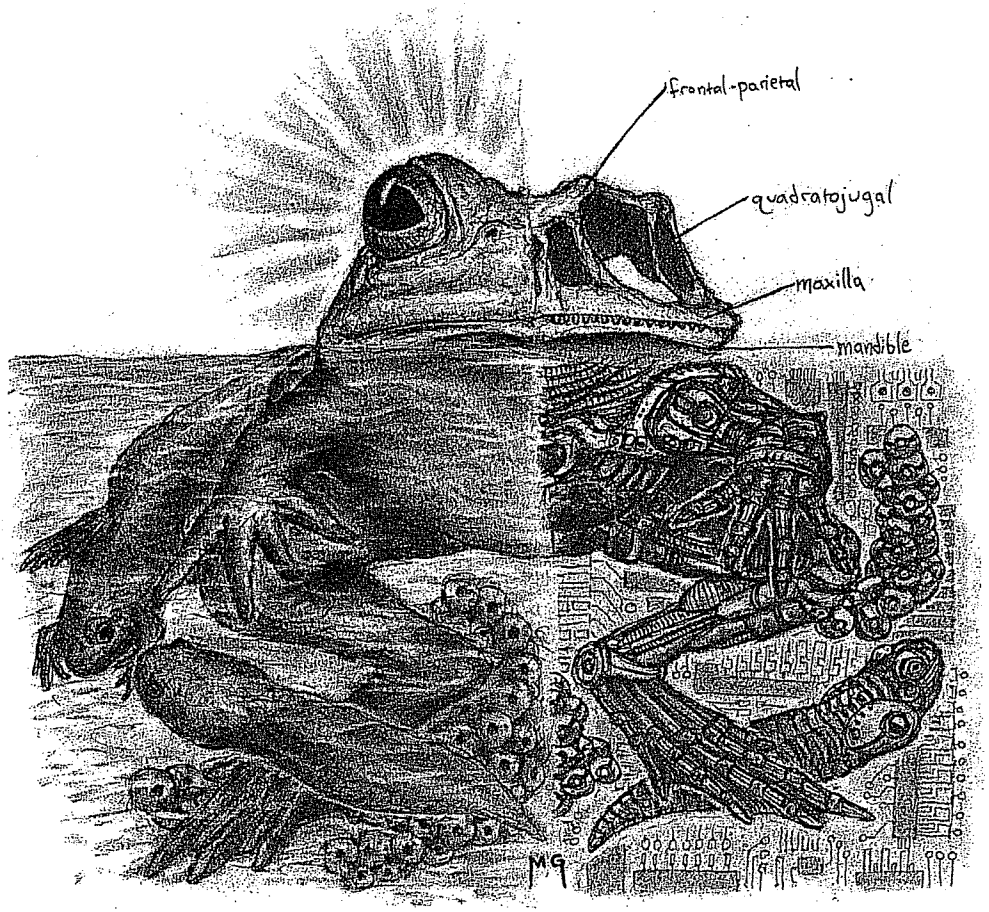

Integral Ecology

Uniting Multiple Perspectives on the Natural World

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Michael E. Zimmerman, PhD

With case studies by Gail Hochachka, Brian N. Tissot, and Darcy Riddell

Foreword by Marc Bekoff, PhD

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To Tatiana Rose, the queen of all those unseen at Sea Frog Haven

—SEAN ESBJÖRN-HARGENS

To my wife, Teresa, and my daughter, Lizzie

—MICHAEL E. ZIMMERMAN

CASE STUDY II

Integral Marine Ecology: Community-Based Fishery Management in Hawai'i*

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Successful fishery management requires that a dynamic balance of disciplines provide a fully integrated approach. I use Integral Ecology to analyze multiple-use conflicts with an ornamental reef-fish fishery in Hawai'i that is community-managed via the implementation of a series of marine protected areas and the creation of an advisory council. This approach illustrates how the joyful experiences of snorkelers resulted in negative interactions with fish collectors and thereafter produced social movements, political will, and ecological change. Although conflicts were reduced and sustainability was promoted, the lack of acknowledgment of differing worldviews, including persistent native Hawaiian cultural beliefs, contributed to continued conflicts.

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KEYWORDS: aquarium fish, fishery management, Hawaiian culture, Integral Ecology.

INTRODUCTION

Marine ecosystems are renowned for their abundant and seemingly endless resources. However, despite the long-term importance of these ecosystems in protecting shorelines, controlling climate, and providing food and inspiration, the world's oceans are currently in crisis (POC, 2003). This situation is particularly clear with respect to fisheries, which are declining globally (NRC, 1999). Commercially important species are under increasing fishing pressure (FAO, 2000), and ecosystem structure and function are compromised (Jennings and Kaiser, 1998). Efforts to manage fisheries have largely met with failure. These management failures are primarily due to our limited understanding of marine ecosystems, uncertainties between fishing intensity and stock depletion, underestimation of the complex interactions with social systems, and lack of political will (Botsford et al., 1997). Catches are primarily driven by economic forces that eventually overwhelm slowly replenishing stocks. In some cases, specific stocks have been so severely overexploited that they are now listed as endangered species (e.g., abalone: Hobday and Tegner, 2000).

This case study illustrates a new approach to fishery management using Integral Theory (Wilber, 1995) to examine community-based management of marine protected areas (MPAs). A major goal of MPAs is to establish a network of areas closed to fishing (marine reserves) that promote sustainable fisheries outside their boundaries (Murray et al., 1999). MPAs are currently of wide national and international interest (Allison et al., 1998; Bohnsack, 1998; NRC, 2000), as they have been shown to benefit fishery populations, support fishery management, enhance nonextractive human activities such as tourism, protect ecosystems, and increase scientific understanding of marine communities (Hastings and Botsford, 1999; Murray et al., 1999).

