AQUARIUM FISHERIES MANAGEMENT IN WEST HAWAII: A DYNAMIC CONFLICT

By
CLAUDIA ANGELA CAPITINI

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The members of the Committee appointed to examine the thesis of Claudia Angela Capitini find it satisfactory and recommend that it be accepted.

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Chair

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Abstract

by Claudia Angela Capitini
Washington State University
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Chair: Brian Tissot

Aquarium collecting in Hawaii has been the subject of controversy for 50 years. The conflict evolved from struggles among user groups over resource access and conservation. This article explores the dynamic nature of the conflict in West Hawaii by examining the dispute in the context of the legislative framework in Hawaii, the different values and interests and values involved, and the role of science. EDR processes offer an alternative to traditional legislative processes, whether consensus based or not. EDR also allows for a tailored approach to interest-based, identity-based, and interest-/identity-based conflicts, which all have different resolution goals. West Hawaii's Fishery Replacement Area conflict was originally framed as an interest-based dispute, although it includes aspects that are clearly identity-based. The uncertainty in coral reef and fisheries management and the science behind access and harvest adds additional complexity to consensus processes. This conflict resolution process occurred within a limited legislative framework and was steered by scientific interests. A facilitator might employ steps such as reframing the issues to reveal respective and shared needs, encouraging positive contact between stakeholders, and incorporating aspects of identity-based approaches into the situation in West Hawaii.

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CHAPTER ONE

INTRODUCTION

Coral reefs are the largest biological constructions on Earth; they are systems involving complex interactions between physical, chemical, biological, and geological factors over a range of spatial and temporal scales (Viles and Spencer 1995). Reefs create and optimize their own environments through the concerted efforts of several simple organisms, and, consequently, are the focal points of relatively high gross primary productivity in the ocean (Viles and Spencer 1995). Reef species have been harvested for centuries, but the advent of aquaria for research, tourism, zoos, and aesthetics has encouraged a new form of highly selective reef exploitation. Coral reef diversity has supplied the tropical aquarium business in a largely unregulated manner in recent years, and this, in addition to the increasing demands of fisheries and human populations, has contributed to the decline and mismanagement of marine resources worldwide (Chiappone and Sealey 2000, Tissot et al. 2002).

Coral reefs face threats from a number of sources, many of which produce synergistic effects and originate from non-point sources. Marine reserves serve as one method for preventing overexploitation, and while problems of water quality, exotic invasion, and rising ocean temperature require multidisciplinary conservation tactics, reserves afford some protection for highly fished species (Allison et al.1998, Simberloff 2000). Marine reserves have become a highly advocated form of marine conservation because they provide an absolute refuge for species, hopefully encouraging natural mortality to control populations rather than harvest-induced morality (Allison et al.

1998). Unfortunately, the nature of marine ecosystems does not allow for simple transposition of theories such as island biogeography, SLOSS, source-sink, patch dynamics, or metapopulation from the terrestrial realm (Allison et al. 1998, Simberloff 2000). Marine populations do not necessarily mimic those of terrestrial populations, forcing managers to be flexible, adaptable, and educated. Additionally, human access to underwater systems for monitoring and enforcement suffers technological limitations that are not usually evident in terrestrial systems.

Adding human dimension to marine ecosystems complicates marine reserves much further, but at the same time lends some hope to a dire situation (Sorokin 1993). Properly defined goals and an understanding of the nature of exploitation in an area can lend valuable insight into the management of a marine reserve (Allison et al. 1998, Carr and Reed, 1993, Fogarty and Murawski 1998). Fogarty and Murawski (1998) state that establishing realistic management and monitoring goals are essential to effective population assessment and then adaptive management. Dayton et al. (2000), Chiappone and Sealey (2000), and Allison et al. (1998) agree that the extent and nature of enforcement and compliance is tantamount to successful reserves because even relatively moderate levels of poaching can rapidly deplete the gains achieved by closure. Fisheries science as a field recognizes the need for successful human dimensions for marine reserves, but sociology provides an approach whereby conflicts that impede management can be resolved.

West Hawaii

In the United States, 80% of the coral reef resources are found in Hawaii (Wood 2001). As with many coral reefs, overexploitation is a problem in the Hawaiian reef system. *Z. flavescens,* valued for their bright yellow color, aggregate into schools in the Hawaiian islands, a rare occurrence, and they are important herbivores in Hawaii's coral reefs. A decline in the number of reef species including *Z. flavescens* has been reported by the Division of Fish and Wildlife as early as 1973, although local residents had noticed reductions prior to that date. With over 700,000 live individuals taken annually in addition to subsistence uses, they are among the most popular and highly exploited aquarium species (Wood 2001).

The number of local aquarium collecting permits has increased, and the recreational dive tour industry along the West Hawaii coastline has expanded. A conflict between the aquarium collecting community and the recreational dive industry in West Hawaii arose over access to reefs with abundant colorful species *like Z. flavescens*. A monitoring project is in place to examine the reef resources in greater detail.

Pressure to institute preventative conservation measures as recommended by the IUCN led the Hawaii Department of Aquatic Resources (DAR) to initiate a community-based management system to establish and manage reserves for threatened species. The State of Hawaii created the West Hawaii Regional Fishery Management Area located on the western shore of Hawaii's Big Island in response to dwindling stocks of aquarium fish species including *Z. flavescens*. A 24-member Council was established in 1998 through invitation and volunteer interest, and through their impetus, nine reserves were legally established to protect aquarium fish species along Hawaii's west shore.

Monitoring of aquarium species over several years is required to evaluate the efficacy of reserves, but early data has already revealed an increase in abundance in these protected areas (Tissot et al. 2002).

EDR Thesis

It is through my study of marine conservation and reserve design that I came across alternative environmental dispute resolution, or EDR, as it can be applied to management situations that suffer internal, disruptive conflicts. After understanding the complexities of organismal dispersal, reproduction, population dynamics, harvest, and management, the overriding importance of the human dimension in ecology became distinctly apparent. Humans are responsible for most environmental impacts and suffer the consequences of mismanagement or abuse on a variety of levels. These consequences can be the source of multi-party conflicts over natural resources. Alternative EDR is a growing field where the psychology and behavior of conflicting interest groups is recognized and developed into more progressive, self-generated conservation tactics that preserve personal goals. It provides a developed system that ultimately may enhance conservation approaches in densely populated areas.

Having been introduced to EDR, I chose an analysis of the conflict resolution process in West Hawaii for my thesis. Community-based marine management and its history in West Hawaii provide an interesting example of a successful approach to an over-utilization conflict regarding aquarium fish reserves. My interest in the Council focused on the nature of the conflict itself and how the resulting lack of enforcement provisions in the final marine reserve ruling may have been included had the nature of

conflict been examined theoretically initially. The well-documented EDR process provided an opportunity to evaluate the process itself to understand why the process suffered these small, but consequential omissions.

REFERENCES

Allison, G., Lubchenco, J., and M. Carr. 1998. Marine reserves are necessary but not sufficient for marine conservation. Ecological Applications 8(1): S75-S92.

Carr, M., and D. Reed. 1993. Conceptual issues relevant to marine harvest refuges: examples from temperate reef fishes. Canadian Journal of Fisheries and Aquatic Science 50: 2019-2028.

Chiappone, M., and K. Sealey. 2000. Marine reserve design criteria and measures of success: lessons learned from the Exuma Cays Land and Sea Park, Bahamas. Bulletin of Marine Science 66(3): 691-705.

Dayton, P, Thrush S., Sala, E., and M. Tegner . 2000. Marine reserves: parks, baselines, and fishery enhancement. Bulletin of Marine Science 66(3): 617-634.

Fogarty, M., and S. Murawski. 1998. Large-scale disturbance and the structure of marine systems: fishery impacts on Georges Bank. Ecological Applications 8(1): S6-S22.

Simberloff, D. 2000. No reserve is an island: marine reserves and non-indigenous species. Bulletin of Marine Science 66(3): 576-580.

Sorokin, Y. 1993. Coral reef ecology. Springer-Verlag. Berlin, Germany.

Tissot, B., Walsh, W., and L. Hallacher. 2002. The effectiveness of marine protected area and the impacts of aquarium fish collecting in Hawai'i. Technical Report.

Viles H., and T. Spencer. 1995. Coastal problems; geomorphology, ecology, and society at the coast. Hodder Headline, PLC. London, England.

Wood, E. 2001. Collection of coral reef fish for aquaria: global trade, conservation issues and management strategies. Marine Conservation Society.

