

# The Training Managers for 21<sup>st</sup> Century Fisheries Initiative: Summary and Recommendations from the Inaugural International Workshop

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**Abstract.** Organizers convened an international workshop to address training necessary to produce effective managers for 21<sup>st</sup> century fisheries. The workshop involved government, industry, academic, and non-governmental organization (NGO) leaders from Oceania, North America, and Europe. They addressed vision and management challenges of 21<sup>st</sup> century fisheries; requisite skills and knowledge; current training capacity and curricula; and incentives, responsibilities, and rewards to enhance recruitment and retention. Participants formed the following consensus strategies and recommendations significant to development of training capacity at international, national and regional levels - 1) develop creative partnerships within and among institutions, sectors, and nations; 2) include the management process as a learning experience; 3) broaden and lengthen career paths; 4) identify the gaps between those supplying and demanding management training; 5) create a website which shares information about training programs and resources; 6) encourage industry scholarships; 7) develop a case study library similar to those created by the top business management programs; and 8) establish a network of training providers. Participants also agreed that they should continue working together to improve the education of fishery managers. The workshop concluded with establishing an international steering committee charged with facilitating implementation of major recommendations and strategies critical to this initiative. The full workshop report is available online at: <http://oregonstate.edu/dept/trainfishmngnr/>.

**Keywords:** Training, education, fisheries management, leadership, innovation.

## 1. INTRODUCTION

The world's nations and regions, both developed and developing, confront significant and complex challenges in managing fisheries resources in the 21<sup>st</sup> century. Is the current supply and range of training opportunities sufficient and capable of meeting the demand for effective 21<sup>st</sup> century fishery management? To address this and other questions, the international workshop, *Training Managers for 21<sup>st</sup> Century Fisheries*, was convened in Queenstown, NZ, on December 5-7, 2001. This workshop brought together sixty-three recognized government, industry, academic, and non-governmental organization (NGO) leaders from Oceania, North America, and Europe to discuss fishery management challenges and to define the training, education, and professional working environments necessary to produce 21<sup>st</sup> century fishery managers. Representatives of environmental organizations were also invited but none was able to attend. The paper summarizes the rationale, outcomes and recommendations resulting from speaker presentations and workgroup discussion.

### 1.1. Workshop Rationale

The 21<sup>st</sup> century reveals a fishery management process experiencing unprecedented socioeconomic, environmental, and institutional challenges. Over the last fifty years, fisheries governance has rapidly evolved from primarily open access to regulated common property and rights-based institutions. Under the rubric of "sustainability", 21<sup>st</sup> century fishery managers are charged with balancing society's conflicting needs with the unknown desires of future generations while employing vaguely defined concepts of precautionary and ecosystem based management principles. Managers are also expected to accommodate an ever-widening range of community and industry "stakeholder" interests in the management and scientific process. The rapidly mounting legal and social pressures are grinding down fishery management systems and revealing fundamental flaws in governance and institutional design. These challenges require fishery managers who are expert problem solvers, leaders, and institutional innovators capable of working with a variety of stakeholders and advisors and addressing local, regional, national, and international management needs. As the definition of the "fishery manager" broadens in response to evolving institutions and increased participation in management, our

understanding of training needs must also expand. These pressures are revealing an equally disturbing and related problem – society has not adequately invested in the human capital capable of co-designing and implementing the institutional structures which will lead to rational management of 21<sup>st</sup> century fisheries.

The need to invest in human capital is paramount as many nations are experiencing problems with recruitment and retention of quality managers. In the United States, for example, 30 to 45% of NOAA Fisheries (National Marine Fisheries Service) employees who are upper level scientists, managers, and administrators are estimated to be eligible for retirement in 2005 (Holliday, 2001; Ocean Studies Board, 2000). During the economically vibrant 1990s, many nations lost existing or potential quality fishery scientists and managers to private corporations capable of providing better salary and benefits.

