Chapter 14

Use of Social and Economic Information in Fisheries Assessments

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14.1 INTRODUCTION

Fisheries management can be defined as the process of working with a given aquatic habitat and community of organisms for the benefit of people in a recreational or commercial setting (Weithman 1999). This process depends on numerous inputs to decision-making with strong emphasis on scientifically-based information (Decker et al. 2001). For many years, fisheries managers collected biological and ecological information to support management decisions, but information from resource users and other constituents was typically collected in an informal manner or through public hearings and responses to public notices. Nevertheless, it has often been said that any policy or regulation, no matter how scientifically sound, will fail if it is not in accord with the fundamental views of the public. Many seasoned fisheries managers will admit, often reluctantly, that fisheries management is as much or more about people management as it is about the fish and to be effective they must have information about those with an interest in the fate of aquatic resources. These individuals and groups are often referred to as stakeholders (see Chapter 5). Therefore, it is important that fisheries managers collect scientifically-based information from their stakeholders as well as the fishes and their habitats.

The information needed from stakeholders is diverse and involves numerous fields related to the study of humans, such as psychology, sociology, demography, anthropology, public administration and policy, geography, and economics. Each disciplinary perspective considers a different dimension (or different perspective on the same dimension) of the complex of social phenomena that is fisheries management. Collectively, these disciplines are more commonly referred to as the "human dimensions" of fisheries management and their consideration is essential for fisheries administrators and managers to make more informed fisheries management decisions. Compared with biological and ecological studies of lakes, reservoirs, rivers, and streams, human dimensions studies are relatively recent arrivals to the inland fisheries management process, primarily taking root in the past 40 years. However, understanding human dimensions has become important because the angling (and nonangling) public is increasingly demanding that the fisheries management process be open and transparent and that decisions be based on a fair process that considers the best available scientific information.

The intent of this chapter is to introduce the stakeholders involved in inland fisheries management and the general uses of social and economic information in the management

process. The types and uses of social and economic information that is needed from recreational anglers in fisheries assessments are discussed and the various levels of human dimensions research that provide this information are described. The numerous types of social and economic information needed in fisheries assessments are usually collected with one of the various survey methodologies available to researchers: personal interviews, telephone interviews, self-administered mail questionnaires, Internet-based surveys, or secondary analysis of existing data. Specific rationales and techniques for survey research methods are beyond the scope of this chapter and readers are encouraged to see Knuth et al. (in press) for an in-depth treatment of the use of these methodologies in fisheries management.

14.2 SOCIAL AND ECONOMIC RESEARCH

During the course of a fisheries manager's day, important questions may arise about stakeholders and the infrastructure surrounding inland recreational fisheries. Unless management wants to rely on anecdotal information, it is necessary to have valid and reliable data. The information needed from stakeholders can be "broad" for long-range planning purposes; "comprehensive" for short-range planning decisions, commitment of resources, or establishment of goals and objectives at the program level; or "focused" for more immediate action decisions and implementation of activities (Brown 1987). Social research involves identifying stakeholders, their trip origins, species and experience preferences, and their attitudes toward fisheries resources and management (Decker et al. 2001). Social research can provide information to guide long-range planning decisions and measure what constitutes satisfying fishing experiences so that managers can develop the best possible products, services, marketing strategies, and educational programs. Economic research can assess expenditures made by stakeholders in pursuit of activities associated with fisheries resources, resultant economic impacts to local and regional economies, and what aquatic resources and fishing is "worth" to individuals and to society. Social and economic information is used to provide justification and guidance for policies and programs at various levels of the fisheries management process, and it gives agencies multidisciplinary problem-solving capabilities. Both social and economic information is critically needed but is often lacking in fisheries assessments.

14.2.1 Stakeholders in Fisheries Management

A fishery can be defined as a social system that includes fish, harvesters, and the entire support industry whose long-term success rests with sustainable fishery resources (Ditton 1997). Thus, one of the first steps in human dimensions research is identifying stakeholders who will be affected by possible changes to management practices designed to alter a fishery. Stakeholders are individuals or groups who may be affected by, or may influence, fisheries management decisions and actions—they are interested parties who have a stake in the decision. Likely stakeholders in inland fisheries management decisions include licensed recreational anglers, unlicensed recreational anglers (e.g., those exempt from license requirements like youth and the elderly), recreational fishing guides, charter and headboat operators, commercial fishers, private landowners, fishing tackle producers, local businesses that cater to anglers, Native Americans who often have fishing rights protected by certain treaties,

nongovernmental organizations, other state and federal regulatory agencies, and the general public.

Although much of the general public does not currently use many fisheries resources, they may still be considered stakeholders as they can value fisheries resources and opportunities intrinsically or for their use potential. This can be considered "option value," meaning that individuals like to know they have the opportunity to use aquatic resources if they so desire. In addition to recreational opportunities, some stakeholders may value educational and research uses (e.g., scientific value). "Existence value" describes when people value fisheries despite the fact that they do not currently use aquatic resources or ever plan to in the future (Weithman 1999). Knowing that resources are out there providing important ecological functions (i.e., ecological value), valuing resources for the benefit of future generations (i.e., bequest value), and valuing the survival of species (i.e., altruistic value) are examples of existence values (Loomis and White 1996).

In addition to identifying stakeholders, fisheries managers must be prepared to weigh various viewpoints in their decision-making process because the diversity and number of stakeholders may be quite large (Krueger and Decker 1999). Often, those with a vested social or economic interest in fisheries resources receive the largest consideration in the decision-making process. Nevertheless, fisheries managers can benefit from collecting information from a variety of stakeholders before decisions are made. If managers consistently gather information from only one stakeholder group, their views of how people are affected by management decisions will be limited and biased. Often, debates about potential fisheries management goals, funding mechanisms, effects on people, and effects on other resources may be germane to more than just anglers and commercial fishers. The failure to account for all stakeholder groups on a particular decision could result in underrepresented or dissatisfied stakeholder groups challenging the legitimacy of the final decision (e.g., initiating litigation), which may delay proposed changes to management regulations or practices and sometimes can derail them altogether.

An important stakeholder group in inland fisheries management is licensed recreational anglers. Recreational fishing is important to national economies. In the USA, anglers spent nearly US$45.3 billion in 2006 on recreational freshwater fishing (Southwick Associates 2007). Canadians spent nearly CAN$2.5 billion in 2005 on fishing-related expenditures (Fisheries and Oceans Canada 2007). These expenditures have a significant effect on national economies. For example, in the USA in 2006, the US$45.3 billion spent on recreational fishing was associated with a total economic output of nearly US$125 billion and supported over 1 million jobs (Southwick Associates 2007). Sizeable portions of local and regional economies, aquatic resource conservation programs, numerous nongovernmental organizations, and fishing tackle and boating manufacturers rely on recreational fishing remaining a viable outdoor recreational activity. Additionally, many of the U.S. aquatic resource conservation efforts are funded by angler expenditures by means of license fees and excise taxes paid on fishing equipment and motorboat fuel collected through the Federal Aid in Sport Fish Restoration Act. From 1950 to 2000 in the USA, anglers contributed over US$12.0 billion for state-level fisheries conservation as a result of this act (Bohnsack and Sousa 2000). On average, 83% of funding for state fish and wildlife agencies' aquatic resource management budgets is supported by sportsmen and sportswomen (Southwick Associates 2002). Therefore, considerable social and economic research conducted for inland fisheries assessments has focused on this stakeholder group and the remainder of this

chapter uses angler research as the central example to explore the application of social and economic research in inland fisheries management.

Although the chapter focuses largely on recreational anglers, that should not diminish the need to consider other stakeholder groups in decision-making processes. Fisheries stakeholder groups are diverse and may include fish watchers (e.g., salmon migration viewing), underwater photographers, scientists, members of animal protection groups, water resource dependent industries, and private property rights organizations. Varying opinions on the appropriate uses of fisheries resources are also pervading the fisheries profession (Muth et al. 1998). As a general rule, the more the inland resource is used for multiple purposes the more likely managers will encounter diverse groups with differing opinions on what constitutes appropriate use of resources. Resultantly, managers will need to seek feedback from those other than recreational anglers.