Community-based management is a process that empowers local communities to manage their resources by letting individuals in the community contribute to decisions that affect local resources. One of the major benefits of community-based management is the development of strategies compatible with the unique environment, with the specific resources, and with the cultural and historical context of the local area (White et al., 1994). Community-based management also aids in resolving conflicts

over limited fishery resources among multiple stakeholders (Capitini et al., 2004).

Environmental conflicts are notorious for their complexities stemming from a combination of biological uncertainty, multiple stakeholders and issues, multiple and unique values and worldviews, and clashes between scientific and traditional knowledge (Daniels and Walker, 2001). Effective conservation and management require the dynamic incorporation of multiple disciplines including biology, ecology, political economy, and sociology to create an integrated management approach (Honing, 1978; Michaelidou et al., 2002).

In 1995 Ken Wilber published *Sex, Ecology, Spirituality*, in which he presented an Integral Model that describes evolution as co-occurring in four dimensions or quadrants: the exterior-individual (behavioral) quadrant, the exterior-collective (systems) quadrant, the interior-collective (cultural) quadrant, and the interior-individual (experience) quadrant. Within each quadrant lies an unfolding holarchy of components that embrace and transcend each other in complexity. Integral Ecology (IE) is one application of Wilber's Integral analysis applied to ecological issues (Wilber, 2000). IE can also provide effective tools for addressing ecological issues through increased explanatory power by integrating divergent domains and by connecting with Wilber's comprehensive research (Hargens, 2002). The approach used here is to explore and acknowledge each of the quadrants with all of their attendant complexity, thereby applying the AQAL (all-quadrants, all-levels) model (Wilber, 1995). The IE AQAL approach to ecological issues takes into account all perspectives and their respective knowledge claims, thus examining all interests, and providing recommendations for solutions that honor each perspective while maximizing the sustainability of the system as a whole (Esbjörn-Hargens and Zimmerman, *Integral Ecology*, 2006).

IE is particularly well suited to examine the complex interactions associated with the management of coastal fisheries. Most studies of fishery management acknowledge the roles of biology, ecology, sociology, economics, and politics while paying little attention to important cultural dimensions (Dyer and McGoodwin, 1994; Friedlander et al., 2003). Furthermore, no one, to my knowledge, has integrated experiential or spiritual dimensions into the discussion. In this article I use IE to analyze a coral reef fishery in Hawai'i that uses community-based management of MPAs as a process to resolve conflicts and develop sustainable resources. The example presented is unusual in scope and complexity in that it involves the harvesting of live reef fish for the aquarium trade in areas where viewing reef fish is part of local recreation and a high-volume tourist business. Thus, in addition to the normal complex interactions associated with fishery management, there exists an additional multiple-use conflict over the extraction of these resources that involves differing worldviews regarding the appropriate use of the coral reef fishes. Intermeshed with these issues are the sociological, cultural, and spiritual dimensions of native Hawaiian culture, which persists in many of the more rural communities of Hawai'i.

Aquarium Fishery in West Hawai'i

Global trade in marine ornamental fishes is a major international industry involving an annual catch of 14–30 million fish (Wood, 2001). Almost all tropical marine ornamentals are collected live from coral reefs, and many originating from the United States are captured in Hawai'i, which is known for its high-quality fishes and rare, high-value endemics (ibid.). In the 1970s aquarium collectors along the west coast of the island of Hawai'i (hereafter, West Hawai'i) first developed conflicts with the rapidly growing dive-tour industry selling views of fishes on the reef. The conflict developed around the perception by the dive-tour industry that colorful reef fishes were dwindling due to collecting activities, thus diminishing the aesthetic value of the reef—a classic clash of conservationists' (i.e., sustainable yield) versus preservationists' (i.e., aesthetic beauty) worldviews (Capitini et al., 2004). One rallying point of the conflict for preservationists in voicing their concerns was the abundant, colorful yellow tangs (*Zebrasoma flavescens*) that form large schools at natural high densities and swarm over the reefs. Yellow tangs account for over 72% of the aquarium trade harvest in West Hawai'i and thus numerically dominate the collector's take (Miyasaka, 1997). Significantly, the dominant and aesthetic presence of these bright yellow schools of fish along the coastal reef is one reason why West Hawai'i is often referred to as the "Gold Coast."

Although the conflict was recognized in the 1970s, the issue was not fully addressed for two decades (Tissot and Hallacher, 2003). However, by 1997 the situation had grown into a serious multiple-use conflict bordering on violence (Dybas, 2002). Because the state agency charged with managing fishery resources, the Department of Land and Natural Resources' Division of Aquatic Resources (DAR), repeatedly failed to resolve the conflict,

pressure by local citizens' groups resulted in several bills submitted to the Hawai'i state legislature to ban collecting or to establish MPAs. In 1998 one of these bills passed to become Act 306, creating a fishery management area along the entire 120-kilometer coastline of West Hawai'i and mandating substantive involvement of the community to help manage reef resources. One of the specific mandates required that a minimum of 30% of the West Hawai'i coastal reef be designated Fishery Replenishment Areas (FRAs)—MPAs that specifically prohibit aquarium fish collecting. The law also required a scientific evaluation of the effectiveness of the FRAs after five years (Tissot, 1999).

