Fishing, Seafood, and Community Research in the Main Hawaiian Islands: A Case Study of Hanalei Bay, Kauaʻi

-Final Report -

Prepared for

State of Hawaiʻi
Department of Land and Natural Resources, Division of Aquatic Resources

by

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May 2012
(Revised)

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The study described in this report was funded by the State of Hawai‘i, Division of Aquatic Resources under Purchase Order No. CO2996. The project is a component of the NOAA Fisheries Local Action Strategy in Hawai‘i (FLASH). Fishing, Seafood, and Community Research in the Main Hawaiian Islands: A Case Study of Hanalei Bay, Kaua‘i. Prepared for the State of Hawai‘i, Division of Aquatic Resources. Impact Assessment, Inc., 910 Pueo Street, Honolulu, Hawai‘i 96816.

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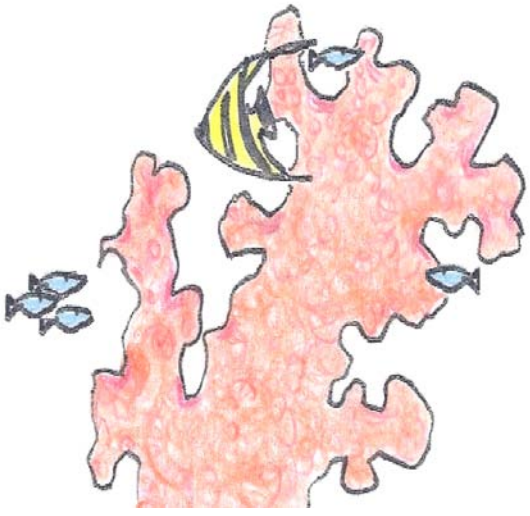

Acknowledgements

We wish to express our appreciation to the State of Hawai‘i Division of Aquatic Resources (HDAR) for funding this important project. Thanks especially to Mr. Ray Uchimura and Ms. Petra MacGowan of HDAR for their diligent technical and administrative oversight. We also offer heartfelt thanks to Maka‘ala Ka‘aumoana of the Hanalei Watershed Hui. Ms. Ka‘aumoana provided entré into the community and assisted the research effort in every possible way. We also extend our sincere thanks and appreciation to Ms. Debbie Gowensmith of the Hawai‘i Community Stewardship Network. Ms. Gowensmith provided invaluable assistance throughout the course of the project. Dr. Cheryl Anderson of the University of Hawai‘i Social Science Research Institute, and Sarah Henly-Shepard of the University of Hawai‘i Department of Natural Resources and Environmental Management graciously offered their time and expertise as they simultaneously examined natural hazards and community resilience issues in the study community. We also wish to acknowledge the assistance of Dr. Stewart Allen, Director of the Human Dimensions Research Program at the NOAA Pacific Islands Fisheries Science Center. Dr. Allen provided data and spatial analysis of commercial and recreational fishing activities undertaken by residents of Hanalei. Finally, we wish to thank the many fishermen and other residents who so graciously shared their perspectives and knowledge of the marine environment and the community of Hanalei.

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Summary Overview

This report summarizes a pilot study of consumption-oriented fishing and shoreline food gathering activities and associated social context in the Main Hawaiian Islands. The project was sponsored by the State of Hawai‘i's Division of Aquatic Resources (DAR) as a component of the NOAA Fisheries Local Action Strategy in Hawai‘i (FLASH). The research involved development and testing of a methodology for generating detailed assessment of local fishing activities as these occur in Hanalei Bay and in relation to the community of Hanalei on the Island of Kaua‘i. The methodological approach and project findings have the potential to enable useful comparative analysis of fishing activities undertaken in other communities around the islands, with implications for prospective future natural resource management decisions across the state.

Relatively few island or coastal residents around the world today are in a position to undertake natural resource harvesting activities on a full-time or exclusive basis. This holds true in the study community of Hanalei and in the Hawaiian Islands in general. It is rather the case that fishing, hunting, and other ocean- and mountain-based food gathering activities are elements of an overall suite of activities that facilitate the economic viability of the local household. These also include: part-time and full-time jobs– often in the tourism-related service and construction industries; small-scale agriculture; various investments and subsidies; customary exchange; and intra- and inter-familial reciprocal sharing of labor, foods, and fiscal resources. Commercial fishing and income-bearing sub-rosa activities are also important in economic terms in certain family and community settings around the islands. By combining many sources of food and income, local residents are able to take part in historically important and culturally meaningful activities that bear tangible benefits to the family unit and, collectively, to the community of involved residents. This simultaneously requires maintenance of local and traditional ecological knowledge and strategies for conservation and wise use of living marine resources, as is presently occurring among residents of Hanalei.

Observation in Hawai‘i community settings such as Hanalei makes clear that most fishermen take to the shoreline and open-ocean to capture food for consumption in nuclear and extended family settings. The activities are often observably enjoyable to the participants, and in this sense it may be said that a recreational experience is involved. But fullest enjoyment tends to be observed or reported when a successful harvest is achieved and there is food from the sea (or mountains) to eat, to share, and to instigate or satisfy interest in communal celebration. In some cases, these experiences reportedly involve a spiritual connection with the natural environment, with one’s family, and with creative powers greater than the individual. This study underscores the importance of such activities and experiences, and the ways in which they serve to organize local society. Although socio-demographic and economic changes are altering the nature of contemporary life in the community of Hanalei, long-time residents continually assert the importance of: ensuring the continuation of local traditions, ecological knowledge, and prudent use of resources by residents and non-residents alike; pursuing and consuming seafood in family and community settings; and deriving dietary, social, and household-economic benefits from successful fishing activities. This analysis suggests that the importance of these aspects of contemporary life in the Hawaiian Islands cannot be overstated. Indeed, neglecting such factors in the natural resource management process could potentially serve to constrain customs and traditions that were and remain fundamental to development of Native Hawaiian and local societies across the region.

Fishing, Seafood, and Community Research in the Main Hawaiian Islands:

A Case Study of Hanalei Bay, Kaua‘i

1.0 Introduction

This report summarizes an exploratory study of consumption-oriented fishing and shoreline food gathering activities and associated social context in the Main Hawaiian Islands. The project was sponsored by the State of Hawai‘i's Division of Aquatic Resources (DAR) as a component of the NOAA Fisheries Local Action Strategy in Hawai‘i (FLASH).

The mission of DAR is to effectively manage, conserve, and restore the state's aquatic ecosystems and associated resources for present and future generations.[1] The FLASH program facilitates collaborative action among federal, state, and non-governmental partners to reduce threats to coral reef resources across the Hawaiian Islands. Both entities maintain an interest in the nature of direct and indirect interactions between humans and marine ecosystems in the region, including interactions involving human use of marine resources for purposes of consumption, commerce, and recreation.

The research described in this report involved detailed assessment of local fishing activities as these occur in Hanalei Bay and in relation to the community of Hanalei on the Island of Kaua‘i (Map 1-1). The project was conducted in this location because it is similar to other small Hawai‘i communities in which fishing, shoreline gathering, and consumptive use of seafood are important aspects of local society and occur in a larger social and economic context of extensive tourism services.[2] As such, the findings of this study have the potential to inform comparative analysis of consumption-oriented fishing activities as these are undertaken in other communities around the islands, with implications for prospective future natural resource management decisions across the state.

This project was conducted by the Pacific Islands Office of Impact Assessment, Inc. (IAI). IAI has over the last 30 years supported the information and analytical needs of government agencies acting under NEPA, OCSLA, OPA, the Magnuson-Stevens Act, and other public trust natural resource policies and mandates. The firm specializes in research of issues associated with management of living marine resources along the coastal zone of the United States and abroad.

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[1] DAR manages Hawai‘i's marine ecosystems "through programs in commercial fisheries and resource enhancement; aquatic resources protection, habitat enhancement, and education; and recreational fisheries." Major program areas include: management of marine fisheries is a way that ensures the long-term sustainability of the resources, protection and restoration the aquatic environment, protection of native and resident aquatic species and their habitats, and provision of facilities and opportunities for recreational fishing (DAR 2012).

[2] Moreover, studies of coral reefs, reef-associated fishes, and fishing activities were conducted in Hanalei Bay during the mid-1990s and 2000s (Friedlander et. al. 1997). The current study updates certain aspects of the earlier research and provides additional detail regarding social and cultural aspects of fishing in the study area.

1.1 Project Goal and Research Objectives

The following pages constitute a report on a pilot study of consumption-oriented fishing and shoreline gathering activities and the sociocultural background in which these activities occur in the Main Hawaiian Islands. The primary goals of the research were to enhance management of coral reef ecosystems in Hawai‘i by elucidating the nature and significance of this important but largely understudied category of use of the marine environment, and to test a variety of methodological approaches to the subject matter. Meeting these goals required the satisfaction of ten interrelated social science research objectives. These objectives are as follow:

(1) Develop a research design through which to examine consumption-oriented fishing activities in a specific community setting in the Main Hawaiian Islands, wherein the methodological design and its testing are useful for the current project and for research of similar topics elsewhere in the state;

(2) Conduct an initial period of exploratory ethnographic research to: (a) enable basic understanding of the nature and importance of fishing and other seafood-gathering practices in the study area, (b) ensure a valid and culturally appropriate approach to further research, and (c) identify, and establish rapport, trust, and working relationships with knowledgeable persons in the study community;

(3) Simultaneously identify and review pertinent literature and archival data needed to inform development of a valid research design and to contextualize any subsequent description and analysis of fishing, shoreline gathering, and related aspects of life in Hawai‘i generally and the study community specifically;

(4) Develop a valid research protocol and implement a purposive sampling approach to conduct a series of in-depth interviews with residents who are known to consistently engage in shoreline fishing and gathering activities and/or who are highly knowledgeable of such practices and associated environmental factors in and around the study area;

(5) Ensure that in-depth interviews involve discussion of historic and contemporary local resource management strategies; social, economic, and demographic aspects of local consumption-oriented fishing and shoreline gathering activities; and personal observation of changes in the status of local marine resources over time;

(6) Develop a survey instrument with which to examine pertinent aspects of life among householders in the study community, ensuring that the instrument includes queries about: (a) basic social, demographic, and economic attributes of and conditions in local households; (b) localized pursuit and use of marine and terrestrial natural resources; and (c) perspectives on community life and relationships between residents and the natural environment;

(7) Enumerate and map households in the study community and implement the survey among an exhaustive sample of households, to include both permanent and seasonal residents (the latter as available during the course of the survey);

(8) Analyze pertinent qualitative, quantitative, and spatial data deriving from: (a) archival sources, (b) in-depth interviews, (c) intercept interviews, and (d) household surveys, ensuring that all forms of information are used in a complementary and cross-validating manner to enhance understanding of the subject matter regardless of a relatively small pool of research participants;

(9) Generate and present for review to a knowledgeable member or members of the study community a draft report providing: empirical description, basic quantitative analysis, and informed narrative discussion of consumption-oriented fishing and the social and economic context in which fishing occurs in and around the study area; and critical discussion of the project methodology and its potential application elsewhere in the islands;

(10) Address reviewer comments, revise draft report and deliver a final project report to DAR and FLASH program administrators; present key project findings to the sponsors and/or to interested members of the study community.

1.2 Project Sequence

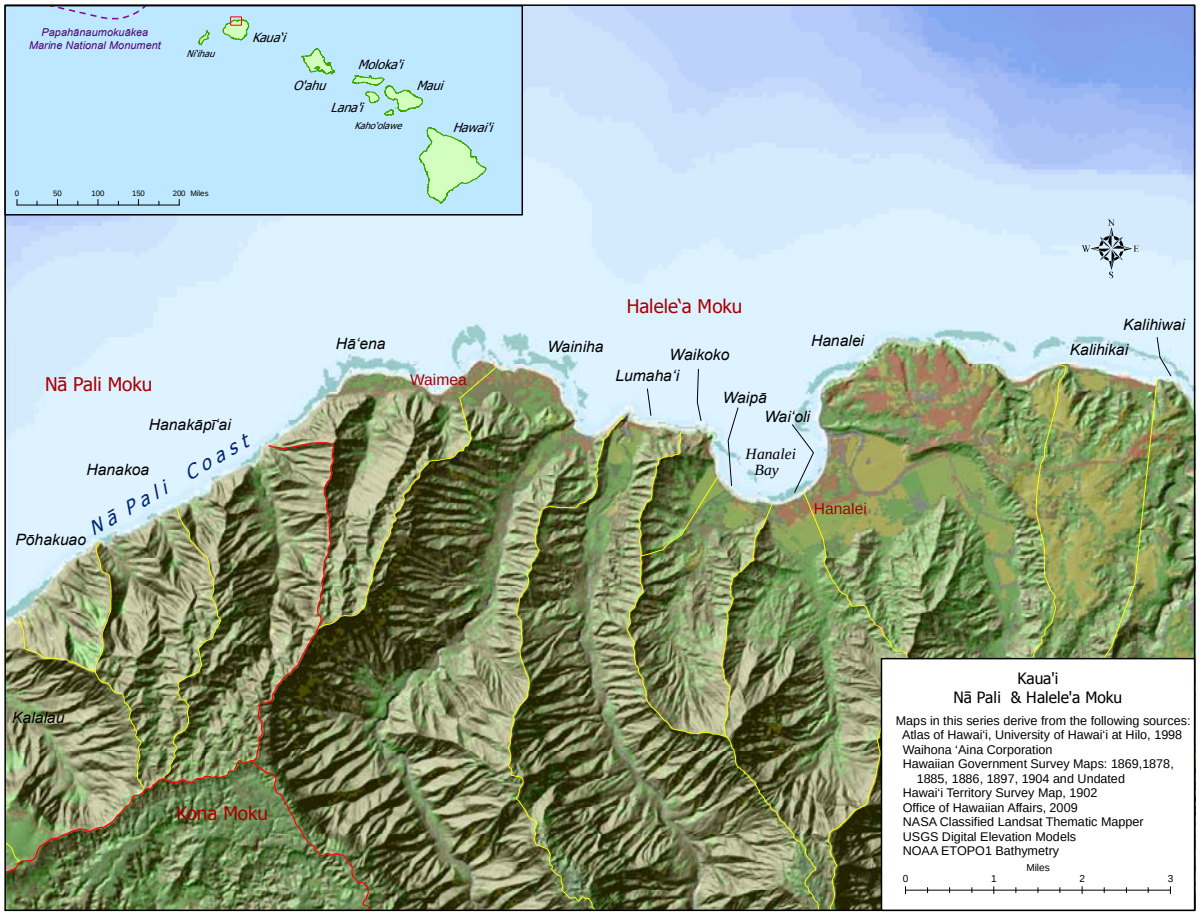
This project involved a series of early planning meetings between IAI staff members and: (a) key members of the study community, (b) administrators at DAR, and (c) a research team from University of Hawai‘i's Social Science Research Institute (SSRI). The SSRI team was also planning to undertake research in Hanalei during 2010 and 2011. The meetings were held to help formulate a useful research agenda and to develop strategies for collaboration. It should be noted that the Hanalei Watershed Hui[3] contributed extensive time and energy to the project, hosting initial community meetings, providing entre into the study area, and facilitating various phases of the research.

The study contract was officially awarded in May 2010. IAI researchers conducted the bulk of project field research between the summer months of 2010 and the early winter months of 2011, with an especially intensive period of ethnographic fieldwork and survey research occurring during the late summer and fall months of 2010.

[3] Hanalei Watershed Hui is a 501(c)(3) non-profit environmental organization that strives to care for the ahupua‘a of Hanalei, Wai‘oli, Waipā, and Waikoko. The organization is "guided by Hawaiian and other principles of sustainability and stewardship, integrity and balance, cooperation and aloha, cultural equity and mutual respect."

