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Publisher: Taylor & Francis

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Fisheries

Publication details, including instructions for authors and subscription information:
<http://www.tandfonline.com/loi/ufsh20>

Insights for Undergraduates Seeking an Advanced Degree in Wildlife and Fisheries Sciences

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Published online: 09 Nov 2013.

To cite this article: Mark A. Kaemingk, Daniel J. Dembkowski, Hilary A. Meyer & Larry M. Gigliotti (2013) Insights for Undergraduates Seeking an Advanced Degree in Wildlife and Fisheries Sciences, *Fisheries*, 38:11, 483-490, DOI: [10.1080/03632415.2013.826200](http://dx.doi.org/10.1080/03632415.2013.826200)

To link to this article: <http://dx.doi.org/10.1080/03632415.2013.826200>

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Insights for Undergraduates Seeking an Advanced Degree in Wildlife and Fisheries Sciences

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ABSTRACT: *In today's job market, having a successful career in the fisheries and wildlife sciences is becoming more dependent on obtaining an advanced degree. As a result, competition for getting accepted into a graduate program is fierce. Our objective for this study was to provide prospective graduate students some insights as to what qualifications or attributes would best prepare them for obtaining a graduate position (M.S.) and to excel once they are enrolled in a graduate program. A survey was sent to 50 universities within the National Association of University Fisheries and Wildlife Programs (NAUFWP) where both faculty and undergraduate students were asked questions relating to graduate school. Faculty rated the importance of various criteria and attributes of graduate school, and students answered the questions according to how they believed faculty members would respond. Overall, undergraduate students shared many of the same graduate school viewpoints as those held by faculty members. However, viewpoints differed on some topics related to admittance and the most important accomplishment of a graduate student while enrolled in a graduate program. These results indicate that undergraduate students may be better prepared for graduate school—and they may understand how to be successful once they are enrolled in a program—than was initially thought.*

INTRODUCTION

Like it or not, getting a job and having a successful career in fisheries or wildlife sciences is becoming more and more dependent on obtaining an advanced (e.g., M.S.) degree. Getting accepted into graduate school and competing for limited assistantships is one of the first hurdles in obtaining this advanced degree. To a large extent, success in this endeavor depends on the platform built as an undergraduate. Faculty members are the gatekeepers for this important step because they are ultimately the ones admitting or accepting students to work in their respec-

Consejos para estudiantes que buscan un posgrado en ciencias pesqueras y de vida silvestre

RESUMEN: *en el mercado laboral actual, lograr una carrera exitosa en las ciencias pesqueras y de vida silvestre depende cada vez más de obtener un posgrado. Como resultado, la competencia para ser aceptado en un programa de posgrado es feroz. En objetivo en este estudio es proveer a los prospectos a estudiantes de posgrado de algunos consejos en cuanto a las cualidades y atributos que los preparen de la mejor manera para obtener un posgrado (M. en C.) y destacar una vez que pertenezcan a un programa. Se realizó un sondeo a 50 universidades que se encuentran dentro de la Asociación Nacional de Programas de Universidades en Pesquerías y Vida Silvestre (ANPUPV) en el que se plantearon, tanto facultades como aspirantes, preguntas relativas a las escuelas de posgrado. Las facultades calificaron la importancia de distintos criterios y atributos de las escuelas de posgrado, y los estudiantes contestaron las preguntas de acuerdo a cómo creen que responderían los miembros de las facultades. En general, los estudiantes de licenciatura comparten muchos de los puntos de vista de los miembros de las facultades. Sin embargo, difirieron en algunos temas relacionados con la admisión y con cuáles son los logros más importantes de un estudiante que pertenece a un programa de posgrado. Estos resultados indican que los estudiantes de licenciatura pueden estar mejor preparados para entrar a una escuela de posgrado —y entender mejor cómo tener éxito una vez que entran al programa—de lo que inicialmente se pensaba.*

tive labs. Acceptance into a graduate program is vastly different than acceptance into an undergraduate program. The looming question is “Do undergraduate students know the key criteria and attributes that faculty consider important when selecting graduate students in today’s competitive market?”