To create the FRAs, DAR and the University of Hawai'i Sea Grant Extension established the West Hawai'i Fisheries Council (WHFC), a community-based group composed of the diverse stakeholders associated with reef resources in West Hawai'i (Capitini et al., 2004). The WHFC included aquarium collectors, the owners of aquarium retail stores, commercial dive-tour operators, a hotelier, commercial and recreational fishermen, shoreline gatherers, recreational divers, and several general community representatives—some of whom were members of the Lost Fish Coalition, a grass roots organization that aimed to shut down the aquarium industry (Capitini et al., 2004). Two council members had fishery degrees, and 40% of the council identified themselves as native Hawaiians. In addition to stakeholder representation, the WHFC also attempted to balance membership among the diverse geographic areas in West Hawai'i (Walsh, 1999), based in part on traditional Hawaiian land divisions, or *ahupua'a*, thus building one aspect of the council on the community- and *'ohana* (extended family)-based traditions of Hawaiian culture. *Ahupua'a* are ecological, sociological, and political land divisions created by native Hawaiians. These divisions are generally delineated by natural watersheds running from the mountains to the sea and out onto the reef (Handy and Pukui, 1958; Kirch, 1984; Callicott, 1994).

One of the major goals of the WHFC was to establish the location of the FRAs using a consensus-based approach (Capitini et al., 2004). Thus, the council provided not only a process to generate the location of the FRAs, but also a means to resolve conflicts among the diverse group of stakeholders. After considerable, often contentious debate, the council proposed to DAR that a series of nine FRAs be spread out along the 120-kilometer coastline of West Hawai'i (figure II.1). The West Hawai'i community rallied around the proposal, providing a 93% approval at a public meeting. The proposal was then approved by the Governor's office and, as a result, the series of FRAs were officially closed to collectors in January 2000 (Walsh, 1999).

After the FRAs designation but before its closure, I helped organize and coordinate a group of researchers focused on the design and development of a coral reef fish monitoring program in and around the designated FRA sites. The resulting West Hawai'i Aquarium Project (WHAP) was created to evaluate the effectiveness of the FRAs in recovering depleted aquarium

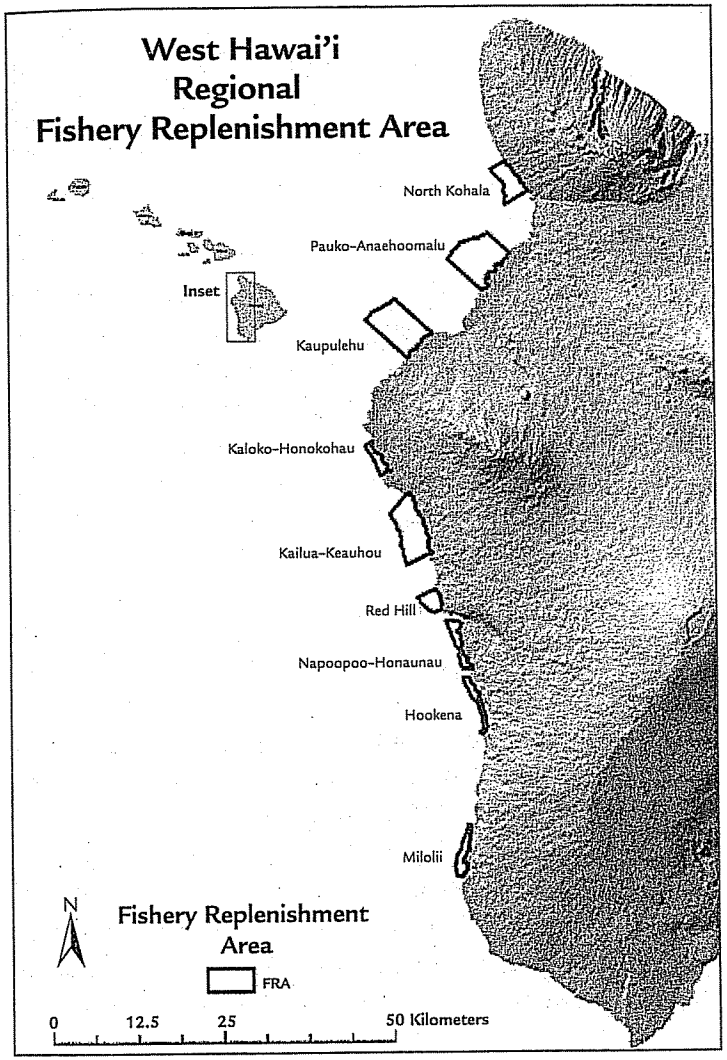

Figure II.1. Map of West Hawai'i illustrating the location of the nine Fishery Replenishment Areas (FRAs).

fish stocks. Results of our surveys are summarized quarterly and provided to DAR, the WHFC, and the public in an attempt to provide near real-time awareness of biological changes in the FRAs and engage the community in management issues (see http://coralreefnetwork.com/kona).

After five years of closure, the overall abundance of aquarium fishes significantly increased in the FRAs, relative to areas closed for over 10 years and those still open to collecting (Tissot et al., 2004; Walsh et al., 2004). Although only two of the ten most commonly collected species have significantly increased since 1999, one of these is the yellow tang, the hallmark of the aquarium industry in West Hawai'i (Tissot et al., 2004). Equally important, the catch and catch-per-unit-effort of aquarium fishes in West Hawai'i has not significantly declined after FRA establishment, indicating that a productive aquarium fishery can coexist with a large network of FRAs (Walsh et al., 2003, 2004).

In order to illustrate the IE components of the West Hawai'i aquarium fishery, I will provide an Integral analysis of the issues surrounding the aquarium fishery. I will use the 4 quadrants as a framework for highlighting the multiple dimensions and their respective issues/levels involved: behaviors, systems, cultures, and experiences (figure II.2). I include in the analysis components of native Hawaiian culture that played a role in the complex process. After presenting key elements associated with each quadrant, I provide a discussion of fishery management in Hawai'i from an Integral Ecological perspective.