1.3 Organization of the Report

Following this introductory section, Section Two describes the project methodology and the scientific principles upon which the methodology is based. Because an important objective of this pilot project was to develop and test a methodology of potential viability for examining similar topics elsewhere in Hawai‘i, particular attention is given to methodology, and use of multiple methods for purposes of cross-validation. Section Three provides basic description of: (a) the study community, (b) relevant aspects of fishing and use of seafood in Hawai‘i, and (c) social, economic, and cultural aspects of fishing in Hanalei Bay and use of seafood by residents of Hanalei. Section Four provides analysis of quantitative and qualitative data generated during the course of the study. Section Five provides summary conclusions. References follow.



Map 1-1 Study Area

2.0 Research Approach and Rationale

Contemporary marine fisheries research is a patently scientific endeavor, and fishery management decisions ideally are based in large part on scientific research. Because marine fisheries constitute a highly complex field of study, a variety of scientific disciplines are needed to generate sufficient understanding of the subject matter. Oceanographers, biologists, geneticists, statisticians, and social scientists have the collective potential to generate an overarching understanding of marine fisheries and the ocean ecosystems in which they are conducted (Glazier 2011). The following pages review the basic principles of a social science of marine fisheries and its utility for this and other studies of consumption-oriented fishing and associated aspects of society and culture in the Hawaiian Islands and elsewhere.

2.1 Social Science Applications to Marine Fisheries

Social Science and Empiricism

Some philosophers of science and the humanities assert that the goal of social research is merely interpretation of human behavior (Geertz 1973). Others argue for application of the scientific method to social research questions (Harris 1994) with varying perspectives on how an empirical social science should be defined and conducted (cf. O'Meara 2001). The current project is based on the natural science model, wherein social phenomena are examined and explained in an empirical manner, and where *empirical* refers to description that is based on data of direct observation and/or on data deriving from valid proxies for direct observation.

Like ocean scientists who generate understanding of ecosystems through direct observation of various physical and biological phenomena, and indirectly through remote instrumentation and use of available data, social scientists generate understanding of human-social phenomena through direct observation of human behavior and social life, and indirectly through use of proxies such as archival research and discussion with persons who can describe their own experiences and perspectives. When oceanographers or other physical scientists detect some unexpected anomaly in their direct or indirect observations, they seek to understand the origin of that anomaly, evaluate and adjust for potential mistakes or instrumentation errors, and/or begin to consider that the unexpected findings may be valid, and initiate new theoretical perspectives to examine and explain them. Similarly, when social scientists document some unexpected human social behavior through direct or indirect observation, they reexamine their data, use other sources of information to cross-check their findings, and continue working toward attainment of valid understanding, description, typology, generalization, and refutable explanation of individual and collective human phenomena in specific context (cf. O'Meara 1989).

With regard to the current project, an observation-based social science of marine fisheries was used to generate information about a variety of topics of pertinence to the goals of the project. These topics included: local fishing activities and other forms of interaction between residents and non-residents and the natural environment; the nature of ʻohana (family and extended family) and community celebrations; the role of fishermen and seafood in a wide variety of community and familial contexts; the nature of social interactions between kamaʻāina (long-time

residents) and malahini (persons recently arriving in the islands); and reciprocal transactions of seafood, food from the garden and the mountains, labor, and cash.

Direct and indirect observation were used to improve understanding of such topics, but in this case limited time and resources required extensive use of proxies for direct observation. These included: interviews with public officials, community leaders, and kūpuna (elder residents); questioning of knowledgeable persons who themselves observe and use the natural environment and its resources on a regular basis; examination of fishery license, permit, landings, and related data, with accompanying interviews addressing data challenges and solutions; and examination of various archival information, including Census data and existing reports and articles of relevance to the research topics.

Application of the scientific method to the study of community-based fisheries in Pacific island settings is by no means a new endeavor. For instance, Malinowski (1922) observed and documented fishing-oriented communities in the Kiriwina Islands northeast of Papua New Guinea just after World War I; and Firth (1939) used a science-based approach to examine fishing and related social and economic aspects of life in many areas of Polynesia and Malaysia prior to and during World War II. Many researchers have since used the principles of science to examine social, economic, and cultural dimensions of fishing and related aspects of community life in archipelagos across the Pacific Ocean.

Validity and Reliability

Social science research requires close attention to the issue of validity. Bernard (1995:38) asserts that "nothing in research is more important than validity," defining the term as "the accuracy and trustworthiness of instruments, data, and findings."

A particularly valid approach to the study of fishing activities and connections between fishermen and their communities involves systematic observation of such activities and connections *in situ*. The level of validity of the resulting description and analysis will increase in proportion with: (a) the skill and training of the researchers involved, (b) the depth and extent to which the subject matter is examined, (c) the degree to which questions are appropriate and meaningful to the interviewee and thereby elicit the kinds of information they were intended to elicit, and (d) the degree to which steps are taken to verify the truth value of the resulting data.

Regarding (d) above, data validity and the validity of subsequent analyses are likely to be enhanced when ethnographic oversight is used to help the researcher ensure that respondents are being truthful and accurate in their discussion of the subject matter. For instance, as is the case for certain individuals in any social setting, some fishermen may exaggerate or prevaricate if something can be gained by so doing. Without sufficient objective oversight of the research and the social context in which it is conducted, the researcher may be duped, rendering spurious any subsequent description or analysis.[4]

[4] Readers are referred to the famous case of Margaret Mead, who apparently believed and reported spurious information provided by local informants during the course of her work in Samoa (1928). The case is discussed at length in Derek Freeman's *The Fateful Hoaxing of Margaret Mead* (Freeman 1999).

Reliability is closely related to validity and also is an important consideration is social research. In the context of survey research, reliability refers to the capacity of a specific question or questions to *consistently* elicit the kind of information that is intended to be elicited among interviewees. For instance, a question about use of fishing gear may be considered a consistently reliable measure only insofar as it is perceived and responded to in the same basic way over time by all interviewees in the sample population. Responses will vary, of course, but if they do so in a consistent fashion, it is likely that the question or measure is both reliable and valid.

Representation and Sampling

It is important that the population that is the subject of social research be clearly specified in advance, and that the research design effectively represents the experiences and perspectives of that population. But complete representation of even highly specific aspects of human social experience is rarely possible. For this reason, social science researchers must work with or regarding a subset or *sample* of the population of interest and generalize findings to a larger population, whether it be a fishing fleet, a community, a region, or a nation. This is similar to the approach used by natural scientists who seek to understand biophysical processes by examining tractable, feasible (and fundable examination of) elements or aspects of larger ecological systems.

The current project methodology involved three basic sampling strategies. A *purposive* approach was used to identify and conduct in-depth interviews with persons known to be experts on the topics of fishing, shoreline food gathering, ecological aspects of Hanalei Bay, and various aspects of life in the community of Hanalei. Purposive sampling refers to preferential rather than random or opportunistic selection of settings, persons, or events for description or analysis (Maxwell 1997). In this case, the research team worked extensively with a select subset of residents who were widely known to possess direct experience and knowledge of the subject matter. This was the only logical approach to sampling given the small size of the study community and the limited number of available persons possessing expert knowledge of fishing in Hanalei Bay.

An *opportunistic* sampling approach was also used. Opportunistic sampling can be useful for exploratory purposes, helping to determine, for instance, whether questions and lines of questioning make sense in a real-time setting. In this case, opportunistic sampling was used to generate a basic understanding of the experiences and perspectives of anglers visiting Hanalei Bay and to ensure that certain queries and the concepts underlying them were valid and appropriate to the context. In the end, it was determined that the queries were valid but that approaching certain active fishermen and ensuring their participation in the study was challenging and in need of more time and persistence than project resources would allow.

Finally, while the household survey design called for an *exhaustive* sampling approach, the fieldwork itself made clear that many part-year householders were not readily available to participate. Thus, although efforts were made to contact persons over 18 years of age in each local household, the end sample of residents unavoidably favored available permanent residents and a smaller number of available part-year residents. Visiting tourists were subject to being overrepresented inasmuch as their relative lack of local knowledge was not in line with study objectives calling for improved understanding sustained human interaction with the local marine environment. Such persons did, however, lend to an improved understanding of non-local perspectives on a variety of topics, including collective resilience to natural disasters. This sampling challenge can be expected (and adjusted for) in other Hawai‘i communities in which visiting tourists occupy local housing units during the course of a given year.

Replication and Refutation

Finally, an empirical approach to social science must lend itself to replication and refutation. *Replicability* in this context means that the research has been designed in a way that would allow other scientists to conduct similar work in order to examine similar subjects, questions, or hypotheses, and thereby contribute to the existing body of knowledge about the subject matter.

Because social scientists often work in natural settings, it is not possible to physically control important background factors when replicating a study– as might be done in experimental research in a laboratory setting. Controls in this case are rather analytical in nature. For instance, persons wishing to replicate the current research in another community would need to analytically control for variability in: local economic, demographic, and environmental conditions; access to coastal and ocean resources; and so forth. Further, social scientists wishing to replicate the Hanalei study at a later date would need to account for significant changes in local conditions over time, such as might be associated with construction and operation of a new resort complex, for example. Accounting for and analyzing such differences facilitates comparison between study areas and between an area or areas over multiple points in time.

The concept of *refutation* in social research means that findings are developed and presented in a way that allows them to be contested or falsified by other researchers or analysts. For instance, the observation- or interview-based finding that local fishermen harvest a certain species with a certain type of gear at a specific time of year can potentially be refuted by other researchers interviewing fishermen and observing fishing activities in the study area at another time. But certain topics, such as those involving subjective human experience, are more difficult to examine and present in a refutable way. For instance, it is difficult to scientifically represent the emotions experienced by members of a community when they sit down to celebrate the passing of a fellow fishermen, offering pule (prayer) in memory of their friend or relative, and consuming seafood captured in local waters.

Because emotive and other subjective states cannot be directly observed, it would be contrary to the concept of refutation to describe them without acknowledging that such description is based either on the fisherman's report about the experience and/or on some observable indication of its social nature, such as changes in facial expressions and tones of voice "when hana pa'a" (when a fish is hooked). Testing, supporting, refuting, falsifying, and reconstituting suppositions about individual and collective human interaction with the marine environment form the basis of an empirical social science of marine fisheries.

Keiki (child) Fishing from Hanalei Pier, September 2011

Principal Ethical Considerations

Social science research has the potential to affect people's lives in a variety of ways. As such, care must be taken to minimize any potentially detrimental effects on research participants and the social groups of which they are a part. An ethical approach to fisheries social science especially requires that participants fully understand the objectives and potential implications of the project at hand, and that information generated during the process is represented as accurately and objectively as possible, and in a way that does not compromise individual or collective well-being or the health of marine ecosystems upon which people depend for food, commerce, and recreation. A useful discussion of social science research ethics in maritime settings is available in Miller (1992), and generalized discussion of research ethics in the social sciences is available in many sources, including a useful contemporary discussion provided by Israel and Hay (2006).

2.2 Social Research Methods and Applications to the Current Study

Overview

With regard to the current study, an overarching ethnographic approach to the work enabled researchers to better understand the local setting, develop working relationships with key persons in the community, generate empirical description and analysis, and provide a measure of objective oversight of the overall research process. Archival research was used to prepare researchers for work in the community and to help generate useful descriptive context. An in-depth interview component enabled documentation and analysis of the perspectives and experiences of expert fishermen and other residents of Hanalei and the immediate surroundings. An intercept interview component improved understanding of the perspectives and behaviors of fishermen who traveled from other parts of the island to fish in Hanalei Bay and adjacent areas. A mapping exercise was used to document and analyze spatial aspects of fishing and shoreline gathering activities in Hanalei Bay. Finally, household survey methods enabled project collaborators to analyze community resilience and vulnerability to natural hazards in Hawai‘i, and in so doing contribute to the collection and analysis of information about local fishing activities and use of seafood in nuclear and extended family settings.

Archival Research

Review and analysis of existing information can be a useful, inexpensive, and unobtrusive means for documenting historic and contemporary aspects of social life (Bernard 1995). However, its use should be qualified by the admission that the validity and reliability of archived information is unavoidably strengthened or limited by the nature of the original research and analysis. For instance, fisheries landings data are often problematic in that official reporting of landings by fishermen often is inconsistent or inaccurate over the course of time. This situation is by no means specific to Hawai‘i but rather is common in all of the nation’s coastal states. Such information can nevertheless be useful if the sources and general margins of error can be identified.

The principal intent of using archival research methods in this case was to enable description of the social, economic, and cultural context within which fishing and shoreline food gathering activities occur in the study community and in the Hawaiian Islands in general. Archival research findings were also used to help researchers prepare for work in the study community, identify salient interview topics, and validate findings generated through other methods.

Many archival materials are available to assist in describing pertinent attributes of Hanalei and Hanalei Bay. The current project involved a series of visits to local and regional libraries and other repositories to identify, collect, and review secondary source information of particular relevance to the goals and objectives of the study. Archival research in this case also involved acquisition and analysis of: (a) recreational and commercial fisheries data compiled by the U.S. Department of Commerce, National Oceanographic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries), and (b) pertinent demographic information from the U.S. Census Bureau.

Ethnography and Ethnographic Observation

Approaching strangers and requesting detailed information about important aspects of their lives is very often a challenging process. This is particularly the case when the researcher and the interviewee operate from differing cultural perspectives, social experiences, or linguistic backgrounds, as is often the case when an outside researcher enters a new study area, such a multi-cultural community in Hawai‘i. The challenges may be addressed by implementing a research strategy that includes: (a) sufficient archival research, which can inform the researcher about important aspects of the study community prior to his or her arrival, (b) early and ongoing interaction with persons who know the community and its residents and who can properly introduce the researcher to the new setting and to key persons in the community; and (c) early and ongoing observation, careful documentation, and reflexive consideration of what is being learned about community life.

Ethnographic observation here refers to a process in which the researcher objectively watches, listens, and seeks to learn, document, and question his or her concepts about the society and culture being studied. The approach should involve casual interaction and discussion with residents in everyday settings in and around the community; attendance at local events and meetings; participation in certain activities (such as fishing or eating fish with others); focused but informal discussions about topics of local interest; and meticulous note-taking. The research should be transparent, with the ethnographer maintaining a readiness to discuss the nature and objectives of the research with those who are interested. Moreover, community residents must clearly understand and accept the goals and objectives of the ethnographer and the ethnographer must develop rapport and trust with residents potentially involved in the research.

Ethnographic observation is an essential prerequisite to valid survey research and in-depth interviewing, and it should be continued throughout the course of social research in any community setting. By investing time and resources in participant and unobtrusive observation, it is possible to significantly enhance the overall research effort by: (a) generating valid empirical data about individual and collective human behavior, in this case in a specific community context and with regard to a specific set of topics of local importance; (b) using such data to ensure that the in-depth interview process and survey instruments are appropriate to the sociocultural context at hand; and (c) enabling an additional source of information with which to cross-validate or invalidate preliminary findings generated by other means.

Given use of multiple methods during the current project, it should be kept in mind that while surveys and other interview-based research methods have the potential to generate useful quantitative data and analysis, such information is valid and relevant only when the topics are salient and the questions are culturally meaningful. The utility of the ethnographic process in achieving these objectives in cross-cultural settings cannot be overstated– as the extensive literature on social science research methods makes clear.[5]

[5] A particularly relevant and useful discussion is available in Agar (1996).