CHAPTER TWO

AQUARIUM COLLECTING IN WEST HAWAII: A DYNAMIC CONFLICT

Aquarium fish collecting in Hawaii has been the subject of controversy particularly on the western side of the Island of Hawaii, where the abundant coral reefs have supplied the aquarium industry for 50 years. Competition exists for reef access between an increasing number of aquarium fish collectors and recreational dive tour operators. Much of the West Hawaii community depends upon revenue generated from tourism, and, while a proportionately lower number rely on aquarium collecting profits, these gains are substantial and have a total annul export value of up to US $300,000 (Wood 2001). Conservation and beneficial management strategies are important to a growing population in the community. Disputes over reef access for an increasing population of user groups have developed into an environmental conflict where community members have employed alternative environmental dispute resolution (EDR) tactics to manage the situation. This case study presents an example of an environmental conflict where the nature of the conflict itself is an amalgamation of two distinct types of conflict, values-based and interest-based conflict, and the resolution process is one that demonstrates substantial success in many ways, yet contains several unresolved components.

The conflict evolved from struggles among user groups over resource access and conservation. For the past 25 years, the Hawaii Division of Aquatic Resources (DAR) has largely ignored public concerns regarding the expansion of the aquarium collection

industry, blaming the lack of a definitive study on perceived impacts (Tissot 1999, Walsh 1999). In recent years, state agencies have prescribed the use of measures such as cooperation, consensus, participation, and collaboration to enhance the efficiency and effectiveness of their policies (Cleaver 1999). The case of West Hawaii is one where such state prescribed community-based management stimulated the development of an EDR process by local DAR managers. The process was conceived, developed, and implemented locally and has become and example of an EDR process that both attempted to resolve community conflict and establish resource management in the form of marine reserves.

Environmental conflicts are renowned for complexity that stems from the combination of biological complexity and uncertainty, multiple parties, multiple issues, unique values and worldviews, scientific and traditional knowledge, and legal requirements (Daniels and Walker 2001). Difficulties arise when attempting to manage a resource like reef fisheries that also contain a high degree of uncertainty and are utilized to varying extents by numerous community groups. Reefs face large-scale environmental threats, like global warming, which are relatively new to management. Additionally, human pressure on marine fisheries is increasingly more prominent. The management of small-scale coastal fisheries requires a thorough understanding of the fishers, their values, culture, resource attributes, and governing institutions together with the overall environment in which the fishers operate (Pomeroy 1994).

Legislative systems generally are ill-equipped to deal with the inherent complexity and unpredictability of biological systems and their interactions with different human cultures (Sneddon et al. 2002), as the dynamics of human and biological

interactions often can not be incorporated into the hierarchic confines of legal systems. Disputes can change in scope and nature over time, compromising resolution measures that fail to concurrently evolve. In addition, a working appreciation for the specific type of conflict and the values associated with each user group is essential to designing an approach to manage or remedy it.

This article explores the dynamic nature of the conflict and the resolution process behind the establishment of West Hawaii's Fishery Replenishment Areas (FRAs), areas that are designed to ultimately protect aquarium species and reduce conflict among user groups. Using the West Hawaii case study, I will examine the role of science as both a values-based and interest-based component of the conflict. I argue that the DAR developed a sound EDR process, but one that had a large emphasis on scientific values, rather than community values. The agreement suffered procedural complications as it proceeded from the community level to the state level. As a result, the purpose of this paper is to describe where the shortcomings lie and provide avenues for improvement.

To examine this topic, this paper is divided into several sections. First, we describe the rational for the use of EDR to resolve issues within a community-based management protocol. We define 'consensus' and compare EDR to traditional legislative processes. Second, we explore three types of conflict, and then more specifically, the role of science in conflict. Third, the complexity and conflict in a reef fishery setting such as West Hawaii is discussed, and West Hawaii's aquarium fishery management process is presented as a case study. The stakeholder process is described and group dynamics within the resolution process are explained to illustrate the nature of the

situation. Last, the West Hawaii case is examined with respect to important elements characterizing the dispute, and its enforcement.

Community-Based Management and EDR Use

Effective conservation and management requires dynamically incorporating ecology, political-economy and sociology into a management approach (Holling 1978, Michaelidou et al. 2002, Wilshusen et al. 2002). Community-based management has emerged as an apparent panacea whereby such amalgamation is seemingly simple, yet the absence of an established template has made the design, monitoring, and evaluation of such integrated projects challenging. Many of the hindrances to successful community-based management revolve around an insufficient strategy to dispel disputes and eventual controversies between and among users and managers. Many strategies exist within community-based management to include and involve the community. Specifically EDR can be used as a methodology for resolving or managing practical and inflammatory conflicts, often over environmental resources, and as such, it can theoretically fit into well-developed conservation plans.

Within a community-based management framework, EDR processes may manage or ameliorate a resource dispute (Daniels and Walker 2001), achieve sustainability and resolution (Cormick et al. 1996), reduce the shortcomings of previous unsuccessful administrative and legislative resource management initiatives (Pomeroy 1994), facilitate decision-making among stakeholders while fostering local stewardship (Deal and Hahn 1994), and integrate multidisciplinary aspects of resource use into an agreement or action (Colvin 2002). Mediation and other EDR processes often emphasize resolution through

compromise and participation, and have achieved some degree of settlement success since their emergence (Painter 1988, Bingham 1985). Environmental dispute resolution is useful for situations where complex conflicts prohibit rational management strategies, particularly when management requires a cooperative effort from community members for monitoring and implementation (Colvin 2002).

Although a paucity of empirical data exists to evaluate the success rates for EDR, the theoretical framework suggests it to a radically more comprehensive and compassionate approach to environmental conflicts (O'Leary 2001). If attention is given to the type of conflict, structure and process, parties, motivations, goals, timing, morals, values, power relationships, and facilitators, then EDR potentially becomes a tool within community-based management (O'Leary 2001). Disputes otherwise inhibiting the success of a community-based management plan can be managed and even possibly developed into solutions more dynamic than those originally intended (Cormick et al. 1996). In one study, Bingham (1985) found that 79% of all site-specific conflicts were able to reach decision, and of those, 80% were implemented as planned. The rational behind using EDR is that stakeholders are more satisfied with the decision and thus more likely to implement any agreement or action (Bingham 1985).

Consensus

Not all conflicts are resolvable, especially those that revolve around differing worldviews, values, or cultures, hence the importance of understanding the nature of the conflict prior to launching resolution measures. Perceived differences, frustrations, or threats over resource access, existential needs and values can all stimulate environmental

conflict between involved parties (Rothman 1997, Fiske 2001). It may be more realistic to develop an atmosphere where incompatible parties can accept and understand the fundamental values of each other before attempting to achieve agreement.

One of the most important components in many EDR processes is the idea of consensus, whether it is achieved or not. Consensus herein is defined as a "process in which all those who have a stake in the outcome aim to reach agreement on actions that resolve or advance issues related to environmental, social, and economic sustainability" (Cormick et al. 1996). Heralded as the basis for the evolution of collective action, consensus provides an efficient means of reducing enforcement effort while equalizing power in many types of conflict (Berkes 1989). In conflicts that surround differing values or cultures, consensus may never be attained, but in realizing this, a group may develop a far more tailored outcome that accommodates the inherent differences within their community.

EDR vs. Legislative Processes

Successful EDR often yields results not achievable through an administrative or legislative process, and theoretically, this superior procedure enhances the quality of the decision (Cormick et al. 1996). Legislative and administrative bodies have traditionally handled disputes over resource allocation using consultation-type approaches. Unfortunately, this method tends to exacerbate underlying conflicts, leaving the combatants frustrated in both interest- and values-based conflicts (Susskind and Ozawa 1985). According to Susskind and Ozawa (1985),

> *Successful mediated negotiation produces informed voluntary agreements by removing the artificial constraints imposed by standardized adjudicatory procedures . . . Mediators (and facilitators) . . . play a crucial role in ensuring that public disputes are not transformed into private settlements; they accomplish this by keeping channels of communication open and pressing the participants to keep the interests of the public-at-large in mind.*

Consideration of environmental situations and their interactions with human systems can lead to a questioning of values, interests, knowledge, and facets that transcend the bounds of policy and litigation.

