personal webpage—an easy task with the use of free page building websites (e.g., Weebly, WordPress). Having a personal website can help you share your work with family, friends, and the greater public domain. Another often overlooked tool in the academic's tool box includes utilizing your university's outreach and communications department. Though you may not know how to draft a press release, they do. The communication department is there for the exact reason of bolstering the university's own web presence with research done under their umbrella. If you've done

research, they want the information. Consider drafting up 200 words for them, including some high-definition photos. All of these sources can greatly help in communicating your research, and you should attempt to use some of them, because at the end of the day, your research and publications only exists to those who read them.

Is It Who You Know or What You Know? Both, Really ...

The idea that "it's not what you know, it's who you know" was shown to be rather context dependent. Daniel Health (professor, University of Windsor) and Don Jackson (professor, University of Toronto) discussed how the concept of scientific pedigree (e.g., your scientific background) has recently lost its importance. The chief reason is because academics are much more interested in your publication record (i.e., what you have done). Similarly, screening approaches at most government institutions make it highly unlikely that someone you know will be handling your application, at least in the first round. In many cases, applications are screened using automated keyword searches. Because of this, who you know can have some impact in academia. A strong reference letter from a well-known scientist may help human resources when they are trying to make a decision between two equal candidates. Accordingly, the importance of having all of the basic qualifications (e.g., a degree) and setting yourself apart with unique skill sets and experiences cannot be overstated. Conversely, who you know can be an incredibly beneficial asset if trying to land a job in the private sector where employers have much more latitude in who they hire. Environmental consultant companies will often seek candidates who are either known in the field or who have had past work-related experience with them. Generally, building a social network is indeed important, but you must still focus on gaining useful skills that will benefit you in your chosen field of study.

You Have More Skills Than You Think as a Graduate Student

Early career researchers actually have many more skills than they typically think. Rarely do ECRs stress the importance of their graduate research as a skill beyond the degree they've achieved. Yet, unlike medical school, the path for students in aquatic sciences is diverse. In many settings, graduate research offers important skills that employers desire. Tailor your skill set to the job application and include skills like project management (a very important asset no matter what the job); logistical expertise (e.g., the ability to plan fieldwork in difficult environments, development of safety plans); supervisory experience; and budget experience, when appropriate. And, of course, your publication record demonstrates to employers your ability to complete a project. Remember, publications show people your ability, commitment, and capacity to follow-through.

Keywords are Not Just for Publications

For many jobs, just getting screened is a difficult process. Often human resources personnel are inundated with applications, and screening is done through an automated process of looking for keywords or by a clerk who may not have the same background and is similarly looking for keywords. Look at the job advertisement and use the same keywords as in the employment ad in both your cover letter and résumé or CV. Make sure your keywords are succinct; for example, if the ad says "biomonitoring," don't write biological assessments.

Should I Take a Job Abroad or Stay Where I Am to Build My Social Network?

Mobility helps for many reasons. There are rich experiences to be had all over the world. Get experience in your field, wherever that experience can be found. Moving to Europe to get a job in fisheries (if you're a fish scientist) is more beneficial for your career than staying and working in a job outside your line of work. The key to being a great job candidate is having a balance of experiences and an ability to demonstrate a wide breadth of skills. Aim for a middle ground between your current expertise and your next project with the goal of expanding your skill set, and seek out opportunities to collaborate on multidisciplinary teams.

Interview Your Potential Graduate Advisors and Their Students

When choosing a prospective graduate (or postdoc/job) adviser, make sure that you will be able to work and communicate well with him or her (O'Connor 2012). This can be a relatively easy task to accomplish and can be done at the same time you are being interviewed. Have a list of questions to ask your potential adviser following the questioning period. After the interview, e-mail his or her current students, and ask questions about both the advisor and the other students in the lab. These questions shouldn't be personal in nature but more general. For example, "How do you like working for Dr. John Doe? Does he/she provide a guideline from which research will be done, or does he/she provide autonomy for you to steer your project in the direction you see fit?" These questions can end up saving you immeasurable headaches in the future. A supervisor whom you cannot work or communicate with will often lead to failed opportunities and a lower likelihood of finishing your degree. Indeed, in an ideal scenario your graduate advisor will become one of your lifelong mentors, helping to guide you with your professional and personal development (Cooke and O'Connor 2014), emphasizing the importance of getting it right!

"Building successful policies requires credibility, legitimacy, and relevance; we rarely consider all three."—Jake Rice, Chief Scientist, Department of Fisheries and Oceans

Developing policies at the science–policy interface often requires a transdisciplinary consensus between scientists, social scientists, political scientists, and economists. At the heart of achieving success is the understanding that science–policy requires credibility, legitimacy, and relevance. Any idea, proposal, or policy must be put forth by credible authorities, have a legitimate chance of working, and be relevant to the people it will affect. Effective policy making must therefore take into account that the policy is needed and how the public will be impacted by the policy. To be successful, ECRs need to understand the ways in which decisions are made and identify ways in which they, the ECR's, can contribute to the process (see Rice 2011).

CONCLUSION

The path to a successful career in research—whether in academia, government agencies, nonprofits, or the private sector—is rife with challenges, difficulty, and uncertainty. Early career researchers are indeed the most vulnerable group in the science system (Laudel and Gläser 2008) and are thus most in need of guidance in dealing with both large, important topics (e.g., working with journal editors, deciding whether to move abroad for work, etc.) as well as the often seemingly inconse-

quential, though necessary, minutiae of the research process (e.g., following journal guidelines, communicating with the general public, etc.). Obtaining guidance from senior researchers can often be a difficult task given the sheer number of responsibilities and commitments they have on a daily basis. We hope that this compilation of advice from some of the most prominent researchers in the aquatic sciences—whose collective experience totals many decades of work—ameliorates some of the challenges. Early career researchers have in the path to success. Finally, though this perspective is targeted toward ECRs, we hope that more seasoned researchers will also find this information useful and encourage them to provide guidance to those endeavoring to pursue a career guided by the scientific process.

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