Following is an example of the need for ethnographic oversight of fishing-related research in Hawai‘i. Note that historic sources assert that Native Hawaiian fishermen so valued the act of fishing that the activity was not to be spoken of in advance of any given fishing trip. Kahā‘ulelio (2006) describes this situation in an article originally published by the Hawaiian newspaper *Nupepa Kuokoa* in 1902:

> When getting ready to go fishing at night it is not well to say 'Let us go fishing.' It is better to say 'Let us go see how our sugar canes are growing' or 'Let us go to the wildwoods.' Then you'll get some fish, but if you say 'Let us go fishing' . . not a fish you'll catch . . . Kalaukane said to Kapohakimohewa, 'Have you a bit of net?' 'Yes.' 'Well then, let us go fishing.' Just then a light flew past like a shooting star in the evening. Kapahakimohewa remarked to me 'There, that is just what the words of our companion got for us.' There were about five of us, including myself, with Kalaukane and the native of the place to frighten the fish into the net. We let the net down twice. The fish seemed to come in, yet the tongue of our companion licked up salt and we laughed at ourselves when we got home.

Ethnographic research conducted by the principal investigator over the last 15 years makes clear that elderly Native Hawaiian fishermen often adhere to this old custom. The work has also made clear that while it is certainly possible to talk with Hawaiian fishermen about fishing, this is best done at the right time and with ho‘ihi (respect) and due sensitivity to the cultural and dietary importance of the activity and the customs that surround it. In the absence of this approach, surveyors may experience a lower rate of response than might be expected among certain sub-populations of fishermen. Further, without due understanding of and respect for the general and specific nature of the research setting, researchers may be ignored, censured, or in some rare cases put in danger (see Glazier 2007:7-8).

This relates to an overarching and profound culture-based challenge to social research in Hawai‘i, and one which may be sufficiently addressed through ongoing acculturation of the researcher to local society. Notably, while non-local social science researchers often espouse the process and products of their vocation, this is so because it is consistent with their own cultural background and values. But research participants do not necessarily share all such values, of course, and in fact certain research participants in Hawai‘i operate from a customary perspective which holds that it is rude to be niele (highly inquisitive) about certain subjects, and even worse to be maha‘oi (intrusive) in this regard (cf. Keene 1970:57) – both intrinsic attributes of field-based social research. Indeed, some topics and types of information are particularly sensitive and therefore kapu (taboo; inappropriate for discussion). An unobtrusive ethnographic approach can help field researchers understand what is culturally appropriate and what is not, and therefore avoid problems in this regard.

Moreover, as asserted by Trask (1999) and Tuhiwai Smith (1999), for example, outside researchers are not likely to be *universally* welcomed in Hawai‘i– one effect of a macro-political history in which foreigners have in various ways disrupted an established indigenous social order since first contact. While the situation certainly does not preclude the conduct of interview-based research in Hawai‘i, it does call for a culturally sensitive and appropriate research strategy, and continual reflection on whether the questioning of local informants is introducing ethnocentric bias and thereby challenging the validity of subsequent description or analysis.

Professional Anthropologist Courtney Carothers Interacting with O‘ahu Fisherman in 2009

In-Depth Interviewing

Interview work can be highly structured and formal or relatively open-ended and informal. But it is important to note that: (a) with skill and training, a social scientist can systematically elicit the same kinds and quality of information through either approach, and (b) a less formalized interview approach has proven to be appropriate for examining culturally significant topics in local settings in Hawai‘i and is therefore more likely to generate valid information and analysis about such topics than is a highly structured approach. The subtle mechanics and benefits of skilled cross-cultural interviewing are pivotal here; a particularly useful review is available in Bernard (1988).

Subsequent to the development of working relationships with key persons in Hanalei and development of a valid understanding of basic aspects of life in the community, it was possible to identify valid and culturally meaningful categories of inquiry about fishing and shoreline gathering activities and associated aspects of life in the study area. These categories of inquiry included: (a) basic information about local social demography, (b) information about personal and collective motivations for fishing and gathering of shoreline resources in Hanalei Bay, (c) localized marine resource use patterns past and present, and (d) local observations of change in the status of living marine resources and ecosystems in and around Hanalei Bay over time. The interview process involved both semi-structured and unstructured components. As intended, the former provided some degree of guidance and control over the interview on the part of the interviewer, while the latter allowed interviewees to elaborate on specific topics and salient issues as they desired. The overall approach was applied in a consistent manner so that results would be comparable across the sample of discussants.

Given the need to understand the fishing-specific experiences and perspectives of long-time and knowledgeable residents, a purposive sampling strategy known as social network or snowball sampling was used (see Lin 1999; Penrod et al. 2003; Bernard 2006). This requires that a person acting as point of entré into the community provide the identity of persons who are highly knowledgeable in their field of expertise, in this case, fishing and related aspects of local society. Such persons are interviewed and subsequently asked to identify other persons they deem to be knowledgeable of the same subject matter. The process is repeated until no new informants are identified. In small communities, this approach tends to yield a small but robust sample of informants and should be seen as a particularly useful means for generating valid understanding of locally important topics and social processes.[6]

Intercept Interviewing

The intercept interview is specific to settings in which people harvest natural resources from land or sea. The researcher approaches the fisherman or hunter to ask questions about the harvest and associated activities. Biologists may term such work a "creel survey," though social researchers are apt to ask questions beyond those specific to the nature of the catch (cf. Pollock et al. 1994). From a maritime social science perspective, intercept surveys are particularly useful for validating information about local fishing patterns. When used in conjunction with other forms of information and with due regard to sampling concerns, results can potentially be generalized to a broader population of persons who also use the area in question (see McKenzie and Mistiaen 2009; Kinnell et al. 2007).

Intercepting fishermen and engaging them in an in-depth conversation can be challenging since, at the point of intercept, the fisherman is either getting ready to fish, is fishing, or has concluded the activity and is moving on to something else. Care must be taken not to create too much distraction, and at times it is prudent to ask the fisherman for an interview at a later date. A limited series of intercept interviews were conducted during the current project to garner a better sense of the experiences of anglers who travel from elsewhere on Kaua‘i to fish in Hanalei Bay.

[6] Further, it is possible to assess the relative extent of understanding or knowledge possessed by each person in the sample (cf. Romney et al. 1986); the degree to which each informant is socially connected with others in the group; and each person’s degree of social status within the group or community being examined. The reader is referred to Hanneman (2001) for detailed discussion of the rationale for and statistical underpinnings of social network-based sampling and analysis.

Participatory Mapping

The location and nature of important marine resources and their use by humans over time can be documented by inviting knowledgeable persons to participate in an informant-based mapping process. Trusted and knowledgeable research participants are asked to relate their understanding of local marine resources, resource use patterns, ecosystem processes, and other factors to a bathymetric base map. Maps from multiple informants are subsequently analyzed and aggregated to generate a composite map of utility to natural resource management agencies. Because this process can yield information that is of great importance to the persons who rely on such resources for food and/or commerce, great care must be taken to ensure that the level of resolution and content of the maps do not compromise the interests or well-being of the participants or the proprietary nature of the information they provide, or in some manner detrimentally affect the marine environment.

Participatory mapping has a long history of use in natural resource settings and has gained popularity among scientists working to understand ocean space use conflicts (cf. Glazier et al. 2006), and the socioeconomic and biophysical implications of marine reserves (see Aswani and Lauer 2006; Impact Assessment, Inc. 2010, 2011). The approach was used to a limited extent during the current project to document spatial aspects of fishing, shoreline gathering, and recreational activities in and around Hanalei Bay (Map 4-1).

Household Survey Research

Household survey research is an effective means for generating data with which to represent and compare important aspects of life within and between specific community settings (Bernard 2006; McKenzie and Mistiaen 2009). In marine fisheries settings, the approach is useful for representing the nature and extent of localized pursuit and use of natural resources (Kramer et al. 2002; Kuster et al. 2005; Cinner et al. 2009), and for examining the larger social and economic context in which these activities often occur.

The survey-based work of Usher et al. (2003) is particularly useful in its instruction about production and consumption of natural resources in contemporary indigenous households in North America, and the work of Wolfe et al. (1987) is particularly useful for understanding the interplay between commercial and subsistence fisheries in such settings. Notably, the Alaska Department of Fish and Game has for many years employed a household survey approach to examine subsistence fishing and hunting activities in rural communities across the 49th state – an agency division is devoted to this purpose. A household survey approach has also been used to study the effects of oil spills on subsistence fishing and hunting activities and on related aspects of life in Alaska (Impact Assessment 1990).

As described above, IAI assisted researchers from the University of Hawai‘i with their own study of hazard vulnerability and resilience among residents of Hanalei (Henly-Shepard 2012). The intent of the collaboration was to generate information of utility for both research teams. This information included: (a) basic socio-demographic characteristics of local households; (b) economic inputs, including sources and amounts of income, and sources and types of natural

resources used for food; (c) the nature and extent of fishing, shoreline gathering, hunting, and farming activities, and (d) various indicators of vulnerability and resilience to hazards, among others. Of note, the survey process made clear that Hanalei neighborhoods can be characterized in terms of the coexistence of: many kamaʻāina households; some malahini households; some homes that are occupied by part-year residents; and numerous vacation homes.

Approach to Data Analysis

Useful discussion of various strategies and techniques for analysis of interview and other social science data is available in Glaser and Strauss (1967); Schatzman (1991); Bernard (1995); Baxter and Eyles (1997); Barbour (2001); and Thomas and James (2006), among others. In the case of the current project, quantifiable interview and household survey data were transcribed and entered into a Microsoft Excel spreadsheet, reviewed for accuracy, and subsequently imported into SPSS statistical software (SPSS 2001).

The largely descriptive nature of this study called primarily for descriptive statistical analysis. Because the study community is relatively small in terms of population, the sampled populations were accordingly small, thereby limiting the potential for more extensive quantitative analysis.

Archival data, data of observation, and interview data were synthesized to generate description of relevant aspects of the study community and to help validate and contextualize quantitative data regarding fishing and related social activities. Participatory mapping data and pertinent fisheries data were used to initiate development of a Geographic Information System (GIS) through which descriptive cartographic products were generated.

2.3 Additional Considerations

Use of multiple, cross-validating social science research methods can yield particularly valid and robust findings about human communities and social-environmental interaction. When such research is carefully developed and implemented, the resulting description and analysis can significantly enhance understanding of the subject matter and analogous social and cultural phenomena in similar settings elsewhere.

But this outcome is not easily, immediately, or cheaply attained. Rather, the effort requires a series of steps, each of which involves significant outlay of human and fiscal resources. These steps include: (a) the hiring and ongoing employment of trained staff: (b) travel to and periodic or ongoing residence in the study community and travel to work in other parts of the study area, as needed; (c) development of trust and rapport with community leaders and research participants; (d) development of a research design suited to the research questions and issues at hand; (e) development and pre-testing of research instruments, with due attention to issues of validity and reliability; (f) conduct of secondary and primary source research in a manner that maximizes output with minimal burden on the study community; (g) compilation, review, analysis, and synthesis of the resulting information; (h) follow-up work with informants and respondents to clarify descriptive and analytical uncertainties; (i) development of a draft project

report and identification of prospective experts who can constructively review the work; (j) revision of the draft report based on reviewer comments, (k) production and delivery of a final project report; and (l) presentation or delivery of findings to the study community and/or project sponsor.

Given funding limitations, this project necessarily assumed the characteristics of a preliminary or exploratory research effort. That is, time in the field was unavoidably limited and the variety of methods described earlier in this section could not be implemented to their fullest extent. The work has nevertheless resulted in a much improved understanding of the subject matter and enhanced understanding of the performance value of the component research methods, with implications for the design and funding of similar work in other parts of the islands. The following pages summarize the results of the effort and inform a rationale for continuing research, analysis, and monitoring of human interaction with Hawai‘i's coral reef ecosystems in the years to come.

Local Fisherman Working the Surface near Waipā

3.0 Essential Background

This section of the report describes select social and environmental aspects of consumption-oriented fishing and shoreline gathering activities as these are conducted in the Hawaiian Islands in general and in Hanalei Bay in particular. The description is focused on important historic and contemporary dimensions of fishing and seafood in the islands, and current sociocultural, demographic, and economic conditions in the study community.

3.1 Historic Background

Subsistence in Old Hawai'i

Extensive ecological knowledge and well-practiced pursuit of marine and terrestrial environments enabled Polynesian voyagers to colonize and eventually develop highly organized societies across the main islands of the Hawaiian Archipelago, the most remote island chain on earth.[7] In fact, scientists increasingly believe that the Hawaiian Islands were found and colonized not by chance, but through knowledge and skills developed over many millennia, first in Australasia, and gradually across the far reaches of Oceania (Irwin 1992, 2007; Kirch 2000)

As such, the acquisition of food from the sea was a familiar pursuit and an essential aspect of early subsistence economies among the Polynesians who colonized Hawai'i. Efficient means were developed to capture a wide variety of pelagic, nearshore, reef, and shoreline species endemic to Hawai'i, and new ecological knowledge was accumulated over time. 'Opihi (*Cellana spp.*), crabs, urchins, and limu (seaweeds) were collected by hand along the shoreline, and hukilau (seine) nets, hook and line, and other types of fishing gear were commonly used to capture a wide variety of reef-associated fishes in the nearshore zone. Early Hawaiians also pursued deepwater bottom fish such as 'ōpakapaka (*Pristipomoides spp.*), and pelagic species such as aku (*Katsuwonus pelamis*) and ahi (*Thunnus albacores*), among others (cf. Beckley 1883, Cobb 1902, Malo 1951; Kahā'ulelio 2006).

Fishponds provided a consistent source of protein after the fourteenth century, as is well documented in the literature (cf. Apple et al. 1975, Kirch 1985). Seafood was complemented with kalo (taro or *Colocasia esculenta*), sweet potatoes (*Ipomoea* spp.) and other resources gathered or produced in ahupua'a across the islands.[8] In conjunction with the tending of fishponds and various agricultural pursuits, fishing and shoreline gathering activities facilitated the expansion of the pre-contact indigenous population of Hawai'i into the many hundreds of thousands (cf. Stannard 1989:45).

[7] The systematic pursuit and use of seafood, various agricultural strategies, and associated ecological knowledge on the part of Polynesian and proto-Polynesian voyagers were fundamental to the successful exploration and colonization of islands across Oceania (Irwin 1992, 2007).

[8] Ahupua'a are land divisions wherein available resources from mauka (mountain) to makai (sea) are managed and utilized by local residents. Moku are political districts, the boundaries of which encompass multiple ahupua'a. Hanalei Valley and adjacent areas are part of Halale'a Moku. There are four traditional ahupua'a in Hanalei Valley: Hanalei, Wai'oli, Waipā, and Waikoko.

Ancient Hawaiians necessarily maintained a close association with the surrounding sea as it was a regular source of food, recreation, and spiritual fulfillment (cf. Kamakau 1964), and a venue for trade and transportation within and between the islands. Pursuing, consuming, and sharing seafood were important aspects of Native Hawaiian culture, spirituality, and physical well-being prior to and following contact with Europeans. But as the indigenous society and culture were increasingly disrupted through interaction with haoles (foreigners), so also were the social processes that sustained fishing and associated activities, such as the crafting of makau (hooks), aho (fishing line), and waʻa (canoes). Europeans brought the concept of private ownership of land, a variety of contagious diseases, new religious beliefs, and the cash economy, each of which led to social changes that diminished the capacity for extensive fishing activity (Glazier et al 2007).

Although fully functioning ahupuaʻa were increasingly rare during and after the Great Mahele,[9] traditional fishing methods and related cultural practices were practiced even during this period of dramatic change. Indeed, the oppressive actions of the haoles may merely have served to strengthen and render huna (secret) various cultural practices and ecological knowledge in many areas around the islands, including communities along the remote north shore of Kauaʻi. Entrenched indigenous knowledge and culture subsequently influenced the lives and perspectives of immigrants who were arriving in increasing numbers during the latter half of the 19th century.