A second question, complementary to and equally important as the one presented above, is whether undergraduate students know what their graduate advisors expect of them. After all, getting accepted is only half the battle; successful completion of the requirements of an M.S. degree is the ultimate goal. Faculty expectations for graduate students may be different and more demanding than for undergraduate students, and these expectations may not be explicitly addressed once accepted into the graduate program. Graduate students are responsible for the success of their projects and must be cognizant of the expectations and responsibilities set forth by their advisor. Becoming

aware of these expectations will help undergraduates better prepare for graduate school, should they decide to take that next step toward a career in fisheries or wildlife.

To explore these questions in more detail and to provide undergraduate students across the country with better information, we surveyed faculty members and undergraduate students from 50 different universities across the United States on their perceptions of graduate school. We were primarily interested in whether or not perceptions of current undergraduate students and graduate faculty members were similar in regards to graduate school selection criteria and performance expectations. We hypothesized that there would be some divergent viewpoints between these two groups because faculty members are increasingly busy, and the demands on (and expectations of) them have accelerated over the past several years. This may lead to less time to communicate these thoughts or ideas related to graduate school to undergraduates. We understand that there is probably not a secret formula when it comes to answering these questions, but we wanted to highlight trends related to these topics. Our intent for this survey was to aid prospective graduate students by providing information on faculty members' viewpoints regarding graduate school (M.S. level).

METHODS

Students and faculty members were contacted from all member universities ($N = 50$; Table 1) of the National Association of University Fisheries and Wildlife Programs (NAUFWP).¹ Surveys were designed in SurveyMonkey (SurveyMonkey.com) and distributed via e-mail to faculty members listed in the NAUFWP database (naufwp.org, updated in 2009). Due to confidentiality issues, we were unable to acquire a list of undergraduate student e-mail addresses from each department within our target universities. As a result, we contacted department administrative staff and asked whether they would distribute this survey to undergraduate students through their respective listservs. Both students and faculty members were contacted initially during mid-October 2011, and a reminder was sent in mid-November 2011 to increase response rates (Salant and Dillman 1994). Data collection ended in mid-December 2011 when survey responses began to decline (survey open for ≈ 60 days).

Survey questions were developed via discussions with graduate students and faculty at South Dakota State University. The survey questions pertained to perceptions held by undergraduate students about what experience and credentials would better prepare them for obtaining a graduate position (Table 2) and the likely expectations they would face once they had been accepted into a graduate program (Table 3). All questions were posed from a faculty member's perspective (i.e., undergraduate students were asked to respond according to how they thought a faculty member would respond). These same questions were asked of faculty members to provide a baseline to compare an-

Table 1. University members of the National Association of University Fisheries and Wildlife Programs.

Alabama A&M University	Tennessee Technological University
Arkansas Tech University	Texas A&M University
Auburn University	Texas Tech University
California Polytechnic State University	The University of Montana
Clemson University	University of Arkansas at Monticello
Colorado State University	University of Arkansas at Pine Bluff
East Carolina University	University of California–Davis
Humboldt State University	University of Connecticut
Iowa State University	University of Florida
Louisiana State University	University of Georgia
Louisiana Tech University	University of Idaho
Michigan State University	University of Kentucky
Michigan Tech University	University of Maine
Mississippi State University	University of Massachusetts
Montana State University	University of Minnesota
North Carolina State University	University of Missouri
Northern Arizona University	University of Nebraska–Lincoln
Oklahoma State University	University of Tennessee
Oregon State University	University of Wisconsin–Madison
Pennsylvania State University	University of Wisconsin–Steven Point
Purdue University	University of Wyoming
South Dakota State University	Utah State University
Southern Illinois University	Virginia Tech
State University of New York, Syracuse	Washington State University
Stephen F. Austin University	West Virginia University

swers provided by undergraduate students. Respondents rated the importance of each of the items in questions 1 and 2 (Table 2) and question 6 (Table 3) on a 10-point scale (10 = most important, 1 = least important). Each participant could theoretically rate all questions the same; however, providing a unique rate option for each question provided flexibility and added input from each survey participant that could not be captured through a strict ranking approach.