14.2.2 General Uses of Social and Economic Information

To determine how human dimensions research is used by U.S. fisheries management agencies, Simoes (2009) conducted telephone interviews with agency contact persons for human dimensions from each state and the District of Columbia. When respondents were asked to report on the ways in which human dimensions data were used by their agency from a list of five items, the majority of respondents reported that human dimensions data were used in the design of fisheries regulations (89%); local resource management plans (84%); statewide resource management plans (82%); angler educational and outreach programs and materials (69%); and other uses (38%; see Box 14.1). Most of the comments offered by respondents in the "other" category could be grouped into one of two broad categories: fiscal justification or outreach (e.g., information for legislature, public relations, economic impacts, or other fiscal justification) or, to a lesser extent, recruitment and retention of anglers (e.g., angler marketing or angler motivations). These results indicated that angler human dimensions data are being used to communicate the mission of fisheries management agencies and the economic and other societal benefits of angling activities.

Economic information is needed in fisheries assessments for several reasons. First, angler expenditures provide important revenue and employment for local communities, states, provinces, and nations. Second, many communities and their businesses, especially those in rural areas, are dependent on users of local resources for tax generation and retail sales revenues. Third, because of these benefits, there likely will be economic consequences to fisheries legislation and management decisions. Fourth, economic dependency can help to justify the need for protection or conservation of fisheries resources. Fifth, economic information can show the value of resources over time, which can reflect the changing quality of the fisheries resource and (or) fishing experiences. Sixth, economic information can aid in determining compensation in the event of environmental damage to fisheries resources through negligent land use practices or blatant criminal activity (e.g., dumping). Finally, economic information is useful in setting license and permit fee structures.

14.2.3 Specific Types and Uses of Social Information

The information needed for various uses of social information falls into six general categories: (1) angler characteristics; (2) participation patterns; (3) opinions and preferences; (4)

Box 14.1. Collection, Use, and Importance of Angler Human Dimensions Data: a Survey of U.S. Fisheries Management Agencies

Table A. Frequency and percent of U.S. fisheries management agencies (N = 55) that indicated they used human dimensions information for the listed reasons.

Human dimensions use	*N*	Percent
Design of fishery regulations	49	89
Local resource management plans	46	84
Statewide strategic resource management plans	44	81
Development of angler educational and outreach programs and materials	38	69
Other	19	35

Those who responded to the "other" category were asked to indicate how human dimensions data were used by their agency. Respondents reiterated each of the four original response categories, with several other dominant themes also emerging. Most of the 19 respondents added that angler human dimensions data were used in developing resource management plans; less than half indicated that data were used in conducting public relations and outreach, informing legislature or validating programs, and developing regulations.

Table B. Frequency of open-ended responses by U.S. fisheries management agencies that indicated "other" uses of human dimensions information in their agency (N = 19).

Human dimensions use	Frequency
Developing resource management plans	14
Conducting public relations and outreach	9
Informing legislature or validating program	8
Developing regulations	7
Researching angler motivations or behavior or profiling	7
Obtaining economic information or assessing impacts and valuation	6
Marketing to anglers and increasing recruitment retention	5
Evaluating programs and services	3
Evaluating fiscal justification (state and federal funding)	3

perceptions, beliefs, and attitudes; (5) motivations, expectations, and satisfaction; and (6) culture and value orientations. As natural resource agencies continue to conduct human dimensions research, they can develop a perspective on trends in each of these areas. Together with biological, economic, and policy information, agency personnel are better able to develop an integrated management perspective that allows them to make more justifiable recommendations to fisheries decision-makers (Brown 1987). For example, collecting social information may be paired with the collection of biological data to understand the interdependence of human well-being and ecosystem health and services, and to inform fisheries managers. Further, such comprehensive studies help inform decisions about species management and regulation alternatives. For example, social research addressing whether the angling public is satisfied with current fishing opportunities, fish populations, composition of catches, or fishing regulations can be compared with fish stock assessments to determine whether different regulations may be possible or whether manipulations of the organisms (e.g., stocking) or habitat (e.g., fish-attracting structures) should be considered as possible management alternatives. If management goals may be achieved through different regulations or organism or habitat manipulations, angler surveys can help inform managers about the course of action likely to be desired most by anglers.

14.2.3.1 Angler characteristics

Collecting information to describe an angler population is similar to collecting water temperature, dissolved oxygen, and pH data each time a biologist goes to the lake. Information about angler populations provides managers with basic information needed to put other findings in context. By understanding the relationships of human descriptors with other social and economic information, managers can design management programs that are responsive to the needs and abilities of a variety of angler groups or stakeholders. Information that characterizes participants includes demographic and social information.

Demographic information characterizes who anglers are and their trip origins, and includes data such as age, income level, education level, race, ethnicity, and gender. Anticipated changes in the U.S. general population, particularly an aging population, increased immigration, and an increased percentage of minority populations, will likely have future effects on fisheries management (Murdock et al. 1996). For example, some states in the USA, such as California, Florida, Arizona, New Mexico, and Texas, are currently witnessing drastic increases in their Hispanic-Latino populations. Tracking changes in the demographic composition of anglers is important in determining which strategies to use to ensure recreational fisheries management will continue to be relevant to all of society. Additionally, a more diverse population will require more diverse amenities at fisheries resources to meet their needs and expectations.

Coupled with demographic information and anglers' trip origins, social characteristics of anglers can further inform the manager about this stakeholder group. For example, the proportions of anglers who belong to fishing clubs or organizations (e.g., Trout Unlimited or Bass Anglers Sportsman Society), participate in fishing tournaments, or subscribe to fishing magazines, and with which organizations, tournaments, or magazines they are affiliated, can assist fisheries managers in determining the types of clientele visiting a particular resource. This can assist managers in determining where to relay fishing and marketing information about agency programs and services. The incorporation of geographic information system

tools into social research also enables managers to visualize better where angler trips originate, provided zip code, city, or county of home residence information is collected.

14.2.3.2 Participation patterns

Many fisheries management objectives are targeted toward achieving a particular level of angler-days and increasing overall participation in recreational fishing at particular resources or statewide or province-wide. Therefore, it is important to gather information about fishing frequency and participation rates in recreational fishing. For instance, fisheries management agencies track angling participation rates (the proportion of the public that participates in fishing) for determining short- and long-term demands that will be placed on fisheries resources. Agencies and researchers have also recognized that angler populations are not composed of the same people year after year and therefore investigate the rate at which anglers enter or drop out of the customer base in terms of purchasing or not purchasing fishing licenses; this is termed the angler "churn rate" (Strouse 1999). Understanding participation is critical to the financial side of fisheries management. The number of fishing licenses sold is part of the equation for determining each state's allotment of funds from the Federal Aid in Sport Fish Restoration Program (see Box 4.3) and provides much of the matching funds necessary to receive that allotment. Such data enable fisheries agencies to document the values of fisheries management to policy makers and the general public.

Whereas the number of anglers in the USA appears to be relatively stable, participation rates have decreased nationwide in the past 25 years (USDI 2007). Similarly, resident angler participation rates in Canada have shown a downward trend in most provinces and territories since 1995 (Fisheries and Oceans Canada 2007). It should be noted that a rise in the number of anglers does not necessarily result in a rise in the participation rate. In fact, the participation rate can still decline if the number of new recruits to fishing does not increase at the same rate as the general population increases. Whereas a large number of anglers can show legislators that fishing is important to many people, agencies may be more effective if they can show that the percentage of the population participating in fishing is increasing as well.

Recognizing declining participation rates, many fisheries management agencies are trying to improve angler retention by producing more satisfying recreational experiences and are instituting recruitment efforts designed primarily to attract youth. However, most of the increases in the U.S. population, and most of the future recruits to recreational fishing, are projected to come from nontraditional groups (e.g., those other than Caucasian males) (Murdock et al. 1996). It is important to know whether nontraditional groups differ in their resource use and socialization patterns so agencies can develop recruitment efforts to attract them for further financial and political support. For example, Hunt and Ditton (2002) found that the average African-American male angler in Texas did not start fishing until his teens and the average Hispanic male angler did not start until his early twenties. Current agency efforts aimed at reaching out to youth alone may not be as effective at attracting new participants from an increasingly diverse cultural population. Fisheries managers need to be able to track and recognize participation trends by various segments of a population so they can be proactive in developing strategies to address these new circumstances. In the future, it will be difficult for agencies to maintain their support from increasingly diverse state legislatures if they cannot provide equitable benefits and services to a diverse citizenry.