Commercial fishing was a viable employment option for Native Hawaiians during the early Plantation days. Cobb (1905) reports that Hawaiʻi's first seafood market was established in Honolulu in 1851; the majority of products were supplied by Native Hawaiians. A range of reef, neritic-pelagic, and pelagic species were available to buyers (Cobb 1902; Schug 2001), and a percentage of seafood landed by commercial fishermen during this period was consumed, shared, given, and/or bartered in the fisherman's home community. Subsistence-oriented use of reef ecosystems continued around the islands during the Plantation era (Coulter 1931; Newman 1970). Andrade's (2008) work with elders in the community of Hāʻena[10] evinces the dietary and social importance of seafood during the period:

> Then you go fishing. Because we catch our food first and then we go down there, grandma is cooking her salt rice and then she pūlehu (broil over coals) the fish. And that's what we're going eat. Wana (sea urchin), loli (sea cucumber), raw enenue (chub fish), raw moonlight fish. Almost every fish I ate raw [at times]. Hīnālea (wrasse, family Labirdae), raw, pūlehu or fry. All those things, but mostly pūlehu because ono (delicious) eh?

The volume of seafood landed by Native Hawaiian commercial fishermen in Honolulu was eventually superseded by that of Japanese immigrants, some of whom had arrived in the islands with the skills and capital needed to initiate fishing operations. Gaps in the historical record preclude a clear and continuing account of Native Hawaiian fisheries in the years following the

[9] The Great Mahele occurred between 1848 and 1850, when institution of fee simple rights enabled haoles to purchase land, dispossessing many thousands of Hawaiians from their ancestral ahupua'a. The importance of subsistence-oriented fishing held true for Native Hawaiians into much of the 20th century, and lingers into the 21st.

[10] Hāʻena is a small community located roughly four road miles west-northwest of Hanalei, also in Halaleʻa Moku on Kauai's North Shore.

rise of the aku fleet and predominance of the sampan. This is partly because most authors living through the period (e.g., Scobie 1949, Handy and Pukui 1972; Titcomb 1972) were focused on recalling the distant past rather than recording the present. Moreover, Shomura (1987) notes that early landings data cannot indicate the scope of subsistence or recreation-oriented fishing in the islands during the early part of the last century, since only commercial landings were reported between 1900 and 1986.

Although many Native Hawaiians who would be able to discuss fishing as it occurred in the pre-World War era have passed on, Maly and Maly's (2003) work with expert fishermen and kūpuna makes clear that indigenous fishing traditions and knowledge continued to evolve across the islands during the period. The research includes detailed description of many historically effective fishing practices— so detailed, in fact, that there may be risk to local ecosystems should contemporary fishermen employ the techniques of the past without the restrictions formerly associated with their use. The work also includes extensive discussion of how Native Hawaiians conserved and managed marine resources in general terms and how this was accomplished in specific ahupuaʻa and nearshore ecosystems around the islands. An overarching dictum held that fishermen should take only what was needed and no more, with localized standards determined by the konohiki (expert under the chief) and violators subject to hoʻopaʻi (punishment) (cf. Kahāʻulelio 2006).

There can be no doubt that indigenous fishing methods, culture, and resource management ethics and sanctions influenced immigrant fishermen during the early part of the 20th century. This is indicated in a variety of sources, including Keene (1970:59) who, in his discussion of ethics and the environment on Molokaʻi during the era, states that "Filipinos, Japanese, Chinese, and haoles all suffered from their failure to observe Hawaiian kapus."

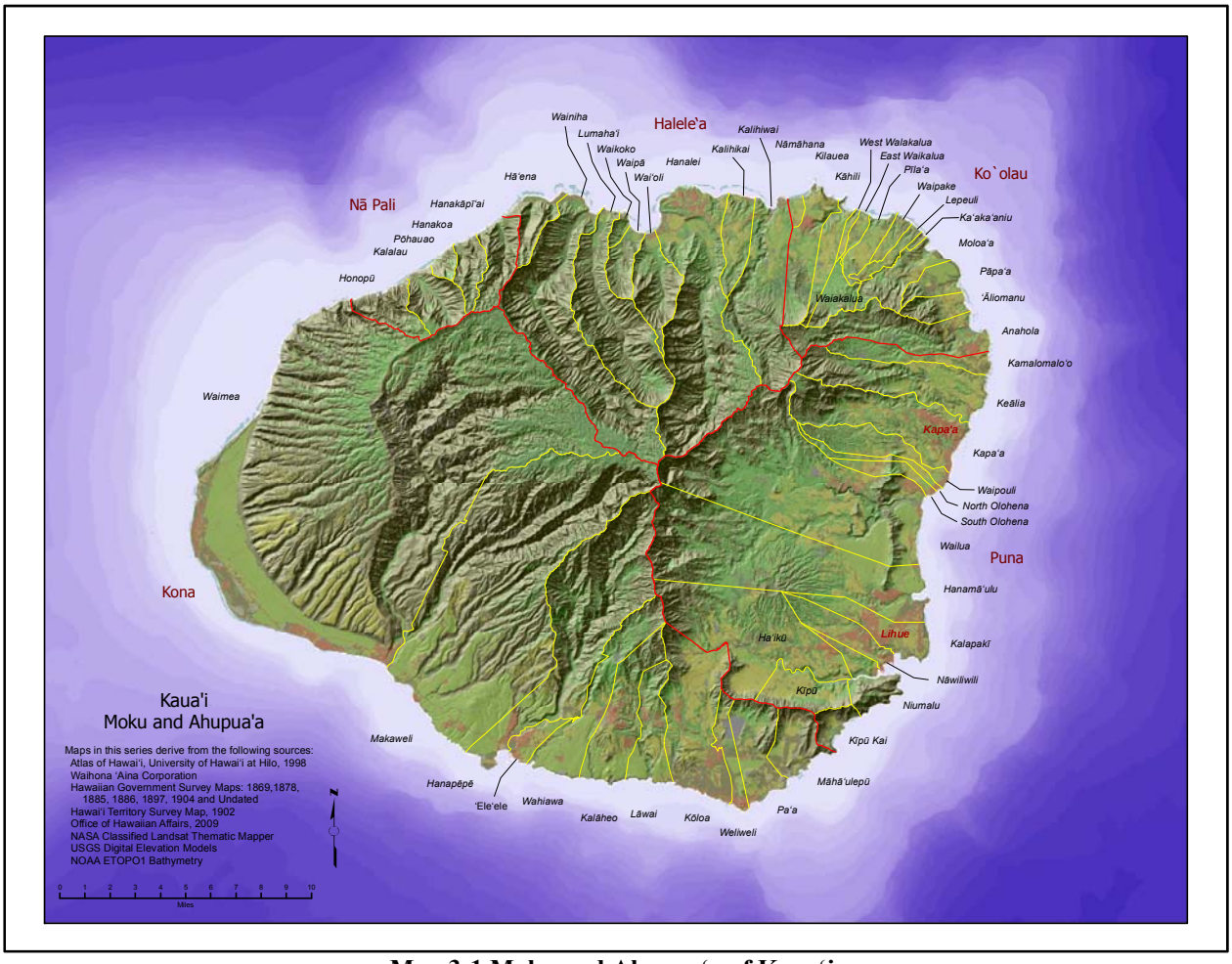
Hawaiʻi's reef, benthic, and pelagic ecosystems continued to be used for subsistence and commercial fishing after World War II, and increasingly so as populations grew and the quality of hulls, engines, gear, and marine electronics improved over time (Glazier 2007a,b; Kittinger et al. 2011). Modern boats and gear eventually replaced the old even in the more remote areas around the Islands. But customs and traditions tended to linger and evolve in what McGregor (2007) refers to as kīpuka or pockets of traditional culture. Fishing from the shoreline was increasingly popular in the post-World War II era; Hoffman and Yamaguchi (1972) estimated that some 68 percent of a total of 122,000 non-commercial anglers were fishing from Hawaiʻi's shorelines in the late 1960s. Shore-based angling continued and continues to be popular across the islands, as does boat-based trolling and fishing for various benthic species (Glazier 1999a, 2007). These opportunities provide a source of food and recreation for many residents of all ethnicities at the start of the second decade of the 21st century.

3.2 Overview of Hanalei, Hanalei Valley, and Hanalei Bay

Geographic Overview

Kauaʻi is the northwestern-most of the main Hawaiian Islands. Its southeastern shorelines in Kona and Puna Districts are located roughly 70 miles from Kaena Point, the northwestern-most place on Oʻahu. Kauaʻi is a remnant shield volcano encompassing some 553 square miles of variegated and often verdant landscape that includes steep mountains and sea cliffs, sandy beaches and lava-strewn coastlines, inland rivers, estuaries, rolling puʻu (hills), and flat tablelands. Peak elevation occurs at the 5,243 foot summit of Kawaikini. At 5,148 feet, Mt. Waiʻaleʻale is the second highest peak on the island and one of the rainiest spots on earth, averaging some 450 inches per year (Encyclopedia Britannica 2012).

The community of Hanalei is located along the central northern shoreline of Kauaʻi, roughly nine miles due north of Waiʻaleʻale's summit and immediately adjacent to Hanalei Bay. Hanalei is roughly 30 miles by road from Līhue, the most populous community on the island. The study community and the ahupuaʻa in which it is located are part of Haleleʻa Moku (Map 3-1).



Map 3-1 Moku and Ahupuaʻa of Kauaʻi

Historical Overview

Archaeological data regarding the date of initial settlement and associated agricultural pursuits in Hanalei Valley is difficult to interpret (Kirch 1985:101). Schilt (1980) suggests that early Polynesian colonists were growing foods here as early as the 7th century A.D., while the work of Athens (1983) indicates that this did not occur until the 14th century. Scholarly debate notwithstanding, Native Hawaiians were working the land and harvesting food from the sea many centuries prior to contact with European explorers and missionaries. Basic reliance on the natural environment continued in conjunction with other forms of economic production during the Plantation era (cf. Andrade 2009) and this continues today among certain families and individuals residing in Hanalei Valley and adjacent areas of Halele‘a Moku.

The alluvial soils of Hanalei Valley were indeed well-suited to the subsistence-oriented agricultural pursuits of early settlers, and many lo‘i were constructed here over the centuries. Lo‘i are irrigated pond-like structures that hold water and facilitate growth of kalo (taro; *Colocasia esculenta*), the plant from which poi is made. Contemporary local residents continue to produce high quality kalo in much of Hanalei Valley. Extensive quantities are sold on the commercial market, and some is grown and consumed as an important part of the local diet.

Highly Productive Kalo Field in Hanalei Valley, 2010

The ethnic composition of Hanalei's resident population became more complex upon the arrival of haole missionaries and entrepreneurs during the early 19th century, and as a variety of immigrant groups arrived to labor on plantations later in the 19th century. Many Native Hawaiians were displaced from the land during this time. Dong et al. (2002) report that most land in Hanalei Valley is now owned by: the Princeville Corporation, Kamehameha Schools, Gaylord Wilcox Trust, Wai'oli Corporation, government agencies, and local families.

Notably, immigrant populations came to Hanalei Valley with their own dietary preferences, and the wet environment and preexisting irrigation systems that had been used to produce kalo were in some cases subsequently used to produce rice (Dong et al. 2002). Rice production was an important aspect of the local economy into the early 1930s (1000 Friends of Kauai 1997). [11]

Hanalei and points west were relatively difficult to access prior to the construction of a bridge over the Hanalei River in 1912.[12] Thus, the region and its communities were somewhat isolated from extensive outside influences well into the modern era.

Today, Hanalei and immediately adjacent portions of Halele'a Moku are home to some 570 permanent residents (see Table 3-1 below). While numerous Native Hawaiians and non-indigenous kama'āina families reside on a permanent basis in and around Hanalei, the number of part-year residents and the number of seasonally occupied housing units have increased in recent decades. The area is attractive to affluent individuals and families from the North American continent, and this is indicated by significant increases in household income and the value of local housing units as reported in the most recent decennial Census.

Sky, Mountains, Sea: Hanalei

[11] Lands in Hanalei Valley and adjacent areas of Halalea Moku were used for a variety of purposes during the 19th century, including cattle ranching, and coffee, silk, rice, sugar, and pineapple production (see Dong et al. 2002).

[12] The one-lane bridge was substantially reinforced in 1967. Riznik (1989) provides extensive discussion of the historical significance of the bridge and its symbolic potential for maintaining the rural character of Kauai's North Shore. Hanalei River was designated as an American Heritage River in 1998.

Table 3-1 Select Demographic Conditions in the Hanalei CDP: 1990-2009

Factor	1990	2000	2005-2009*
Total population	461	478	572
Gender Ratio M/F (Percent of total population)	52.0/48.0	49.8/50.2	51.6/48.4
Age (Percent of total population)			
Under 18 years of age	22.1	24.1	22.4
18 to 64 years of age	63.2	64.4	66.9
65 years and over	14.7	11.5	10.7
Ethnicity or Race (Percent of total population)			
White	56.8	57.1	59.4
Black or African American	0.8	0.0	0.7
American Indian and Alaskan Native	0.2	0.0	1.2
Asian	41.6	18.4	18.7
Native Hawaiian and other Pacific Islander	n/a	2.9	1.7
Some other race	0.4	0.4	0.7
Two or more races	n/a	21.1	17.5
Hispanic or Latino (any race)	3.9	4.8	11.7
Educational Attainment (Population 25 and over)			
Percent with less than 9th grade	12.9	3.8	3.7
Percent high school graduate or higher	68.5	82.8	93.2
Percent with a Bachelor's degree or higher	9.0	21.7	22.5
Language Spoken at Home (Population 5 years and over)			
Percent who speak a language other than English at home	16.0	12.4	10.6
And Percent who speak English less than very well	7.5	3.9	0.4
Household income (Median $)	33,304	34,375	72,917
Poverty Status (Percent of population with income below poverty line)	13.2	25.3	0.5
Home Ownership (Number)			
Owner occupied	92	102	89
Renter occupied	79	91	72
Value Owner-occupied Housing (Median $)	357,100	422,900	1,000,000+
Monthly Contract Rent (Median $)	633	911	1,554
Employment Status (Population 16 yrs and over)			
Percent in the labor force	64.2	68.0	78.1
Percent of civilian labor force unemployed	5.9	2.6	0.0
Occupation (Percent in workforce)			
Management, professional, and related occupations	21.1	24.5	16.6
Service occupations	17.4	25.8	24.6
Sales and office occupations	24.3	23.1	33.8
Farming, fishing, and forestry occupations	8.4	1.7	6.3
Construction, extraction, and maintenance occupations	22.7	16.6	15.8
Production, transportation, and material moving occupations	6.1	8.3	2.9
Industry (Percent in workforce)			
Agriculture, forestry, fishing and hunting, and mining†	8.4	5.7	14.3
Manufacturing	6.8	3.5	1.1
Percent government workers	6.8	12.7	7.7

*Data derived from the 2005-2009 American Community Survey 5-Year Estimates

The tourism-related service industry– particularly that associated with the immediately adjacent Princeville Resort– provides a source of income for many permanent residents. As discussed in the following section, some residents engage in commercial fishing activity on a part-time basis. This work is often undertaken in conjunction with part-time, full-time, or part-year employment in the tourism industry and construction trades and associated businesses. Some residents take advantage of job opportunities in and around towns such as Līhue and Kapa'a on the east side of

the island. Notably, many local families continue to engage economic strategies that include wage labor, small-scale agriculture, harvest of foods from the sea, and culturally significant sharing of food, labor, and other important resources with others in their home community and to a lesser extent with persons living in other communities around the island.

Hanalei Bay

The town center of Hanalei is located about 300 yards south of the center of the Hanalei Bay shoreline. The arc-shaped bay encompasses some 1.6 square-miles of ocean and is the terminus of the 32 square-mile Hanalei Valley watershed. The watershed includes the Hanalei River, Waioli Stream, Waipa Stream, and Waikoko Stream. Hanalei Bay is roughly 1.15 miles wide at its entrance between Makahoa Point on the western side of the bay and Pu‘u Poa on the east. The arced shoreline stretches for roughly two miles. The shoreline along the most makai (seaward) portions is primarily comprised of lava rock and rocky flats with pockets of sand, while the more mauka (mountain) portions are comprised of white sandy beaches.

