SECTION 4
Review of Current Training Programs

Introduction and Challenges
Training a variety of generalists and specialists with different degrees of breadth and depth in knowledge and skill will require a variety of approaches. While much of fisheries management training has occurred at academic institutions, a postsecondary, undergraduate, or graduate academic program is not always the answer for training all types of managers. For example, on-the-job and in-service training may be the best approach for industry. Specialized extension courses or workshops might be best for stakeholders or professionals. Graduate-level academic training or advanced continuing education may be the best solution for training managers with responsibilities for decision making, policy, planning, and research administration.

In the past, workshops on fisheries training have focused on undergraduate education and preparation for entry-level management positions or on continuing professional training, primarily for mariners. In 2000, the U.S. Ocean Studies Board of the National Research Council held a workshop titled “Education and Training Needs for Fisheries Science and Management: Stock Assessment Science, Fisheries Economics, and Fisheries Social Science.” The workshop focused on graduate-level training of science and management specialists to meet the needs the National Marine Fisheries Service, but did not consider the education of broadly trained managers capable of leading teams.

The physical and biological dynamics of marine systems and their institutional challenges create a need for management skills in integrative and critical thinking. The challenge is to determine the best way to produce these skills through a variety of educational media. This section provides a summary of academic graduate programs and some information on continuing education programs that are targeted at training fishery managers toward the level of training highlighted by the workshop.

Assessing Training Capacity—Review of Current Programs
Workshop participants were provided with a review of current graduate-level training programs by Jodice and Sylvia (see Appendix F for full report) and presentations on models of flexible learning appropriate for continuing education (see Appendix G and http://oregonstate.edu/dept/trainfishmngr/presentations.html for workshop presentations by Cloughesy and Johnsen on this topic). Given the need for advanced training in fisheries management, the review of existing programs focused on graduate-level academic programs but also provided some information on relevant training capacity in continuing education and advanced professional training. Existing training programs were identified through a web search of academic or university-based, postgraduate programs (postgraduate diploma or certificate, Masters, or Ph.D.) and continuing education programs with information available in English. Any programs with relevance to marine fisheries management (marine resource management, environmental management, environmental studies, conservation biology, environmental policy, resource economics, agribusiness, human ecology/human dimensions, and forestry; environmentally or socially
oriented public administration, law, business, or management science programs; dual or joint degree programs; and leadership programs) were also examined and included as links on the current training website (http://oregonstate.edu/dept/trainfishmgtr/training/TFM21.html) created for this review.

The review, conducted between August and October 2001, found 72 graduate/postgraduate academic programs offering 165 degree options at a total of 46 institutions, located in the United States, Canada, Europe, Asia, and Australia, with at least some specific stated focus on fisheries management. Fifty-four percent of the programs were located in the United States (Figure 1 in Appendix F, Appendix F.1).

These 72 programs were reviewed more thoroughly by searching academic program web literature for keywords in vision, mission, goals, degree requirements, and courses. The keyword list was created from skills, knowledge, and training goals emphasized in previous fisheries and natural resource management training workshops. This effort produced qualitative information on program organization, curricular features, and quality.

**Organization**

Academic, graduate, or postgraduate programs in fisheries management range from science-based or other specialist programs (e.g., fisheries, aquatic, or marine science, fisheries economics, law or policy) to more management-based, multi-disciplinary, generalist programs (e.g., marine or natural resource management or policy, dual or joint degree between science or environmental management) containing a fisheries management concentration or emphasis (Appendix F.1). The 72 programs reviewed have the following organizational attributes:

- Programs in fisheries management appear to have evolved primarily from fisheries sciences programs. Fifty-eight percent of the academic degree programs reviewed offer “fisheries” as a major, usually as fisheries science. Some institutions offer fisheries as a major but also as an emphasis or option within another degree program.