Differences between faculty and student responses (main effect) and criteria (main effect) were examined using an analysis of variance (ANOVA, Proc Mixed, SAS) for survey questions 1, 2, and 6, whereas questions 3, 4, 5, 7, 8, and 9 were assessed using Fisher's exact test. We chose to analyze some questions with a parametric test (i.e., ANOVA) despite violating a few assumptions. The nonparametric equivalents (i.e., Kruskal Wallis test, Mann-Whitney test) revealed similar statistical results, and for ease of interpretation and use we decided to proceed with a parametric approach despite these assumption violations. Significance was achieved at an alpha of 0.05. For enhanced readability, statistical information such as P -values, F statistics, and degrees of freedom are omitted from the text.

¹ This project was approved as exempt from human subjects' research by the South Dakota State University Office of Research and Human Subjects Committee (approval #IRB-1110007-EXM).

Table 2. Questions asked to survey respondents about how a faculty member would respond if asked the following questions relating to considerations taken prior to admittance of a potential graduate student into their program. Asterisks indicate how each question was analyzed (* = ANOVA; ** = Fisher's exact test).

Question	Answer options
1.* Please rate the importance of each of the following criteria that are considered prior to acceptance into a graduate program (M.S.-level position) from 1 to 10 (1 = least important to 10 = most important).	(1) Experience (field or lab) (2) GPA (3) Quality of recommendation (4) Involvement in a professional society (e.g., American Fisheries Society, The Wildlife Society) (5) Professional meeting presentations (oral or poster) (6) Undergraduate publications (7) GRE scores
2.* Please rate (same as above) each of the following attributes that are most desirable in a prospective graduate student.	(1) Ethical (2) Highly motivated (3) Excellent critical thinking (4) Great collaborator (5) Good public speaking skills (6) Good field skills (7) Collegial (has good working relationship with other lab members) (8) Independent
3.** Is it important to consider how well a prospective student will interact with the rest of the lab?	(1) Yes (2) No
4.** Is a student's GRE score (standardized test) alone a good predictor of how well that student will likely perform?	(1) Yes (2) No
5.** In general, is a student more or less likely to be accepted into a program at the university where she or he completed a B.S. degree?	(1) Yes (2) No

Table 3. Questions asked to survey respondents about how a faculty member would respond if asked the following questions relating to expectations they have for a student that has been admitted into graduate school (M.S. level). Question number 10 was only asked of undergraduate students and not of faculty members. Asterisks indicate how each question was analyzed (* = ANOVA; ** = Fisher's exact test).

Question	Answer options
6.* Please rate each of the following accomplishments (1 = least important; 10 = most important) based on desirability for an M.S. student to accomplish prior to graduation.	(1) Active involvement in a professional society (i.e., held a position at either the local, regional, or national level) (2) Presented research findings at a professional meeting (3) Maintained a high GPA (>3.8) (4) Completion of additional research that was not previously included in the proposal
7.** How many hours each week are expected for an M.S. student to work on his or her project?	(1) <20 (2) 20 (3) 30 (4) 40 (5) 50 (6) 60 (7) >60
8.** What are the expectations in terms of publications resulting from an M.S. thesis?	(1) Completion of thesis (2) Publish one article in any non-peer-reviewed journal (3) Publish one article in a peer-reviewed journal (4) Publish two articles in a peer-reviewed journal (5) Publish three articles in a peer-reviewed journal (6) Publish four or more articles in a peer-reviewed journal
9.** How often will an advisor want to meet with his or her graduate students (M.S. level) to discuss project ideas, updates, or other pertinent information?	(1) Daily (2) Weekly (3) Bimonthly (4) Monthly (5) Every 3 months (6) Less than every 3 months
10.** Do you plan to go on to graduate school?	(1) No (2) Uncertain at this time (3) Yes



Donna Abler (undergraduate student) collecting zooplankton samples for a Bluegill and Yellow Perch recruitment study on Pelican Lake, Nebraska. Photo credit: Mark Kaemingk.