14.2.3.3 Opinions and preferences

Social research helps managers assess the likely effects of management decisions on people. Understanding opinions and preferences about alternative management approaches enables managers to judge the probable political and social acceptability of various sets of actions. Managers are able to select management actions that have a high degree of probable acceptance, effectiveness, and desirable human outcomes in an affected community, which in turn enhance compliance. Those who interact with fisheries resources often have novel ideas that may assist managers in providing quality recreational experiences (Ditton 2004).

Three common approaches for obtaining preference information from anglers include: (1) the traditional single-item question approach, (2) revealed-preference models, and (3) stated-preference choice models (Louviere and Timmermans 1990). The traditional single-item question approach involves asking anglers to indicate whether they support or oppose each of several management options, usually as stand-alone items (e.g., a proposed 305-mm minimum length limit or a five-fish-daily bag limit on rainbow trout). Although this has been the traditional approach used in fisheries assessments, it does not convey the relative importance of each of the options to anglers and the tradeoffs they are willing to make when considering restrictions jointly (Ditton 2004). The revealed-preference approach looks at actual behavior to determine angler preferences for regulations. It is assumed that anglers will choose fishing locations with the regulations that they prefer. To determine preference, anglers are surveyed as to where and how often they fish at various locations and what the regulations (and other attributes) were at those locations. The stated-preference choice approach makes use of hypothetical scenarios to derive individuals' preferences by measuring their choice of preferred scenarios. This approach assumes that complex decisions are not based on one factor, but on several considered jointly. Results allow managers to understand how anglers combine their preferences for various management measures under consideration and the relative influence of each management measure (e.g., a combination of 305-mm minimum length on rainbow trout and a five-fish-daily bag with the bag limit contributing most to the angler's support rating). Because of its ability to use hypothetical scenarios, the stated-preference choice approach has been used increasingly in angler surveys as more researchers and agencies discover its benefits (Aas et al. 2000; Gillis and Ditton 2002; Oh et al. 2006).

14.2.3.4 Perceptions, beliefs, and attitudes

A complete understanding of participation patterns and preferences often requires understanding angler perceptions, beliefs, and attitudes. Information about people's perceptions, beliefs, and attitudes helps managers understand what people think about a fishery resource, its importance, and how stakeholders would like to interact with the resource. Individuals' perceptions about what is real (whether it is or not) often influence their beliefs (e.g., whether something is good or bad) and resultant attitudes (e.g., positive or negative evaluation) toward particular behaviors and management actions. For example, where most individuals are no longer relying on fish and wildlife resources for subsistence purposes (i.e., living directly off of the land), many individuals use fisheries resources for sustenance (i.e., supplementing their diet). Often, those who rely more on fisheries resources for sustenance include lower-income anglers, and some ethnic groups have been found to have attitudes more consistent with higher consumption (Burger 2000; Hunt et al. 2007). We would expect these groups to

respond unfavorably to reductions in bag limits, even if reductions may protect anglers from high levels of toxic substances increasingly being found in inland waters. We would expect this response because their beliefs are consistent with their perception that fish are a healthy and inexpensive source of protein. As a result, they have developed positive attitudes toward consuming fish, especially if they have not witnessed any negative health effects. Where contamination risks and these populations coincide, a stronger propensity to consume fish puts them at greater health risk than others (Burger 2000). In this situation, knowing the perceptions, beliefs, and attitudes held by anglers about consuming fish beforehand can assist agencies in developing information and education programs designed to produce voluntary changes in behavior that may limit their risks and (or) create more compliance with necessary regulations.

14.2.3.5 Motivations, expectations, and satisfactions

The reasons why people participate in recreational fishing have been studied extensively by human dimensions researchers. Research in this area began when Bultena and Taves (1961) observed that anglers returning from fishing trips in the Quetico Superior area of Minnesota were not dissatisfied with their visit to the area despite not having any fish in their creels. Bultena and Taves hypothesized that there must be multiple motivations for fishing, and researchers since have sought to investigate reasons for fishing aside from the catch. Most of the non-catch-related motivations for fishing have been found to be to relax, to experience natural settings, to explore or achieve, to escape temporarily from the regular routine, to be with family and friends, or to get away from family and friends (Fedler and Ditton 1994). Although many believe that fulfillment of these motivations are out the fisheries manager's control, it has helped to educate fisheries managers that the fishing experience is more than catching fish and to lead managers to look for better ways to improve the esthetic and social settings surrounding fisheries resources.

In social science research, satisfaction is defined as the fulfillment of expectations (or motivations) and is ideally measured by subtracting a posttrip or postseason measure of performance from a pretrip or preseason measure of expectation (Brunke and Hunt 2007). Nevertheless, only posttrip or postseason satisfaction ratings have been found to provide managers with useful information about fishing trips (Arlinghaus 2006). Measuring satisfaction allows fisheries managers to determine to what extent the needs and desires of people are met through a fishery resource and a fishing experience. Fisheries management actions may be developed to increase satisfaction, either by manipulating the biota (e.g., stock different species), altering the physical environment (e.g., provide more observation or access points), or informing or governing people (e.g., setting realistic expectations by providing factual information or shifting fishing pressure by regulating angling behavior). Fly-fishing-only, catch-and-release-only, limited-use, or family-oriented areas that offer various amenities are just a few examples of managing resources to attract similarly motivated anglers. Thus, multiple uses can be managed in a manner that maximizes overall satisfaction.

The definition of what constitutes a satisfying fishing experience is highly subjective. Each angler derives somewhat different benefits from a fishery resource and has a different set of preferences and opinions of how a fishery should be managed. Because preferences vary widely among individual anglers, the capability to manage resources based on specific angler desires is in its infancy, and some may even argue that it is impractical. Therefore, most

agencies focus on providing a diversity of recreational fishing opportunities with the hope that each angler will seek out the experience that meets his or her particular expectations. According to Weithman (1999), fisheries managers will be successful in meeting expectations if they: (1) carefully consider the entire array of benefits that fisheries resources offer, (2) make the effort to determine what anglers want, and (3) develop a process to explain to anglers the differences between their expectations and a manager's ability to affect change at a particular resource. A fourth item should be added to Weithman's list: communicating the types of available resources so the angler can make a more informed decision in choosing a fishing locale from the diversity of opportunities.

14.2.3.6 Culture and value orientations

Culture embodies a system of shared beliefs, values, customs, symbols, and behaviors that members of society use to cope with their world and with one another (Bates and Fratkin 2002). Cultural patterns or value orientations contribute to the way people think about the world and the manner in which they behave. Four cultural patterns have been identified as key descriptors of differences in leisure and environmental orientation: (1) humankind-nature orientation (utilitarian, harmonic, or fatalistic), (2) time orientation (past, present, or future), (3) activity orientation (doing or being), and (4) relational orientation (individualistic or collectivistic; Simcox 1993). U.S. society has traditionally been dominated by the Anglo or European culture, which is seen as utilitarian and individualistic and in which people are future oriented and goal driven to achieve desired end states. Other cultures around the world and some subcultures within the USA have been found to have different value orientations (Bates and Fratkin 2002). This is important because value orientations combine to represent a collective feeling toward fish and wildlife as well as recreational opportunities (Weithman 1999).

Recent research indicates that wildlife and fisheries value orientations are changing as the USA becomes a more diverse society (Teel et al. 2007), and some U.S. subcultures have been found to be different with respect to fishing behavior, motivations, and attitudes (Toth and Brown 1997; Hunt and Ditton 2001, 2002; Hunt et al. 2007). Additionally, recent declines in fishing participation, increased attention to the actions of animal rights organizations, and increasing multiuse conflicts over wildlife- and fisheries-related issues are all signs of changing value orientations. For example, catch-and-release fishing is becoming increasingly popular among the traditional clientele. However, some cultures view fish predominately as a food source and argue that this practice is akin to playing with fish and results in waste. Studies of culture and values can help managers understand why people use fisheries in certain ways.