- Curricula titled “fisheries management” occur most frequently as 1) single course offerings or a series of courses (43 percent); 2) as a degree specialization, option, or emphasis (38 percent); and 3) less typically as an actual major (19 percent). A fisheries management emphasis is also possible as a thesis or research project focus within programs that are primarily fisheries science or some other natural science or resource management discipline.

- Curricula on fisheries management are available at various degree levels (Figure 4. 2). Of the 72 programs, 58 percent offer a Masters degree with a required thesis, 37 percent offer Ph.D. training, and 24 percent offer non-thesis masters-level degrees. Less than 20 percent offer a postgraduate certificate or diploma and only 6 percent provide continuing education programs.
Several programs offer more than one degree option (Appendix F.1). A few United States programs offer both thesis and non-thesis options, certificate programs which must be combined with a graduate degree, or dual major programs. European programs typically offer a Postgraduate Certificate (Pg.C.), Postgraduate Diploma (Pg.D.), and Masters thesis or non-thesis options (e.g., M.Sc. or Mphil.), depending on the number of courses the student completes and whether the student also completes a research project or dissertation, as well as a Ph.D. option. Australian Maritime College’s “MBA in Marine Resource Management” adds even more flexibility by offering accelerated (6-day live in) or distance courses suitable for practicing managers. This type of degree flexibility provides a model for evolving a more traditional, academic program toward inclusion of academic-based continuing education opportunities for industry or agency managers, as well as other stakeholders.

Curriculum Strategy and Content
Fisheries management curricula vary in their mission and goals, course requirements, and skill and disciplinary emphases.

- **Goals:** The typical focus is on training entry-level professionals in areas of fisheries science and/or resource management and providing a scientific foundation for further graduate work leading to the Ph.D. degree; some focus is on developing scientists and professional resource managers capable of leadership and multidisciplinary problem analysis.

- **Mission statements:** The most common key word occurring in mission statements of the 72 programs was “sustainable” (45.8 percent). Fewer than 15 percent of programs include words such as “innovation,” “leadership,” “synthesis,” “stakeholders,” “collaborate,” “critical thinking,” and “resolution.” At least a third of the programs use words such as “interdisciplinary,” “integrated,” or “multidisciplinary” in describing their curriculum or approach to resource management problems.

- **Disciplinary foundation:** Fisheries management programs are located in a variety of disciplinary or academic homes, which in turn influences curricula (e.g., core course emphasis). Twenty-nine percent of the programs are located in departments focused on fisheries science, 20 percent are located in departments focused on fisheries management, and the remainder are spread among departments focused on natural resources, aquaculture, marine or ocean science, marine affairs or policy, environmental policy, economics, and wildlife science.

- **Science and management curricula:** The most common science-related key words found in materials describing curricula were “fisheries biology” (76 percent), “fisheries ecology” (68 percent), and “economics” (70 percent), with “aquatic science,” “aquaculture,” and “population dynamics” also being fairly common. Management related key words primarily include “fisheries management” (80 percent), “policy” (62 percent), “sociology” (52 percent), “law” (47 percent), and “business” (35 percent).
Despite what would appear to be a heavy interest in fisheries management and economics, only 31 percent of the institutions offer a course titled “fisheries economics,” and 55 percent offer marine or more commonly natural resource and environmental economics. In most cases, there is only one course in fisheries or resource economics. Ninety percent of the institutions offer a course titled “fisheries management,” but emphasis for this type of course varies from the more common focus on habitat management to the less common social and political focus.

- **Skills**: Program literature was searched for key words similar to those listed by New Zealand workshop participants (Tables 3.1 and 3.2). Administrative skills, such as teamwork, employee supervision, and budget preparation occur the least in academic program web literature. Research, scientific analysis, and technical writing skills receive the greatest emphasis (see Figure 7 in Appendix F).