Along the southeastern shoreline is Hanalei Pier, long a popular fishing location for local anglers. The pier was constructed in the 1890s to facilitate the shipping of locally grown rice. The structure was rebuilt in 1912 and renovated in the early 1920s (Clark 1990:29). Today, the pier is used for a variety of recreational purposes, including fishing, meeting and resting in the shade of the lānai (veranda) at pier’s end, and entering and exiting the water. Small waves break along the pier and thus the area is popular with young surfers and other beginners.

The Hanalei River meets the ocean at Blackpot Beach Park, an area long and regularly used by local residents for pā‘ina (social gatherings very typically involving seafood), family and extended family celebrations, and larger community events. Clark’s (1990:27-28) description of the area makes clear its historical importance to Native Hawaiians in the community, while indicates some historical tension between land owners and local residents using or attempting to use the site prior to its official designation as a county park:

> The sand spit often bars the river mouth, preventing the passage of all but shallow draft boats. The extensive estuary of Hanalei River is famous among Hawaiians for its native biota, including ‘o‘opu (goby fish), ‘ōpae (shrimp), and hīhīwai (mollusks) . . . The eastern corner of Hanalei Bay is a traditional gathering place for the residents of Hanalei. Even before the construction of the landing, they congregated here to launch their boats, to fish, to swim, and to socialize. Today the same activities and others continue at the same site. The name Black Pot predates the development of the public park. For many years a group of Hanalei residents kept a large black cooking pot at the beach, which became a focal point for social gatherings and eventually gave the site its popular name. In December 1967, a group of investors purchased the Black Pot site . . Although the area had been used continually for many years, it was private property. The new owners closed the area to the public . . Their plans touched off six years of controversy as local residents refused to give up their traditional recreation site. By 1973, the developers still had been unable to get the permits needed [for development] . . and they sold the parcel to the county . . In July of that year, it was reopened as Black Pot Beach Park.

Hanalei Bay is oriented to the northwest and is therefore directly exposed to large ocean swells generated in the higher latitudes of the North Pacific during much of the year. This can result in massive breaking waves on coral reefs outside of the bay and along the fringe reef and sandy shoreline; numerous world-class surfing breaks are located here. Persons who moor small sail- and motor-powered vessels in the deeper portions of the east side of Hanalei Bay must move them to other locations during the winter months when large swells can affect the entire area. Notably, Hanalei Bay was the site of a long-standing controversy regarding commercial tour boat operations which serves tourists seeking a visual experience of the Nā Pali coastline. While many tour boat captains operated from Hanalei Bay during the 1990s, only a few are now permitted to do so.

Hanalei Bay is also subject to periodic tsunami events generated by earthquakes in the tectonically active Pacific Rim. Significant events occurred in 1946 and 1957; the 1946 event killed 15 residents and destroyed many homes, bridges, and other infrastructure in Halele‘a Moku. The original Hanalei Pavilion Beach Park, located toward the mid-shoreline of the embayment, was destroyed by a tsunami in 1957 (Clark 1990:29). A new open-air structure was rebuilt in 1960; it too is an important contemporary gathering area for local residents.

People also meet and recreate in the area known as Pine Trees. This site is located slightly west of the middle of the bay. Yet further west are a variety of surfing spots, he‘e grounds, and areas used for throw net and pole and line fishing activities.

Given extensive energy from ground swell and wind waves, and a continual influx of fresh water and alluvial sediments, Hanalei Bay is fairly characterized as a highly dynamic marine environment. This conditions growth of coral throughout the area. Friedlander and Brown (2005) characterize important physical attributes of Hanalei Bay as follows:

> Hanalei Bay is characterized by well-developed fringing reefs bordering an extensive area of unvegetated carbonate sediments in the center that stretches from beyond the mouth of the bay to the shoreline in the southeast quadrant. Areas of mostly hard substrate cover approximately 0.90 km^2 of the west side of the bay and 1.5 km^2 of the northeast side. Extensive hard substrate habitats range from low profile to highly complex reef, from reef slope to reef flat, and from large expanses of contiguous reef to small patch reefs. A large area (ca. 2.8 km^2) is composed of unconsolidated sediments. Most of the central bay sediments are fine to medium grain carbonate sands of marine origin. Coarse marine sands occur along some reef margins and in all sand patches within the reef.

Brown and Friedlander (2007) state that “natural factors such as large wave events are thought to be more important in structuring the coral reef community of Hanalei Bay than anthropogenic factors,” and that “Hanalei Bay is one of the few areas in Hawai`i that has shown an increase in live coral cover over the past decade”

Friedlander and Brown (2005) also describe select biological aspects of Hanalei Bay, and recent trends in the status of its reef-associated fishes. In their assessment of changes occurring in the dynamic Hanalei Bay ecosystem between 1992 and 2004, the authors state that:

> Fish species richness, biomass, and diversity were higher in habitats with high spatial relief adjacent to reef-sand interfaces. Most measures of fish assemblage structure were lower during the winter months when large north Pacific swells and heavy rainfall, coupled with high river discharge, impacted the bay. Fish assemblage characteristics did not vary significantly between 1993 and 2004, although trends in biomass are suggestive of an increase over time. Three introduced fish species (bluestripe snapper, blacktail snapper, and peacock grouper) have become well established in Hanalei Bay, and their contribution to total fish biomass has increased from 15% in 1993 to as high as 39% in 1999.

Montipora patula was the most abundant coral species observed in Hanalei Bay in 2004, accounting for more than half of total observed coral cover (Friedlander and Brown 2005:12). *Porites lobata* and *Montipora capitata* were the next most abundant species during the 2004 study. As might be expected, (a) the morphology of the observed species had been affected by the dynamic underwater environment, mostly appearing in an encrusted or encrusting form, and (b) overall **c**overage was least extensive in those parts of the bay that are most exposed to wave action and it was most extensive in the most protected areas. An overall increase in coral cover was noted over the time series, mostly attributed to an increase in *M. patula* (ibid., p. 13).

With regard to diversity of fish species present in Hanalei Bay, Friedlander and Brown (2005:12) report that a total of 129 species from 29 families were identified between 1992 and 1994. No significant departure from the observed level of diversity was noted when partial sampling was undertaken in 2003 and 2004. Regarding species diversity and distribution, the authors report that:

> Transects with the highest number of species tended to be those that were adjacent to a sand interface, deeper, and those with high habitat complexity. Low numbers of species were observed at transects within reef flat complexes that were distant from sand areas and had low habitat relief. High biomass was also associated with reef edge habitats and areas with high habitat complexity. Transects with low numbers of species also harbored few individuals and low biomass. Most reef flat transects had low diversity (Friedlander and Brown 2005:12).

A wide variety of reef-associated fish species have been observed in Hanalei Bay, and as indicated in Table 3-2 below, these include a variety of fish and other creatures that are pursued by resident and non-resident anglers for purposes of consumption, recreation, and commercial sale. The species are pursed by boat- and shore-based anglers; netters and net throwers; persons using spears and Hawaiian slings; and harvesters using other types of gear.

Table 3-2 Select Fish Species of Social and Economic Significance: Hanalei Bay

Hawaiian Name	Common Name	Genus/Species
A‘ama	Rock crab	*Grapsus tenuicrustatus*
Āholehole	Flagtail	*Kuhlia sandvicensis*
‘Ahi	Yellowfin tuna	*Thunnus albacares*
Aku	Skipjack tuna	*Katsuwonus pelamis*
Akule & Halalū	Bigeye scad	*Selar crumenophthalmus*
‘Ala‘ihi	Squirrelfish	*Sargocentron & Neoniphon spp.*
‘Ama‘ama	Striped mullet	*Mugil cephalus*
A‘u	Blue marlin	*Makaira nigricans*
Awa	Milkfish	*Chanos chanos*
He‘e	Octopus	*Octopus cyanea* & *Octopus ornatus*
Hināle a	Wrasse	*Thalassoma duperrey*
Iheihe	Halfbeak	*Hyporhamphus pacificus*
Kala	Unicornfish	*Naso unicornis*
Kawakawa	Bonito	*Euthynnus affinis*
Kole	Yellow-eyed tang	*Ctenochaetus strigosus*
Kūpīpī	Blackspot sergeant	*Abudefduf sordidus*
Mahimahi	Dolphin	*Coryphaena hippurus*
Manini	Convict Tang	*Acanthurus triostegus sandvicensis*
Menpachi & Aweoweo	Bigeyes	*Priacanthidae*
Moi	Threadfin	*Polydactylus sexfilis*
Nenue	Chubs	*Kyphosus spp.*
‘Oama, Weke‘a	Yellowstripe goatfish	*Mulloides flavolineatus*
‘Ō‘iō	Bonefish	*Albula spp.*
‘Ōmilu	Ulua, Bluefin trevally	*Caranx melampygus*
Ono	Wahoo	*Acanthocybium solanderi*
‘O‘opu	Brown tidepool goby	*Bathygobius cocosensis*
‘Ōpae	Shrimp	*Stenopus hispidus*
‘Ōpelu	Mackerel scad	*Decapterus macarellus*
‘Opihi	Limpets	*Siphonaria normalis*
Pā‘kuhi‘kuhi	Surgeonfish	*Acanthurus archilles*
Puhi	Moray eel	*Gymnothorax spp.*
Ta‘ape	Bluestripe snapper	*Lutjanus kasmira*
To‘au	Blacktail snapper	*Lutjanus fulvus*
Uhu	Parrotfish	*Scaridae*
Uku	Gray snapper	*Aprion virescens*
Ula	Spiny lobster	*Panulirus penicillatus and P. marqinatus*
Ula papapa	Slipper lobster	*Scyllarides squamosus and S. haani*
Ulua	Jack; Giant Trevally	*Carangoides orthogrammus*
‘Upāpalu	Cardinalfish	*Apogon spp.*

3.3 Contemporary Fishing and Shoreline Gathering in and around Hanalei Bay

Overview

Fishing and seafood have long been important aspects of community life in Hanalei Valley. Numerous elders interviewed during the course of the current study described various shoreline and boat-based fishing activities, and the gathering of limu, ‘opihi, and other foods from the shoreline as these occurred during the first part of the 20th century. The area was then relatively isolated and good-paying jobs were limited in number. Thus, seafood was a critically important

element of the household economy. Beach-based hukilau (literally, "pull ropes"; manually gathered surround net fishing) for akule (bigeye scad) was particularly important in social terms in that it involved the extensive kōkua (cooperation) of residents, the product of which was distributed within and between families in the community. Clark's (1990:27) description of historical hukilau is similar to that provided by elderly key informants involved in the current study:

> Pu'u Poa, the hill where the hotel is built, was once used as a fish-spotting site. From its heights, a *kilo i'a*, or spotter, would observe the movements of fish schools below him in Hanalei Bay and direct the surround-net operations of the fishermen in their canoes. Sometimes he would signal with a white flag, sometimes with his hands. Similar methods are employed today, but the *kilo i'a* now spots from an airplane and uses two-way radios to communicate with the net fishermen below. The primary catch is still the same– *akule*, or big-eyed scad.

It is said that community-based hukilau now occurs less frequently in Hanalei Bay than in years past, though the products of this and other forms of fishing activity are still consumed and shared by families across the study community. Notably, a commercial fisherman from another part of the island who formerly used surround net gear to catch akule for commercial sale also does so less frequently than in years past. It was/is this fisherman's custom to share a significant portion of his catch with certain Hanalei families.

As noted above, beginning late in 1995, Friedlander and Parrish (1997) began an intensive 18-month study of fish stocks and fishing activities in Hanalei Bay. The authors report that the study generated "unusually valuable quantitative fishery data and concurrent estimates of natural density of reef fish for a complete, small, subsistence/recreational/artisanal fishery on a small, remote island in the tropical mid-Pacific." Data were collected via a stratified random sampling design and direct observation of fishing activities by researchers who positioned themselves with binoculars on Pu'u Poa.

According to the authors (ibid., p. 33), the then-extant commercial surround net fishery accounted for over 70 percent of the enumerated catch. Most other fishing activities were undertaken for purposes of recreation or subsistence. Shore-based pole and line fishing and boat-based fishing reportedly accounted for much local fishing effort, but with a low catch per unit effort (CPUE). CPUE for local throw net and spear fishing tended to exceed 2.2 pounds per hour of effort, and a diversity of reef-associated species tended to be landed by the fishermen.

Standing stocks of reef fishes were estimated based on hundreds of underwater visual censuses. The authors report (ibid., p. 33) that estimates of yield from Hanalei Bay were very low compared to other locations in the Pacific, and that the small fraction of standing stock then being harvested suggested that the bay was not being severely overfished at the time of the study. Parrotfish, goatfish, and surgeonfish were important target species.

With regard to the temporal and spatial distribution of fishing effort, the authors note (ibid, p. 38) that recreational angling was more extensive on weekends and holidays than weekdays. Pole and line fishing was observed on virtually all accessible shorelines where deep water could be reached by casting. Although boat-based fishing was seen to be much less extensive than shore-

based fishing, pelagic landings were relatively more extensive. Boat-based fishing activity tended to occur "along the outer edges of reefs and hard bottom and over the sandy bottoms of the central bay" (ibid, p. 38) and trolling for pelagic species typically occurred in the center of the bay. Small gill nets typically were set adjacent to hard substrate along the sides of the bay. Crab nets were commonly set from Hanalei pier. Spear fishing also tended to be observed along the sides of the bay. Throw nets were used in many shoreline areas. Regarding use of surround nets, the authors state (ibid., p. 38) that:

> Surround netting was unique in several respects. Long nets with fine mesh were deployed from the surface (often extending the full depth of the water column) to encircle rather large schools of fish, almost always *Selar crumenophthalmus* or *Decupterus spp.* Units of gear were large and had high fishing power, and each typically required several fishermen. Size and corresponding fishing power varied greatly among nets. Therefore, the net-hour used in this work is a crude, non-standard unit of effort for surround nets at Hanalei, and aggregated values of effort obtained by summing such dissimilar gear are difficult to interpret. Timing and frequency of surround net fishing were entirely dependent on discovery of infrequent, large schools of the target species within range of the gear. Relatively few surround net sets occurred in a year. Comparison of weekday versus weekend/holiday effort is probably meaningless. All known surround netting occurred well inside the bay. Some sets were made in the central bay, but most nets (except a few large units set and hauled from boats) were hauled ashore on beaches south and southwest of the estuary (Friedlander and Parrish 1997:38).

While the current research generated similar findings in terms of general gear use patterns and distribution of fishing activities in Hanalei Bay (discussed in the following section), the two project methodologies were significantly different, as were the objectives of each study. Results therefore are not directly comparable.