RESULTS

The survey was sent to 550 faculty members within NAUFWP, and 171 of them completed our survey (31%). Approximately 2,600 undergraduates (representing 14 universities within NAUFWP) received our request, and of these students, 252 completed the survey (10%).

Prior to Admittance into Graduate School

There was good agreement among faculty members and undergraduate students when asked about the most important criteria that faculty members considered prior to admitting a prospective student into their program (Figure 1). The top four criteria in order of importance were (1) lab or field experience, (2) quality of recommendation, (3) grade point average (GPA), and (4) GRE scores. Overall, there was only one statistically significant difference between faculty members and student ratings of the importance of seven criteria. Undergraduates gave “undergraduate publications” a lower importance rating compared to faculty members.

Faculty members and undergraduates were not as congruent when asked about what attributes of a prospective graduate student are considered most important by faculty members in their decision to admit a student into their program (Figure 2). Five criteria were rated similarly in both groups (highly motivated, critical thinking skills, independent, collegial, collaboration, and public speaking skills). However, students ranked the “ethical choice” lower than faculty members, and indicated field skills were more important to consider compared to the response given by faculty members. It is important to note that the survey did not define the term “ethical” in the questionnaire

so there may be different interpretations to the meaning and scale of the “ethical” choice.

Both groups were in agreement when asked whether it was important to consider how well a prospective student would interact with their lab (Yes: faculty members = 95.3%, undergraduates = 96.4%). Likewise, both groups agreed that a student’s GRE score (not a good sole predictor: faculty members = 88.8%, undergraduates = 87.1%) and GPA (not a good sole predictor: faculty members = 86.0%, undergraduates = 78.2%) alone were not reliable predictors of how well that student would perform. Faculty members thought that students were less likely to be accepted into a program at the university where they completed a B.S. degree (59.5%), whereas only 17.9% of undergraduates shared the same perception.

Postadmittance into Graduate School

Once accepted into a graduate program, both undergraduates and faculty members agreed that presenting (student) research findings at a professional meeting was the most important accomplishment while in the program, although faculty members gave this item a statistically higher importance rating than did students (Figure 3). Faculty members and students gave similar importance scores to maintaining a high GPA, professional involvement, and completing additional research.

Responses of undergraduates and faculty members were similar regarding how many hours students would need to work on their research project each week (Figure 4). However, undergraduates seemed more content with completing a thesis when it came to the expectations of publications, whereas most faculty members expected at least one peer-reviewed publication (although a few undergraduates anticipated writing four or more peer-reviewed publications during graduate school; Figure 5).

Undergraduate student answers on expectations for meeting with advisors mirrored responses from faculty members (Figure 6). Both groups agreed that meeting once a week would be preferred. Finally, a majority of undergraduate students who completed the survey were planning to attend graduate school (57.7%) and the remaining students were either uncertain at this time (35.9%) or not planning at all (6.4%) to attend graduate school.

DISCUSSION

Overall, we were quite surprised to see that the perceptions held by undergraduate students were closely related to the viewpoints held by faculty members across the country. Most often, students and faculty were in close agreement with the top qualities of a prospective student and only differed with respect

to a few important factors. This seems to be very positive news in that faculty may be effectively communicating and preparing their students for graduate school, despite potentially having less time for interaction with students. Alternatively, students may be taking a more proactive approach when it comes to this topic by contacting faculty members in their department. Whichever hypothesis is more supported, it seems apparent that students are getting the message about expectations related to graduate school (but see other comments on this topic later in the discussion).

According to our survey, all respondents consider lab or field experience, the quality of recommendation, GPA, and GRE scores as the four most important factors (in that order) when evaluating a potential student. We were somewhat surprised to see GRE scores ranked fourth, because in our personal experiences it seemed that faculty members are hesitant to consider a student with a lower GRE score despite being strong in the other three areas. The GRE score may serve as a screening tool that provides a red flag indication (as several respondents indicated), but once the accepted minimum is met it is considered fourth in line during the selection process. An overwhelming majority of both students (87%) and faculty (89%) agreed that a student's GRE score alone (and GPA, for that matter: students, 78% and faculty, 86%) is not a great predictor of how well that student will perform in graduate school.

