Aquaculture Education: Are Our Programs Relevant?

By Robert D. Brown

A wake-up call has been sent to higher education. In the 1993–94 fiscal year, 11 states reduced their budgets for higher education from the previous year, and 10 states cut university budgets in the middle of the academic year (Chronicle of Higher Education 1994 XLI(1):2). Increasingly, universities are scrutinized by their state legislatures to ensure the relevancy of instruction. Universities are caught between ever-increasing enrollments, declining budgets, and an atmosphere often deemed hostile to higher education (Zemsky 1994). Land grant universities and colleges of agriculture seem to be under particularly close scrutiny and have often been accused of becoming irrelevant (Kunkel 1993; Meyer 1993). "The question is no longer, Do we need to change? but rather, In what direction and how fast? The argument about whether change is necessary is over" (R. Zemsky, Chronicle of Higher Education 1994 XIL(1):5).

Unfortunately, fisheries academic programs sometimes fall prey to critics, particularly academic accountants and eventually legislators, because such enrollments are often smaller than those in more popular majors, e.g., education, business, and engineering. Aquaculture programs are especially vulnerable because enrollments tend to be low, and aquaculture education is expensive. Nearly all aquaculture courses require labs, and a pond or tank facility is necessary for a viable educational experience in fish culture.

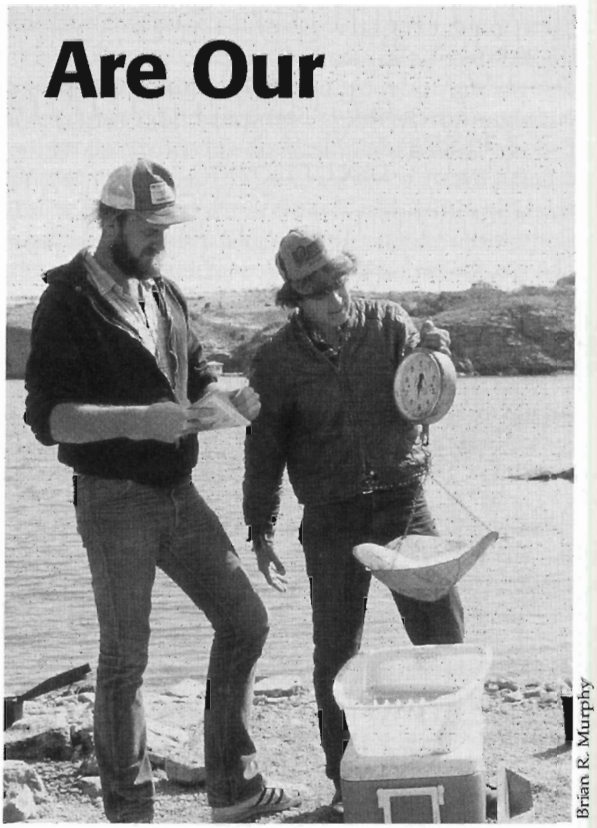
Relevance and cost become an issue for critics. The question parents of potential aquaculture students often ask is, Will our kids find jobs? Meanwhile, the aquaculture industry asks, "Are you adequately educating our future employees?" And university accountants ask, "Do we need aquaculture education at all?"

Today, we academics and those in the aquaculture profession must grapple with these issues. Are we anticipating the knowledge and abilities students must have to function in the next century? Are we anticipating the types of jobs that will be available and designing curricula to prepare students for those positions?

Robert D. Brown is professor and head of the Department of Wildlife and Fisheries Sciences at Texas A&M University.

Enrollment in Aquaculture Academic Programs

Enrollments in agriculture programs nationwide have been declining for years, although that trend may be stabilizing for some majors



Brian R. Murphy

It is imperative that an "introduction to aquaculture" course be offered to those agricultural economics, agricultural engineering, food science, business, and veterinary medicine majors who may enter aquaculture support fields.

(Coulter et al. 1990). In my experience, students entering typical production agriculture still tend to be those raised on farms. Although aquaculture continues to grow as an industry, it still represents a small segment of agriculture overall. The number of families involved in fish culture is still small, thereby producing relatively few offspring who need a university education in aquaculture before returning to manage the family fish farm.