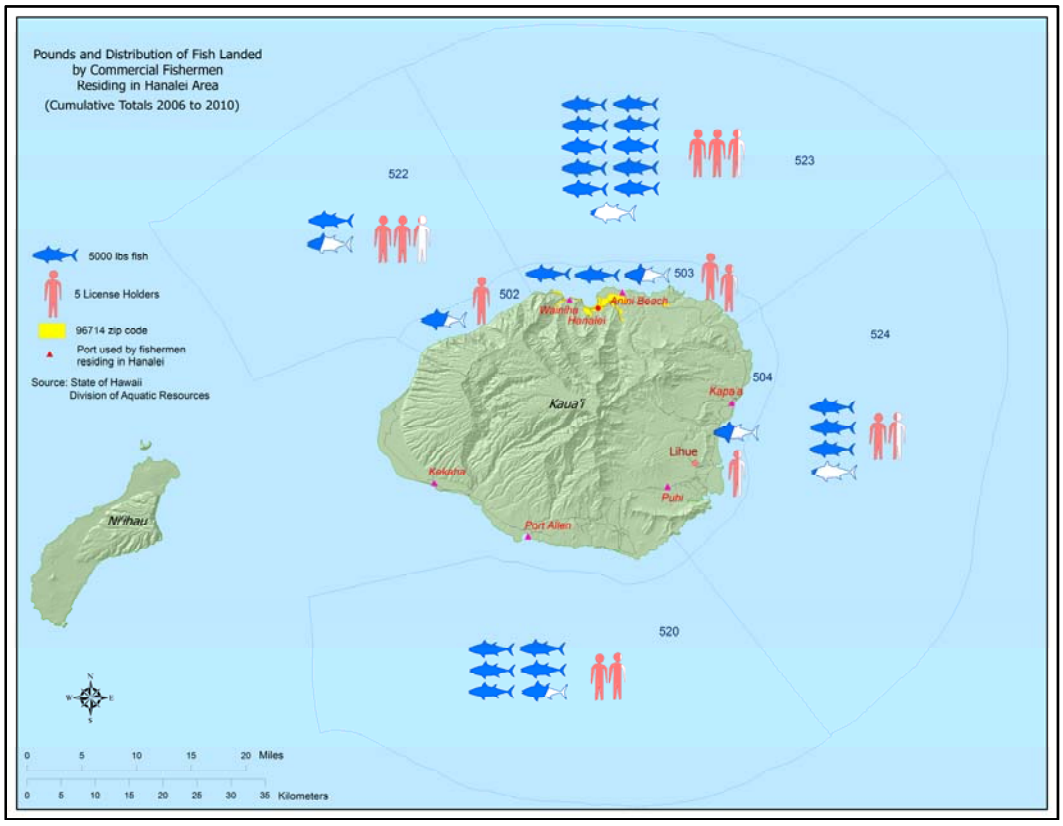
Spatial Distribution of Commercial and Recreational Fishing by Residents of Hanalei

This project involved compilation and spatial representation of archived data regarding fishing activities undertaken by residents of Hanalei between 2006 and 2010. The information is intended to illustrate the general extent and nature of commercial and recreational fishing activities undertaken by residents both in Hanalei Bay and in other locations around the island of Kauaʻi. The data, generated by the State of Hawaiʻi Division of Aquatic Resources and NOAA Fisheries, were provided by the Human Dimensions Research Program at NOAA Fisheries Pacific Islands Fisheries Science Center (PIFSC). Such information is maintained by the Western Pacific Fisheries Information Network at PIFSC.

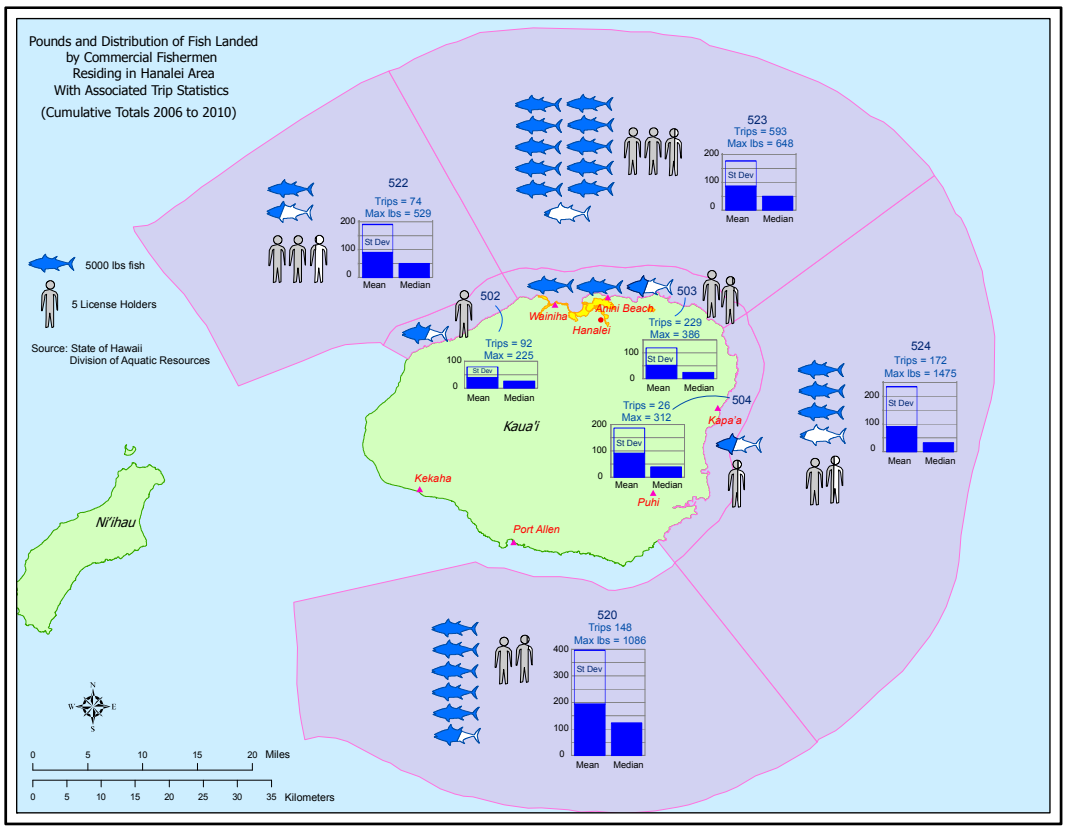
Map 3-2 below depicts spatial patterns of catch and effort for commercial fishermen residing in the Hanalei area, defined here as the zip code tabulation area (ZCTA) that corresponds with Hanalei and immediately surrounding areas. As can be discerned from the map, a total of 11 resident fishermen were involved in the commercial harvest sector on a part- or full-time basis between 2006 and 2010. Notably, most of the reported fishing activity and landings occurred in statistical grid block 523, which is directly north of the study community. Given the prohibitive nature of contemporary fuel costs, this suggests that locally owned fishing vessels are often launched from Hanalei Bay or adjacent areas, though it is known that some Hanalei-based

commercial operators launch from other areas around Kaua‘i. Indeed, the data indicate that such captains fish productively in locations around the island.

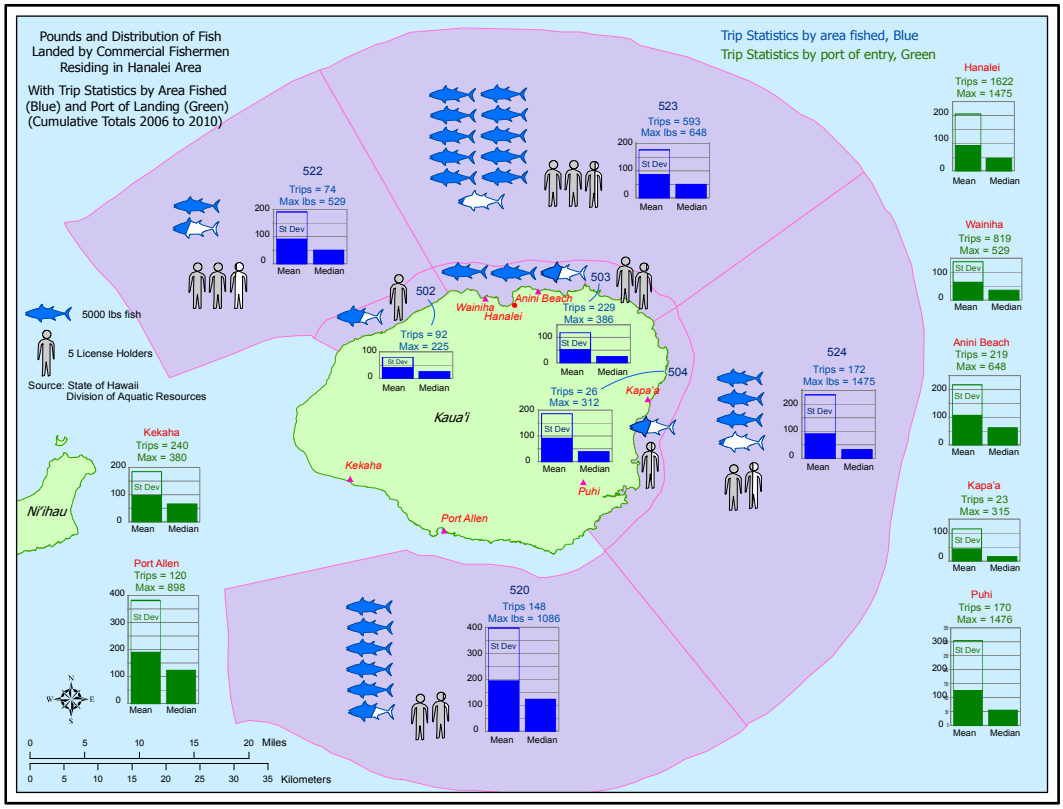
The data also indicate that most of the commercial catch is caught in the open ocean pelagic zone. Some bottomfish are pursued and landed, but much of the commercial catch is comprised of pelagic species such as ‘ahi (yellowfin tuna; *Thunnus albacares*), ono (wahoo; *Acanthocybium solandri*), a‘u (marlin; *Makaira mazara*), and mahimahi (dolphinfish; *Coryphaena hippurus*), among others. Key informants in the study community discuss the economic importance of these species and the fact that a varying portion of the commercial pelagic catch is often distributed among and between families and individuals residing in Hanalei. Most of the catch is sold to buyers in Līhue or Kapa‘a and to restaurateurs and retailers around the island, including restaurant owners and operators in Hanalei. But it should be noted that pelagic species and certain bottomfish species are often freely provided by commercial fishermen for use at Hanalei community functions such as weddings, baby lū‘au, funerals, and various holidays, among other events.



Map 3-2 Cumulative Landings by Commercial Fishermen Residing in Study Community



Map 3-3 Cumulative Commercial Landings by Hanalei Residents, w/Statistics

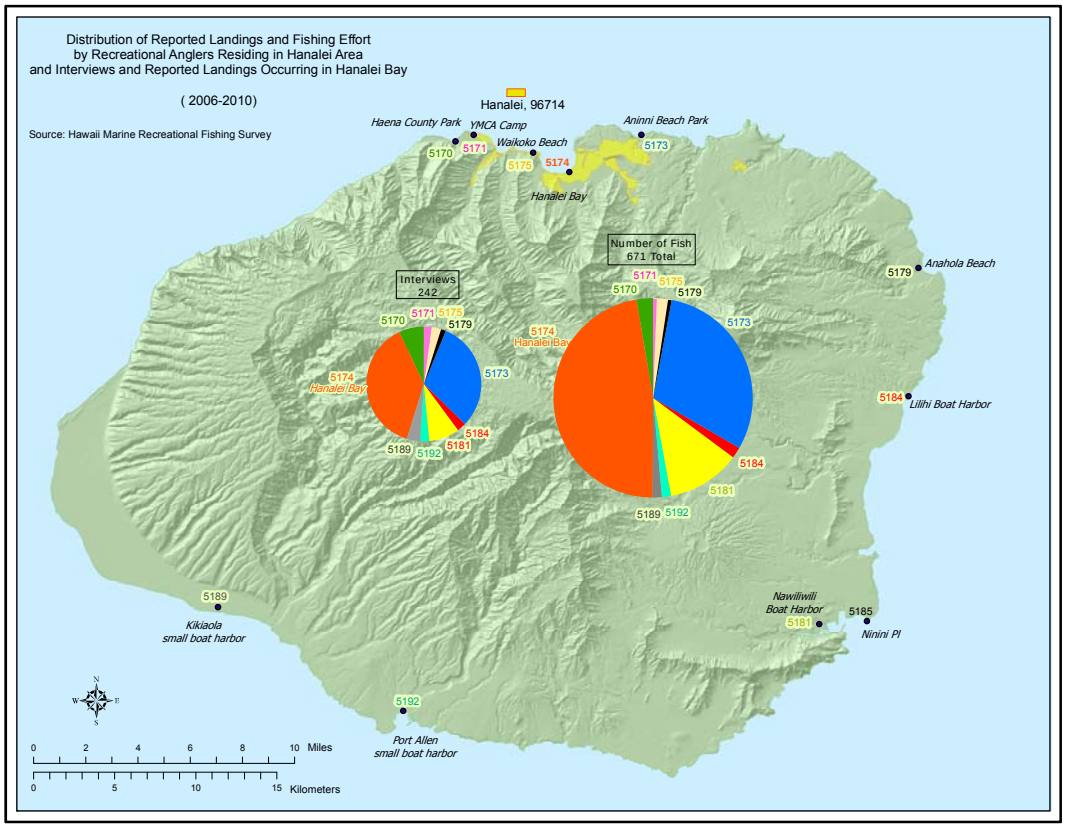


Map 3-4 Commercial Landings by Hanalei Residents, w/Statistics by Area

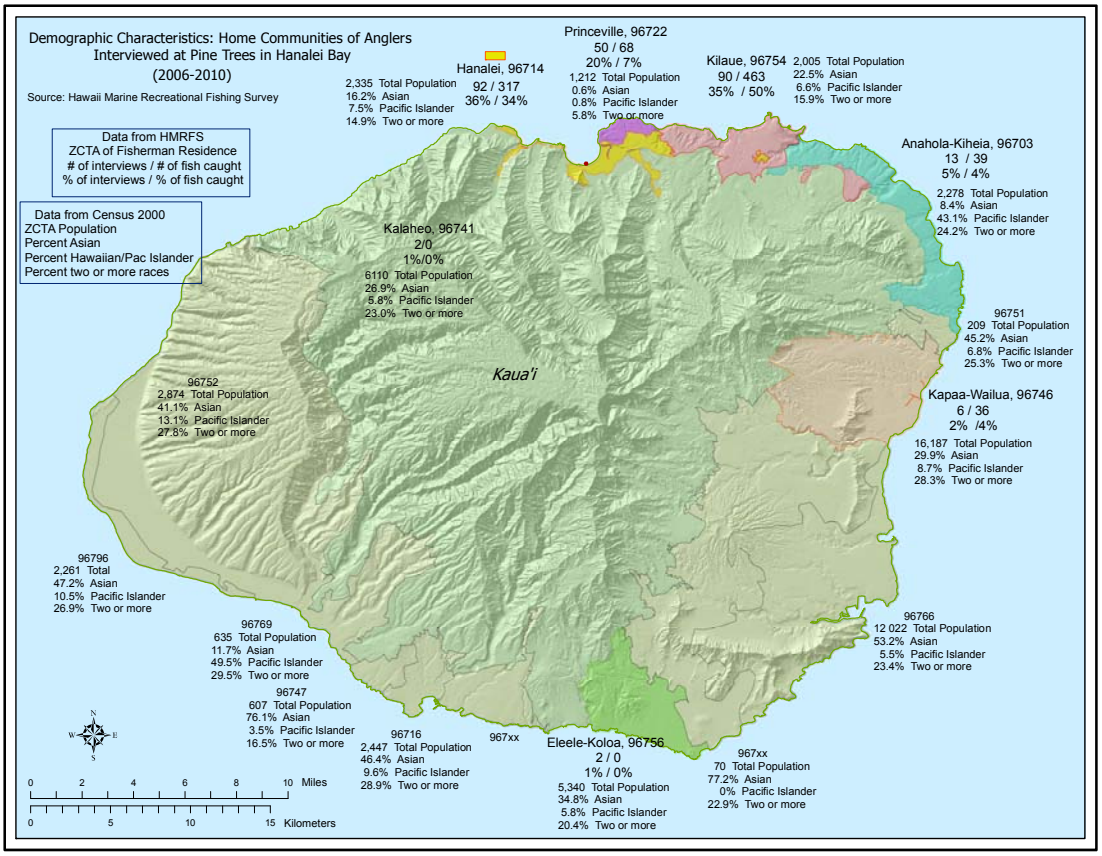
Archived recreational fishing data are also available to inform the current discussion. Maps 3-5 and 3-6 below depict data generated by the Hawai‘i Marine Recreational Fishing Survey (HMRFS), which is jointly funded and supported by the State of Hawai‘i Department of Land and Natural Resources and NOAA Fisheries (see http://hawaii.gov/dlnr/dar/hmrfs.html).