The low level of investment in human capital is illustrated by the observation that the majority of fishery managers worldwide have received no formal academic training in fisheries management. Recognizing this limitation, many government agencies have continued to promote biological scientists to key management positions, and industry typically recruits top managers from business programs. This method of creating managers is insufficient to meet 21<sup>st</sup> century challenges. For example, Rassam and Eisler, 2001 performed a survey of North American (U.S. and Canada) fisheries administrators who indicated that fishery and aquatic science professionals were in need of continuing education in fisheries management (64%), public administration (62%), management theory (52%), natural resource economic theory (40%), fisheries law (43%), technical writing (79%) and communications (41%). Furthermore, few continuing education or academic programs exist that are designed to provide professional development training in fishery management and decision-making processes for the working fishery manager. The need to examine training capacity is particularly apparent as managers in both developed and developing nations are now suffering from regulatory implementation overload and require relevant education to facilitate effective implementation of existing protocols, including those suitable to rationally developing and managing smaller scale fisheries.

Past workshops on fisheries education have discussed training for scientists and technicians; however, more recent discussion has focused some on greater inclusion of management skills and theory in academic curricula (Paulik, 1968; Lackey, 1979; Smoker, 1981; UNESCO, 1981; Amidei, 1987; Ocean Studies Board, 2000). Where academic training does exist in fisheries management it has evolved from a biological focus to include varying degrees of multidisciplinary training in marine resource management, including courses in biology, economics, law, and policy, usually with the goal of creating entry level professionals or broadly balanced research scientists (Kelso and Murphy, 1988, Oglesby and Krueger, 1989, Adelman, et.al. 1990). Although these programs offer a breadth of training which prepares graduates to facilitate a fishery management process, they rarely provide enough depth or focus to produce graduates equipped to be strategic and accountable managers who possess the requisite skills to successfully manage an organization and advance private and public welfare. Some fisheries educators have argued that organizational management and administrative skills are best developed through employment (e.g. Kelso and Murphy, 1988). In contrast, business management programs have been working hard in the last decade to redefine their management curricula to prepare professionals for similarly recognized challenges of the 21<sup>st</sup> century (Lamond, 1995; Heinfeldt and Wolf, 1998; Kedia and Harveston, 1998; Mckendal, 2000).

Redesigning curricula and training programs may only be part of the solution to building human capital. Attracting people with the intellect and abilities requires a work environment that provides appropriate freedoms, responsibilities, and rewards. Talented managers have many opportunities in the global marketplace. Unless provided an enabling and rewarding professional environment, they will seek opportunities elsewhere, leaving fisheries with perfunctory administrators and second-rate managers.

## **1.2. Workshop Organization**

The Queenstown workshop directly addressed the training, education, and working environment required for fisheries management in the 21<sup>st</sup> century. The workshop was divided into three sessions designed to promote interaction among speakers and other participants through thought provoking presentations and breakout group discussion. Participants included managers from the private and public sectors in fisheries and other natural resource industries, industry and government decision-makers, university educators and administrators, and non-governmental organizations. Speakers represented a cross section of fisheries, management organizations, industries, and educational organizations. Speakers and participants addressed a wide range of questions and issues organized under five topic headings: 1) vision and management challenges of 21<sup>st</sup> century fisheries; 2) requisite skills and knowledge; 3) current training and curricula; 4) incentives, responsibilities, and rewards to

enhance recruitment and retention; and 5) consensus strategies. Breakout groups, in some cases divided by sector, addressed leading questions organized around these topics. Prior to the workshop, invitees were asked to respond to survey with a series of focus questions related to these topics, and responses were provided as additional input to discussion.

## **2. CHALLENGES FOR 21<sup>st</sup> CENTURY FISHERIES AND BROAD VISION FOR TRAINING**

The workshop participants attempted to develop a vision of 21<sup>st</sup> century fisheries and described a challenging and complex management future requiring fishery managers to have a broad range of skills and abilities. Differences arose in defining fisheries management and the ideal fishery manager. These differences can be partially explained by participants' experience, nationality, and sector, but also stem from different perspectives on the underlying models of fishery management and the perceived complexities of the management process. No attempt was made to define a succinct consensus vision for fishery management. Instead, participants focused on elucidating how differing visions of future fishery management influence perceptions about the knowledge, skills, and personal qualities needed by future fishery managers.