Behavioral Dimension (Exterior-Individual)

The behavioral dimension explores the behaviors of individuals within the system. These may include the actions and movements of fish and humans. For example, the tendency of yellow tangs to form colorful schools of "golden" fish at high densities is an indicator of natural high abundances. When the schools are reduced by collecting pressures, their absence impacts the aesthetic quality of the reef overall, eliciting protests by people who view the fish on a regular basis. The response of different stakeholders to abundant tangs and other reef fishes also invoked differing behaviors. Tourists and locals enjoy observing the fish in their natural environment—a preservationist view. In contrast, aquarium collectors react to an abundant resource by harvesting—a conservationist view. Furthermore, individual collectors take different approaches to capturing live fish. Some collectors are yellow tang specialists and use barrier nets to capture high numbers of

	INTERIOR	EXTERIOR
INDIVIDUAL	**Psychological** • Joy in viewing colorful fish on the reef • Anger when missing local fish • Horror of connecting with fish's journey to aquarium • Anger and frustration of collectors singled out by community **Spiritual** • Connection between people and marine life • Connection with ancestral spirits or *na 'aumakwa* **I**	**Behavioral** • Schooling behavior of yellow tangs at high density • Novice snorkelers who observe schools of colorful fish • Professional scuba divers who target rare fishes and behaviors • Aquarium collectors who target rare and endemic fishes of high value **IT**
COLLECTIVE	**WE** **Cultural** • Aquarium collectors' concept of sustainability clashing with preservationist attitude of fish viewers • Interest- vs. identity-based values in conflict resolution process **Religious** • *Hawaiian Kumulipo* and connection with nature • *Aloha 'āina* reinforcement of *pono* • *Mālama 'āina* concept of taking only what is needed with respect	**ITS** **Ecological** • Response of ecosystems to decline in herbivorous aquarium fish abundance **Economic** • Importance of marine tourism to economy **Political** • Failure of DAR to manage the aquarium fishery • Pressure by citizens' groups to create laws to develop FRAs **Educational** • Research on collector harvesting • Monitoring of the effectiveness of FRAs to replenish aquarium fishes **Sociological** • Representation of individuals in traditional *ahupua'a* • Establishment of FRAs in *ahupua'a* • Availability of information on marine resources to WHFC representatives and local community • Recognition and integration of *pono*, *ahupua'a*, *konohiki*, to reinforce management approach

Figure II.2. 4-quadrant analysis of West Hawai'i community-based management of the aquarium fishery.

fish for the bulk wholesale market. Conversely, other collectors target uncommon or rare fishes of higher individual value, such as Tinker's butterfly fish (*Chaetodon tinkeri*).

Concomitantly, varying collecting strategies impact specific sectors of the dive tour industry in different ways. A major component of West Hawai'i's dive tour industry consists of large vessels transporting hundreds of novice snorkelers out to the reefs to experience the reef and its organisms as a whole. In contrast, other dive operations specialize in repeat, quasi-professional scuba divers who target specific organisms for new species sightings to add to their dive logs or for marine photography enthusiasts. In the latter case, value is placed on dive operations that have detailed, long-term ecological knowledge of the locations and habits of rare marine species. Therefore, when collectors target and remove rare, resident fishes from the reef, the more specialized dive tours are directly affected. Conversely, the bulk removal of whole schools of yellow tangs and other colorful reef fishes has a more pronounced effect on the larger-scale diving operations and ultimately on the snorkelers' aesthetic experience on the reefs. Thus, the behaviors of individual fish species and human usergroups have direct consequences on each other and play a major role in the kinds of interactions between stakeholders in West Hawai'i.

Systems (Exterior-Collective)

Another dimension included in an Integral analysis is the overlapping natural, social, and political systems, and their interactions. This dimension is well recognized and analyzed in traditional fishery management.

At the ecosystem level, yellow tangs are herbivorous fish that may play an important regulatory role in controlling the abundance of algae in coral reef communities. However, although several groups used this interplay to oppose aquarium collectors, there are no observed increases in the abundance of algae in areas subjected to aquarium fish harvesting (Tissot and Hallacher, 2003). On the human level, local aquarium collectors are a small component of a large international trade network involving wholesalers, retail store owners, and worldwide hobbyists. Fish collected on reefs in Hawai'i are sold to local wholesalers for several dollars each and then shipped cross-country; they can, for example, end up in a store in Kansas retailing for more than $60 each. In West Hawai'i there are approximately 60 active collecting permits and, based on voluntary reporting, the annual harvest in 2001 was 708,000 fish at a total value of $1.06 million (Walsh et al., 2003). However, it is likely that the catches and values are underrepresented and the actual value of the fishery may be considerably larger than reported (ibid.).

Coral reef aquariums, ranging from small private displays to massive public exhibits, are sophisticated operations requiring detailed knowledge of environmental conditions, nutrient dynamics, and habitats of coral reef fish. Subsequently, many hobbyists own large aquaria stocked with a variety of reef fishes and living corals from around the world in complex, closed aquaria costing thousands of dollars to stock and maintain (SPFS, 1999). These displays can have high educational value and may provide the opportunity for people far removed from Hawai'i to enjoy the wonder and beauty of coral reef fishes in their own homes or at their local public aquarium. As hobbyists promote sustainable practices in the aquarium industry, educational opportunities provided by the aquariums they create can lead to increased awareness of and appreciation for the oceans' resources, and thereby help promote worldwide conservation efforts to protect coral reefs (ibid.).