The data depicted in Map 3-5 indicate that Hanalei-based recreational anglers fish in a variety of locations around the island, obviously including Hanalei Bay itself. The majority of landings enumerated by the HMRFS during the period occurred in and around Hanalei Bay.

Map 3-6 depicts select demographic characteristics of the home communities of anglers interviewed at the Pine Trees intercept site in Hanalei Bay. Notably, the data indicate a wide range of variation in demographic conditions between the various communities.



Map 3-5 Distribution of Recreational Catch and Effort by Hanalei Fishermen: 2006-2010



Map 3-6 Characteristics of Home Communities of Recreational Fishermen Using Hanalei Bay

Critical Considerations

Fishing and shoreline food gathering activities require dedication of time and effort.[13] A successful trip involves: a motivating factor or factors; some degree of forethought and planning; acquisition of certain gear or use of existing gear; allocation of time, physical energy, and money to support the trip; knowledge of basic environmental parameters and appropriate use of gear; and in the metaphysical terms often used by the fishermen, good luck, blessings, and/or good fortune. Consistent success is ensured by: ongoing dedication to the activity; accumulation of environmental knowledge and effective use of gear as derived from direct experience and information garnered by observing and/or listening to knowledgeable persons; and the ability or capacity to retain the time, skill, physical energy, and wherewithal needed to fish and gather seafood while maintaining a modern household.

[13] Hunting also requires time, effort, skill, ecological knowledge, and cooperation. While the focus of the current study is on pursuit and use of living marine resources, the act and use of the products of hunting are in many ways similar to those of fishing, as are associated challenges and solutions. Hunting for pigs and goats in the mountains of Halele'a Moku is very important to many families in the study community; the meat so derived contributes to the larder in many local households and often constitutes an important food source for family and community celebrations. Moreover, the act of cooperative hunting; sharing and bartering meat; and consuming such foods in family and community settings are important organizing features of local societies in the study community and other rural settings in the Hawaiian Islands.

Given such demands, relatively few island or coastal residents around the world can undertake commercial or consumption-oriented natural resource harvesting activities on a full-time or exclusive basis. It is rather the case that fishing, hunting, and other shore- and mountain-based food gathering activities are elements of an overall *suite* of activities that facilitate the economic viability of the household. These also include part-time jobs, full-time jobs, small-scale agriculture, various investments and subsidies, customary exchange, and intra- and inter-familial sharing of labor, foods, and fiscal resources. Commercial fishing and income-bearing *sub-rosa* activities are also important in economic terms in certain family and community settings in Hawai‘i. By combining many sources of food and income, local families are able to take part in historically important and subjectively meaningful activities that also bear tangible benefits (and costs) to the family unit and collectively to the community of involved residents.

Many years of observation in Hawai‘i community settings have made clear that most fishermen go fishing to capture food for consumption in ‘ohana and community settings. The activities are often observably enjoyable to the participants, and in this sense it may be said that a recreational experience is involved. But fullest enjoyment tends to be observed or reported when a successful harvest is achieved and there is food from the sea (or mountains) to eat, to share, and to instigate or satisfy interest in communal celebration. In some cases, these experiences reportedly involve a spiritual connection with the natural environment, with one’s family, and with creative powers greater than the individual. This study underscores the importance of such experiences and the ways in which they serve to organize local society. The social significance of pursuing and consuming seafood in family and community settings, and the subjective satisfaction that results from successful fishing and shoreline gathering activities are critically important considerations here. Indeed, neglecting such factors in the natural resource management process could potentially serve to constrain traditions that were and remain fundamental to development of Native Hawaiian and local societies across the Hawaiian Islands.

Local Kupuna Mending Net for Use in Hanalei Bay, 2011

4.0 Results of In-Depth Interview, Survey, and Ethnographic Research

This section of the report provides select results of in-depth interview and survey research conducted during the course of the study in Hanalei. The section begins with description of: localized fishing effort, the nature and use of various fishing gears, patterns of harvest in the various habitats, and local perspectives on environmental change. This is followed by description of recent social, economic, and demographic changes in the community, and the implications of such changes for fishing traditions and related ecological knowledge.

4.1 Descriptive Assessment: Characterizing the Fishing Community

Recent Fishing Effort in Hanalei Bay

Over 40 resident fishermen were identified during the course of the project, and 14 of the identified kamaʻāina families included family members who had been fishing in Hanalei Bay for many years. Nine local fishermen participated in the in-depth interview process, about half of whom reported taking 1.5 or more fishing trips per month. Many others in the community reportedly fish on a less frequent basis and some fish only on a seasonal basis for species such as halulū, ʻoama, or ʻoʻopu. A limited number of local residents participate in periodic hukilau events.

As noted in the previous section, the 2010 Census enumerated 572 Hanalei residents. Based on census data alone, it is difficult to determine which households are comprised of local residents, vacationers, or second homeowners who do not reside on a permanent basis in the community. Fieldworkers advanced understanding of rates of occupation by the various types of inhabitants, and it was made clear from observation that many homes in Hanalei are only seasonally occupied. If it can be assumed that roughly half of the reported population of Hanalei is comprised of permanent residents, then the 42 fishermen identified through fieldwork would comprise approximately 15 percent of the resident population.

Intercept Interview Results

Fieldworkers conducted eight intercept interviews. None of the interviewees were from Hanalei, half were from elsewhere in Haleleʻa Moku, and three were from east Kauaʻi (Anahola to Līhue). One was from the island of Oʻahu. These results and ongoing observation of life in the study area make clear that Hanalei Bay is often used by non-resident anglers.

These data are also in accordance with information provided during unstructured interviews with members of the study community, many of whom communicated that anglers from other Kauaʻi towns often fish in the area. Moreover, field staff cross-validated data from the State of Hawaiʻi commercial marine landings (CML) database (DAR 2009) and the Hawaiʻi Marine Recreational Fishing Survey database (HMRFS) (DAR 2011), which have been combined into a Fisheries Ecosystem Analysis Tool (FEAT) by researchers at NOAA's Pacific Islands Fisheries Science Center (Allen and Austin 2009).

FEAT outputs (including Maps 3-5 and 3-6 above) corroborate ethnographic findings from the current study that fishermen from throughout the Halele‘a region and east Kaua‘i regularly fish in Hanalei Bay. Conversely, fishermen who live in Hanalei often fish elsewhere on Kaua‘i. The number of fishermen involved in these activities varies on a seasonal basis in relation to various runs of fish and periodic constraints such as seasonally large swells and varying weather conditions around the island. In any case, the high rate of usage of Hanalei Bay by persons from elsewhere on the island is notable, and may in fact eclipse rates of use by residents of the study community.

Household Survey Results

With regard to the household survey, field researchers spent much of September and October 2010 going door-to-door in Hanalei. Altogether, 57 households were surveyed, representing approximately 23.2 percent of local households. Of the 57 households surveyed, 20 were occupied by vacationers (35 percent) and 37 were occupied by permanent residents (65 percent). The household survey included a suite of questions regarding fishing practices, distribution of the catch, and seafood consumption patterns. Pursuant to the overall goals of the survey, interviewees also provided information on material preparedness for natural disasters, including preservation and storage of seafood.

Of the 57 householders surveyed, 21 confirmed that they fish in Hanalei Bay (57 percent of residents surveyed, 37 percent of all households surveyed). Most residents indicated that they engaged in shoreline fishing (10/21; 48 percent) and 8 respondents (38 percent) reported that used vessels and troll gear to pursue various pelagic species. Other reported gears included: hand lines (3/21; 14 percent), spear guns (3/21; 14 percent) and fish/crab traps (3/21; 14 percent). The average frequency of fishing trips among household survey respondents was one to two times per month for shoreline fishing and pelagic trolling, though trolling was less common during winter months; one to four times per month for hand line methods, generally with crew numbering between one and four persons; and twice per month for fish/crab traps, typically with two person participating.

Assuming this sample is generalizable to the larger community, it suggests that fishing activities are commonly undertaken by local residents, with about half of the surveyed households reporting involvement. As might be expected, fishing activities were relatively rare among vacationing respondents. Among permanent residents, the most common fishing activity is shoreline fishing (pole-and-line; 48 percent), though many also pursue pelagic species by boat, most typically with troll gear (38 percent).

Discussion: Socioeconomic and Demographic Context

Fishing is a common activity among contemporary residents of Hanalei. But defining the contemporary community of Hanalei is complicated by the fact that rapid demographic change has recently altered observable characteristics of the area. Notably, some persons who are

widely considered part of the community do not actually live in the town itself but rather reside elsewhere in Halele‘a Moku. Such persons often remain active in community life, participate in Hanalei Bay fisheries, and share seafood landed in the bay and elsewhere on the island with local residents. Some such persons were recently forced to move from Hanalei due to ever-increasing rates of real estate taxation; others relocated for various reasons in decades past.

According to the 2010 decennial census, the study community is comprised of 89 owner-occupied households and 72 renter-occupied homes, for a total of 161 households. As noted above, there now are many vacation homes in the Hanalei area, and numerous second homes. Home values have risen dramatically over the past two decades, from a mean of $357,000 in 1990 to more than $1,000,000 in 2010. Moreover, median household income doubled over the same period, from $33,304 in 1990 to $72,917 in 2010. The percentage of the local population with income below the poverty threshold decreased from 13.2 percent to 0.5 percent between 1990 and 2010.

While increasing costs of living and a decrease in the number of homes occupied by permanent residents have altered the demographic composition of the local population, long-term residents continue to form the nucleus of civic life in Hanalei. In sociological terms, malahini residents are often initially quite distinct from kama‘āina residents. The former have only recently arrived and cannot possibly possess the understanding of place and history that is possessed and often cherished by long-term residents. Kama‘āina families constitute the core of local society and newly arriving residents must eventually acculturate to that society, form small societies of their own, and/or remain on the margins. This situation also applies to localized knowledge of fishing and ecological aspects of Hanalei Bay and surrounding areas. It takes a considerable amount of time and exposure for malahini residents to gain a fraction of the knowledge possessed by those who have been fishing in the bay for most of their lives. Differences between groups in this regard may serve to strengthen the fishing-specific identity of persons who are well-tenured and knowledgeable of local resources (cf. Glazier 2007), with implication for the nature of fishing-specific social interactions in the study area.

Many kama‘āina residents take part in fishing activities in Hanalei Bay and elsewhere on the island. However, there is some disparity between estimates of the overall number of resident fishermen as determined by social network sampling and as determined by household surveying methods. As noted above, social network sampling indicates that approximately 15 percent of the local population engages in fishing in Hanalei Bay. However, household survey findings indicate that roughly half of the total population of permanent residents engages in some type of fishing activity during the course of a given year. The disparity likely is a result of the fact that available project resources could allow for only a partial ethnographic understanding of the network of fishermen and fishing-oriented families present in the study community.

Taken together, however, the two estimates indicate that between 15 and 40 percent of local residents undertake fishing activities in Hanalei Bay during the course of a given year. This falls within the statewide estimate generated by Hamnett et al. (2004), who reported that some 31 percent of Hawai‘i households include a family member who engages in recreational fishing, and 10 percent of households include a family member who engages in subsistence-oriented fishing, though again, clearly differentiating recreational and subsistence-oriented fishing is problematic

in this context. Definitional questions aside, there also is notable variability in terms of patterns of resource use, with a relatively small number of fishermen who use Hanalei Bay on a regular basis, and many others who fish less frequently. In total, we conservatively estimate that some 25 percent of local residents engage in some form of fishing activity in the immediate area during a given year. Using conservative estimates for how many households in Hanalei are comprised of permanent local residents, these findings suggest that between 42 and 70 local fishermen take part in Hanalei-based fisheries during the course of the year. As noted above, Hanalei Bay is also a popular fishing destination for persons who reside elsewhere on the island. Many such persons have familial ties in Hanalei and some have fished here for many years.

Gear, Habitat, and General Resource Use Patterns

Fishermen reported using a variety of fishing methods and types of gear in Hanalei Bay (Table 4-1). The most widely used gears include: pole and line, troll gear, and throw nets. Spears of either the 3-prong (Hawaiian sling) or spear gun varieties are also prevalent (Figure 4-1).

Table 4-1 Characterization of Fishing Activities in Hanalei, Kaua'i (n=16)

Fishing Activity	Total Number of Interviewees Engaging in Activity	Total Number of Trips/Month among Interviewees	Average Number of Trips/Month among Interviewees
Trolling	8	41	3
Gill/lay net	5	11	1
Throw net	6	20	1.5
Hand spear	5	20	1.5
Spear gun	5	19	1.6
Fish/crab trap	2	2	0.2
Shore/pole fishing	11	55	4
Reef gleaning	3	1	0.1

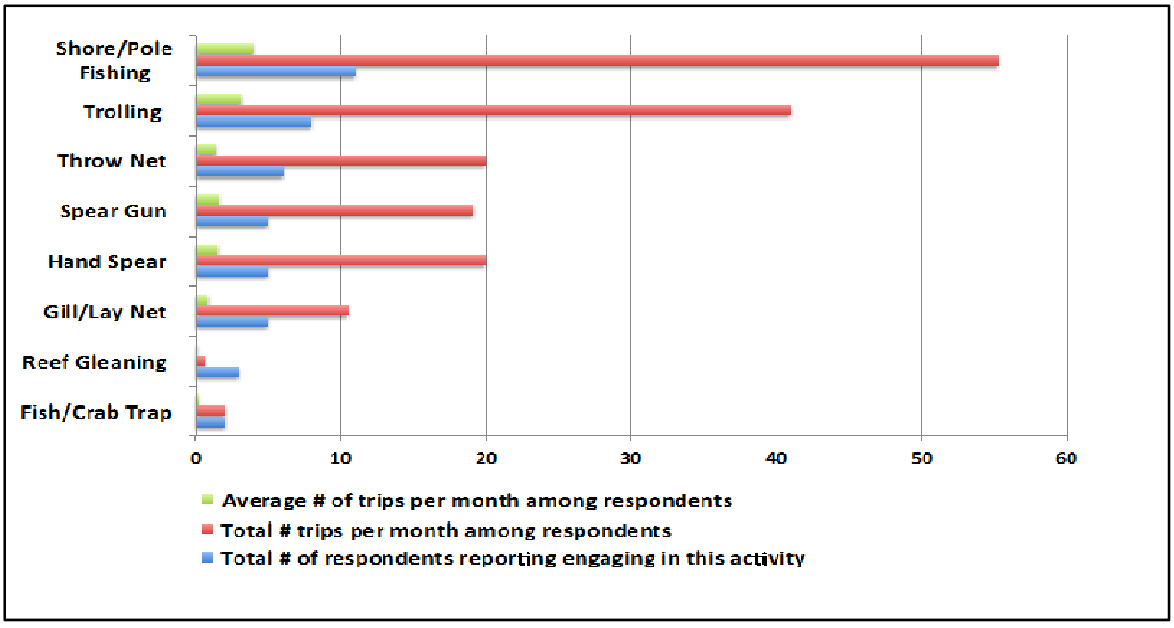


Figure 4-1 Gear-Use Patterns in Hanalei Bay

Participants in the in-depth interview process reported taking about six fishing trips per month on average, with around 69 total trips per year. Intercept interviewees reported taking nearly 11 trips per month and 127 trips per year. This suggests that fishermen from elsewhere are using Hanalei Bay with a higher degree of frequency than are local fishermen, though the small sample of intercept interviewees may reflect some bias towards avid and relatively mobile fishermen. Four of the resident in-depth interviewees reported fishing twice a week or more, while four fished on a less frequent basis. Similarly, two of the intercept interviewees reported fishing at least twice a week or more, and two reported fishing 20 to 25 times per month (>5 trips/week).