### **2.1. Visions of Fishery Management**

The workshop discussion and written focus question comments demonstrated agreement that fishery managers face major difficulties in addressing the following categories of challenges or issues – sustainable fisheries; cooperative and stakeholder-based management and research; ecosystem management; management under risk and uncertainty; property rights and allocation; international management; public environmental objectives; management effectiveness; ocean governance; and litigation

Specific challenges and their perceived priority varied. Those with significant administrative responsibilities emphasized the gap between recent legal mandates for sustainable fishery management and existing management practices and argued fishery managers should use the next ten years to overcome “implementation-overload” and address legal responsibilities under current law. Many participants stressed the need to move to stronger rights-based approaches for fishery management. Industry representatives emphasized the importance of private sector stakeholder responsibility for fishery management and recognized the challenge of reconciling management by fishing rights holders with other stakeholder groups. Representatives of indigenous people highlighted the need to meet sustainability mandates, particularly the needs of future generations, and stressed the importance of integrating ethics with institutional design and scientific management responsibilities. They also cited the value of indigenous knowledge and the need to minimize loss of historical, cultural and resource knowledge as traditional users and managers retire or end their participation in fisheries.

### **2.2. Vision of the Ideal Fishery Manager**

Workshop participants understood that depending on the governance system, there may be many “managers” in the fisheries management process including stakeholders, stakeholder leaders, formal directors of private sector and NGO groups, mid-level government managers, elected policymakers, and policy analysts and institutional designers. Thus they agreed to accept a broader fishery manager definition, which includes many of the participants in the fisheries management process.

Participants agreed that fishery managers in the 21<sup>st</sup> century must be effective leaders possessing significant moral character and intellectual ability. They must lead a policy process and lead teams of competent professionals capable of addressing management challenges. They should be passionate about improving management of fishery resources and increasing public and private benefits. They must have the necessary technical management skills, but must not lose touch with the physical and human components of fishery management—the fish, water, fishers, and seafood processors.

Consistent with this characterization, participants identified three underlying principles guiding their discussion of training needs. These are listed in Table 1.

**Table 1:** Guidelines for defining training needs.

<p><i>Fisheries management is a process, not a tightly bounded organization.</i></p>	<p>In the past, fisheries management might have been narrowly defined as an occupational category. Now it is a decision-making process with an integrated view, focusing on how to manage a multitude of inputs and outputs. Like management in any complex system or organization, the fisheries management process requires team-based analysis and implementation. Thus, fisheries management involves individuals with strengths in different disciplines and skill sets that must be melded together to address complex problems.</p>
<p><i>All necessary skills and knowledge cannot exist in one manager.</i></p>	<p>All participants in fisheries management require common skills and knowledge, but at different depths. Participants need to be familiar with other areas of expertise; however, the level of familiarity will vary depending on their role in the process. Effective team-based analysis requires managers to take a comprehensive perspective, understand the management process, identify problems and challenges, and lead teams to address ecosystem-level problems at different scales. Managers leading teams must recognize the value of different areas of expertise and possess the necessary professional experience and skills to lead a team toward a solution. There will still be a need for specialists, but these specialists will need some knowledge of other disciplines.</p>
<p><i>The role of the fishery manager varies.</i></p>	<p>The degree of accountability and authority held by the manager will vary depending upon the manager's role in the process. Managers primarily responsible for implementing decisions and monitoring and evaluating outcomes generally have a lower level of authority and accountability than managers responsible for strategic planning, policy-making, innovation, and leadership. Stakeholders with decision authority have a higher level of accountability than others who are only advisory. The managers role and level of accountability is also defined by the institutional setting (e.g. rights-based), sector (e.g. government, industry, nongovernmental organization), management scale, type of fishery, and level of economic development.</p>

### 3. DEFINING CURRICULA

Given the broad and inclusive definition of the fishery manager, workshop participants focused on creating a comprehensive generic list of key skills, knowledge, and learning opportunities that educators should emphasize when designing curricula for 21<sup>st</sup> century fishery managers.

#### 3.1. Generic List of Skills and Knowledge

Respondents to the pre-workshop survey focused primarily on leadership qualities and skills related to leadership – communications, conflict resolution, decision-making, problem-solving, critical thinking, and systems analysis. Respondents also placed a strong emphasis on knowledge of ecosystem science and management as well as holistic, multidisciplinary systems thinking. These emphases were echoed by workshop discussion. Many of the skills and knowledge areas listed by participants are similar to those produced by previous fisheries education workshops (e.g. Amidei, 1987; Smoker, 1981) and other natural resource education discussions (Sample, et al. 1999; Crawford, 1995), and are comparable to the leadership and management skills emphasized by business management and public administration programs (Business Week, 2001; Jodice and Sylvia, 2001). Pre-workshop focus questions and workgroup discussion results were combined to produce a comprehensive list of specific knowledge and skills necessary for effective 21<sup>st</sup> century fisheries management (Table 2).