Legislative approaches may disregard the relationships among all the resource stakeholders and even the basic causes of the environmental disputes. While generating a solution, it often reinforces perceived imbalances in power. Legislative and administrative solutions are constraining, lengthy, expensive, often inconclusive, and fail to incorporate indigenous knowledge and skills in management systems. This can result in the marginilization and loss of local rights for traditional users and overall unsatisfactorily deals with the real issues in dispute (Talbot 1983, Cormick et al. 1996, White et al. 1994, Bingham 1985).

One of the larger difficulties in evaluating the use of EDR compared to legislative processes is to ascertain and quantify successful and failed processes (O'Leary 2001). It should be noted that relatively little empirical evidence exists to broadly generalize the preference for EDR instead of legislative processes (O'Leary 2001); instead the communication concepts behind EDR and the potential that it provides for more progressive and comprehensive conflict resolution seems to account for the compelling arguments towards its use. Cultural and values-based conflicts especially may suffer

more from general legislative resolutions because many legal systems do not accommodate or necessarily reflect the values of the disputants.

Nature of Conflicts

Environmental dispute resolution not only serves as an arena for the amelioration of conflicts in addition to traditional legislative approaches, it allows for different types of conflict to be resolved. This tailored approach would logically seem to be superior to a legislative approach that may not have the capacity to address multiple issues. Conflicts can be differentiated by their nature. It should be noted that many conflicts contain several issues that are perceived differently among stakeholders; some issues may be fundamentally different than others in nature. We will describe three major types of conflict and how resolution differs between them.

Interest-based conflicts

Disputes over the allotment or distribution of concrete, usually observable interests and resources are considered interest-based or resource-based conflicts (Daniels and Walker 2001, Rothman 1997). For example, hunting or fishing access disputes can be characterized as interest-based as all participants can identify their interests with respect to the resource. The focus in an interest-based conflict is on discussing, realizing, and characterizing all the involved interests of participants rather than their positions (Deal and Hahn 1994). As such, interest-based conflict resolution is successful in conflicts where the nature of the dispute is readily definable. Interest-based conflict resolution helps parties generate creative resolutions to include non-conflicting interests,

more effective responses to emotional outbursts, acknowledgment of the underlying interests behind the outbursts, and encouragement to reach agreement (Deal and Hahn 1994).

Carpenter and Kennedy (1988), Deal and Hahn (1994) describe procedures that should be taken in interest-based conflict resolution to encourage dialogue between parties. Typically occurring in phases of pre-negotiation, negotiation, and implementation, these steps have been designed to encourage dialogue, mutual education, joint fact finding, generation of multiple options, consensus, and resolution criteria through the use of a facilitator (Deal and Hahn 1994). Each dispute is unique and the different phases of resolution may occur in a different manner and are somewhat dependent upon the constituents and facilitator. While this approach fosters a higher degree of communication among antagonistic participants, one of its major shortcomings is the reliance upon the facilitator to skillfully navigate through the prescribed phases of the process and manipulate the discussion to a meaningful result.

It is important to note that reliance on the group alone to resolve a multi-party environmental dispute can lead to a mischaracterization of the conflict. Indeed the interests of the participants can be easily identified, but careful research and even progress through early stages of conflict resolution can reveal any other interests that stem from underlying worldviews values. These may involve deeper issues than the identifiable or tangible interests thought to be the focus of conflict.

Values- or Identity-based conflicts

Not all conflicts are so easily definable. Some derive from long standing differences and concerns, psychology, culture, and threatened beliefs (Rothman 1997). Known as identity-based or values-based conflicts, these disputes are characterized by an unclear determination of their parameters and boundaries as they stem from deeper personal values (Rothman 1997). Identity-based conflicts can be "disagreements over what should be the determinants, criteria, bases, or priorities of a policy decision, a relationship or a conflicting issue" (Daniels and Walker 2001). These types of conflict are more complex and require skill and patience to remedy because fundamental values and views are not necessarily voiced or understood in many instances. Parties can be highly emotional and will not agree to outcomes that contradict their worldviews (Daniels and Walker 2001).

The identity-based issues need to be recognized at the onset of the EDR process for appropriate progress. Resolving an identity-based conflict using EDR processes geared for an interest-based conflict may only worsen the underlying issues and community divergence. Rothman (1994) states that negotiation and bargaining too early in a conflict process can exacerbate identity-based conflicts because the true conflict has not been uncovered and realized by all stakeholders.

It is important to note that conflicts that start primarily as interest-based, when ignored or poorly handled may evolve into identity-based conflicts; the longer a conflict continues, the more people connect their dignity and prestige with the dispute (Rothman 1997). A conflict may not necessarily originate as an identity-based conflict, making flexibility an important component of any EDR. One of the shortcomings with identity-based conflict resolution is that it is not necessarily designed for more than bilateral

disputes. Resolution depends heavily upon a facilitator, and requires a greater emphasis on uncovering and developing a comfortable environment in which communication can develop. Realization and acceptance of participant's underlying values can be a difficult group exercise, but important for implementation success as the resolution process unfolds.

Identity- and Interest-based conflicts

Because environmental conflicts are rarely simple, application of a model that includes aspects of both interest-based and identity-based EDR is useful. Schwarz (1994) describes an approach where the organizational context of the dispute includes both interest- and identity-based components. These conflicts are more complex and may include interest-based issues for some participants and identity-based issues from others. Not all participants necessarily attach values to the conflict, while others who do, may fear marginilization of their deeper values as the resolution process unfolds.

Resolution in this instance hinges on an identification, awareness, and communication of both the interest and identity-based issues within the controversy. As Schwarz (1994) suggests, working to include both interest- and identity-based components in a conflict can result in attaining difficult goals in EDR. A group 'culture' is developed that includes the values of valid information, free and informed choice, and internal commitment to support the group's structure, process, and increase its efficacy (Schwarz 1994). Creating such a 'culture' becomes one of the larger challenges to group process, but the inclusion of participant values introduces an element of greater depth into resolving conflicts that may hinge on such feelings. When the motivations of all the

participants are not shrouded by emotional fronts, their underlying values can be freely expressed and truly creative solutions generated.

Conflicts in Reef Fisheries

Identity-, interest-, and identity/interest-based environmental conflicts all deal with an understanding and involvement with the environment, resources, and biology of a particular area, especially in situations where scientific data and harvest practices are involved. To introduce West Hawaii's aquarium collecting conflict, I will first outline several unique aspects of coral reef resources, aquarium collecting and the role of science in EDR.

Reef Resources

Human situations are often seen as separate or external from ecosystems, but the goods and services provided by natural systems not only support human systems, they help define the overall capacity of culture, economy, and society (Berkes and Folke 1998, White et al. 1994, and Bingham 1985). Coral reefs are one such ecosystem. They hold immense intrinsic values in addition to providing food, revenue, medicines, coastal protection, recreational areas, support for the social fabric of coastal communities, and unique opportunities for research and education (Pomeroy 1994, White et al. 2002).

Perhaps most notably, the inherent complexity and unpredictability characteristic of coral reef ecosystems, particularly when associated with reef fisheries, contributes to controversies over access and managment. Reef productivity, fish life cycles, patterns of

recruitment and spawning, larval dispersal, community dynamics, historic conditions, harvest pressure, and species abundance are all aspects of uncertainty in a fishery (Walsh 1987, Watson and Ormond 1994, Roberts and Ormond 1987, Pomeroy 1994). Differences also exist within managing a single-species fishery compared to a highly selective fishery or a large-scale commercial enterprise. Unknowns in fisheries management are confounded as broad-scale, analogue threats to reefs emerge such as non-point source pollution, global warming, and increased human population pressure. These threats to aquatic systems are reflected negatively in human systems, and, along with a high degree of uncertainty, contribute to conflicts over management and harvest.

Aquarium Fisheries

Unlike commercial fishing enterprises, the collection of aquarium species requires highly selective harvesting procedures whereby young, small-bodied species are taken for aesthetic qualities. Recent studies show that only seven species of fish comprise over 90% of the West Hawaii aquarium catch (Tissot and Hallacher 2003). The potential for overexploitation is high, and unfortunately, corrective actions are usually taken only after a problem has become acute (Bohnsack 1997, Tissot and Hallacher 2003). Due to the complexity of aquarium fisheries and reef conflicts, alternative conflict resolution approaches provide an opportunity for greater involvement and interpretation of scientific issues.