The least important factors from a faculty member's standpoint to consider in the evaluation of a student for admittance into graduate school were professional society involvement, professional presentations, and undergraduate publications. Students further indicated that undergraduate publications were the least important. We can interpret this result in several different ways. Interpreted negatively, faculty members do not hold in high regards a student's commitment or involvement in professional societies. Or, interpreted positively, a student's involvement in a professional society will give them an added advantage during the selection process considering that all other four areas (lab or field experience, quality of recommendations, GPA, and GRE scores) are equal among applicants. We believe that the latter is better supported (through our personal experience and anecdotal evidence); however, we do not have any evidence of viewpoints on this topic by faculty members. We believe all factors included in this survey are important and should be considered by students, since none of the factors received a low score. While the four top-rated factors (lab or field experience, the quality of recommendations, GPA and GRE scores) are especially important because they will likely be evaluated for admission, students should also spend time on undergraduate presentations, publications, and involvement in professional societies so that they may have a competitive edge. More commonly, in the face of increasing competition, a student will likely need to consider involvement in these secondary factors to rise above their peers in the selection process.

Based on our personal experiences we believe the most important attributes that a prospective graduate student should possess include motivation and critical thinking skills. These



Undergraduate students (Jason Augspurger, left; Donna Abler, right) record substrate firmness in a Nebraska Sandhill lake. Photo credit: Mark Kaemingk.

factors are essential for an M.S. student to be productive and become successful in his or her program. A student lacking motivation is likely not going to excel. Undergraduates did rank having good field skills higher than the other choices, including "ethical," which could be a result of trying to meet the expectations and demands to compete for graduate or full-time positions (Hayer et al. 2013), but as mentioned earlier the "ethical" choice in the survey was not as specifically defined as some of the other choices. Certainly, this topic warrants further discussion and should not be ignored, because ethics are an important aspect of any profession or business (Hayer et al. 2013). We also wonder whether this response reflects the message being delivered by faculty members relating to our initial question (question 1, Table 2), whereby it was indicated that field or lab experience was the most important criteria for acceptance into graduate school. Alternatively, it could be presumed that good field skills are more easily taught compared to traits such as being ethical, motivated, and critical thinking. Both groups agreed that public speaking skills are the least important of the attributes listed, but we believe this attribute will be enhanced during the process of obtaining the degree.

One of the most surprising results from this survey was that undergraduate students believed that they had a high chance of being accepted into the program where they received their B.S. degree, even though a majority of the faculty member's responses were the opposite. We suspect that viewpoints on this topic vary widely across universities, within departments, and



Kristopher Stahr (undergraduate student) releasing a Northern Pike on Pelican Lake, Nebraska, after recording length and weight information. Photo credit: National Wildlife Refuge.



Paul McKenna (undergraduate student) measuring length of age-0 fishes in a Nebraska Sandhill lake. Photo credit: Mark Kaemingk.

among faculty members. We agree with Horta et al. (2010) that staying at one's undergraduate alma mater for an advanced degree may promote the recycling of scientific ideas—a deviation of a practice commonly referred to as “academic inbreeding.”

Venturing away from one's undergraduate institution will not only help build a list of contacts of potential employers and collaborators but will also provide a diversity of perspectives on different scientific ideologies. However, staying at one's undergraduate institution is unlikely to impede employment and may be the best choice for some individuals (Cohen 2012). In addition, the decision regarding where to attend graduate school is

often based on more complex matters involving many personal issues (i.e., proximity to family, local recreation opportunities, financial considerations, etc.; Schultz and VanDeHey 2012) than on what is best from an academic or future career standpoint (Cohen 2012).