#### 3.2. Capstone Opportunities

Capstone opportunities are experiences that allow learners to integrate and apply knowledge and skills acquired through a training program. Workshop participants agreed that all levels of managers need integrative training

**Table 2:** Knowledge and skill areas identified for 21<sup>st</sup> century fishery managers

<p><u>SCIENCE</u></p> <ul style="list-style-type: none"> <li>• Science basics</li> <li>• Fisheries science</li> <li>• Ecosystem science</li> <li>• Integrated marine ecology</li> <li>• Environmental science</li> <li>• Ocean and climate science</li> </ul>	<p><u>SOCIAL SCIENCE</u></p> <ul style="list-style-type: none"> <li>• Human behavior</li> <li>• Socio-economics of fisheries</li> <li>• History of fisheries</li> <li>• Stakeholder communities</li> <li>• Culture</li> <li>• Value systems, myths and beliefs</li> </ul>	<p><u>BUSINESS/INDUSTRY</u></p> <ul style="list-style-type: none"> <li>• International</li> <li>• Business administration</li> <li>• Seafood marketing</li> <li>• Co-management</li> <li>• Practical knowledge of fishing industry</li> </ul>
<p><u>TECHNICAL ANALYSIS</u></p> <ul style="list-style-type: none"> <li>• Geospatial statistics</li> <li>• Data handling</li> <li>• GIS and remote sensing</li> <li>• Computer skills</li> <li>• Accessing fisheries data</li> <li>• Population dynamics</li> <li>• Stock assessment</li> <li>• Ecosystem modelling</li> <li>• Risk assessment/mitigation</li> <li>• Monitoring and reporting</li> </ul>	<p><u>ECONOMICS</u></p> <ul style="list-style-type: none"> <li>• Resource/Fisheries economics</li> <li>• Externalities</li> <li>• Market institutions</li> <li>• Biostatistics/ econometrics</li> <li>• Economic management</li> <li>• Conducting socio-economic studies</li> </ul>	<p><u>POLICY/LAW</u></p> <ul style="list-style-type: none"> <li>• International and federal marine law and policy</li> <li>• Legal/legislative process</li> <li>• Policy analysis</li> <li>• Governance frameworks</li> <li>• Policy analysis</li> <li>• Policy development and implementation</li> <li>• Institutional analysis</li> <li>• Rule making and codification</li> </ul>
<p><u>LEADERSHIP</u></p> <ul style="list-style-type: none"> <li>• Engendering trust and respect</li> <li>• Integrity</li> <li>• Creating positive change</li> <li>• Collaboration and relationship building</li> <li>• Interpersonal skills</li> <li>• Coherent delegation skills</li> <li>• Strong organizational skills</li> <li>• Selling concepts</li> <li>• Engaging</li> <li>• Success under difficult conditions</li> <li>• Managing change and recognizing change drivers</li> <li>• Facilitating delivery of programs and policy</li> </ul>	<p><u>PROBLEM-SOLVING</u></p> <ul style="list-style-type: none"> <li>• Developing new approaches,</li> <li>• Team decision-making and planning</li> <li>• Lateral thinking and acting processes,</li> <li>• Analytical and integrative thinking</li> <li>• Recognizing the governance system</li> <li>• Strategic planning, decision-making under uncertainty,</li> <li>• Government decision-making</li> <li>• Creative thinking</li> <li>• Critical thinking</li> <li>• Systems analysis</li> </ul>	<p><u>MANAGEMENT</u></p> <ul style="list-style-type: none"> <li>• Key management tools</li> <li>• Comparative systems analysis</li> <li>• Fisheries management process</li> <li>• Decision support systems</li> <li>• Decision-making and planning</li> </ul>
<p><u>ADMINISTRATIVE</u></p> <ul style="list-style-type: none"> <li>• Executive management;</li> <li>• Personnel</li> <li>• Budgets</li> <li>• Workload planning</li> <li>• Project management</li> <li>• Recognizing and providing for professional development and advancement of staff</li> <li>• Recognizing staff limitations and need to fill gaps from outside, particularly for special problems.</li> </ul>	<p><u>CONSENSUS/CONFLICT</u></p> <ul style="list-style-type: none"> <li>• Facilitation</li> <li>• Mediation</li> <li>• Bargaining negotiation</li> <li>• Teamwork and team building</li> <li>• Group process</li> <li>• Inclusion (public involvement)</li> <li>• Community-based planning;</li> <li>• Maintaining consensus</li> </ul>	<p><u>COMMUNICATIONS</u></p> <ul style="list-style-type: none"> <li>• Listening, understanding and responding</li> <li>• Communicating with diverse audiences</li> <li>• Translation/transformation and presentation of technical information</li> <li>• Cross-cultural interpersonal skills</li> <li>• Multilingual; public relations</li> </ul>