Role of science

Awareness of the potential biological impacts associated with aquarium collecting has substantially increased in recent years. Scientific disputes demand a greater recognition of the facts and values behind policies and research, as values can affect both the selection of evidence, methods of evaluation, and overall interpretation by all participants (Ozawa and Susskind 1985). Scientific or technical specialists use expertise and analytical techniques to develop solutions for complex controversies, often on the basis that their data should be sufficient to mitigate or eliminate the conflict (Daniels and Walker 2001). It should be noted that intervenors who are concerned with collecting facts as the basis for solutions are often highly emotional in conflict situations (Cormick 1980). Science is one form of socially constructed knowledge, and is not devoid of values (Ozawa and Susskind 1985). The complexity of environmental disputes presents a challenge to scientific specialists, and the creativity of their solutions ameliorates the core problem in their eyes. Differences of opinion result when those with other values or worldviews feel threatened by their exclusion or marginilization in the scientific resolution.

Conflicts involving complex scientific issues usually entail disagreements not only over those scientific issues, but also over the distribution of costs and benefits associated with the relevant resources (Ozawa and Susskind 1985). In selective fisheries like the aquarium industry, the major scientific issues revolve around over-exploitation of target species and the conservation of the reef habitats (Wood 2001). Disputes erupt over the extent of over-exploitation, access to resources, management of resources, and enforcement tactics. Access to fisheries has also be a focus of conflict, whether

traditionally or legislatively regulated. Interaction with other high-revenue activities like recreational diving has produced socio-economic conflicts (Wood 2001).

Studies in Hawaii have produced contradictory results however, some older and highly criticized studies showing few adverse affects to aquarium species (Taylor and Nolan 1978, Randall 1987), while other, more recent studies have found significant declines in abundance because of aquarium collecting (Tissot and Hallacher 2003). While managers prescribe methods for site-specific management on an ad-hoc basis, management and research is often supported by distant state authorities. Until community-based initiatives became more common in reef fisheries management, most conflict resolution occurred in the legislative arena without necessarily taking into account the nature of the conflict itself.

West Hawaii Case Study

Increases in aquarium collecting combined with the growing public perception of a dwindling number of "colorful shallow water marine fish species" developed into an intense multiple use conflict between aquarium collectors and the dive tour industry in 1970 in west Hawaii (Tissot et al. 2002). In response to the animosity between these two groups in 1973, the DAR began to require monthly collection reports from all aquarium collecting permit holders. It was hoped that resource managers could characterize the growing industry from this data. Five years later, however, biologists noted further increases in the number of permits issued and realized that data from catch reports was subject to the compliance and accuracy of the permit-holders (Walsh 1999).

As the number of aquarium collectors increased, discontent and harassment escalated between the two groups. Dive tour operators reported a decline or elimination of colorful reef species in areas they deemed essential for business, in addition to discontent at seeing aquarium collecting occurring during recreational tour dives. They concluded that collecting was eroding their industry. In contrast, aquarium collectors considered the divers claims unjustified and felt that these abundant areas were essential for their livelihood. In 1987, encouraged by the DAR, an informal yearly agreement was negotiated between the two groups in an attempt to quell the antagonism over aquarium collecting in certain areas. Aquarium collectors agreed to refrain from collecting in "four specific areas and in return, dive tour operators agreed not to initiate legislation opposing collecting and to cease harassment" (Walsh 1999). This was relatively effective for six months, but when this informal agreement expired, collectors resumed their previous activity. Meetings were held in August and September of 1988 to reinstate the agreement and permanently close the previously agreed upon areas. Only in October 1991 was aquarium collecting prohibited in these areas. Despite this accord, controversy and conflict over aquarium collecting continued unabated (Walsh 1999).

In May 1996, Hawaii House resolution (HCR 184) was passed that stipulated the designation of a taskforce by the DAR to develop a comprehensive management plan for regulating aquarium collecting in West Hawaii. The DAR, asked the University of Hawaii Sea Grant Extension Service Agent for West Hawaii to develop a list of participants derived from competing resource interests. The resulting group of seventy members, known as the West Hawaii Reef Fish Working Group (WHRFWG), held nine meetings over 15 months. A professional facilitator and a DAR agent facilitated these

meetings. It was hoped that by providing scientific information from the DAR's work, this initiative would ultimately engender a dialogue among user groups on a variety of social and biological issues and result in successful and sustainable management recommendations. The WHRFWG identified areas along the coast where user group conflict was particularly intense, known as "hot spots". A considerable list of marine resource management recommendations was developed, however, due to opposition from aquarium fish collectors and a lack of political will in the state legislature, no substantial recommendations passed.

In response to the WHRFWG's perceived lack of success in dealing with what were considered more pertinent issues surrounding aquarium fish collecting, several citizens formed a grassroots organization call the Lost Fish Coalition (LFC) to promote a total ban on fish collecting in West Hawaii (Walsh 1999). They presented a 4000-signature petition requesting a total ban on aquarium collecting to state legislators. Additionally in 1997, monitoring projects were initiated to obtain objective data for reef species prevalence, and to investigate reef damage along Hawaii's west coast from dive tour operators and aquarium collectors. Because of the interest in reef protection, in January 1997 a bill, HB 3349, was introduced to Hawaii State legislature to accomplish this objective on a broad scale. The introduction of another bill, HB 3457, shortly followed, and was more specifically aimed at creating a West Hawaii Regional Fishery Management Area (WHRFMA) along the 235km West Hawaii coast. Of this area, 50% was demarcated as fish replenishment areas (FRAs) where fish collecting would be prohibited. The first bill did not pass in 1998, but HB 3457 was debated and eventually endorsed by the community. During committee hearings, user groups compromised to

designate *a minimum of* 30% of the coastline by October 1 1998 as FRAs. This bill passed on July 13 1998 and become Act 306. It should be noted that the FRA designation was to occur within three months and that the decision to came largely without any outside support in the form of facilitators or staff.

Provisions of Act 306 included the effective management of fishery activities to ensure sustainability, enhancement of near shore resources and minimization of conflicts in the WHRFMA (Walsh 1999). To address the management of aquarium collecting, the DAR was charged with selecting and designating a minimum of 30% of the West Hawaii coastal waters as FRAs and establishing a portion of the FRAs as Fish Reserves, prohibiting the collection of reef-dwelling fish. Act 306 directed DAR to identify these areas after close consultation and facilitated dialogue with working groups of community members and resource users (Walsh 1999). To add a more dynamic management strategy to the FRAs, Act 306 required a review of the effectiveness of the WHFRMA every five years, providing an opportunity for amendment.

To insure broad community involvement, DAR biologists and UH Sea Grant Extension Agents chose to create a Community Council comprised of representatives from the diverse stakeholder groups in the West Hawaii community. Many different groups had vested interests in the aquarium resources aside from dive tour operators and aquarium collectors, and the groups' coordinators attempted to include as many representatives as was feasible in this Community Council, eventually forming the West Hawaii Fisheries Council (WHFC) in June l998. Using the roster of the earlier WHRFWG as a guide, the 24 voting Council members included, among others, three aquarium collector representatives, an aquarium retail storeowner, three commercial dive

tour operators, six ex-officio, non-voting agency representatives, and one hotelier. The remainder of the WHFC consisted of members with a variety of overlapping interests such as LFC members, commercial and recreational fisherman, shoreline gatherers, recreational divers, and community representatives. Two members had degrees in marine or fishery science and 40% of the WHFC was native Hawaiian. Seven members were added later to expand expertise as the WHFC processes unfolded, bringing the total to 30 members. The coastal area and upland ahupua'a (traditional Hawaiian land division) areas were so large that UH Sea Grant and DAR created a stakeholder demographic/geographic representation matrix with which WHFC members could determine any gaps in representation. Thereafter, members were sought to fill those gaps.

Consensus Processes

The goals of the WHFC were to ensure sustainability, enhance nearshore marine resources, and minimize conflicts over resource use (Walsh 1999). To accomplish this, DAR scientists, researchers from the University of Hawaii (UH), and other resource managers presented information to the WHFC to assist in the FRA site selection process. Information presented to the Council included topics such as fish movements, reserve design and function for aquarium reserves as well as location, enforceability, traditional Hawaiian knowledge, and conflict resolution. The meetings were variously facilitated by a DAR scientist, a WHFC member, a retired fisheries biologist familiar with multi-stakeholder meetings, and when deemed necessary, a trained professional facilitator. The

UH Sea Grant Extension Service Agent recorded meetings, prepared groups notes from these recordings, and distributed notes to WHFC members.