Information about the social world or culture surrounding the human element of a fishery also provides a context for the manager to understand the sources of human beliefs about a fishery and the importance of a fishery to local or regional communities. For example, in many Hispanic-Latino communities in the USA outdoor recreation participation occurs in large groups consisting of family and extended family (Hunt and Ditton 2002). Thus, their selection of resources will most likely consist of areas that can support larger groups and may be inconsistent with some current management practices that are designed to minimize participation to help anglers "get away from it all." This latter philosophy is based primarily on the needs and desires of the traditional angler clientele, not necessarily those that managers will be increasingly encountering in the future. Thus, understanding differences in cultural

value orientations and how they relate to uses of fisheries resources will be an increasingly important component to fisheries management.

14.2.4 Specific Types and Uses of Economic Information

To gather economic information related to fisheries assessments, economic research focuses on two primary areas: (1) economic impacts, often referred to as input-output analysis, and (2) economic valuation.

14.2.4.1 Input-output analysis

Economic impact analysis often focuses on fishing activities and economics associated with an economy of interest (typically a county or combination of counties, parishes, a state, states, or provinces) and provides measures of fishing activities' contribution to these economies. Economic impacts derived from each separate or collective set of counties, states, or provinces are increasingly modeled using impact analysis for planning (IMPLAN) software originally developed by the U.S. Forest Service to assess its forest management plans on a local economy. This software uses economic data from an area of interest (e.g., individual counties or a specific state or province) to construct a model of the economy. Expenditure profiles of fishing trip participants, coupled with respective angler use in terms of activity days, are needed to perform an economic impact analysis. Economic impacts of expenditures from angling activities (e.g., sporting gear) and associated trip activities (e.g., fuel and food) can be generated from county or statewide models derived from IMPLAN software.

Expenditures can be identified during a survey process (e.g., mail or on-site) by type of purchase made in a specific location on behalf of fishing activity and the expenses associated with all fishing trip activities. These expenditures can then be organized into final demands on county, state, or provincial industries and businesses. An activity day is the presence of one person for a portion of a day at a resource where the activity is taking place. As a result an itemized participant expenditure profile (U.S. dollar/participant/activity day) is often used as an input in the IMPLAN model, in which each item is entered separately and aligned with its appropriate economic sector. Once all expenses are entered, they are matched with activity days for a site or activity.

Input-output models for each county, county combination, or state (or province) economy can be built to generate direct and secondary economic impacts resulting from in-economy expenditures and coinciding activity days. Table 14.1 is a typical economic impact table that presents results of a local input-output analysis which fisheries managers will likely come across during their professional career. Direct impacts include sales, salaries, wages, and jobs created by the initial purchases of recreational anglers and represent that portion of these expenditures retained by local businesses in their business operations. Secondary impacts are composed of indirect and induced impacts. Indirect economic impacts occur when industries or businesses the local economy sell their products to those making direct sales. Indirect impacts are created through purchases made by directly engaged businesses or individuals that have supporting businesses in the local economy. Indirect impacts will include the same categories as direct impacts since industries or businesses then purchase additional inputs such as materials and labor from other economy sectors (Grado et al. 2001). Induced impacts occur

Table 14.1. Economic impacts of fishing trips associated with the 2007 recreational boat fishery at Sardis Lake, Mississippi, to the three-county region surrounding the reservoir. All dollar amounts are in U.S. Dollars.

Industry	Direct impacts ($)	Secondary impacts ($)	Total economic impacts ($)	Value added ($)	Employment number
Agriculture, forestry, and fisheries	1,198	110,763	111,961	49,785	1
Mining	0	499,059	499,059	307,711	3
Construction	0	703	703	92	0
Manufacturing	9,333,182	4,397,459	13,730,641	6,245,044	163
Transportation, communication, and utilities	0	434,824	434,824	216,956	4
Trade	0	382,833	382,833	197,448	5
Finance, insurance, and real estate	0	129,123	129,123	63,286	3
Services	6,052,332	2,027,145	8,079,477	4,242,441	105
Total	15,386,712	7,981,909	23,368,621	11,322,763	283

from household consumption generated by employment tied to direct and indirect economic impacts that generate sales, salaries, wages, and jobs. An example is contributions to the local economy from wages spent by hotel and lodging employees catering to anglers visiting the resource. The sum of direct and secondary impacts is the total economic impact to the economy of interest as a result of angler expenditures.

In addition to total economic impacts from employment and income, value added and total full- or part-time jobs are often presented in economic impact tables. An important component of value added is the employee income garnered by the local labor force. This benefit is measured by the number of jobs supported annually on a full- and part-time basis. Additionally, economic multipliers are derived and used to evaluate incremental contributions to each economy from changes in final demand for commodities associated with fishing and fishing trip-related activities. Results enable researchers to determine the extent to which other industries of a local economy (e.g., manufacturing, government, and services) benefit from resource-related activities and (or) may be underserving current clientele through their scarcity or absence in a local economy. Leakages (i.e., expenditures leaving the local economy due to its lack of capacity to supply the good or service) from both direct and indirect purchases do occur and are taken into account in the IMPLAN model.

Economic multipliers derived from input-output analysis are used to explain a respective economy's (e.g., local, region, state, or province) ability to absorb and use in-region fishing-related expenditures. Several key ratios or multipliers are developed from IMPLAN outputs for each resource-based activity. Social accounting matrix (SAM) multipliers are used to evaluate incremental contributions to an economy from per unit changes in activity-based expenditure levels. A SAM multiplier (often referred to as TYPE SAM) is computed by dividing total economic impacts by direct economic impacts (Olson and Lindall 2000). Figure 14.1 shows the relationship between direct economic and total economic impacts. As can be seen from the figure, two reservoirs that have the same amount of direct impacts from angler expenditures can have different total economic impacts. Dividing total economic impacts by direct economic impacts shows that the SAM multiplier for reservoir 2 is 1.6 whereas that of reservoir 1 is 1.4. Therefore, money

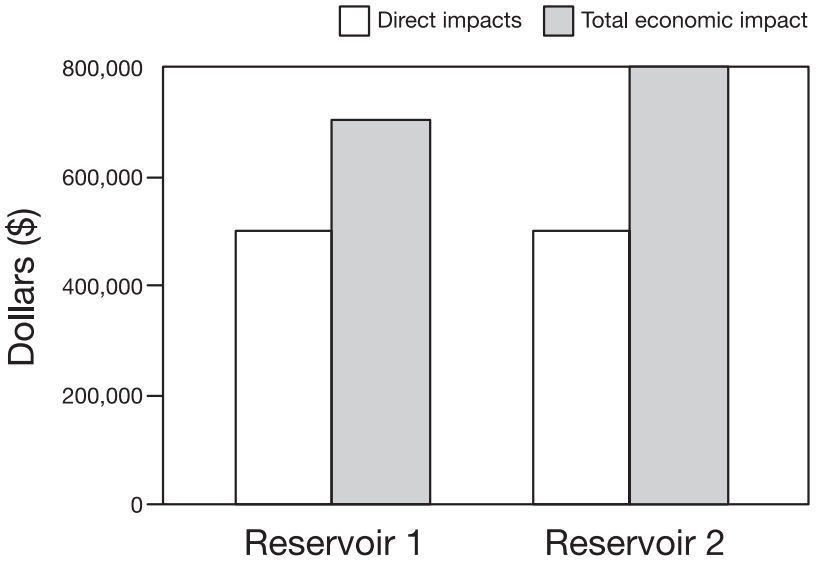

Figure 14.1. Economic impact of two reservoirs illustrating the relationship of direct impacts (equal in this case) to total economic impact. Money spent at reservoir 1 "leaks" out of the local economy at a faster rate than it does at reservoir 2.

spent at reservoir 1 "leaks" out of the local economy at a faster rate than it does at reservoir 2. Multiplier size may be related to the areal size of an economy because value added within an area has the potential to increase as its geographic area increases: more than likely a smaller proportion of expenditures are purchased outside the region (Loomis and Walsh 1997). Also, the extent of development within an economy is a factor in multiplier size. Typical recreational expenditure multipliers vary from 1.5 to 2.7 in the USA (Loomis and Walsh 1997).