opportunities that include reality-based classroom experience and field practice. Classroom based training should include case studies, applied research projects, analytical team projects, applied management courses, fishery management plan development, modeling or simulation, role playing or debating, and multidisciplinary studies of the connection between fisheries and other social issues at local and international scales. Field practice should include internships, professional mentoring, or secondments\*; sea time; engagement in multi-party conflict resolution; interaction with fishing communities; and involvement in fishery management decision-making processes.

\* Secondment - Transfer of personnel to another section or organization for a specific period followed by their return to their original position. The personnel involved usually experience no change in salary or terms of employment.

### 3.3. Strategies for Further Defining and Improving Curricula

Participants agreed there is a need to further define training needs and delivery methods or venues specific to managers of different sectors, responsibilities, regions and nations. This effort will require performing sector-level needs assessments, identifying gaps between needs and the full range of existing and accessible training programs, and developing and adopting specific training objectives and benchmarks for personal achievement (or competencies) related to target levels of management skills. Effective training needs communication, cooperation, and coordination among all groups involved in fisheries management, enhanced through the formation of cooperative partnerships within and across sectors. Cooperative efforts should include identification and development of capacity for integrated capstone training opportunities.

## 4. CURRENT TRAINING CAPACITY

Training a variety of generalists and specialists with different degrees of breadth and depth in knowledge and skill will require a variety of approaches. Much of fisheries management training in developed nations has occurred at academic institutions; however, this is not always the answer for training all types of managers in either developed or developing nations. For example, on-the-job and in-service training may be the best approach for industry. Specialized short 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. As input to discussion of curricular needs and training delivery methods, the workshop included presentations reviewing current training capacity and examples of flexible training models.

### 4.1. Current Training Review

Jodice and Sylvia (2001) presented the review of current training programs. Given the perceived need for advanced training in fisheries management, this review focused primarily on graduate level academic programs and to a lesser extent on continuing education.

#### 4.1.1. Academic Programs

The review identified 72 academic programs, offering 165 degree options (primarily with postgraduate diploma or certificate, Masters, or PhD) at a total of 46 institutions with at least some specific stated focus on fisheries management (Figure 1). Programs were found through an extensive search of online program literature.

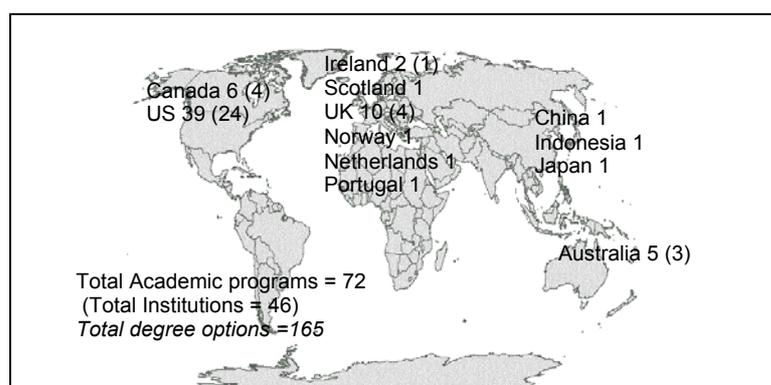


Figure 1. Distribution of fisheries academic programs identified in current training review.

Admittedly, some programs were missed, including non-English language programs in Central and South America, Africa, Europe and Asia, which were excluded from the review because of translation constraints.