At this point the WHFC meetings were conducted in a semi-facilitated manner and the goal was to attain consensus and reduce conflict. The importance of WHFC members representing their respective interest groups was repeatedly stressed. After establishing site selection criteria, WHFC members were asked to canvass their respective communities and submit maps of areas proposed for FRA designation. From the onset of the site selection process, the WHFC struggled to limit the total FRA area to 30% of the coastline. Although Act 306 designated a minimum of 30% off limits to aquarium collecting, the map-submission strategy was adopted to counter the considerable pressure from dive tour operators, community representatives, and LFC members to close a significantly larger portion of the coast. It was hoped that by determining consensus areas visually, a minimum of 30% would become readily apparent. However, aquarium collectors reacted adversely to closing more than 30% of the coastline, resulting in discord. They claimed this figure was too high and had been misinterpreted during the legislative process, resulting in an unfair proportion of coastline awarded to conservationists.

The process nevertheless continued and final maps were compiled from those submitted by members to provide clear graphical indication of the groups selections. Agreement on certain areas became readily apparent. Although aquarium collectors were reluctant to fully participate, the areas they selected were remarkably congruent with those chosen by the rest of the WHFC. In September 1998, the master consensus areas were adopted into a FRA plan, proposing nine FRAs (Fig. 1), comprising 35.2% of the

West Hawaii coastline, including previously protected areas. State enforcement agency representatives recommended that the FRA decision include prohibitions on possession of aquarium collecting gear and collected animals within the FRAs. In March 1999, these and other enforcement modifications were presented to the WHFC and they recommended that these nuances be incorporated a an upcoming public hearing.

At the public hearing in April 1999, the FRA plan received 93.5% support from the community at large for the proposed management plan. The hearing, with an estimated attendance in excess of 860, was the largest such meeting ever held by the DAR. In October 1999 the final draft of the Rule was sent to the Office of the Attorney General for language review. The Deputy Attorney General, who is alleged to have allegiance to the aquarium collecting interests, questioned the legality of the enforcement provisions added at public hearing. In his opinion, provisions should be removed because they did not go through earlier public hearing. The Rule then went through reapproval without any enforcement provisions. A four-year long effort to replace those provisions has ensued and much consternation exists in the West Hawaii community over the details of losing enforcement strategies. According to Act 306, the FRA Rule will be reexamined in 2005 by DAR and the WHFC to evaluate its effectiveness. At this point, reef monitoring data will become tantamount to evaluating the success of the FRAs and adapting their design to continue successful conservation.

Group Dynamics

Harassment and conflict between dive operators and aquarium collectors over the FRAs has decreased and the conflict is markedly less than before the FRAs. Some community members feel that the dispute between these two groups was not fully resolved during the FRA process and that neither group appears to have come to the WHFC under the auspices of unified stakeholder group. Facilitators demonstrated significant compassion for these interest groups during early WHFC meetings to squelch any perceived imbalance of power or prestige among the groups.

Despite the establishment of the FRAs, frustrations with enforcement and continuing harvest of aquarium species are contentious points for West Hawaii. Research studies to evaluate the effectiveness of the FRAs and to replenish aquarium fish populations are underway. This information is intended to alleviate some of the uncertainty associated with this particular fishery and also to provide baseline data for continued monitoring of the FRAs.

Following the establishment of over 30% of West Hawaii's coast as FRAs, the WHFC took a hiatus to organize itself in an unfacilitated 'meeting mode'. It is now run by a three-person triumvirate, a decision the WHFC itself initiated, and has generated policies and procedures for etiquette and process. A Covenant was developed during a facilitated retreat which reflects the values of the group and serves a tool to guide future group dynamics as the Councils changes membership over the coming years. The WHFC's membership has adjusted over time to include representatives from other interests and areas as new concerns arise, such as spear fishing and gill netting. A few of these procedural amendments emerged gradually over the course of the FRA planning

process, but most were adopted after the WHFC's desire for a more formal and efficient process became apparent.

Discussion

The West Hawaii conflict over FRA establishment is a model system for EDR processes in controversies over reef fisheries resources. Instead of a purely legislative solution, the use of collaboration was prescribed by the State of Hawaii. When DAR and the UH Sea Grant Extension Agent worked to create an empirical design for the resolution of this conflict under the auspices of community-based management, they designed a comprehensive and educational system where consensus was to be attained. The conflict itself included a large emphasis on scientific principles and applications, which dictated much of the WHFC's directions during the resolution process. The success of the conflict can be seen in the creation of the FRAs, but the lack of enforcement provisions leads to a questioning of how well this EDR process worked within the existent government system.

The WHFC was reliant on scientific expertise in a two of ways. First, DAR scientists often functioned as organizers, facilitators, and educators simultaneously as they managed and facilitated the WHFC. Their familiarity of the conflict's biological implications was unique and they often disseminated information to the group in order to raise the awareness of the biological impacts associated with aquarium fishing and reserve design. This action served to equalize perceived power differences among stakeholder groups who may have had less familiarity with scientific principles, but in itself, the instruction and information delivered may not have been devoid of the

scientist's values. According to Ozawa and Susskind (1985), "it is often assumed that scientific experts stand apart from the "political" arena in which decision makers and affected interests operate" and that the facts the deliver are rationally sound and "apolitical". In West Hawaii, the scientists were also state employees and resource managers, reliant on government support and community recognition. Their role as unbiased scientific interests becomes cloudy when their position in the WHFC's organization is so pivotal. It should be noted, however, that other "experts" were invited to occasional meetings at the DAR's behest and that the DAR was not exclusively the WHFC's scientific interest group.

Second, a dispute arose initially over the scientific data itself. Many aquarium collectors claimed that their harvest impacts were minimal. They noted that little evidence existed to the contrary and that previous papers on aquarium collecting stated impacts were not significant, despite the outdated status of this research. Much of the information that the Council gleamed about harvest impacts came directly from the DAR's presentations at meetings. The vague separation between the DAR's role as experts, stakeholders, and facilitators could be construed as threatening to aquarium collectors who have different values and are not acting as instructors or experts. On the other hand, groups like the LFC and dive tour operators perceived that the reduced number of colorful species was the result of excessive aquarium collecting. Trends in recent monitoring data support this stance and these early studies have spurred the convictions of preservationist stakeholders.

In the West Hawaii FRA controversy, it appears that science has been used instrumentally to produce an outcome that is desired rather than as the basis for change.

Following the idea that applying a scientific approach to resolution can solve complex situations, science was taught to the group and then the consensus process itself was based on that science. At the time of the WHFC meetings, only preliminary data was available to show benefits of closed areas to aquarium fish populations, and its seems that the role of science in the process was to steer the group to generate an accord compliant with Act 306. No specific steps were outlined in the Act to minimize conflict, only that it had to be done. Based on the theories behind EDR, a conflict resolution is best of generated by the group for their implementation (Cormick et al. 19). Although the group was asked about the representative's values, the group culture was hostile at times and not conducive to open communication about personal worldviews and values. The goals of the groups were predetermined by Act 306 so they did not necessarily have the liberty of creating a unique, self-generated resolution. The framework provided to the DAR through Act 306 was essentially limiting.

Existent monitoring programs are extensive along the coastline and scientific interests hope the results of these studies will justify the FRAs when they are reevaluated in 2005. Early data reveals that the FRAs are beneficial to aquarium fish populations and it seems likely that in 2005 the WHFC will have the scientific data to support and characterize the effectiveness of the reserves. If this occurs, the controversy will experience a change in the role of science as a determining factor in FRA efficacy. While the FRAs were created in a short time, we should consider the largest shortcoming of the FRA Rule: the enforcement provisions.

Enforcement

Understanding of the institutional frameworks in which the conflict occurs is important, especially if the process is initiated by an outside or administrative entity as the state did in West Hawaii (White et al. 1994). This structural component may seem obvious initially, but as the case of West Hawaii demonstrates, it can also be an unforeseen variable. The events surrounding the removal of enforcement provisions in West Hawaii's FRA Rule are perhaps the most contentious in the process. The implementation of any agreement is a challenging aspect of EDR. Post negotiation there is a need for enforcement and accountability. Clearly developing enforcement strategies during the consensus process serves as a group-generated system of checks and balances. The enforcement provisions in the FRA Rule were recommended to the DAR by the enforcing state agency and then presented to the WHFC for consideration and amendment. Although they were not exclusively generated by the Council, they were agreed upon by the WHFC and presented at a public hearing. It is difficult to evaluate whether the enforcement provisions would have been more successful had they been generated by the Council alone, nevertheless the WHFC placed its faith in the provisions and then in the general public at Public Hearing.