At odds with the aquarium industry is the much larger tourism industry, which is the second largest generator of revenues for the State of Hawai'i. A major component of tourism in Hawai'i centers on marine dive tours, which account for a large component of the $3 billion a year ocean industries revenue in Hawai'i (Cesar and van Beukering, 2004). Dive tour operations are closely linked to a wide variety of other industries that capitalize on the beauty of local reefs, including hotels and restaurants, apparel, jewelry and art, and eco-tourism that combines land and sea tours. Over the last 30 years both the dive tour and aquarium industries have experienced dramatic growth in Hawai'i (Cesar and van Beukering, 2004; Walsh, et al., 2003; Miyasaka, 1997). Overall, however, revenues from dive tourism dwarf those of the aquarium industry, which may well explain why aquarium collectors were unable to develop the political support to oppose the establishment of FRAs in West Hawai'i. In contrast, as discussed in the addendum (page 448), the more traditional recreational and artisanal fisherman have tremendous political support and have been very effective in preventing MPA establishment for consumption-based fishing practices.

A wide variety of institutions and organizations also played important roles in the development of the fishery management plan for West Hawai'i. Although DAR is responsible for state fisheries management, dissension

within DAR over management issues and a consistent laissez-faire attitude about management in general ultimately led to a legislative resolution of the conflict. The legislature became involved because the West Hawai'i community strongly protested the lack of effective management of the aquarium fishery by DAR. In 1997, the Lost Fish Coalition presented a 4,000-signature petition to state legislators and requested a total ban on collecting. Thus, during the 1997–1998 legislative session there were two competing bills moving forward: one creating a total ban on collecting in West Hawai'i and another mandating a minimum of 30% of closed areas managed with community participation. Understandably, the collectors endorsed the latter, joined the WHFC, and helped influence the location of the FRAs.

Working with several university-affiliated marine ecologists and DAR, I also was involved in an important role by conducting a study to document the extent of harvesting by aquarium collectors in West Hawai'i and provide objective data to the legislature and the public. The results of the study documented significant 38%–75% declines in 7 of the 10 aquarium fishes studied (Tissot and Hallacher, 2003). The results of these studies were presented to DAR, the legislature, and the West Hawai'i community, and summaries were provided during committee hearings and at public meetings. Moreover, once the FRAs were demarcated, studies were established by WHAP to monitor the effectiveness of the management plan to replenish aquarium fishes and provide information to all stakeholders (Tissot et al., 2004).

Significant contributions to the conflict resolution process were also made by acknowledging and building on aspects of traditional native Hawaiian fishery management. The concept of resources management is implicit in native Hawaiian culture and was traditionally embedded in the overarching sociopolitical and spiritual construct of *pono*, or "balance" between the community and the ecosystem. *Pono* is recognized as the dynamic balance between the *Ali'i nui* (high chiefs), the common people, the gods, and the sacred *'āina* (land and sea), from which all food and water and thus all life is provided and maintained by the just rule of the *Ali'i* through strict laws and rituals, and ancient sacred traditions. Thus *pono* is consistent with the purposeful management of natural resources to promote sustainability; a concept clearly at odds with modern fishery management in Hawai'i today (Friedlander et al., 2003).

Recognizing the importance and value of these traditional concepts, the WHFC membership and FRAs are associated with traditional Hawaiian *ahupua'a* and with native Hawaiian populations that supported the aquarium ban and provided community-based support for enforcement, which is severely lacking in Hawai'i (ibid.). Moreover, periodic closure of fishing grounds was a common fisheries management technique in ancient Hawai'i, where *kapu* (strict laws) were used in resources management to enforce no-take areas, to restrict hunting and fishing seasons, and to establish sacred or forbidden species, often with severe penalties for violating such laws—including banishment and death. These laws were passed after the *konohiki* (a resources manager/steward appointed by the *Ali'i*) consulted with the *po'o lawai'a* (master fishermen), who had generations of intimate knowledge of the status of marine resources in their *ahupua'a*. Two functions of the WHFC mirrored this arrangement by allowing a two-way flow of information from individuals in the community to the council, scientists, and DAR, and from these groups back to the community. The attempt to provide near real-time data from WHAP to the WHFC with representation of individuals from multiple *ahupua'a* recognizes the value and builds on the flow of information in this traditional model.

Cultural Dimension (Interior-Collective)

The cultural dimension includes collective attitudes and beliefs that shape the behaviors and action of groups within the social systems. Although this dimension is acknowledged in the arena of environment conflict resolution, it is a complex and often neglected dimension of fishery management that deserves significantly more attention.

The origins of the conflicts over aquarium collecting and the lack of complete resolution were intricately intertwined with the different ethics/values, or belief systems, of the various stakeholders. Although few people in Hawai'i take issue with catching reef fish for consumption, collecting live fish for exportation is viewed as a wholly different matter. At issue are several divergent ideas. One is the local acknowledgment that supplementing your family's food by living off of the land is a common and accepted lifestyle in Hawai'i, and subsistence catch still provides a vital component to the household food budget for many *'ohana* today. However, the practice largely involves eating or sharing with your neighbor what you catch, and never taking more than you need. Clearly, selling live fish for solely

economic gain stretches the traditional Hawaiian concept of subsistence catch. In addition, some communities more heavily dependent on subsistence catches wanted collectors banned due to a perceived competition for food fish (Walsh, personal communication) and because collectors may have been perceived as "greedy" in a Hawaiian cultural context, when compared with the local subsistence fishermen.