The authors discovered the following general characteristics of the 72 academic programs:

*Organization:*

- Programs range from science-based or other specialist programs (e.g. fisheries, marine science, 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.
- Twenty-nine percent are located in fisheries science and 20% are located in fisheries management departments (often “Fisheries and Wildlife”); the remainder are spread among natural resources, aquaculture, marine or ocean science, marine affairs or policy, environmental policy, economics, and wildlife science departments.
- Fifty-eight percent offer “fisheries” as a major, usually as fisheries science.
- “Fisheries management” occurs most frequently as a course offering or a series of courses (43%), or as a degree specialization, option, or emphasis (38%), and less typically as an actual major (19%).

*Degree type:*

- Masters level training with a required thesis is the most prevalent; PhD is the second most prevalent.
- Some programs offer more than one degree option, such as Postgraduate Certificate (PgC) and Postgraduate Diploma (PgD), or Masters thesis and non-thesis options (e.g. MSc or Mphil).

*Target population:*

- Focus is primarily on training entry-level professionals in areas of fisheries science and/or resource management or providing a scientific research foundation for further graduate work leading to the Ph.D. degree; there is some focus on developing scientists and professional resource managers capable of multidisciplinary problem analysis.
- Very few offer accelerated (on-site) or distance courses as a way of offering degrees to practicing fishery managers.

*Knowledge and Skill Emphasis:*

- Less than 20% emphasize leadership, decision-making, innovation, or critical thinking skills in their website literature.
- A third of the programs use words such as “interdisciplinary,” “integrated,” or “multidisciplinary” in describing their curricula.
- The most common science related key words in program literature are “fisheries biology” (76%), “fisheries ecology” (68%) and “economics” (70%); “aquatic science,” “aquaculture,” and “population dynamics” are also fairly common.
- The most common management related key words in program literature are “fisheries management” (80%), “policy” (62%), “sociology,” (52%), “law,” (47%) and “business” (35%).
- Administrative skills, such as teamwork, employee supervision and budget preparation occur the least in program web literature, while research and technical writing skills receive the greatest emphasis.
- The most typical graduate-level capstone in fisheries is the research thesis or project, while emphasis on case study, leadership training, and team projects appears fairly low.
- Only 31% of the 46 institutions (represented by these programs) offer at least one course titled “Fisheries Economics”; another 55% offer at least one course titled “Marine Resource Economics” or something similar to “Natural Resource and Environmental Economics”. Program curricula typically include only one course in resource economics.
- Ninety percent of the 46 institutions offer at least one course titled “Fisheries Management,” usually with greater focus on habitat management rather than on social, economic, and political issues.

*Facilities:*

- Of the 46 institutions, at least 61% are proximal to the commercial fishing industry, 63% have access to a marine or aquatic lab, and 54% have access to a marine research vessel; 39% have all three of these characteristics.

#### **4.1.2. Continuing Education**

For the most part, continuing education programs have focused on providing technical training for scientists and fisheries development specialists, but there has been some recent development of advanced administrative management and leadership training. Nevertheless, capacity still appears relatively weak. The review of current programs revealed four categories of continuing education programs where capacity could be further developed for training professionals and stakeholders at the mid or upper levels of fisheries management:

*Academic:*

- Extension and outreach education programs offering specialized, needs based workshops (e.g. Oregon State University – Oregon Sea Grant Extension; University of Rhode Island – Coastal Resources Center)
- Postgraduate certificate, diploma or professional masters degree programs with flexible learning options (e.g. Marine Institute of Memorial University of Newfoundland – Fish Development Diploma; Australian Maritime College – Marine Resource Management)

*Government:*

- National agency based training center shared by several natural resource agencies (e.g. U.S. Fish and Wildlife Service – National Conservation Training Center; USDA Forest Service – Continuing Education for Natural Resource Professionals)
- In house training

*Industry:*

- Industry based associations or trade groups for industry members (e.g. New Zealand Seafood Industry Training Organization – SITO)

*Non-profit or foundation:*

- Professional societies (e.g. American Fisheries Society – 2002 Leadership Symposium)
- Research foundations or institutes (e.g. Worldfish Center, a.k.a. ICLARM – Fisheries Co-Management, November 2002)
- Other non-profits focused on specific management skills/knowledge areas (e.g. Center for Creative Leadership)