The state acted independently from the Councils advice and in particular, the changes made can be traced to an individual whose allegiance to the aquarium collectors has been called into question. This action also suggests that some aquarium collectors were unsatisfied with the resulting FRA Rule. Administrative removal of the enforcement provisions prior to approval was criticized, and the relatively slow progression to replace lost provisions has frustrated the DAR and members of the

community. Although efforts are underway to replace the lost provisions, the lasting impacts that a lack of sufficient enforcement has for management are substantial. Interestingly, the state's political will has been questioned earlier in the FRA controversy when the WHRFWG's conflict with aquarium collectors failed to ignite a response from the state. In this instance, the states action served as one catalyst for the creation of the LFC by frustrated community members

Unilateral amendments by a legislative body after the meeting process makes the agreement moot in the eyes of many participants who attach their personal prestige and values to the conflict and the agreement (Cormick 1980). Environmental dispute resolution must be applicable within the existing legislative and administrative framework to avoid the complications of outside alterations to agreements. The challenge becomes one where the union between alternative conflict resolution techniques and traditional legislative systems results in successfully implemented community-based agreements. The failure in this controversy was procedural, not managerial. The enforcement provisions were removed after the WHFC and the public approved their inclusion. Although the DAR's intentions were sound, the empirical design of this EDR process was shackled by its eventual incompatibility with the legislative system.

Recommendations

West Hawaii's FRA conflict was originally framed as an interest-based dispute, although it includes aspects that are clearly identity-based, and the use of a trained facilitator may bring a greater level of communication and effectiveness to the group.

This conflict requires a more formal integration of EDR processes, specifically those associated with identity-based conflicts. The animosity and discord between the aquarium collectors and dive tour operators could be remedied by understanding the underlying motivations associated with the conflict itself. Ultimately this might protect agreements from rouge interest groups at other level. A trained facilitator might employ steps such as reframing the issues to reveal respective and shared needs, encouraging positive contact between stakeholders, equalizing the power behind scientific interests, and incorporating aspects of identity-based approaches into the situation in West Hawaii. A trained facilitator may be able to interject supplementary identity-based processes to compliment the continued work of the WHFC. This would require earnest investments from all participants in a facilitator familiar with both identity-based conflicts and the development of stakeholder groups compliant with the responsibilities of representation. The initial resolutions and current procedures of the WHFC already demonstrate their desire to achieve satisfactory implementation. Identity-based adaptations in the WHFC's FRA conflict might provide avenues whereby the communities desired goals come to fruition and the five-year reevaluation may present an opportunity to enhance stakeholder cooperation.

Conclusion

This conflict was both sociologically and ecologically complex. A large part of the controversy revolved around science and it was a dominant of the consensus process as well. The controversy was not purely interest-based or identity-based and included several unspoken, deep values from both the aquarium collectors and the scientific

interests. Monitoring projects will bring a great deal of insight into the effectiveness of the WHFC's ruling and will influence the future procedures of the Council. One of the greatest challenges in the West Hawaii FRA controversy in the role of the state as another entity responsible for funding, approval, and support for the communities work. This group witnessed their FRA agreement reduced to a lesser form in the hands of the state legislative body, a situation that creates significant frustrations and mistrust at the community level. With the help of professional facilitators, this group may be able to function within the limits of the state in future conflict resolution situations.

REFERENCES

Berkes, F., and C. Folke. 1998. Linking social and ecological systems for resilience and sustainability. *In: Linking social and ecological systems. Berkes, F., Folke, C., and J. Colding eds. Cambridge University Press. Cambridge, UK.*

Bingham, G. 1985. Resolving environmental disputes: a decade of experience. The Conservation Foundation. Washington D.C. USA.

Bohnsack, J. 1997. Ecosystem management, marine reserves and the art of airplane maintenance. Proc. 50th Gulf and Caribbean Fisheries Institute, Merida, Mexico.

Carpenter, S., and W. Kennedy. 1988. Managing public disputes: a practical guide to handling conflict and reaching agreements. Jossey-Bass. San Francisco.

Cleaver, F. 1999. Paradoxes of participation: questioning participatory approaches to development. *J Int Dev*. 11:597-612.

Colvin, R. 2002. Community-based environment protection, citizen protection, and the Alband Pine Bush Preserve. *Soc Nat Res*. 15:447-454.

Cormick, G. 1980. The "theory" and practice of environmental mediation. *The Environmental Professional*. 2:24-33.

_____, Dale, N., Emond, P., Sigurdson, S., and B. Stuart. 1996. Building consensus for a sustainable future. National Round Table on the Environment and the Economy. Ottowa, Canada.

Daniels, S. and G. Walker. 2001. Working through environmental conflict: The collaborative learning approach. Praeger Publisher. Westport CT.

Deal, D., and A. Hahn, eds. 1994. Public issues in education. University of Wisconsin.

Glasier, B., and A. Strauss. 1967. The discovery of grounded theory: Strategies for qualitative research. New York: de Gruyters.

Holling, C. 1978. Adaptive environmental assessment and management. Wiley. London.

Michaelidou, M., Decker, D., and J., Lassoie. 2002. The interdependence of ecosystem and community viability: a theoretical framework to guide research and application. *Soc Nat Res* 15:599-616.

Mahanty, S. and D. Russell. 2002. High Stakes: Lessons from Stakeholder Groups in the Biodiversity Conservation Network. *Soc Nat Res.* 15:179-188.

O'Leary, R. 2001. Environmental mediation what do we know and how do we know it. *In: Mediating Environmental Conflicts: Theory and Practice. Blackburn, J., and W. Bruce eds. Quorum Books, Westport CT. p.17-35.*

Ozawa, C., and L. Susskind. 1985. Mediating science-intensive policy disputes. *J. Policy Analysis* 5(1): 23- 39.

Painter, A. 1988. The future of environmental dispute resolution. *Nat Res J* 28:145-170.

Pellow, D. 1999. Negotiation and confrontation: environmental policymaking through consensus. *Soc Nat Res* 12:189-203.

Pomery, R.ed. 1994. Community management and common property of coastal fisheries in Asia and the Pacific: Concepts, Methods, and Experiences. ICLARM. Manilla, Philippines.

Randall, J. 1987. Collecting reef fish for aquaria. In Human Impacts on coral reefs: facts and recommendations. Salvat B. ed. Antenne museum, E.P.H. E. French Polynesia: 29-39.

Roberts, C., and R. Ormond. 1987. Habitat complexity and coral reef fish diversity and abundance on Red Sea fringing reefs. *Mar Ecol Prog Ser*. 41:1-8.

Rothman, J. 1997. Resolving identity-based conflict in nations, organization, and communities. Jossey- Bass. San Francisco.

Schuett, M., Selin, S., and D. Carr. 2001. Making it work: keys to successful collaboration in natural resource management. *Environmental Management*. 27(4):587-593.

Schwarz, R. 1994. The skilled facilitator: practical wisdom for developing effective groups. Jossey-Bass. San Francisco.

Selnin, S., Schuett, M., Carr, D. 2000. Modeling stakeholder perceptions of collaborative initiative effectiveness. *Soc Nat Res.* 13:75-745.

Sneddon, C., Harris, L., Dimitrov, R., and U. Ozesmi. 2002. Contested waters: conflict, scale, sustainability, in aquatic socioecological systems. *Soc Nat Res*. 15:663-675

Susskind, L, and C. Ozawa. 1985. Mediating public disputes: obstacles and possibilities. *Journal of Social Issues*. 41(2):145-159.

Talbot, A. 1983. Settling things. The Conservation Foundation. Washington D.C. USA

Taylor, L. and R. Nolan. 1978. Papers and comments on tropical reef fish. Working papers.

Tissot, B. 1999. Adaptive management of aquarium fish collecting in Hawaii. SPC Live Reef Fish Information Bulletin (6):16-19.

_____, and L. Hallacher. 2003. Impacts of aquarium collectors on reef fishes in Kona, Hawaii. Final Report. Department of Land and Natural Resources. Honolulu, Hawaii.

_____, Walsh, W., and L. Hallacher. 2002. The effectiveness of marine protected areas and the impacts of aquarium fish collecting in Hawai'i. Technical report prepared for Hawaii Coral Reef Initiative, University of Hawaii, Hawaii, and NOAA, Maryland.

Walsh, W. 1999. Aquarium collecting in West Hawaii: An historical overview. Department of Land and Natural Resources. Honolulu, Hawaii.