Another issue often debated in public and presented in the newspapers was the potential negative effects of fish harvesting on the reefs. Collectors held that their industry was sustainable and not causing harm to the reefs, a contention partially supported by scientific study (Tissot and Hallacher, 2003). However, collectors were frequently attacked with accusations that their collecting activities caused long-term reef damage and that their operations promoted unsustainable fisheries. Thus, the lack of clearly demarcated opinions, worldviews, ethics/values, and cultural perspectives, combined with a community-wide debate over the issues, confounded and prolonged the conflict.

Ethical conflicts also emerged in the consensus-based approach used to develop the FRAs. One of the major goals of the WHFC was to achieve consensus among stakeholders on the location of the FRAs and simultaneously resolve the multiple-use conflict using an alternative process of environmental dispute resolution, or EDR. Alternative EDR is a growing field wherein the psychology and behavior of conflicting interest groups is recognized and developed into self-generated conservation tactics that acknowledge and preserve personal goals (Daniels and Walker, 2001). When conflicts are complex, as was the case in West Hawai'i, they can occur at multiple levels, each of which needs to be acknowledged, understood, and honored. Conflicts often revolve around different levels of perception of the issues: so-called interest-versus value-based conflicts (Capitini et al., 2004). From an IE approach these are conflicts in an intersubjective context (i.e., traditional versus modern worldviews). In West Hawai'i the interest-based component of the conflict, a rational and scientifically based dispute over the allotment of fish resources between collectors and tour boats, was clearly recognized and understood. Although framed as a sustainability issue by many, this conflict was resolved by designating the FRAs, which prohibited collectors from operating in areas containing popular dive sites, while leaving the majority of the coastline open for harvesting. In contrast, value-based components are often more complex and derived from long-standing differences and concerns, and stem from psychology, culture, and threatened beliefs (Rothman, 1997). Known also as identity-based conflicts, these disputes are characterized by an unclear determination of their parameters and boundaries, as they stem from deeper personal values that are not clearly demarcated or understood (ibid.). In West Hawai'i, differing beliefs on the appropriate use of fish on the reef were a continued source of discord and dissension on the council. For example, aquarium collectors interpreted Act 306's language stating that "a minimum of 30% of the coastline be designated as FRAs" as meaning exactly 30% of the coast. When the total FRA coverage ended up at 35.2%, many collectors felt they were unfairly singled out and walked off the council (Walsh, 1999). Although it is unclear if their behavior was primarily related to the designation of specific FRAs, it seems likely that collectors felt that their values and rights as fishermen were not acknowledged in the process and thus viewed the conflict from a traditional "membership" position.

Aquarium collectors were dismayed by what they viewed as a small, harmless industry unfairly singled out and criticized for utilizing what they perceived to be a largely untapped, abundant, and seemingly limitless resource (Capitini et al., 2004). Some collectors boasted of harvesting 1,000 fish per day (Walsh, personal communication). Here again, different values and beliefs about the ocean contributed to conflict in West Hawai'i. Although many view the ocean as boundless and unlimited in its productivity and potential uses, others hold the ocean as sacred for sustaining life (the postmodern "sensitive self"). This dichotomy represents a classic conflict between the Judeo-Christian worldview that resources are for our use (i.e., the Garden of Eden) and the Hawaiian philosophy of *mālama 'āina* (caring for the land) (White, 1967; Callicott, 1994).

Thus, embedded in this controversy were threads of native Hawaiian cultural practices and traditions that still exist in the West Hawai'i community. Although present, these beliefs are often fragmented, misunderstood, and occasionally misrepresented or misapplied in modern Hawaiian communities. One such belief is *aloha 'āina*, or love of the land, a traditional Hawaiian value that connects the people to the place where they live and work (Pukui et al., 1972). The foundation of this connection is beautifully told in the Hawaiian creation chant, or *Kumulipo*, which describes the evolutionary descent and familial relationship of all living creatures, eventually resulting in the Hawaiian people (Beckwith, 1951). *Aloha 'āina* serves to

reinforce the concept of *pono*, the balance between people and the *'āina*, but also gives rise to the concept of *mālama 'āina*, or caring for the land.

To the Hawaiians land was not owned as in Western cultures, but was for temporary use and considered sacred. The *'āina* was seen as a place for restoring spiritual, cultural, natural, and individual balance, a concept known as *lōkkahi*. George Helm, one of the founders of the Hawaiian cultural renaissance and respected *kumu* (teacher), expressed his thoughts about this concept in relation to the restoration of the sacred island of Kaho'olawe as a place for restoring *lōkkahi* (Whitcraft and Levin, 2003):

> The truth is, there is man and there is the environment. One does not supersede the other. The breath of man is the breath of Papa (the earth). Man is merely the caretaker of the land that maintains his life and nourishes his soul. Therefore, *'āina* is sacred. The church of life is not a building; it is the open sky, the surrounding ocean, the beautiful soil. My duty is to protect Mother Earth, who gives me life. And to give thanks with humility as well as to ask forgiveness for the arrogance and insensitivity of man.

In this context, then, *mālama 'āina is* a cultural extension of *pono* and serves to reinforce sociological and political systems. *Mālama 'āina* involves asking permission prior to fishing, taking only what you need, sharing your catch with your extended *'ohana*, or community, and having respect for the sacredness of the process. Thus, even though most of ancient Hawaiian culture was dominated by magical and warrior values, the ethics of resource management was guided by the spiritual beliefs of their priests (*kahuna*) elders (*kupuna*) and *kumu*, resulting in the potential for an integral view of their relationship with nature.

Clearly, harvesting live fish for economic gain and shipping them in a bag for a long, convoluted odyssey, potentially resulting in mortality and waste, violated the very core of these traditional values. Thus, the Hawaiian cultural worldview, expressed in various forms and at various levels in the communities of West Hawai'i, contributed to a conflict with ornamental reef fisheries. In the conflict resolution process, a lack of acknowledgment and understanding of these multiple cultural values likely presented a fundamental conflict in developing a consensus-based approach to fishery management on the WHFC.