## **4.2. Flexible Learning Pathways**

Participants heard presentations on continuing education, professional, and stakeholder training programs developed by Oregon State University Extension Forestry (Cloughesy, 2001), the Institute for Fisheries Management and Coastal Community Development in Denmark (Degnbol, 2001), and the New Zealand Seafood Industry Training Organisation – SITO (Johnsen, 2001). Presenters emphasized the need to develop flexible learning pathways which recognize the existing hierarchy of knowledge, attitudes, skills, and abilities (KASAs) of managers as well as the work environment and life style (including time availability) of these professionals or stakeholders. Presenters suggested developing training programs based on needs assessment, goal identification, and evaluation – including measuring goal achievement, formative evaluation during the education program, and more formal summative evaluation to assess effectiveness. Ultimately, it should be possible to benchmark an individual's current KASA against an idealised KASA profile for their particular current and/or potential role in the fisheries management process (Harte, 2001).

Workshop participants agreed that effective demand driven, individually focused training delivered through multiple training pathways must be supported by changes to both training and fisheries management institutions. Training providers and academic institutions have to become demand driven rather than supply focused, and agencies and participants in fisheries management processes must also change their attitudes towards training. If on the job learning is to be formally recognized, management agencies will need to be actively involved in the assessment of work-based, life achievements against standards (Harte, 2001).

## **4.3. Encouraging Innovation**

Although no single education program can be expected to provide all the necessary knowledge, skills, or expertise, there are significant components of top training programs which should be considered if the goal is to develop effective leaders and decision-makers for 21<sup>st</sup> century fisheries. The current training review revealed two areas in need of further development – capstone integrative opportunities and cooperative partnerships.

There has been some progress in these areas. For example, University of Rhode Island's Department of Environmental and Natural Resource Economics has created a simulation laboratory using computer visualization technology to examine the consequences of policy actions. Also in the US, NOAA Fisheries has developed special research and education partnerships with academia, including PhD fellowships in Population Dynamics and Marine Resource Economics (NOAA, 2001). These examples are relatively rare in comparison to

the leading business management, public administration, and natural resource or forestry educational programs which unanimously provide “capstone” integrated courses or requirements with emphasis on leadership, teamwork, and critical decision-making skills and have numerous integrated academic and cooperative research partnerships with industry and government (Jodice and Sylvia, 2001).

Creating new or enhanced opportunities will likely require further development of cooperative multidisciplinary or multi-institutional partnerships among industry, government, NGOs and academia. Participants suggested the following strategies:

- Develop professional opportunities – e.g. fellowships, sabbaticals and cross-sectoral training, and internship and exchange programs (for professionals and students as appropriate).
- Build training capacity using existing potential – e.g. new degree options suited to continuing education of professionals, new interdisciplinary degree options, specialized workshops (onsite or online) using in-house expertise, and participation of industry and government as instructors in academia.
- Make curricular improvements based on a formal evaluation – includes sector-based needs assessments and subsequent gap analysis.
- Create fisheries management training websites or email groups – provides for exchange of information on training opportunities and curricular resources within and across sectors (e.g. online clearinghouse of current training programs relevant to the full range of fishery managers).

## 5. REWARDS AND INCENTIVES

Participants agreed that fisheries management as a profession is in crisis. Key symptoms of this crisis in agencies include – difficulty recruiting, high turnover, low retention, and an aging workforce. Several internal and external causes were identified, including limited professional development opportunities; low job satisfaction; perceived conflict between science and management disciplines; the political and, in some jurisdictions, litigious nature of fisheries management; and low morale. Participants also identified reluctance by non-agency stakeholders to engage in the fisheries management process due to experience of failure to achieve positive outcomes or experience of better results through direct political approaches.

Strategies for overcoming these problems include:

- Attract high achieving graduates from a diverse range of management, resource and biological disciplines by providing competitive salaries and articulating clearly identified career development pathways within fisheries management agencies.
- Reward well performing staff with performance based increases in wages and salaries, creating leadership positions outside the normal hierarchy of agency structures and involving all professional staff in and throughout the decision making process.
- Encourage professional development through training in new areas or advancing existing knowledge; secondment of staff into different agencies, sector, or academia; giving stretch assignments that develop staff both personally and professionally; and rotating positions within organizations, to permit integrated work, and from operational positions into strategic positions.
- Improve involvement in the management process by promoting management successes and collaborative work between all stakeholders (agency and non-agency).

Creating an international association tasked with developing and promoting fisheries management as a profession could benefit this effort.