_____. 1987. Patterns of recruitment and spawning in Hawaiian reef fishes. *Env Biol Fishes*(4):257-276.

Watson, M., and R. Ormond. 1994. Effect of an artisanal fishery on the fish and urchin populations of a Kenyan coral reef. *Mar. Ecol. Prog. Ser.*109:115-129.

Wilshusen, P., Brechin, S., Fortwangler, C., and P. West. 2002. Reinventing the square wheel: Critique of a resurgent "protection paradigm" in international biodiversity conservation. *Soc Nat Res*. 15: 17-40.

White, A., Hale, L., Renard, Y., and L. Cortesi. 1994. Collaborative and community-based management of coral reefs. Kumarian Press, Inc. Connecticut.

Wood, E. 2001. Collection of coral reef fish for aquaria: global trade, conservation issues and management strategies. Marine Conservation Society.

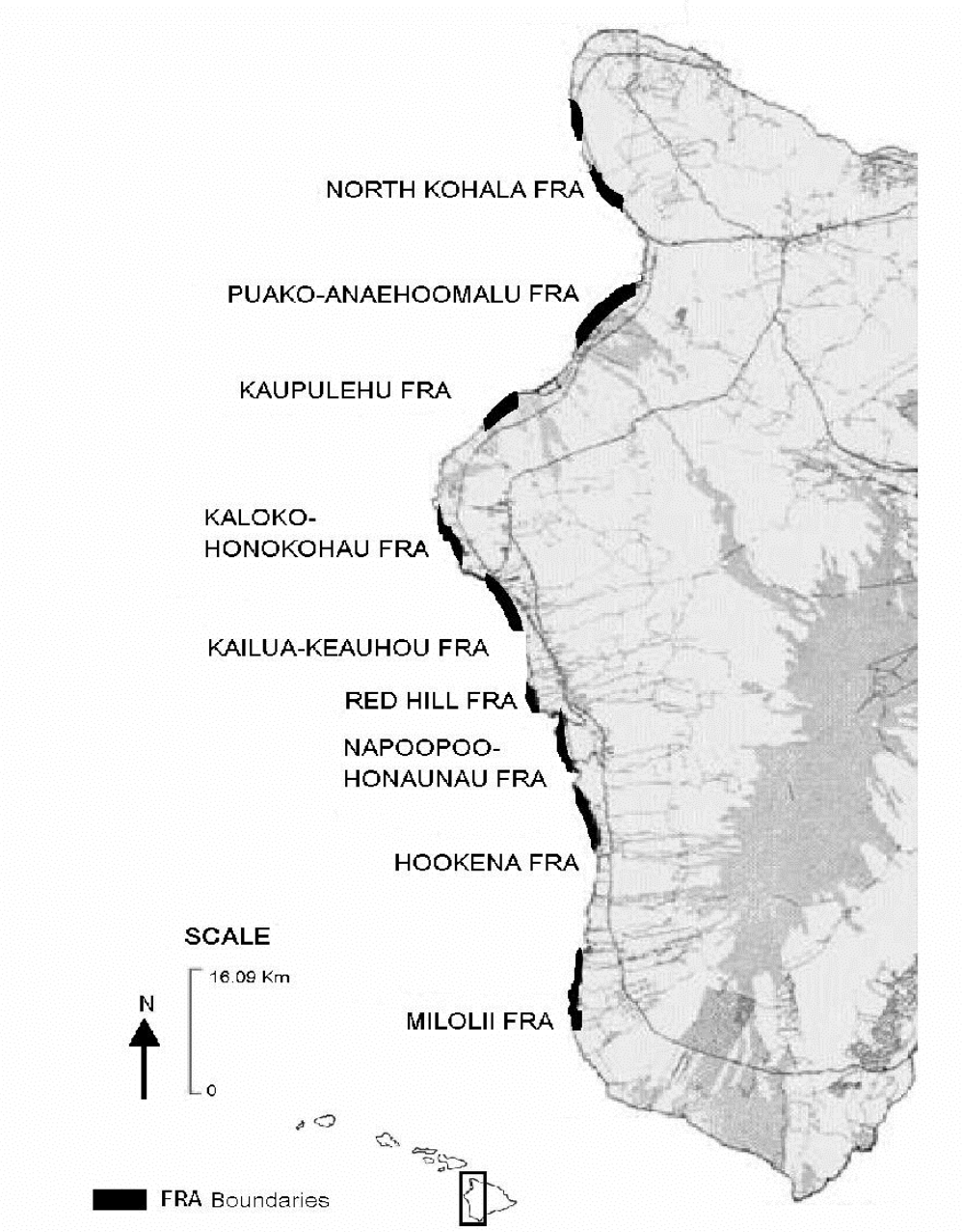

Figure 1. FRA boundaries along western shore of Hawaii.

CHAPTER THREE

CONCLUSION

This chapter is designed as a conclusion to my research. I discuss the largest strength and weakness that I perceived in EDR and the justifications for my selection of a consensus-based model in West Hawaii. Last, I mention my personal directions following this thesis.

Strength

EDR is one of the most optimistic fields that I have encountered. Cormick (1980) opens his paper with a discussion of the benefits of conflict as a mechanism for social change. He is excited and challenged by the possibilities that conflict presents and has written many works that emphasize the unique and positive learning that comes from conflict. The stigma that many place on conflict as something to avoid is often limiting, rather it should be a creative medium for society (Cormick 1980). In much of the literature on EDR, authors present different, progressive ideas as alternatives to a system of governance that fails to solve controversies in many cases. I think the largest strength of EDR and the model presented in my thesis is this notion of a better alternative to a complex problem. The focus is on a different approach, not on fixing the system.

Weakness

My analysis of EDR revealed a great divergence in the field between theoretical and applied ideas. A wealth of information is available on various details of the processes one can take as a manager or a facilitator in a conflict situation, the most

developed being a thirteen step process outlined in Cormick et al. (1996) that addresses the phases a negotiated conflict should go though in order to reveal an environment where resolution is possible. Some authors suggest room design, appropriate attire, communication skills, and behavioral analysis for EDR. Examining the different types of conflict, interest-, identity-, and interest-/identity-based it was clear that different resolution approaches were necessary for each of these conflicts and as such, different techniques can be researched. The most unique model is presented by Rothman (1997), who manages disputes between highly identity-based groups, often with differing worldviews. Many texts strive to provide avenues for the practice and development of sound resolution techniques and are written without much theoretical background.

Theoretical EDR works rarely address the details of applied EDR. Instead broad recommendations are common and goals are stressed. Many interesting ideas can be found in theoretical EDR literature, but harsh criticism exists for a number of works because few studies have supporting data or evidence of successful tactics, as outlined in a chapter by O'Leary (2001) entitled "What Do We Know and How Do We Know It". As with many fields, the theory is ahead of the practical in terms of development. In EDR the next theoretical push seems to be the standardization of EDR assessment (Leach 2002). Many authors seek to include such data in support of their case, but the nature of EDR makes quantification of successes somewhat difficult. The studies that do exist have extensive chapters on their methodology, but are many times unique and difficult to compare to other studies, see Bingham (1985). A few authors bring practical applications into their work, like Daniels and Walker (2001) and have developed entire new

approaches to conflict resolution. Overall, it has been an interesting journey fishing through a plethora of information on a rapidly expanding field.

West Hawaii

Selecting a model for the West Hawaii FRA controversy was difficult initially as so many authors have their own model for which they are usually strong advocates. Eventually, I returned to the WHFC and decided that a consensus-based model would be best as it was the goals of the Council to achieve consensus on the FRAs. Many authors stress the essential nature of consensus, while others do not advocate its use in conflicts that involve deeper values. In Hawaii a large emphasis on establishing consensus areas was evident and the DAR appeared to advocate consensus as well. It is my suggestion that the WHFC strive to add a values-based evaluation of participants into their future endeavors as I feel that many disputes and complications, often stemming from aquarium collectors, revolve around their deeper, unrevealed values. The evidence for this lies in their dissatisfaction and complacency with WHFC meetings and perhaps in the eventual removal of the enforcement regulation in the FRA rule.

As a graduate student, this project reinforced my interest in conservation and reserve design. I would like to continue working with marine systems and reserves, but from an ecological perspective rather than a social perspective. My research in EDR has provided valuable insights into environmental conflict resolution, a field that is expanding and growing in acceptance, application, and theory. It has also spurred many deeper questions into the union of practical and applied environmental science, the nature of multi-disciplinary work, and the maturity of the human species in this new century.