The above discussion of economic impact analysis made no distinction between where the angler expenditures used in the input-output models originated. For nonresidents who do not live in the impact area surrounding the resources in question, their expenditures represent an influx of new money to the county, state, or provincial industrial and commercial bases and are always used in total in economic impact analyses. A debate among economists surrounds how to treat resident expenditures. Some researchers have discounted using resident expenditures to derive in-economy impacts because they are viewed as a redistribution of money within a respective economy. Specifically, it is argued that if residents did not go fishing at a particular resource in a county, state, or province, they would likely spend their money on something else in that same area. However, it is also likely that some resident anglers would fish elsewhere (e.g., another county, state, or province) and some of their expenditures would leave the economy of interest. It is up to the researcher to decide how to parse out this breakdown and determine the appropriate use of resident expenditures. This determination begins by asking appropriate questions on this issue in a survey process.

As understood from the preceding discussion on economic impacts, recreational fishing expenditures can have a pronounced effect on a particular economy from a solely monetary perspective (Johnson and Moore 1993). Regional expenditures can generate millions of dollars in sales and taxes and can be related to the number of jobs supported in the public sector and private industry (Burger et al. 1999; Steinback 1999). Recreational expenditures can have

a positive effect on the natural setting in which they take place since the availability of fisheries, fisheries habitat, and off-site accommodations (e.g., lodging and food) have been known to affect user interest and participation in fishing and could limit revenues to an affected economy unless there is some level of stewardship. Whereas information generated from economic impact analysis can provide fisheries administrators with a great deal of power to garner support from politicians and the business community, it must be emphasized that this method of tallying expenditures results in a monetary value to a local or regional economy and not to the recreation participant or society. Nor does it relate to the on-site value of the activity. Expenditure data are frequently misused by laypersons to represent the value of fishing trips to anglers (Pollock et al. 1994). The economic value of fishing trips to the individual angler and to society is presented in the next section.

14.2.4.2 Economic valuation research

Since the 1970s, economists have become increasingly interested in placing monetary values on goods and services not exchanged in the marketplace. These values are called "nonmarket values" and include recreational opportunities such as fishing. The impetus to develop appropriate methods of valuation arose from the need for benefit-cost assessments of public goods (Swanson and Loomis 1996; Davis et al. 2001). An economically efficient mix of market and nonmarket goods can be determined if public good values (e.g., recreational fishing opportunities) can be estimated in a manner that makes them directly comparable with market prices.

Whereas expenditures and resultant economic impacts discussed in the previous section are useful indicators of the importance of recreational fishing to local, state, provincial, and national economies, they do not measure the economic benefit to either the individual participant or society (beyond the impacts on the economy; Boyle et al. 1998; Aiken and Pullis La Rouche 2003). Expenditures and net economic values are two widely-used but distinctly-different measures of the economic value of recreational fishing. Net willingness to pay (WTP) is usually referred to as "consumer surplus" and represents an individual's WTP for fishing over and above what they actually spend to participate. The summation of all recreational angler consumer surplus, for example, represents the benefit of recreational fishing to society. Figure 14.2 is adapted from an economic valuation addendum to the *1996 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation* (Boyle et al. 1998) and simplifies the concept of economic valuation and its relationship to expenditures and economic impacts.

As per Figure 14.2, the previous section on economic impact is concerned with only expenditures (rectangle a-b-d-e). Net economic value measures participants' WTP for recreational fishing over and above what they actually spend to participate (triangle b-c-d). The benefit to society is the summation of WTP across all individuals. However, there is a direct relationship between expenditures and net economic value. A demand curve for a representative angler is shown in the figure. An individual angler's demand curve gives the number of trips the angler would take per year for each different cost per trip. The downward sloping demand curve represents marginal or additional WTP per trip and indicates that each additional trip is valued less by the angler than is the preceding trip. All other factors being equal, the lower the cost per trip (vertical axis) the more trips the angler will take (horizontal axis). The cost of a fishing trip serves as an implicit price for fishing since a market price generally does not exist for this activity. At $60 per trip, the angler would choose not to fish, but if fishing trips were free, the angler would take 20 fishing trips. At a cost per trip of $25 the angler will

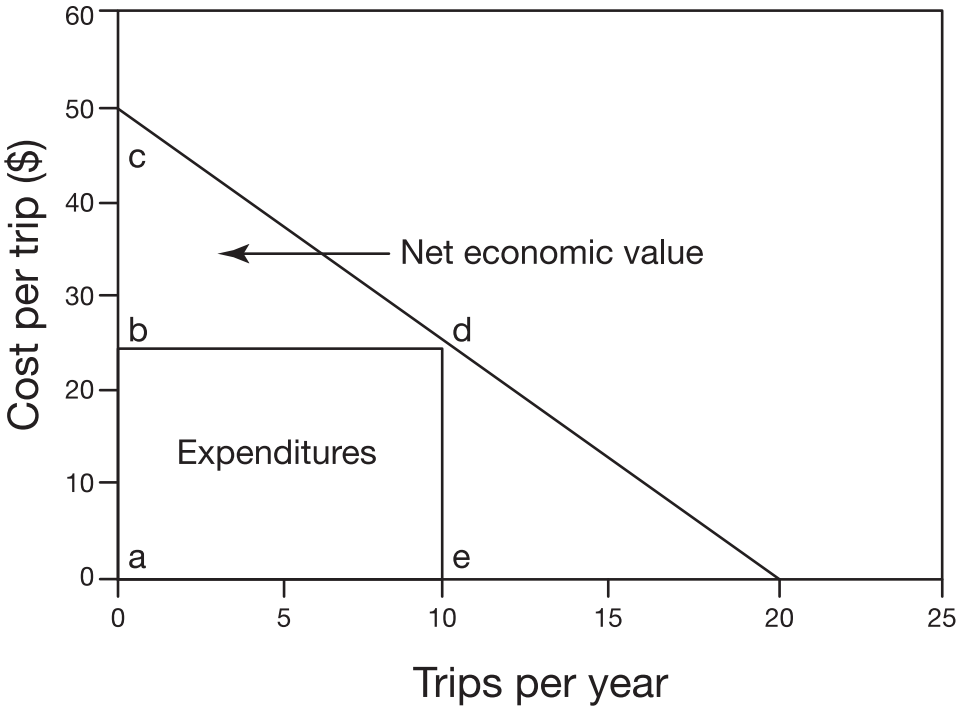

Figure 14.2. Individual angler's demand curve for fishing trips (adapted from Boyle et al. [1998]). The curve represents marginal or additional willingness to pay per trip and indicates that each additional trip is valued less by the angler than the preceding trip. The difference between what the angler is willing to pay and what is actually paid is net economic value.

take 10 trips, with a total WTP of $375 (area a-c-d-e). Total WTP is the total value the angler places on participation. The angler will not take more than 10 trips because the cost per trip ($25) exceeds what they would pay for an additional trip. For each trip between 0 and 10, however, the angler would actually have been willing to pay more than $25 (i.e., the demand curve, showing marginal WTP, lies above $25; Boyle et al. 1998).

The difference between what the angler is willing to pay and what is actually paid is net economic value. In this simple example, net economic value is $125 ([$50 − $25] × 10 ÷ 2; i.e., area of triangle b-c-d in Figure 14.2) and angler expenditures are $250 ($25 × 10; area of rectangle a-b-d-e in Figure 14.2). Thus, the angler's total WTP is composed of net economic value and total expenditures. Net economic value is simply total WTP minus expenditures.