## 6. CONSENSUS STRATEGIES AND THE FUTURE

Workshop discussions generated a wide range of ideas for improving the education of fishery managers. From these, participants identified eight top consensus strategies shown in Table 3. How will these strategies be accomplished?

**Table 3:** Consensus strategies for developing human capacity for 21<sup>st</sup> century fisheries management

1. Develop creative partnerships within and among academia, government, NGOs, industry – Examples include – peer exchanges for managers and agency personnel, teaching fellowships to support government or industry involvement in academia, dual degrees between MBA/Public Administration and resource management programs, and internet based specialized training opportunities which link management and academic organizations internationally.
2. Use the management process as a participatory learning experience – Conduct ongoing evaluation of management outcomes and feed results back into the management and learning process by providing universities with access to the management process and the primary data; allow stakeholders (including agencies) to participate in developing the learning experience.
3. Broaden and lengthen the fishery management career path – Recruit from a broader range of disciplines and provide long-run management career paths including supportive working environments and educational opportunities.
4. Conduct gap analyses – Evaluate existing and potential programs involved in training any of all “classes” of fishery managers; e.g. survey employers to identify recruitment patterns and satisfaction with employees, employees regarding their perceived training needs and incentives for recruitment and retention, and training providers to more formally assess training capacity; results will aid recognition and development of a minimum level of skills and knowledge for managers at all levels and classes of management.
5. Complete the development of an international fishery management education and training website – Develop a comprehensive, multilingual, searchable database or clearinghouse with links to all training programs and opportunities, including notices of internships, secondments, and fellowships, suitable for all levels, sectors, and types of fishery managers.
6. Encourage industry scholarships for fishery managers – This would allow industry to ensure that students have a basic familiarity with industry (the NZ industry would be willing and US industry may be willing but would need someone or a group to lead the effort).
7. Develop a library of fishery management case studies – Determine existing cases used in courses and/or which have already been published; establish the process, standards, and templates for case study development; include written, video, and simulation software as potential materials; include a learning and evaluation component; and coordinate development through IIFET special sessions, case study development workshops, or special sections or issues of fisheries management journals.
8. Organize a network of training providers and users – Identify an individual or organization to coordinate the network and provide accountability, consider tasking the network with coordinating an international needs assessment by sector, and use the internet and website as coordinating tools.

## 6.1. Overcoming Barriers

As with any new initiative, participants suggested a number of practical barriers that need addressing to encourage development and implementation of strategies. These include – potential for institutional inertia, the need for an institutional framework, identification of incentives for involvement, demonstration of importance to stakeholders, financial support, leadership and coordination (particularly at the international level), practicality, difficulty in defining service providers for all levels of training, and addressing cultural issues and diversity. None of these barriers was considered insurmountable. However, the workshop participants recognized that success will require a committed effort by national and international organizations to address these challenges.

The final activity of workshop participants was to define actions for facilitating priority consensus strategies during the 12-18 months following the workshop. The first step was to establish and engage an international steering committee, and this occurred at a follow-up meeting during the August IIFET 2002 Conference in Wellington, New Zealand. The steering committee will now work to facilitate distribution of workshop results to the relevant audience, development of the case study concept, further development of a website to coordinate activities and act as clearinghouse for programs, and pursuit of funding possibilities and ideas within individual countries and international sources. They will also work to pursue partnerships with IIFET, FAO, and the World Bank, among others, and further develop partnership with NOAA Fisheries and other national level agencies and institutions. These actions are considered essential first steps in achieving success and overcoming barriers.

### 6.3. The Next Step

Creating managers who are leaders, innovators and creative decision-makers is recognized as a critical step toward achieving effective management of 21<sup>st</sup> century fisheries. Participants in this inaugural international workshop were engaged and passionate about the many ideas and strategies discussed, and clearly saw value in developing training capacity for 21<sup>st</sup> century fishery managers. Since December, 2001 and the follow-up meeting at the IIFET 2002 conference, the project has continued to gain in interest, and organizers have received several international inquiries for the workshop report and requests to join the new email listserv (trainfishmngn@lists.orst.edu) associated with this initiative. A copy of the entire workshop report including appendices and presentations is available online at: <http://oregonstate.edu/dept/trainfishmngn/>. However, this momentum will be lost without significant and sustained commitment, in the form of funding, time, and cooperation, to strategies and coordination of this effort.

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