Experiential Dimension (Interior-Individual)

The experiential dimension includes the subjective realities of all beings at all levels of awareness. These include the emotions and motivations of humans and their spiritual experiences, which are generally not considered in fishery management. It also involves the forms of experience and perception available to the fishes on the reef. For many individuals, snorkeling over a coral reef in Hawai'i is a rich, joyful, and occasionally spiritual, transformative experience. Floating freely with hundreds of brightly colored fish swarming over an intricate web of coral has inspired many people to learn to value the reef and its organisms. These experiences may also involve the development of personal connections between people and individual organisms on the reef. Some reef organisms are known to inhabit the same areas of the reef for extended periods of time. Butterfly fish, for example, form permanent mated pairs that establish territories on the reef for life (Reese, 1993). Thus, it is not uncommon for people to form long-term connections or relationships with individual fish, in specific areas. For example, in Wai O'pae in East Hawai'i the establishment of a "no take" marine reserve, generally a difficult and contentious process in Hawai'i, was greatly facilitated due to the mayor of Hawai'i island having a long-standing personal relationship with a fish in the proposed reserve. These connections, and the associated sharing of feelings with the plight of fish captured on the reef, played strongly into the animosity against aquarium collectors that developed in West Hawai'i.

People gasped at the thought of beautiful fish being captured and transported off their native reef, never to return. The capture and transportation of live fish is described as a litany of horrors, with often less than 10% successfully surviving the journey to their intended destination, and even then, often dying alone in aquariums due to the inexperience of owners (Baquero, 1995). This emotional connection with the plight of the reef fish was the principal driving force behind the Lost Fish Coalition, whose hallmark was a dead yellow tang in a haggle. Armed with their preservationist convictions and the powerful image of the dead fish, the Lost Fish Coalition was largely responsible for spearheading the passage of Act 306 through the legislature (www.lostfishcoalition.org). Thus, people's personal joy on the reef, transformed into horror, sadness, and eventual anger as their favorite fish disappeared, became the principal motivation to limit or eliminate the actions of aquarium collectors.

Discussion

The IE approach provides a far broader and deeper view of the biology, conflict, resolution, and management process in West Hawai'i than has previously been presented (figure II.2). The principal strength of the AQAL approach is that it provides a means to acknowledge and understand the levels of complexity and the depth of issues and beliefs in each quadrant and to appreciate the interconnections and feedback mechanisms among quadrants and between levels. This approach clearly captures and illustrates how individual experiences on the reef were transformed into social movements, political will, and eventual ecological change. Thus, interiors, largely unrecognized by scientists in fishery management, were ultimately driving the process that led to ecological change. Moreover, the example serves to illustrate the role of scientific research and education in providing informed decision-making at all levels. However, some of the complexity in the system, which perhaps resulted in the failure of the WHFC to reach complete consensus on a management solution, may have been lost by not acknowledging, understanding, or honoring the differing worldviews represented by the various stakeholders. In this respect, there were fundamental values-based or ethical conflicts in the community, and subsequently among members of the council, that were not sufficiently explored nor discussed. Moreover, the IE approach helps clarify and strengthen the overall sustainability of the system and provide a model of fishery management for the rest of Hawai'i.

In the case of the WHFC, building on Hawaiian social and cultural traditions helped promote solutions to management issues that previously may not have been possible. Native Hawaiians developed a management system based on social and cultural controls, and more specifically on a code of conduct and set of laws for fishing that was strictly enforced and provided for sustainable harvests of natural resources. One of the major components of this system was/is the belief that marine resources are limited and, as a result, there was/is a strong social obligation to exercise self-restraint through the process of nurturing and respect (Titcomb, 1972; Friedlander et al., 2003). These traditions and beliefs, although badly fragmented, are still present in modern Hawai'i and are a source of strength for the fishery management approach in West Hawai'i. The AQAL model explicitly honors modern ecological and social approaches—incorporating monitoring, conflict resolution, and fishery councils—along with the existing Hawaiian models by incorporating the political and cultural concepts of *ahupua'a*, *konohiki*, *kapu*, *pono*, and *mālama 'āina*.

In smaller communities, such as on the Ho'olehu Hawaiian Homesteads on the rural island of Moloka'i, effective integration of modern and traditional cultures has allowed the community to adapt its management strategies to the specific environmental conditions of the area and develop scientific assessments alongside a traditional Hawaiian moon calendar to help govern harvesting of reef fish (Friedlander et al., 2003). Based on the success of the Ho'olehu community, one recommendation for the WHFC would be to decentralize into smaller community governing boards associated with individual *ahupua'a* or *'ili* (groups of *ahupua'a*), thereby potentially facilitating an easier flow of information to and from the community, providing for more specific knowledge of reef resources, and allowing local communities a more direct role in the management of their resources.

Another challenge is to more thoroughly acknowledge and incorporate traditional knowledge from communities to complement scientific assessments. Efforts should be made to recruit and support *po'o lawai'a* (master fishermen) and provide an avenue for the recognition and application of their knowledge by the regional boards. For example, one of the major questions of MPA design is where to locate protected areas in order to maximize the productivity of the ecosystem (Allison et al., 1998). This task is particularly difficult due to high levels of fishery exploitation in Hawai'i and thus a lack of understanding of natural, pre-exploited population levels. One idea in addressing this question is to design MPAs using information from traditional Hawaiian fishing areas. Hawaiians marked their productive fishing grounds, often based on centuries of observation, with fishing sacred shrines, or *ko'a* (Titcomb, 1972), some of which are still present in Hawai'i (Whitcraft and Levin, 2003). Archaeological and historical research on the location of *ko'a*, combined with modern scientific assessments and the extensive knowledge of living *po'o lawai'a* and *kupuna*, could provide an effective means of designing networks of MPAs.