Unfortunately, estimating the number of students enrolled in aquaculture programs is difficult. In 1994, I surveyed the 48 U.S. academic institutions listed as having fisheries or aquaculture degree programs (AFS 1990). The survey objectives were to determine the number and types of aquaculture degrees, options, and coursework available, and student enrollment. Initial surveys were mailed in January; follow-up surveys were sent to nonrespondents in March; and respondents could edit tabulated results in May. All 48 institutions responded, and 47 claimed to have an undergraduate fisheries degree or option. Only 12 colleges indicated they offered an aquaculture degree or option, and eight of those indicated they enrolled only 115 undergraduates in spring 1994. These figures are confounded because many universities do not differentiate

between fisheries and aquaculture or even wildlife and fisheries students. Others offer only a fisheries degree but believe they offer sufficient flexibility in electives that students can choose a career path in aquaculture. Of those universities that did not offer an aquaculture degree or option, 19 offered coursework in aquaculture. Three indicated such coursework was available in other departments, such as agricultural engineering, agricultural economics, or veterinary medicine.

The picture of graduate enrollment was no more clear. Thirty-nine respondents stated they offered master of science, master of agriculture (non-thesis), or doctoral programs in fisheries. Nineteen institutions indicated they offered graduate aquaculture degrees or options. Of those, 16 institutions indicated they enrolled 67 master's and 28 doctoral students in spring 1994. Many institutions could not differentiate between graduate fisheries and aquaculture or fisheries and wildlife students. Three universities without graduate aquaculture degrees/options offered graduate courses in aquaculture, and seven indicated graduate courses in aquaculture was available in other departments.

Thirty-seven institutions reported graduating 321 fisheries students with bachelors degrees, 149 with masters, and 37 with doctorates in 1993. Fourteen universities offering undergraduate or graduate aquaculture degrees indicated that they granted 30 bachelor's, 22 master's, and 15 doctorates in aquaculture in 1993.

The Job Market in Aquaculture

Clearly, we are producing many students with fisheries degrees—few of whom specialize in aquaculture—but what about the job market? Adelman (1987) reported a survey of 56 institutions offering degrees in fisheries. Overall, 1985 fisheries graduates were successful in finding employment in natural resources (including aquaculture) at a rate of 43% for those with bachelor's degrees, 60% for those with master's degrees, and 75% for doctorates. However, many of these jobs were either temporary or outside the fields of fisheries or aquaculture. Rates of permanent employment (jobs lasting more than one year) in aquaculture for 1985 fisheries graduates were 5.7% for those with bachelor's degrees, 5.6% for those with master's degrees, and 4.1% for those with doctorates. Adelman (1987) also polled state agencies about their intended new hires during the next two years, but he did not poll the aquaculture industry. Responses from the agencies placed "culture" just below "management" as the area of expertise most needed for new agency hires.

College Degrees V Expertise

In addition to determining employment rates of college graduates, it is important to define the types and levels of expertise needed in the aquaculture industry and to adapt educational programs accordingly. Brown and Brunson (1993) reported the results of their survey of employment opportunities in the catfish culture industry. Of the 51 fish farmers responding, only 16 employed anyone with a college degree (28 bachelor's, eight master's, two doctorates). Almost the same number of employees had some college education but no degree. Large numbers of laborers employed by the fish farmers had no degrees. Whereas all employees with graduate degrees held degrees in fisheries or aquaculture, less than half of those with bachelor's degrees did. The rest had degrees ranging from journalism to math to landscape architecture.

Only 6.1% of the responding fish farmers indicated they intended to hire anyone with a college degree in the subsequent five years. On the other hand, of the 19 non-fish farmer respondents (equipment sales, consulting, marketing, processing, feed production), 18 employed people with college degrees (29 bachelor's, 11 master's, 5 doctorates). When asked if they intended to hire people with college degrees in the next five years, 70.6% of these employers said yes. The areas of expertise needed included aquaculture, veterinary medicine, agricultural economics, business, marketing, and agricultural engineering. Only a few universities with catfish research programs responded to the survey, but as expected they indicated a high percent of college graduates as current employees and an intention of hiring people with college degrees.

Due to the less-than-perfect techniques used in all of the surveys, it is nearly impossible to accurately estimate the number of students now pursuing degrees that will lead to aquaculture careers or the number of jobs that might be available in the United States in the next few years. A national survey of job trends in agriculture (Coulter et al. 1990) predicted an 11% shortage of college graduates for openings in food, agriculture, and natural resources through the mid-1990s. The greatest predicted shortfalls were in marketing, merchandising, and technical sales (18% shortfall), followed by scientists, engineers, and related specialists (15% shortfall). A 9.5% surplus of graduates was anticipated in agricultural communications, education, and production.