The relationship between net economic value and expenditures is the basis for asserting that net economic value is an appropriate measure of the benefit an individual derives from participation in an activity and that expenditures are not the appropriate benefit measure. Expenditures are out-of-pocket expenses on items an angler purchases in order to fish. The remaining value, net WTP (net economic value), is the economic measure of an individual's satisfaction after all costs of participation have been paid. Summing the net economic values of all individuals who participate in recreational fishing derives the value to society. For our example, let us assume that there are 100 anglers who fish at a particular reservoir and all have demand curves identical to that of our typical angler presented in Figure 14.2. The total value per year of this reservoir to society is $12,500 ($125 × 100; Boyle et al. 1998).

Data for estimating net economic values are expensive to collect, challenging to analyze, and difficult to put into useful form for management decisions; they also present difficulties when trying to make convincing arguments as to their validity. Numerous methodologies (i.e., travel cost method, hedonic pricing method, and contingent valuation method [CVM]) can be used to estimate net economic values to achieve a common ground for comparison with market values, but it is not our intent to discuss these methodologies in-depth. A brief description of the CVM follows as this is the methodology that is used by the U.S. Fish and Wildlife Service (FWS) and is increasingly being used by fisheries economists to determine angler WTP. For a thorough discussion of economic valuation techniques, the reader is referred to Weithman (1999) and Haab and McConnell (2002).

The CVM has become a commonly-used tool for valuing natural resources (e.g., aquatic habitats and air and water quality) and other public goods not traded in the marketplace (e.g., recreation activities; Loomis and Walsh 1997; Groothuis 2005; Oh 2005). The CVM has primarily been directed toward the benefit–cost analyses of public goods such as recreation and has been defined as any approach to valuation that relies upon individual responses to contingent circumstances in an artificially-structured market. It typically uses a bidding approach (Swanson and Loomis 1996). The CVM uses simulated markets in an interview process to estimate WTP. The resource to be valued is often described orally with possible on-site inspections or it is presented through the use of self-administered mail surveys, with descriptions, photographs, or drawings to describe changes in characteristics like water, fishing, or habitat quality (Klemperer 1996). In CVM, a sample of the affected population is asked about their WTP contingent on hypothetical changes in existing environmental qualities, settings, or recreational opportunities. Alternatively, as per the previous discussion, CVM questions can be directed to the maximum amount a respondent is willing to pay to experience a resource or recreational fishing opportunity. While these formats are tailored to open-ended questions, closed-ended questions can also be formulated in this process. Regardless, a key assumption in the CVM is that consumers are able and willing to answer such questions truthfully and they have the knowledge to do so accurately. Studies done to test the validity of CVM research found this method to be a reasonable approach to valuation, particularly in the area of natural resources (Loomis and Walsh 1997).

In addition to WTP for recreational fishing opportunities, fisheries management agencies have also used CVM to make management assessments on license fees (Enck et al. 2000). Generally, license fees have been kept low and have not increased at the same rate as the cost of living (Sutton et al. 2001). With the current erosion of fishing and hunting participation across the USA (Mehmood et al. 2003; Miller and Vaske 2003), agencies have been forced to increase license fees or introduce new fees to maintain the current levels of management, programs, and funding. However, increasing license fees or introducing new fees can have negative effects on fish and wildlife agencies in the long run by decreasing participant satisfaction or causing them to drop the activity (Sutton et al. 2001). Sutton et al. (2001) used the CVM to determine angler WTP for license fees at a fishery near Fort Hood, Texas, and to assess how prices could be set to "reduce access," "maximize profits," or "maximize access." The study should be reviewed for a more thorough description. However, Box 14.2 shows a hypothetical example of angler WTP for increases to a reservoir fishing permit. With participation rates decreasing, the box illustrates how results of a CVM question can be used to keep loss of anglers to a minimum while achieving funding goals rather than to maximize revenues.

Box 14.2. Economic Analysis to Set License Fee Increases to Meet Increased Management Costs and Maximize Angler Retention

Imagine you work at a lake where about 26,500 anglers purchase an annual fishing permit for $10.00. This permit covers your salary, a technician's salary, and management costs. For a couple of years, everything is going well and anglers are happy with their fishing and the facilities. After a few years, however, you have witnessed the influx of exotic vegetation and your facilities and boat ramps are in dire need of repair. You need more money for the removal of the vegetation and building materials for facility repair. Your only way to increase revenue is to increase the cost of the fishing permit, but at the same time you do not want to lose a lot of anglers. To accomplish this, you need to determine what price increase will satisfy your need for revenue while minimizing attrition. From a contingent valuation method question you asked in a survey of a sample of anglers using the lake, the logistic regression analysis determined that the median willingness to pay for a permit increase was around $20. Increasing the permit fee to $30 would result in over $250,000 in added revenue, more than enough for your management needs, but at this cost, you would lose 13,250 (i.e., half) the anglers and probably would not win you much favor in the local community. Because you really need only $150,000 for your activities, the prudent thing to do is to determine where the total revenue increase needed (i.e., management costs) intersects the total revenue curve (illustrated by the circle in the figure below) and drop down to the demand curve. Drawing a straight line to the permit cost increase indicates a permit price increase of roughly $8.00 meets your revenue needs and minimizes attrition by only a few thousand anglers.

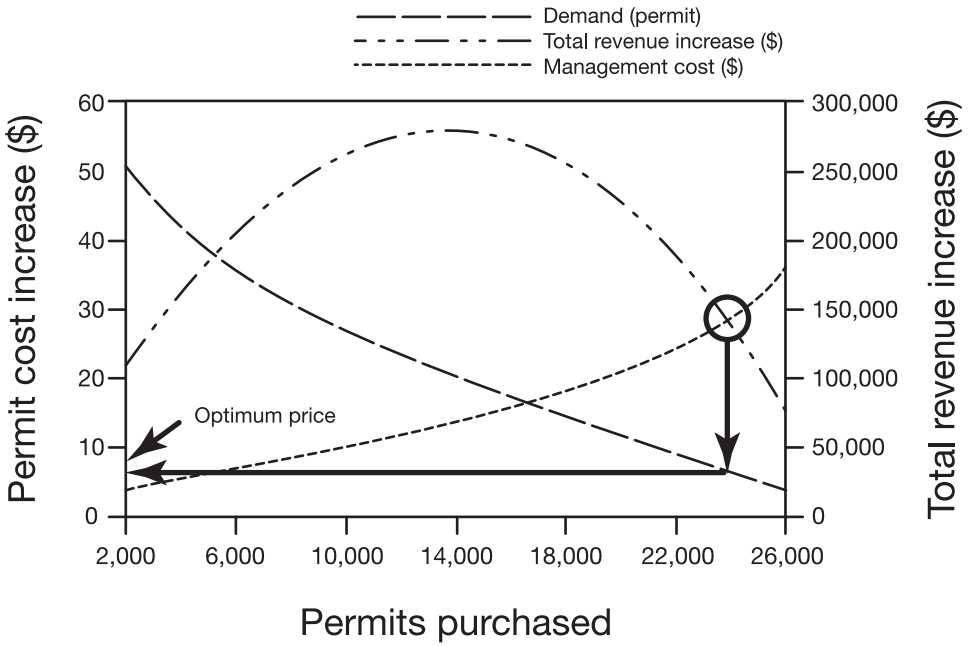

Figure. A graphical demonstration of how to use willingness to pay for increases to a $10 permit to set permit fees at an optimum price. An optimum price maximizes participation while producing sufficient revenues to meet management costs.

14.2.5 Levels of Analysis in Human Dimensions Studies

Evaluation is a key component of the fisheries management process (Krueger and Decker 1999). Most social and economic research starts in an effort to inform, evaluate, and provide a sound scientific basis for broad policies and goals for fisheries management. Many fisheries management objectives focus on human-related outcomes (e.g., number of angler-hours, measures of angler satisfaction, angler approval, or generation of economic impacts), requiring social and economic information to determine if the objective has been met. If objectives for managing a fishery have not been met, human dimensions information may help a manager understand why the objectives were not met. In developing and evaluating management plans, human dimensions information can help inform whether the objectives from the current management cycle are appropriate to continue in the next management cycle or whether modifications or further discussion about the reasons for specific objectives may be necessary.