**Quality indicators**

Among fisheries management academic programs, indicators of program quality include:

**Program capacity**:
- Course quantity, diversity, and quality
- Opportunities for fisheries-related research and faculty performing fisheries-related research

The quality, quantity and diversity of course offerings and research opportunities is influenced by whether the program depends on several other departments or on faculty and courses within a single department, and the strength of these departments or the institution as a whole. Most of the multidisciplinary training programs draw faculty and/or courses from several other departments. These relationships are likely more robust when departments cooperate on course scheduling, include fisheries or at least aquatic resource issues in their teaching and research programs, and cooperate on faculty hiring. The University of Maine’s School of Marine Studies and the University of Washington’s School of Marine Affairs are both able to offer a suite of fisheries-specific courses in management, economics, policy, and social science due to strengths within their own programs.

**Innovative curriculum**:
- Capstone or integrative synthetic courses or opportunities, including reality-based or real hands-on work provide a mechanism for students to integrate knowledge and skills.

The most typical graduate-level capstone in fisheries is the research thesis or project, while emphasis on case studies, leadership training, and team projects is fairly low. Other management and public administration programs serve as resources for capstone opportunities appropriate for fisheries management training. For example, many business management (e.g., M.B.A.) and public administration programs
advertise integrative teaching methods, such as group study, team projects for real clients, case study, and simulation, which also develop practical management skills such as teamwork and leadership. Many of these programs made recent changes in their curriculum to allow for integration of research teaching, research, and industry and specialized global immersion experiences. Appendix F.2 provides a table listing the primary teaching methods and capstone experiences employed by the top 10 MBA programs in the United States and top 7 non-U.S. institutions (as listed by Business Week 2001). Some similar capstone opportunities occur in fisheries management graduate programs. For example, in the United States, Oregon State University’s Marine Resource Management and the University of Washington’s Marine Affairs programs use special course projects to develop products to meet needs of state or federal agencies. In addition, the University of Rhode Island’s Department of Environmental and Natural Resource Economics has created a policy simulation laboratory using computer visualization technology to examine the consequences of policy actions.

Facilities and location:
- Appropriate facilities, including availability, size, and proximity of a marine lab and access to a research vessel
- Proximity and access to the commercial fishing industry or other types of fisheries-dependent communities

Of 46 institutions represented by the 72 training programs reviewed, at least 61 percent appear to be close to a commercial fishing fleet, 63 percent have some type of marine or aquatic lab associated with their program, and 54 percent have access to an oceanographic or smaller coastal research vessel; 39 percent have all three of these characteristics.

Integrative partnerships:
- Inter- and intra-sectoral partnerships and/or cooperative agreements at the local, national, or international level, with industry groups or associations, marine or aquatic resource management government agencies, other academic institutions, other degree programs, or educational delivery programs (such as extension, outreach), research institutes, and other NGOs.

There are a few examples of notable integrative partnerships. Wageningen University and Research Center in the Netherlands claims to have formed a “unique alliance between a university and market-oriented research institutes” that “combines fundamental and applied research with innovative education.” In the United States, NOAA Fisheries has developed partnerships with academia to offer Ph.D. fellowships in Population Dynamics and Marine Resource Economics. These fellowships fund students to work on thesis problems of public interest and relevance and to perform internships under the guidance of a NOAA Fisheries mentor.
Other Academic Programs
Various academic programs that are not fisheries specific provide resource management and policy-related training relevant to fisheries management. Graduates of these programs will likely need additional training in fisheries before or after employment as a fishery manager. Many relevant programs are listed in the current training index prepared for this report (http://oregonstate.edu/dept/trainfishmngr/training/TFM21.html).

Continuing Education
Workshop participants learned about the Oregon State University (OSU) Forestry Extension Master Woodland Manager Program that provides progressive training through basic forestry short courses, resource management planning, advanced woodland management, and eventual certification as Advanced Master Woodland Manager. OSU also develops specialized training workshops based on the needs of private landowners, professional managers, and stakeholders. Instructional design recognizes that learning is hierarchical, and thus, programs are designed to meet the instructional needs of the learners by first assessing existing knowledge, attitudes, skills and abilities (KASAs) of the learners. The curriculum is then adjusted through feedback from formative evaluation (see Appendix G). Workshop participants also heard about the New Zealand Seafood Industry Training Organization (SITO) training program that works with individual companies to analyze and meet their needs by creating relevant training tailored to the learners’ knowledge, skills, and attitudes (http://oregonstate.edu/dept/trainfishmngr/presentations/Johnsen.ppt).