Undergraduates appear, for the most part, to understand what will be required of them once they have accepted a graduate position. Both groups agreed that presenting research results at a professional meeting was the most important accomplishment while in their program, although undergraduates slightly underestimated the value of this activity compared to faculty members. This may be fairly intuitive, because presenting results at professional meetings is a good sign that the student is making progress toward his degree and is also demonstrating his ability to communicate his results among colleagues and potential employers.

Expectations regarding the number of hours per week a student should work on his or her project and meeting frequency with his or her advisor were similar between both undergraduates and faculty members. In fact, both groups provided an almost identical response of once per week when asked about how often they should meet to discuss project updates, classes, etc.

Many undergraduates thought that completing a thesis was sufficient and expected by faculty members, as opposed to producing at least one peer-reviewed publication—an expectation held by faculty members. If anything, faculty members may be pushing their students more because they want them to be successful and competitive for future job opportunities; in addition, faculty members are evaluated on publications for career advancement themselves and thus have a vested interest in helping their students reach a goal of producing a peer-reviewed manuscript. Having

experienced the competition firsthand, they may be more inclined to set the bar higher than their students' goals.

According to our survey, a majority of student respondents were considering attendance at graduate school. Though the percentage of student respondents considering graduate school is likely an overestimate of the actual value due to the low response rate to our survey, we believe that the percentage of undergraduate students seeking advanced degrees could increase as the fisheries and wildlife job markets become saturated (U.S. Department of Labor 2012). Therefore, this trend warrants communication to help prospective graduate students better prepare

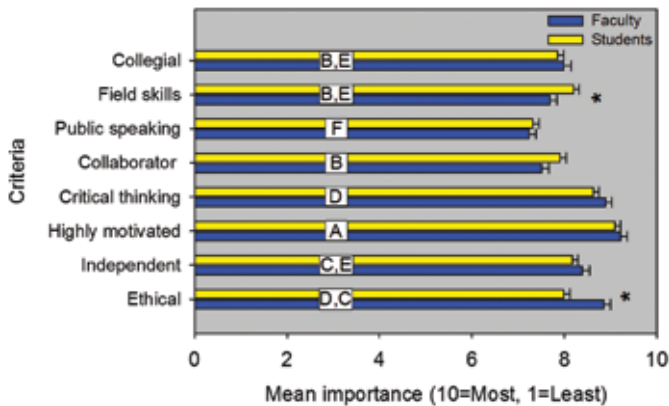


Figure 1. Criteria considered (rated on a scale of 10 = most important, 1 = least important) prior to acceptance into a graduate program (M.S. level) from a faculty member's perspective according to (1) faculty members (blue bar) and (2) undergraduate students (yellow bar). Pertains to question 1 in Table 2. Letters depict significant differences across criteria and asterisks indicate significant differences between faculty and students within a criterion.

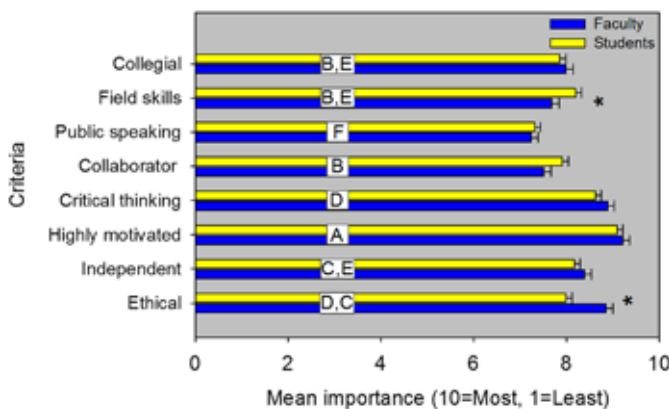


Figure 2. Attributes rated on desirability (10 = most important, 1 = least important) of a prospective graduate student prior to acceptance into a graduate program (M.S. level) from a faculty member's perspective according to (1) faculty members (blue bar) and (2) undergraduate students (yellow bar). Pertains to question 2 in Table 2. Letters depict significant differences across criteria and asterisks indicate significant differences between faculty and students within a criterion.