Social and economic evaluations are often progressive endeavors with many fisheries management agencies. Regardless of the methodology chosen to collect social and economic information, formalized social and economic studies of anglers usually begin at the national level and then evolve to state- or province-wide, species, and resource level studies.

14.2.5.1 National level

The national survey of hunting, fishing, and wildlife-associated recreation conducted every 5 years since 1955 by the FWS (USDI 2007) often is the basis of U.S. management agencies' understanding of their angler populations. Fisheries and Oceans Canada (2007) has conducted a survey of recreational fishing in Canada since 1995. The FWS study is funded by Federal Aid in Sport Fish Restoration Program monies that are removed prior to distribution to the states because all states benefit from the information. The national survey focuses on all participants in fishing and not just licensed anglers. This study gives a broad view of each state's angler population (in-state and out-of-state), their fishing participation patterns, species preferences, and expenditure levels. Similar province-wide information is generated from the Canadian study. Some states and provinces rely solely on the information available in these reports and public hearings for their social and economic information needs. However, many states and provinces use this information as a starting point and embark on more in-depth state or provincial level studies for more precise estimates about their licensed anglers and other human dimensions information not collected in national studies (Wilde et al. 1996).

14.2.5.2 State- or province-wide level

State- or province-wide licensed angler studies are designed to give a broad view of the respective jurisdiction's licensed fishing population. These surveys are conducted annually by some states or provinces or in 3- or 5-year intervals (Wilde et al. 1996). Statewide surveys gather information in a variety of areas: demographics, use patterns, preferred species, participation in clubs and tournaments, reasons for fishing, and attitudes about fish, fisheries resources, and general management tools (e.g., support for the idea of stocking and bag limits). This information provides a rationale for current fisheries policy and management goals and guides their future modification. For example, statewide angler surveys reveal species

preferences and species sought by licensed freshwater anglers in a particular state. Identification of preferred species identifies to agencies which species their management efforts should target. For example, if survey results show that over 60% of all angler-days are targeted at largemouth bass in reservoirs, these results reaffirm to decision-makers that freshwater recreational fisheries management should primarily focus on largemouth bass and that one of the primary management goals should be to provide satisfying largemouth bass fishing experiences in reservoirs.

14.2.5.3 Species level

State- or province-wide surveys are designed to examine fishing activity in general, thus they offer little insight into the fishing behavior of anglers seeking a particular species. Because some agencies are interested in learning more about fishing in the state or province for a particular species (e.g., smallmouth bass), angler responses to species preference questions create a list of species-specific anglers with whom to follow up about their fishing behavior. Since the anglers in state- or province-wide angler surveys are randomly selected from license files, this group can adequately represent smallmouth bass anglers in those areas as well. Currently, in the absence of specific tags or licenses for a specific fish, this is often the most cost-effective way to identify anglers fishing for a particular species for survey research purposes. However, many U.S. states require specific species licenses (e.g., trout stamps, hand-fishing permits, or paddlefish snagging permits), so random sampling of license holders from the databases associated with these licenses is possible.

While the information from state- or province-wide surveys helps justify and guide policies and goals, species level studies shape management plans or can provide economic impact and valuation for a particular species. A smallmouth bass angler study, for example, allows decision makers to determine the popularity of customized smallmouth bass fishing regulations versus uniform state- or province-wide regulations, which of the various management alternatives are most palatable to anglers in particular areas of those boundaries, and how expenditure levels may vary under customized regulations. This type of information is needed to guide a management approach based on providing diverse opportunities not only to anglers and local businesses but also to law enforcement administrators. Law enforcement becomes a more difficult task under a system with customized regulations for each reservoir or stretch of river. Amid this concern, feedback from species level surveys gives decision makers a better idea of the right mix of regulations needed on water bodies throughout the state or province and where they should be implemented to match angler distribution and preference.

14.2.5.4 Resource level

Resource level studies are directed at those anglers who use a particular resource (e.g., lake, reservoir, stream, or stretch of river). They obtain information about fishing success at that resource, attitudes toward its management and issues of local concern, expenditure levels, and degree of support for possible management alternatives. Resource level angler studies usually are conducted as follow-ups of anglers intercepted during creel surveys designed to estimate fish catch and fishing effort. These are called “add-on” surveys in human dimensions research (Pollock et al. 1994). Resource level studies provide a multitude of benefits to fisheries administrators and managers. They evaluate management goals and objectives, equip local

managers with the information they need to become more effective, and provide feedback to improve fishing experiences.

Resource level studies allow administrators to determine whether diverse products are indeed attracting the expected clientele and expected economic consequences. They also give local fisheries managers information they need to be more effective. First, they quantify some of the anecdotal information managers receive through observation and daily interactions, making managers more informed when dealing with the public. Second, information from volunteered comments calls attention to potential problems and is useful because managers can relate to issues and locations mentioned and can investigate. Making changes based on feedback from anglers is extremely important for the agency and local managers because it demonstrates that the agency is attempting to be responsive. This enhances credibility of agencies, increases the legitimacy of management decisions and actions, builds public trust with the agency and managers, and translates into more satisfying fishing experiences.

14.3 CONCLUSIONS

Regardless of the level at which social and economic assessments are conducted in fisheries management, this chapter has hopefully enlightened the reader in their uses and importance in inland fisheries assessments. Nevertheless, the use of social and economic information is still in its infancy. The fisheries profession has long relied on traditional father-son socialization processes to create new customers, and communication by word of mouth and the fishing tackle and outdoor media industry to guide anglers to desired resources. Until recently, there has not been much collaboration between marketing and fisheries departments within natural resource agencies. However, amid high turnover in the fishing public and stagnant or declining rates of participation throughout the USA and Canada, fisheries and marketing departments are realizing they must team up so they can compete with other recreational providers for the public's leisure time. With social and economic data becoming more prevalent, valuable information is available for marketing strategies to guide anglers to desired resources and (or) to market products to targeted clientele. Guiding and attracting anglers to desired resources will create more satisfying fishing trips. In turn, this will aid in retaining anglers in the activity. Although it will take some time for social and economic information to be fully incorporated into fisheries management programs, efforts are underway to integrate social and economic information better into the decision-making process of fisheries agencies.

14.4 REFERENCES

Aas, O., W. Haider, and L. Hunt. 2000. Angler responses to harvest regulations in Engerdal, Norway: a conjoint-based choice modeling approach. North American Journal of Fisheries Management 20:940–950.

Aiken, R., and G. Pullis La Rouche. 2003. Net economic values for wildlife-related recreation in 2001: addendum to the 2001 national survey of fishing, hunting, and wildlife-associated recreation. U.S. Fish and Wildlife Service, Report 2001–3, Washington, D.C.

Arlinghaus, R. 2006. On the apparently striking disconnect between motivation and satisfaction in recreational fishing: the case of catch orientation of German anglers. North American Journal of Fisheries Management 26:592–605.

Bates, D. G., and E. M. Fratkin. 2002. Cultural anthropology, 3rd edition. Allyn and Bacon, New York.

Bohnsack, B. L., and R. J. Sousa. 2000. Sport fish restoration: a conservation funding success story. Fisheries 25(7):54–56.

Boyle, K. J., B. Roach, and D. J. Waddington. 1998. 1996 net economic values for bass, trout, and walleye fishing, deer, elk and moose hunting, and wildlife watching. Addendum to the 1996 national survey of fishing, hunting, and wildlife-associated recreation. U.S. Fish and Wildlife Service, Report 96-2, Washington, D.C.

Brown, T. L. 1987. Typology of human dimensions information needed for Great Lakes sport-fisheries management. Transactions of the American Fisheries Society 116:320–324.

Brunke, K. D., and K. M. Hunt. 2007. Comparison of two approaches for the measurement of waterfowl hunter satisfaction. Human Dimensions of Wildlife 12:1–15.

Bultena, G., and M. J. Taves. 1961. Changing wilderness images and forest policy. Journal of Forestry 59:167–171.

Burger, J. 2000. Consumption advisories and compliance: the fishing public and the deamplification of risk. Journal of Environmental Planning and Management 43:471–488.