Finally, in the conflict resolution process, greater attention should be given to exploring and acknowledging the identity- and value-based conflicts present in West Hawai'i and on the WHFC. The use of a professional facilitator trained to tease out and identify these complex issues might go a long way toward resolving the conflicts still present (Capitini et al., 2004).

One possibility is to use or build on the Hawaiian method of conflict resolution, or *hō'ō pōnō pōnō* (to make things right through healing). *Hō'ō pōnō pōnō* is a process that occurs within an *'ohana* or community to resolve long-standing disputes (Pukui et al., 1972). The process is traditionally led by a *kupuna* and involves long periods of *pule* (prayer), *hala* (airing of grievances or transgressions), *hihia* (recognition of mutual negative feelings), and eventual resolution through *mihi* (apology) and *kala* (forgiveness) (Shook, 1986). Adaptation of this process to local councils might allow disputes among individuals to be more easily acknowledged and resolved, and furthermore may also allow a more complete and appropriate incorporation of spiritual and cultural dimensions into the process. In conclusion, the complexity illustrated using the IE approach clearly opens up a variety of new possibilities for resolving conflicts and promoting sustainability in resources management. IE provides an analytic framework that not only is efficient in identifying the multidimensionality of complex eco-social issues, but also helps identify key leverage points for effective change. IE is capable of recognizing these leverage points by taking an Integral meta-view of any situation and analyzing individual experiences and behaviors, as well as collective complexity. In a world as complex and multifaceted as ours it is hard to imagine using any approach that is not Integral in nature.

Addendum

Since 2004 several changes and events have occurred that further illustrate that multiple-use resource conflicts in West Hawai'i are a lack of mutual agreement and understanding within the subjective context (worldview and value-driven) rather than the objective context (data-driven). Lack of agreement occurs both within and among identified stakeholder groups, validating a full spectrum rather than a traditional stakeholder-driven EDR process. On the reefs, yellow tangs have continued their strong recovery in the FRAs: increasing 49% overall in West Hawai'i since FRA closure, and the aquarium fishery has the highest catch, economic value, and catch-per-unit-effort of its 30+-year recorded history (Walsh, personal communication). For many members of the WHFC, including some aquarium collectors, the yellow tang recovery data have been persuasive, resulting in broader support for MPAs and community-based management. Thus, just as individual and collective interiors initiated first political, then ecological change, Right-Hand data on biology and economics is feeding back, informing, and altering interiors. Ultimately, it is hoped that this AQAL feedback process will provide momentum for further community-based MPA models in Hawai'i, and indeed this is happening at various levels throughout the state of Hawai'i (Tissot et al., in review). However, as the West Hawai'i model became more well known within the state, user conflicts at larger-spatial scales quickly became apparent.

In an effort to extend the West Hawai'i model to other islands, a legislative bill (HB 2056) was submitted to the Hawai'i state legislature in 2004. Although the bill had a fair amount of support within the legislature and statewide, fishing groups (primarily recreational and artisanal fishers, a much larger group than aquarium collectors) rallied together and handsomely defeated the bill. The following year, perhaps in response to HB 2056, two pro-fishing and anti-MPA "Freedom to Fish" bills quickly followed. Although defeated, they made significant headway in committees, including gaining the support of legislators in West Hawai'i. "Freedom to Fish" bills, which are a nationwide phenomenon, use scientific language to purportedly protect fish stocks but in reality place such a high burden of proof on cash-strapped management agencies that they effectively strip away most fishery regulations, including existing MPAs. These bills largely present a traditional worldview membership argument (fishers have a right to fish that preempts other uses or values), using modern rational language (fish need extraordinary protection given their value, and current management is underfunded and sorely inadequate) and have been effective in rallying support to defeat MPA efforts. These conflicts, now manifested at the state level, mirror conflicts in the WHFC EDR process and are systematic of marine conservation in general, where scientific zeal and reductionism (in the form of data and ecological theory) has largely ignored the interior (or Left-Hand) roots of user conflicts under so-called "consensus-based EDR." MPAs have been used as a panacea for ocean ill health, an ideological scientific tool to promote marine conservation. However, in the long run, this narrow exterior and data-driven approach is likely to damage the long-term effectiveness of resolving marine conservation efforts by not resolving resource conflict issues with diverse stakeholders that encompass multiple perspectives, values, and worldviews (Agardy et al., 2003).

Interestingly, within the last two years a similar schism has developed within the scientific community, primarily in response to data on declining global fisheries. One group, represented primarily by academic marine

ecologists who advocate MPAs as the central tool of a new approach to rebuilding the marine ecosystems of the world, is in conflict with scientists primarily working in fisheries agencies, who see many failed fisheries but also numerous successes. While marine ecologists advocate for a paradigm shift in fishery management, the fishery scientists argue that we need to apply lessons learned from successful fisheries and rebuild threatened fisheries. This disagreement within what many see as a unified "scientific community" represents yet another conflict as modern and postmodern ecologists press for no-take areas that preserve fish, habitat, and biodiversity. In contrast, fishery scientists are driven by traditional and modern worldviews and argue for traditional systems approaches valuing policy, management, and economics. Clearly, both sides have enormous merit, but as with the disconnect between fishers and other stakeholders, it is unlikely that mutual agreement will occur anytime soon without a process that incorporates an Integral Ecology approach.

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