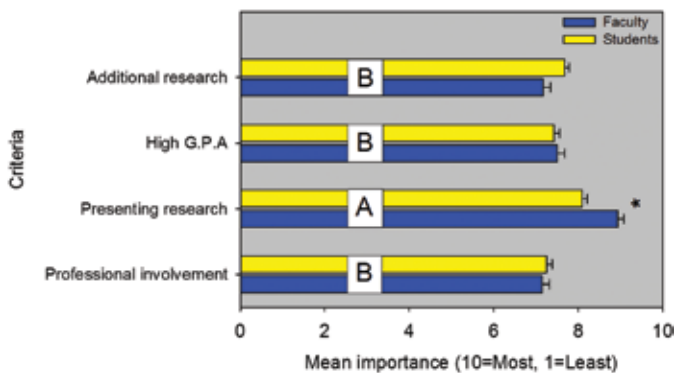


Figure 3. Accomplishments rated on desirability (10 = most important, 1 = least important) of a graduate student once accepted into a graduate program (M.S. level) from a faculty member's perspective according to (1) faculty members (blue bar) and (2) undergraduate students (yellow bar). Numbers in parentheses reflect overall ranking of importance based on mean response values for both groups and the dotted line represents where differences occurred between the two groups. Pertains to question 6 in Table 3. Letters depict significant differences across criteria and asterisks indicate significant differences between faculty and students within a criterion.

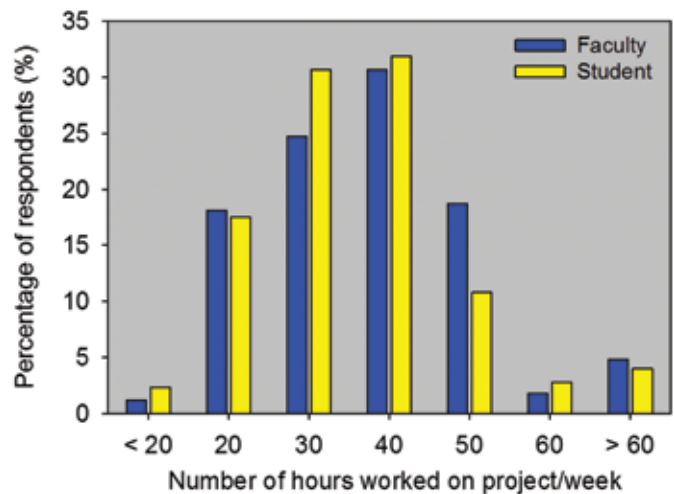


Figure 4. Number of hours a graduate student is expected to work on his or her project per week once accepted into a graduate program (M.S. level) from a faculty member's perspective according to (1) faculty members (blue bar) and (2) undergraduate students (yellow bar). Pertains to question 7 in Table 3.

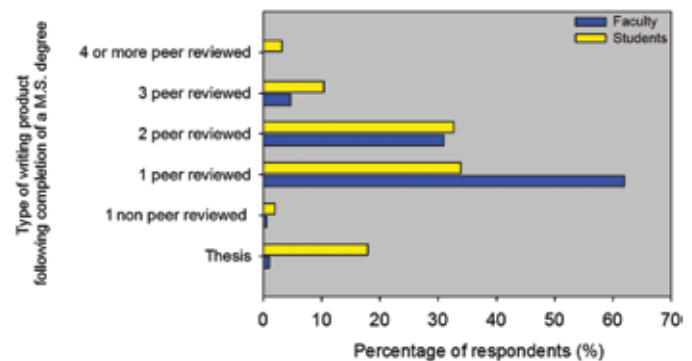


Figure 5. Expectations in terms of publications for a graduate student once accepted into a graduate program (M.S. level) from a faculty member's perspective according to (1) faculty members (blue bar) and (2) undergraduate students (yellow bar). Pertains to question 8 in Table 3.

