Narrow or Broad: Diverse Academic Pathways to a Career in Fisheries Science and Management

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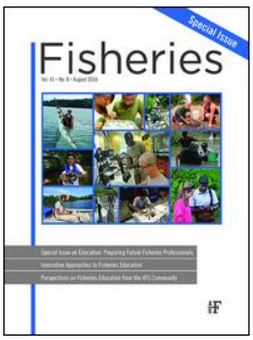

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Narrow or Broad: Diverse Academic Pathways to a Career in Fisheries Science and Management

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The most successful graduates are those who have combined their broad or narrow fundamental knowledge base with diverse experiences to achieve a well-rounded and comprehensive background.

Preparing students to succeed in fisheries-related jobs in a rapidly changing, globally connected environment is challenging (Boreman 2013). Adaptability in a graduate is an asset that stems from having a broad academic base, yet specialization is both necessary and rewarded in science. Depending on the degree program offered, institutions of higher learning may channel students into broad programs (e.g., biology, environmental science) or specialized fisheries programs. This initially sets students on different pathways toward the same goal of gaining employment in fisheries. Fundamentally, however, employers naturally seek the most knowledgeable and most experienced candidates that can also communicate effectively. Therefore, regardless of the broad or specialized approach, formal academic settings may provide the necessary foundation and can certainly promote skill development. Experience, however, is also critical and is often gained by seeking out additional opportunities external to formal academic programming (McMullin et al., this issue). The most successful graduates are those who have combined their broad or narrow fundamental knowledge base with diverse experiences to achieve a well-rounded and comprehensive background.

The pressure to specialize is rooted in the ease of dividing science into fields and the depth of knowledge required to become competent and compete successfully within those divisions (Casadevall and Fang 2014). Specialization is generally a measure of success in science because it is reflective of the amount of information available in a particular field. The specialized approach is common in institutions of higher learning in the United States, and such specialization is rewarded through the requirement of specific courses as prerequisites for employment eligibility or professional designation (i.e., the American Fisheries Society Professional Certification Program). Researchers associate their scientific identity with their specialization (Casadevall and Fang 2014), and students may seek to carve out a very specific niche as a viable strategy to be competitive for an equally specific job. Through this process, specialists also gain a sense of community, which facilitates networking and thus collaboration. Indeed, specialization is pervasive and even inherent to science.

There are, however, disadvantages to specialization. Specialists risk having lower adaptability and being compartmentalized or isolated. In a fluctuating economy and competitive job market, specialists may have difficulty finding employment within their niche or adapting to shifting political priorities. In addition, multidisciplinary collaborations in a specialized environment could mean collaborations among subfields of science, rather than being integrative or across disciplines, which may result in losing valuable insights due to restricted perspectives. Indeed, the risk of specializing is becoming too focused (Casadevall and Fang 2014), and thus being maladapted for varying environments.

A broader approach to a career in fisheries allows for the integration of information from multiple perspectives but at a cost of the knowledge being less in-depth. This broader approach is more common in Canadian universities because named fisheries programs at the undergraduate level frequently have been replaced by integrative programs such as natural resource management, environmental sciences, and conservation biology. Although there are instructors with deep expertise in "fisheries" at many institutions, specialized fisheries programs are uncommon. This broad approach rewards facilitation of adaptability, which promotes employment survival, and development of a wider collaborative network, which leads to transdisciplinary opportunities for research.

There is a cost to such breadth. Graduates often lack some aspects of core training or requisite depth of knowledge in fundamental topics such as quantitative stock assessment and systematics, despite obvious needs (Whitehead 1990; Cotterill 1995), or are missing important fisheries-specific courses such as ichthyology or fisheries techniques (McMullin et al., this issue). In addition, the erosion of laboratory courses with hands-on training in the field (especially at field stations; Eisner 1982; Hodder 2009) and the reduced resourcing of field stations makes it difficult for professors to provide practical skill development in university settings. College polytechnical programs continue to exist where there is a focus on skill development, but it means that students may have to opt for both college and university programs to learn the practical skills and the theory. Although broad training is useful, this should not be at a cost of having graduates who truly do not understand the fundamentals of fish biology, stock assessment, and management.

Pragmatically, gaining a fundamental science degree, whether specialized or more general, should only be viewed as a step toward becoming a fisheries professional (McMullin et al., this issue). To be successful, graduates also need practical

experiences in communication, decoding policies, writing proposals, preparing and managing budgets, managing people, developing safety plans, adhering to ethics, resolving conflicts, and working in collaborative team environments, among many other things. They must also know about legal instruments such as workplace safety and labor laws, transport of dangerous goods, safe boating, animal care, collaborative agreements, and intellectual property. These topics related to professional practice are generally not taught in either the specialized degree or generalized academic programs. Gaining practical experience, however, as an entry-level employee, as a co-op student, through a mentorship program (e.g., the AFS Hutton Junior Fisheries Biology Program), by volunteering, or by generally seeking experiences outside of a known skillset can help to fill those voids.

Regardless of the narrow or broad academic approach to a career in fisheries, those graduates who seek out diverse experiences will be the ones most employable. A variety of experiences will provide depth of knowledge in certain topics to those with a broad degree (i.e., biology) and a wider breadth of knowledge to those with a specialized degree (i.e., fisheries management). Thus, there is ultimately no prescribed approach for a successful career in fisheries science and management. The best-prepared graduates will be those who have combined knowledge with experience to become generalized specialists.

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FISHERIES INFORMATION AND TECHNOLOGY SECTION

The Fisheries Information and Technology Section and the Organization of Fish and Wildlife Information Managers Guide to Swimming in the Ocean of Information

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The volume of data available for fisheries management and research is growing exponentially, and fisheries professionals need to grow with it. We live in the Information Age, a time when humanity presumably has instant access to the sum total of all human knowledge, distributed freely across the Internet and accessible on any smartphone. Data are the building blocks of information or, rather, the raw material that can be synthesized into information; information can consequently be viewed as the raw material of knowledge (Zins 2007). In the words of Sir Francis Bacon, "knowledge is power", the power to successfully study, assess, analyze, manage, and conserve the natural resources with which we as fisheries professionals have been entrusted is dependent upon on our ability to handle data throughout its life cycle (plan, collect, assure, describe, analyze, share, store; Figure 1). Fisheries programs have traditionally focused on only a few aspects of this cycle, training practitioners to collect and analyze data to create meaningful information and then use that information to build a knowledge base. In order to prepare the next generation of fisheries professionals, we (Fisheries Information and Technology Section and the Organization of Fish and Wildlife Information Managers) believe that future professionals must strive to achieve greater proficiency in all components of the cycle.

Many universities provide a statistics course in experimental design and analysis. Coauthor Jeff Kopaska attended an agricultural university with predefined notions about