Burger, L. W., D. A. Miller, and R. L. Southwick. 1999. Economic impact of northern bobwhite hunting in the southeastern United States. Wildlife Society Bulletin 27:1010–1018.

Davis L. S., K. N. Johnson, P. Bettinger, and T .E. Howard. 2001. Forest management, 4th edition. McGraw-Hill, New York.

Decker, D. J., T. L. Brown, and W. F. Siemer. 2001. Human dimensions of wildlife management in North America. The Wildlife Society, Bethesda, Maryland.

Ditton, R. B. 1997. Choosing our words more carefully. Fisheries 4(10):4.

Ditton, R. B. 2004. Human dimensions of fisheries. Pages 199–208 *in* M. J. Manfredo, J. J. Vaske, B. L. Bruyere, D. R. Field, and P. J. Brown, editors. Society and natural resources: a summary of knowledge prepared for the 10th international symposium on society and resource management. Modern Litho, Jefferson City, Missouri.

Enck, J. W., D. J. Decker, and T. L. Brown. 2000. Status of hunter recruitment and retention in the United States. Wildlife Society Bulletin 28:817–824.

Fedler, A. J., and R. D. Ditton. 1994. Understanding angler motivations in fisheries management. Fisheries 19(4):6–13.

Fisheries and Oceans Canada. 2007. Survey of recreational fishing in Canada 2005. Fisheries and Oceans Canada, Economic Analysis and Statistics Policy Sector, Ottawa.

Gillis, K. S., and R. B. Ditton. 2002. A conjoint analysis of the U.S. Atlantic billfish fishery management alternatives. North American Journal of Fisheries Management 22:1218–1228.

Grado, S. C., R. M. Kaminski, I. A. Munn, and T. A. Tullos. 2001. Economic impacts of waterfowl hunting on public lands and at private lodges in the Mississippi Delta. Wildlife Society Bulletin 29:846–855.

Groothuis, P. A. 2005. Benefit transfer: a comparison of approaches. Growth and Change 36:551–564.

Haab, T., and K. McConnell. 2002. Valuing environmental and natural resources: the econometrics of nonmarket valuation. Edward Elgar, North Hampton, Massachusetts.

Hunt, K. M., and R. B. Ditton. 2001. Perceived benefits of recreational fishing to Hispanic-American and Anglo anglers. Human Dimensions of Wildlife 6:153–172.

Hunt, K. M., and R. B. Ditton. 2002. Freshwater fishing participation patterns of racial and ethnic groups in Texas. North American Journal of Fisheries Management 22:52–65.

Hunt, K. M., M. F. Floyd, and R. B. Ditton. 2007. African-American and Anglo anglers' attitudes toward the catch-related aspects of fishing. Human Dimensions of Wildlife 12:227–239.

Johnson, R. L., and E. Moore. 1993. Tourism impact estimation. Annals of Tourism Research 20:279–288.

Klemperer, W. D. 1996. Forest resource economics and finance. McGraw-Hill, New York.

Knuth, B. A., T. L. Brown, and K. M. Hunt. In press. Measuring the human dimensions of recreational

fisheries. *In* A. V. Zale, D. L. Parrish, and T. M. Sutton, editors. Fisheries techniques, 3rd edition. American Fisheries Society, Bethesda, Maryland.

Krueger, C. C., and D. J. Decker. 1999. The process of fisheries management. Pages 31–59 *in* C. C. Kohler and W. A. Hubert, editors. Inland fisheries management in North America, 2nd edition. American Fisheries Society, Bethesda, Maryland.

Loomis J. B., and R. G. Walsh. 1997. Recreation economic decisions: comparing benefits and costs, 2nd edition. Venture Publishing, State College, Pennsylvania.

Loomis, J. B., and D. S. White. 1996. Economic values of increasingly rare and endangered fish. Fisheries 21(11):6–11.

Louviere, J. J., and H. Timmermans. 1990. Stated preference and choice models applied to recreation research: a review. Leisure Sciences 12:9–12.

Mehmood, S., D. Zhang, and J. Armstrong. 2003. Factors associated with declining hunting license sales in Alabama. Human Dimensions of Wildlife 8:243–262.

Miller, C. A., and J. J. Vaske. 2003. Individual and situational influences on declining hunter effort in Illinois. Human Dimensions of Wildlife 8:263–276.

Murdock, S. H., D. K. Loomis, R. B. Ditton, and M. N. Hoque. 1996. The implications of demographic change for recreational fisheries management in the United States. Human Dimensions of Wildlife 1:14–37.

Muth, R. M., D. A. Hamilton, J. F. Ogden, D. J. Witter, M. E. Mather, and J. J. Daigle. 1998. The future of wildlife and fisheries policy and management: assessing the attitudes and values of wildlife and fisheries professionals. Transactions of the North American Wildlife and Natural Resources Conference 63:604–627.

Oh, C. O. 2005. Understanding differences in nonmarket valuation by angler specialization level. Leisure Sciences 27:263–277.

Oh, C. O., R. B. Ditton, , B. Genter, and R. Riechers. 2006. A stated discrete choice approach to understanding angler preferences for management options. Human Dimensions of Wildlife 10:173–186.

Olson, D., and S. Lindall. 2000. IMPLAN professional, 2nd edition. Minnesota IMPLAN Group, Stillwater.

Pollock, K. H., C. M. Jones, and T. L. Brown. 1994. Angler survey methods and their applications in fisheries management. American Fisheries Society, Special Publication 25, Bethesda, Maryland.

Simcox, D. E. 1993. Cultural foundations for leisure preferences, behavior, and environmental orientation. Pages 267–280 *in* A.W. Ewert, D. Chavez, and A. W. Magill, editors. Culture, conflict, and communication in the wildland–urban interface. Westview Press, Boulder, Colorado.

Simoes, J. C. 2009. Recreational angler surveys: their role and importance national and the 2008 Michigan angler survey. Master's thesis, Michigan State University, East Lansing.

Steinback, S. R. 1999. Regional economic impact assessments of recreational fisheries: an application of the IMPLAN modeling system to marine party and charter boat fishing in Maine. North American Journal of Fisheries Management 19:724–736.

Strouse, K.G. 1999. Marketing telecommunications services: new approaches for a changing environment. Artech House, Norwood, Massachusetts.

Southwick Associates. 2002. Sportifishing in America: values of our traditional pastime. Produced for the American Sportfishing Association with funding from the Multistate Conservation Grant Program, Alexandria, Virginia.

Southwick Associates. 2007. Sportfishing in America: an economic engine and conservation powerhouse. Produced for the American Sportfishing Association with funding from the Multistate Conservation Grant Program, Alexandria, Virginia.

Sutton, S. G., J. R. Stoll, and R. B. Ditton. 2001. Understanding anglers' willingness to pay increased fishing license fees. Human Dimensions of Wildlife 6:115–130.

Swanson, C. S., and J. B. Loomis. 1996. Role of nonmarket economic values in benefit–cost analysis of public forest management options. U.S. Department of Agriculture, Forest Service,

Pacific Northwest Research Station, General Technical Report PNW-GTR- 361, Portland, Oregon.

Teel T. L, M. J. Manfredo, and H. M. Stinchfield. 2007. The need and theoretical basis for exploring wildlife value orientations cross-culturally. Human Dimensions of Wildlife 12:297–305.

Toth, J. F., and R. B. Brown. 1997. Racial and gender meanings of why people participate in recreational fishing. Leisure Sciences 19:129–146.

USDI (U.S. Department of the Interior). 2007. 2006 national survey of fishing, hunting, and wildlife-associated recreation. U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, Census Bureau, Washington, D.C.

Weithman, S. A. 1999. Socioeconomic benefits of fisheries. Pages 193–213 *in* C. C. Kohler and W. A. Hubert, editors. Inland fisheries management in North America, 2nd edition. American Fisheries Society, Bethesda, Maryland.

Wilde, G. R., R. B. Ditton, S. R. Grimes, and R. K Riechers. 1996. Status of human dimensions surveys sponsored by state and provincial fisheries management agencies in North America. Fisheries 21(11):12–23.