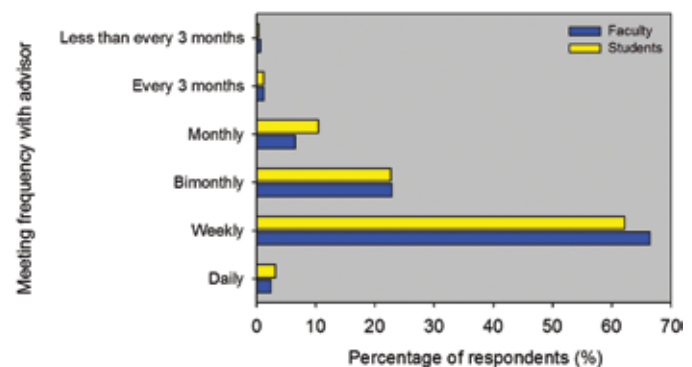


Figure 6. Meeting frequency between a graduate student and his or her advisor once accepted into a graduate program (M.S. level) from a faculty member's perspective according to (1) faculty members (blue bar) and (2) undergraduate students (yellow bar) pertains to question 9 in Table 3.

themselves for graduate school and to understand what to expect once they accept a M.S. graduate position. It also warrants communication among universities, employers, and professional societies to ensure that students are being sufficiently prepared to enter today's job market (a current objective and goal outlined by American Fisheries Society past president John Boreman during his tenure as president).

The feedback we received from faculty members who completed our survey suggested that we did not cover all topics, nor did we provide all available answers when discussing graduate school. In particular, we were unable to fully explore the demographics of our student respondent population because we relied on administrative staff to distribute the survey and attempted to avoid specific demographic questions because of further human subject research approval and constraints, thus potentially impeding progress of the study. The uncertainty of these demographics could alter the interpretation of our results.

Our results suggest that most students who participated in our survey were further along in their undergraduate program due to their close alignment with faculty responses. Some universities may not have specific courses developed for undergraduate students (especially within their first 2 years) that address topics included in our survey. Many of these topics (ethical behavior, critical thinking, motivation, and collaborative and teamwork skills) may be covered through personal mentoring by faculty outside of the classroom when the student is near the completion of his or her degree. This mentoring exercise may be too late to alleviate any potential problems (e.g., low GPA, very little field or lab experience) that have transpired during the first 2 or 3 years of a student's undergraduate career. However, it is possible that our student population represents all individuals pursuing an undergraduate degree.

Other topics not addressed in our survey relate to programs not included in NAUFWP (mostly land grant institutions), which may not focus specifically on wildlife or fisheries topics but that remain important for undergraduate development and preparation for graduate school in natural resource sciences. For example, one of our authors completed his M.S. degree at a university not included in NAUFWP and was financially supported on a teaching assistantship while also conducting research. Many programs within NAUFWP financially support graduate students through research assistantships and not teaching assistantships. Our study was designed and directed toward programs with primarily research assistantships, but some confusion would certainly transpire pertaining to question 7 (regarding the number of hours each week that are expected for a M.S. student to work on their project) given this difference among programs.

Based on responses to our survey, undergraduate students appear to be on the right track in their approach to obtaining a graduate position and in their understanding the expectations once they get there. Our survey results also suggest that faculty members are either doing a smart job of communicating these topics or undergraduates are taking the initiative to find out more about graduate school or both.

This survey and study would be an excellent resource for a first-year experience course to help students prepare for an advanced degree early in their professional development to avoid potential pitfalls that cannot be addressed later. As outlined by American Fisheries Society Past-President Dr. John Boreman, we agree that similar surveys could be conducted to identify gaps among universities, employers, and professional societies. In a time when competition is fierce and resources are limited, any additional information on how to better succeed is vitally important.

ACKNOWLEDGMENTS

We thank the South Dakota State University ecology discussion group and faculty members within the Department of Natural Resource Management at South Dakota State University for aiding in developing questions for this survey. Most important, we thank those students and faculty members who participated in this survey by providing their input on this topic. We also thank the administrative staff and personnel who forwarded our survey to their undergraduate listservs; without their help we would not have been able to conduct this survey. Thanks to D. Willis, J. Lott, and two anonymous reviewers for reviewing earlier drafts of this article. Any use of trade names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

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