The review of current programs revealed four categories of continuing education programs suitable for training mid- or upper-level managers:

Academic:
- Extension and outreach education programs offering specialized, needs-based workshops, some conducted through fisheries or marine institutes;
- Postgraduate certificate, diploma, or professional Masters programs with flexible learning options.

Government:
- National agency-based training centers—e.g., U. S. Fish and Wildlife Service, National Conservation Training Center;
- Agency in-house training.

Industry:
- Training developed by and coordinated by industry based associations or trade groups for industry members—e.g., New Zealand SITO.

Non-profit/Foundations:
- Open-enrollment or custom-designed leadership and other administrative and management training workshops—e.g., Center for Creative Leadership in North Carolina.
Solutions
Workshop participants suggested that training needs could be met by a variety of academic and continuing education programs, including flexible learning opportunities and on-the-job training. Based on workshop comments, review of past workshops, and the review of existing programs, the following are recommendations for interrelated strategies to improve training capacity in fishery management:

1. **Perform sector-based needs assessments.** Collect input from employees, employers and stakeholders on training needs and the suitability of training methods for different sectors and levels of management. The outcome of these needs assessments could be used to develop certification standards.

2. **Survey and evaluate existing training programs.** Conduct a more in-depth survey of programs, expanded to include all possible training programs (including those without website literature in English); academic, continuing education, and in-house. Survey training program representatives (directors, faculty, and continuing education trainers) to gain accurate information. Graduates and employers of graduates should also be surveyed to assess effectiveness of training. Analysis should include programs in other natural resource management, business, management, and public administration that might serve useful for fisheries management and should also identify any redundancy in training within management sectors to indicate areas of potential partnership.

3. **Gap analysis.** Identify the gaps between existing training and the skills and knowledge required for each class of manager. This will require comparison of information from an expanded review of training programs with sector-based needs assessments and graduate and employer survey input. The gap analysis would strongly complement the needs assessment and program review.

4. **Develop and online training database.** Create an online, easily updated database of training programs and courses identified as suitable and categorize these by sector and/or management levels.

5. **Improve curriculum.** Based on needs assessment and gap analysis, academic programs should consider offering additional degree options and flexible learning options suitable to working professionals, particularly if certification standards are developed that require professionals to receive periodic training. Academic programs should also explore developing more options for integrative learning, research, and reality-based or experiential training at the M.S. and Ph.D. levels.

6. **Improve marketing and recruiting.** The web is becoming the primary search tool for students and professionals seeking information on training and education opportunities, as well as a relatively inexpensive method for marketing and recruiting. However, the quality of web literature is highly variable. Training programs interested in recruiting more and higher quality students should place priority on keeping web-based marketing current and professional. Web literature should detail how students gain specific skills and knowledge.
with a clear link to the goals, objectives and philosophy guiding the curriculum, and if relevant, reflect the most prevalent concepts in resource and fisheries management.

7. **Use existing potential to build new capacity.** Training institutions should continue to evaluate whether they can develop a new or stronger fisheries management training program by 1) more fully utilizing or enhancing existing capacity within their institution; 2) developing new cooperative partnerships with other training institutions or local, national, and international agencies, NGOs and other groups in need of training; 3) providing flexible degree pathways and learning options; and 4) developing new continuing education opportunities for upper level managers and specialists.

8. **Encourage innovation.** Through funding mechanisms, encourage development of innovative curriculum and capstone integrative opportunities and cooperative multidisciplinary or multi-institutional models for training partnerships between industry, government, and academia—including fellowships for professionals seeking advanced training or sabbaticals and cross-sectoral training, internship, and exchange opportunities.