The Aquaculture Curriculum

Academics tend to want to produce students who look, act, and think a lot like themselves. Curricula so designed work fairly well for students who want to pursue graduate degrees to enter university life or veterinary medicine. If the curriculum includes courses that allow students

Aquaculture is clearly as much a business as a science.

I have never seen a new aquaculture graduate unemployed.

to meet AFS certification requirements, the program also works well for students who intend to become fisheries biologists to study or manage fishery resources for state and federal agencies. Such fisheries science/aquaculture programs do not work well for those who would enter the world of aquaculture. The bias toward science and natural resources in such programs is created by faculty who design the curricula but have no personal aquaculture business background. Aquaculture is clearly as much a business as a science.

I've often heard aquaculture business owners complain that they hired an aquaculture student who knew all about fish culture but little about financing, marketing, or business. Thus, aquaculture curricula must be designed with educational goals different than those of fisheries programs. That all fisheries students learn some fish culture seems appropriate. Those entering state and federal biology or management fields must understand the function, difficulties, and complexities of hatchery production. Those students who want to enter the aquaculture profession must have a different education, perhaps patterned after those academic programs found in more traditional animal agriculture, such as animal, poultry, or dairy science.

Most fisheries students will study fish biology, fish management, physiology, ichthyology, and limnology. Those entering either the hatchery or aquaculture fields need more course work in nutrition, genetics, animal health, water quality, soils, and pond construction. If fishery courses, such as aquatic nutrition or fisheries genetics, are not available, similar courses are at least taught in a more generic format in animal agriculture colleges. Students entering the aquaculture profession need courses in agricultural economics, food processing, business, marketing, accounting, and taxation.

Curriculum revision can be accomplished by embracing the concept that aquaculture is production agriculture without turning the degree into vocational agriculture. Recipients of bachelor's degrees in aquaculture will become fish farm managers or employees of the fish culture support industry. Vocational coursework—farm mechanics, welding, small engine repair, and building construction—while useful, may not be necessary. Many community or technical colleges now offer such training for entry-level aquaculture technicians. Undergraduate students are encouraged to get experience in such areas through noncredit courses or summer internships.

However, academics must realize that they tend to focus on their own majors when the growth area in aquaculture education seems to be in providing service courses for other majors. Thus, it is imperative that an "introduction to aquaculture" course be offered to those agricultural economics, agricultural engineering, food science, business, marketing, accounting, and veterinary medicine majors who may enter aquaculture support fields. An aquaculture minor, perhaps of four to five courses, would be useful in preparing these students. A non-thesis master's program in aquaculture would allow students with bachelor degrees in such collateral areas to better prepare themselves for the aquaculture business.

Despite difficulty in comparing the number of jobs in aquaculture to current enrollment, most instructors involved in aquaculture education sense that adequate numbers of positions have been available to fisheries graduates. In fact, I have never seen a new aquaculture graduate unemployed.

Those students who would enter the aquaculture field enter an agricultural production business and must be educated accordingly. Aquaculture courses or minors for collateral majors will produce economists, engineers, and veterinarians who are better prepared to serve the fish culture industry. Thus, we can answer the pundits of aquaculture programs that such curricula are indeed relevant to the needs of society.

References

Adelman, I. R. 1987. Placement of 1985 fisheries graduates. Fisheries (Bethesda) 12(4):25–28

(AFS) American Fisheries Society. 1990. Fisheries programs and related courses at North American colleges and universities. American Fisheries Society, Bethesda, MD.

Brown, R., and **M. Brunson.** 1993. Surveying educational needs in the catfish industry. The Catfish Journal 7(12):10–11, 23.

Coulter, K. J., A. D. Goecker, and **M. Stanton.** 1990. Employment opportunities for college graduates in the food and agricultural sciences. Higher Education Programs, USDA-CSRS, Washington, DC.

Kunkel, H. O. 1993. Are land grant colleges prepared to meet the educational challenges of the 21st century? New Pathways in Agricultural Education Symposium. American Society of Agronomy, Cincinnati, OH.

Meyer, J. H. 1993. The stalemate in food and agricultural research, teaching and extension. Science 260:881–882.

Zemsky, R. 1994. To dance with change. Policy perspectives. Pew Higher Education Roundtable 5(3a):1–12.