This thesis represents a small portion of the potential research opportunities in the West Hawaii marine reserve network, both sociologically and ecologically. It has been a privilege to contribute to a greater understanding of the conservation and management issues in West Hawaii, and I eagerly anticipate the results of existent monitoring projects.

REFERENCES

Bingham, G. 1985. Resolving environmental disputes: a decade of experience. The Conservation Foundation. Washington D.C. USA.

Cormick, G. 1980. The "theory" and practice of environmental mediation. *The Environmental Professional*. 2:24-33.

Cormick, G., Dale, N., Emond, P., Sigurdson, S., and B. Stuart. 1996. Building consensus for a sustainable future. National Round Table on the Environment and the Economy. Ottowa, Canada.

Daniels, S. and G. Walker. 2001. Working through environmental conflict: The collaborative learning approach. Praeger Publisher. Westport CT.

Leach, W. 2002. Surveying diverse stakeholder groups. *Soc Nat Res*. 15:641-649.

O'Leary, R. 2001. Environmental mediation what do we know and how do we know it. *In: Mediating Environmental Conflicts: Theory and Practice. Blackburn, J., and W. Bruce eds. Quorum Books, Westport CT. p.17-35.*

Rothman, J. 1997. Resolving identity-based conflict in nations, organization, and communities. Jossey-Bass. San Francisco.

APPENDIX

APPENDIX

SUCCESSFUL EDR

Consensus processes are not without their faults. A number of characteristics may describe a successful EDR approach after it is occurred, but there are several aspects that are thought to be important components necessary for a process to begin. It is important to note that each EDR process is unique and some components may be more valuable in some instances.

Facilitators

Factors such as community and individual resource user characteristics, group processes, membership and environmental characteristics all exert and influence on local capacity (Mahanty and Russell 2002). It is up to facilitators and resource managers to effectively incorporate these dynamics into a process that is beneficial to resolving disputes regardless of capacity. Mahanty and Russell (2002) caution that facilitators must not assume that stakeholder representatives truly typify the community, and must strive to develop their own capacity in this interactive process. The dynamics of social systems, political dimensions, and power structures in a community require thorough research and evaluation prior to brokering and implementing an EDR process.

Representation

Securing sufficient breadth and depth in stakeholder representation is fundamental to achieving consensus and thus successful EDR (Clever 1999, Cormick et al. 1996, Deal and Hahn 1994, Mahanty and Russell 2002, Painter 1988, Pellow 1999, Schuette 2001,

Selnin 2000, Sneddon et al. 2002, Susskind and Ozawa 1985, and Talbot 1983). However, acquiring effective representation and then realizing participation is one of the more difficult components to EDR. "Usually the most obvious stakeholders draw together first; ideally individuals with shared interests should be expected to join forces" (Susskind and Ozawa 1985), but representatives can only be effective if they have the authority and the willingness to interact with their constituents. Attaining a sufficiently diverse representation of stakeholders is a site-specific and somewhat subjective quality defined by the conflict itself.

The popularization of stakeholder participation has raised contention over whether it is primarily an empowerment tool, or simply a means to implementing a better project (Mahanty and Russell 2002). Appropriate pre-negotiation research into the community and conflict can help determine the appropriate representatives for resolution purposes. Also, logistics, timing, and user-group organization can all dictate the eventual composition of representative groups, but individual personality, incentives, obligations, agendas and connections can limit or even undermine participation and effectiveness in an EDR process.

Implementation

Implementing EDR can be difficult because there are usually no formal rules to enforcement agreements (Susskind and Ozawa, 1985). Decisions on implementation, monitoring and enforcement components can be generated by those involved in the EDR process to enhance effectiveness. This again requires skill and sensitivity on the part of the facilitator and genuine participation from stakeholders. The concept of negotiated

agreement is tantamount to EDR success whether it involves stakeholders generate specific self-enforcing mechanisms or cooperating agencies to undertake enforcement responsibility.

One emerging approach is the inclusion of an adaptive management approach to community based management. Adaptive management deals with the propensity of ecosystems to evolve both over time and as they interact with human systems (Berkes and Folke 1998, Holling 1978). Actions and polices that deal with the natural world are treated as 'experiments' from which institutions, managers, and individuals can learn and thus 'adapt' strategies accordingly (Berkes and Folke 1998, Holling 1978). Adaptive management relies on feedback, learning, and insight, all of which eventually intertwine with scientific findings and research into an overall management scheme. By prescribing adaptive management, an element of learning is theoretically infused into the management process and assumes that active participation and eventual enforcement will continue. Adaptive management does not necessarily provide a framework for the continued resolution of stakeholder conflicts. It has an element of institutional responsibility and flexibility that may not be realistic in many situations, but the potential for integrated conservation and management is theoretically enhanced through the approach.

Determining Success

Determining which effectiveness indicators to employ in EDR is another important consideration. The first and most simple measures of how successful these processes have been in resolving the issues is agreement success (Bingham 1984). During implementation other problems with the adequacy of a dispute resolution process may

emerge (Bingham 1984). Mahanty and Russell (2002) suggest using multi-item scales to evaluate success rather than single-item measures which tend to inflate perceptions of effectiveness (Selnin et al. 2000). Many authors have identified key elements of successful initiatives: broad representation of stakeholders, well-defined goals and objectives, information exchange, shared decision-making, and building linkages beyond the community (Schuett et al. 2001). Cleaver (1999) finds that many participatory approaches do not translate into a policy or practice that is necessarily consistent with the desired impacts. When mediated settlements do not lend to a complete set of results, the mediation process may be at fault and apparent successes might be clouded (Talbot 1983).

Talbot (1983) says a conflict must mature to a point where it will be mediatable and issues become clearly defined. From there, a balance of power exists and the objectives can require negotiation for successful achievement. Also, he claims that there is a reduced likelihood of mediating disputes in which long-term trends or unpredictable events can only reach short-term agreements (Talbot 1983). White et al. (1994) mentions in Apo reserve in the Philippines where collaboration worked and a successful reserves was created. Success indicators include species abundance and sustainable management. Hawaii could easily mirror this approach and establish successful marine reserves through EDR making community-based management successful as many of the EDR components are already in place in West Hawaii.

REFERENCES

Berkes, F., and C. Folke. 1998. Linking social and ecological systems for resilience and sustainability. *In: Linking social and ecological systems. Berkes, F., Folke, C., and J. Colding. eds. Cambridge University Press. Cambridge, UK.*

Bingham, G. 1985. Resolving environmental disputes: a decade of experience. The Conservation Foundation. Washington D.C. USA.

Cleaver, F. 1999. Paradoxes of participation: questioning participatory approaches to development. *J Int Dev*. 11:597-612.

Cormick, G., Dale, N., Emond, P., Sigurdson, S., and B. Stuart. 1996. Building consensus for a sustainable future. National Round Table on the Environment and the Economy. Ottowa, Canada.

Deal, D., and A. Hahn, eds. 1994. Public issues in education. University of Wisconsin.

Holling, C. 1978. Adaptive environmental assessment and management. Wiley. London.

Mahanty, S. and D. Russell. 2002. High Stakes: Lessons from Stakeholder Groups in the Biodiversity Conservation Network. *Soc Nat Res.* 15:179-188.

Painter, A. 1988. The future of environmental dispute resolution. *Nat Res J* 28:145-170.

Pellow, D. 1999. Negotiation and confrontation: environmental policymaking through consensus. *Soc Nat Res* 12:189-203.

Schuett, M., Selin, S., and D. Carr. 2001. Making it work: keys to successful collaboration in natural resource management. *Environmental Management*. 27(4):587-593.

Selnin, S., Schuett, M., Carr, D. 2000. Modeling stakeholder perceptions of collaborative initiative effectiveness. *Soc Nat Res.* 13:75-745.

Sneddon, C., Harris, L., Dimitrov, R., and U. Ozesmi. 2002. Contested waters: conflict, scale, sustainability, in aquatic socioecological systems. *Soc Nat Res*. 15:663-675

Susskind, L, and C. Ozawa. 1985. Mediating public disputes: obstacles and possibilities. *Journal of Social Issues*. 41(2):145-159.

Talbot, A. 1983. Settling things. The Conservation Foundation. Washington D.C. USA

White, A., Hale, L., Renard, Y., and L. Cortesi. 1994. Collaborative and community-based management of coral reefs. Kumarian Press, Inc. Connecticut.