Based on the results of the household survey, the most commonly reported method was shoreline-based pole-and-line fishing. Some 48 percent of respondents engaged in this manner of fishing one or two times per month. Trolling was the next most common activity, also with an average of one or two trips per month. One participant is a particularly active commercial fisherman who trolls and/or handlines for pelagic species about 21 days each month.

Fishermen reported utilizing a range of habitat types in Hanalei Bay– from the shoreline out to the pelagic zone (Table 4-2). Of 16 respondents, only two reported use of one habitat; four reported accessing three or more habitats. The shoreline, reef flats, and pelagic/offshore zones were most commonly accessed, and also the most intensively fished (Figures 4-2 and 4-3).

Table 4-2 Habitat Use among Fishermen in Hanalei Bay (n=16)

Fishing Habitats	Total Number of Interviewees Fishing This Habitat	Average Percent of Time Fishing this Habitat	Intensity Index*
Shoreline/intertidal	12	62.3	1.0
Reef flat (papa)	9	33.6	.4
Sandy bottom	5	21.6	.1
Reef crest or fore-reef/reef slope	1	10	~
Offshore/pelagic	8	53.7	.6

*The intensity index was calculated as the percentage of total time spent per habitat type multiplied by the number of respondents reporting use of the habitat type. Resulting scores were then converted to a percent of maximum scale (0-1 scale) for comparison; ~: Negligible amount (< .01).

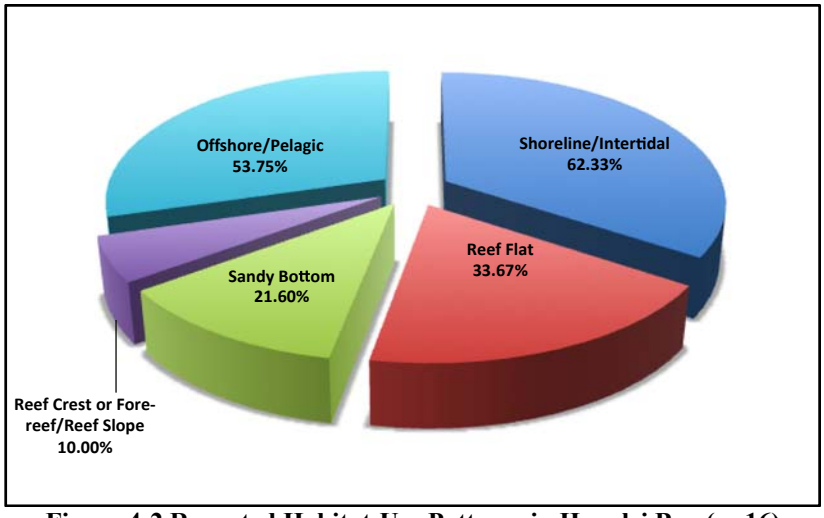
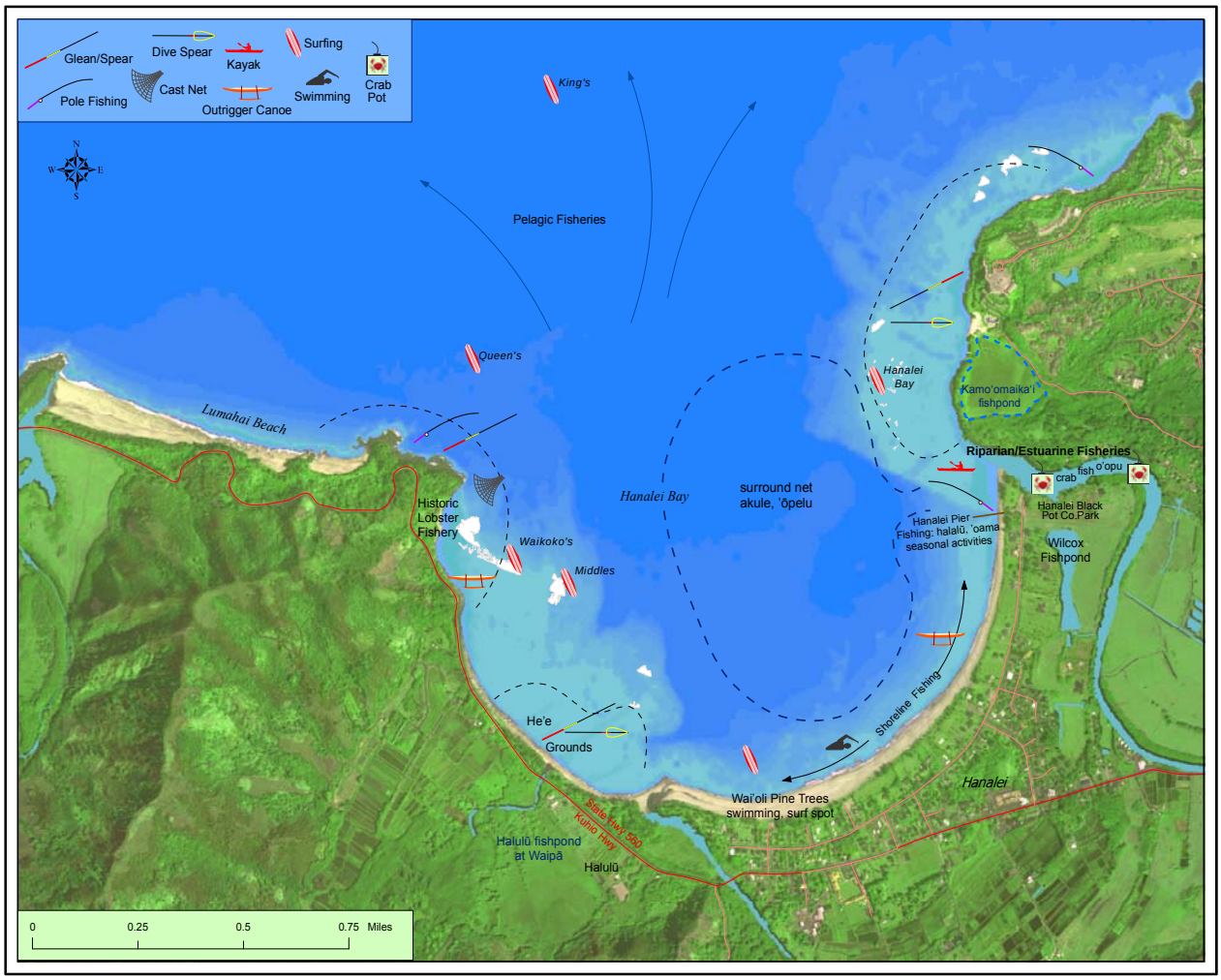


Figure 4-2 Reported Habitat-Use Patterns in Hanalei Bay (n=16)

A wide variety of recreational, commercial, and subsistence-oriented activities occur in Hanalei Bay. Surfing is particularly popular, as are swimming, sailing, kayaking, sailboarding, kite-surfing, boating and boat-based fishing, throw-netting, spearing, and shoreline fishing. As depicted in Map 4-1 below, there is potential for space-use conflict in the area; indeed, some problematic interactions have been noted over the years, particularly between persons who are well-versed in appropriate local behavior on the ocean and those who are not. The ocean zones surrounding Kaua‘i can be highly enjoyable to a variety of user groups. But they can also be very dangerous, and local knowledge and customs have developed over time to prevent accidents and loss of life. With respect to fishing activities, local fishermen often insist that it is best for other ocean users to maintain a sufficient distance from dangerous hooks, lines, and nets. This wisdom also ensures that the fishing operation is not disturbed, thereby increasing the potential for successful effort.



Map 4-1 Depiction of Contemporary Ocean-Use Patterns in Hanalei Bay

Characterizing the Catch

Most fishermen involved in the current study reported that they target a variety of reef, neritic-pelagic, and pelagic species. Frequently pursued non-pelagic species include: āholehole, heʻe, and pāpio/ulua. The next most common include: moi, kala, nenue/enuenue, and akule/halalū. Many other coastal species are also pursued, though to a lesser extent, including: ʻalaʻihi, manini, ʻoama, puhi, uhu, weke and moana, roi, ʻamaʻama, menpachi/āweoweo, ʻoʻio, ʻōpelu, ʻōmilu, ono, ula, perch, and Samoan crab (Table 4-3). Some residents continue to harvest limu and ʻopihi, though there has been extensive pressure on these resources in recent decades.

Table 4-3 Frequency of Species Caught by Fishermen in Hanalei Bay (n=16)

Species		Frequency (Number of Interviewees)		
Hawaiian Name	**Common Name (*Genus Species)***	**Frequently**	**Occasionally**	**Rarely**
ʻaʻama	Rock crab (*Grapsus tenuicrustatus*)	--	2	--
ʻahi	Yellowfin tuna (*Thunnus albacores*)	2	4	--
āhole; āholehole	Flagtail (*Kuhlia sandvicensis*)	6	4	--
aku	Skipjack tuna (*Katsuwonus pelamis*)	2	1	--
akule; halalū	Big-eyed scad (*Selar crumenophthalmus*)	3	4	--
ʻalaʻihi	Squirrelfish (*Sargocentron; Neoniphon spp.*)	--	1	--
ʻamaʻama	Striped mullet (*Mugil cephalus*)	1	4	--
aʻu	Blue marlin (*Makaira nigricans*)	1	1	1
heʻe	Octopus (*Octopus cyanea; Octopus ornatus)*	3	5	--
hināle a	Wrasse (*Thalassoma duperrey*)	--	1	1
kala	Unicornfish (*Naso unicornis*)	3	3	--
kawakawa	Bonito (*Euthynnus affinis*)	--	1	--
kole	Yellow-eyed tang (*Ctenochaetus strigosus*)	--	--	1
kūmū; ʻāhuluhulu	Goatfish (*Mullidae spp.*)	--	1	--
mahimahi	Dolphin fish (*Coryphaena hippurus*)	3	2	--
manini	Convict tang (*Acanthurus triostegus sandvicensis*)	3	4	--
menpachi; ʻāweoweo	Bigeyes (*Priacanthidae*)	--	3	1
moi	Threadfin (*Polydactylus sexfilis*)	3	5	1
nenue ; enenue	Chubs (*Kyphosus spp.*)	4	2	1
ʻoama; wekeʻa	Yellowstripe goatfish (*Mulloides flavolineatus*)	1	3	--
ʻoʻiō	Bonefish (*Albula spp.*)	--	5	--
ʻōmilu	Bluefin trevally (*Caranx melampygus*)	--	1	--
ono	Wahoo (*Acanthocybium solanderi*)	1	3	--
ʻoʻopu	Brown goby (*Bathygobius cocosensis*)	1	1	--
ʻōpakapaka; onaga	Blue snapper (*Pristipomoides sieboldii*)	--	1	--
ʻōpelu	Mackeral scad (*Decapterus macarellus*)	1	4	--
pāpio; ulua	Jack; Pompano (*Carangoides orthogrammus)*	2	7	--
perch	(*Perciformes*)	--	1	--
puhi ao	Eel (*Muraena pardalis*)	1	1	--
roi	Peacock grouper (*Cephalopholis argus*)	1	--	--
Samoan crab	(*Scylla serrata*)	--	3	--
uhu	Parrotfish (*Scaridae*)	3	3	--
uku	Gray jobfish; Snapper (*Aprion virescens*)	--	1	--
ula	Lobsters (*Panulirus penicillatus; P. marqinatus*)	--	1	1
weke; moana	Goatfish (*Mullidae spp.*)	3	5	--

In-Depth Interview Results

For the non-pelagic coastal fisheries, the average daily catch was reported at about 10 to 20 pounds over the course of about one to five hours of effort. On good days, hukilau fishing can yield up to 1,000 pounds with 8 to 12 hours of effort. This type of fishing primarily occurs in the late summer and fall months.

Intercept Survey Results

Catches of reef-associated species averaged 10 to 20 pounds, with good catches ranging from 25 to 75 pounds over the course of 8 to 12 hours of fishing. According to one knowledgeable informant, landings of pāpio averaged around 90 pounds per trip on a very good day. Catches of halalū were reported around 40 pounds over 6 hours of effort while 10 years ago, the catch reportedly was in the range of 100 to 125 pounds for the same amount of effort. Another individual reported that when schools of akule are surrounded, the catch can approach many thousands of pounds, requiring many hands and as much as 12 hours of effort. Catches of moi and he‘e averaged two to eight pounds on an average day, and 20 to 30 pounds on a very good day, typically involving between two and four hours of effort.

Household Survey Results

About half of the individuals who discussed fishing activities during the household survey reported catching one to ten pounds of fish on an average day using their favored gear, with about one to four hours of effort. The discussants most typically tend to use rods and reels, spear guns, and Hawaiian slings (Table 4-4).

Table 4-4 Catch and Effort among Household Survey Respondents in Hanalei

Average Day		Good Day	
Mean Catch (lbs)	**Daily Effort (hours/trip)**	**Mean Catch (lbs)**	**Daily Effort (hours/trip)**
0	3	8	4
1	3	20	20
2	2	4	2
3	3	5	5
4	4	10	4
6	4	12	4
8	1	--	--
10	8	15	8
20	--	200	--
100	10	300	10
100	--	300	--
250	5	300	8
--	1	4	2
42.0	**(Mean) 4.0**	**98.2**	**(Mean) 6.7**

Note: Respondents were asked to quantify their catch and effort on an average (A-B) and good day (C-D) of fishing in the Hanalei area. Catch per unit effort (CPUE) for average day among respondents was 10.5 pounds/hr; for a good day CPUE was 14.7 pounds/hr.

Fish Flow: Catch and the Community

Most local fishermen keep a portion of their catch (average: 34 percent) and give away a substantial amount to friends, family, and other persons in the community (average: 64 percent) (Tables 4-5; 4-6). Only two local fishermen who were interviewed during the household survey reported selling their catch, though it is known that as many as 11 part- or full-time commercial fishermen have lived in the general study area in recent years. Again, some portion of the commercial catch is very typically consumed by the fisherman's nuclear family and/or shared with others. Non-resident fishermen participating in the intercept interviews reported keeping about half of their catch for consumption in their own household. The other half reportedly is given away to extended family and friends (Figure 4-4), and a smaller proportion is sold.

Table 4-5 Disposition of Catch among Interviewed Fishermen

% Consumed	% Given Away	% Sold	% Other
In-depth Interviews (n=9)			
10	--	90	--
5	45	50	--
70	30	0	0
50	50	0	0
30	70	0	0
10	90	0	0
25	75	--	--
100	--	--	--
10	90	--	--
Intercept Interviews (n=7)			
50	40	10	0
50	40	10	0
50	50	0	0
25	70	0	5
60	40	0	0
50	50	0	0
80	20	0	0

Table 4-6 Overall Disposition of Catch among Interviewees

Type	% Consumed	% Shared	% Sold	% Traded	% Catch & Release
In-depth (n=9)	34.4	50.1	15.5	0	--
Intercept (n=7)	52.1	44.3	2.9	0	0.7
Household (n=13)	66.4	19.3	7.1	0	7.1
Mean	50.9	37.9	8.5	0	2.7

Most fishermen participating in the household survey reported that almost all of their catch was consumed by immediate family members (Table 4-5). Those who did not consume almost all of their catch reported giving between 40 to 80 percent to members of their extended family, including friends. Two individuals reported selling their catch; one about 10 percent and the other about 90 percent. None of the individuals reported regular trade of fish for other material

items, although this certainly is known to occur in the community. Only one interviewee consistently engaged in catch-and-release fishing.

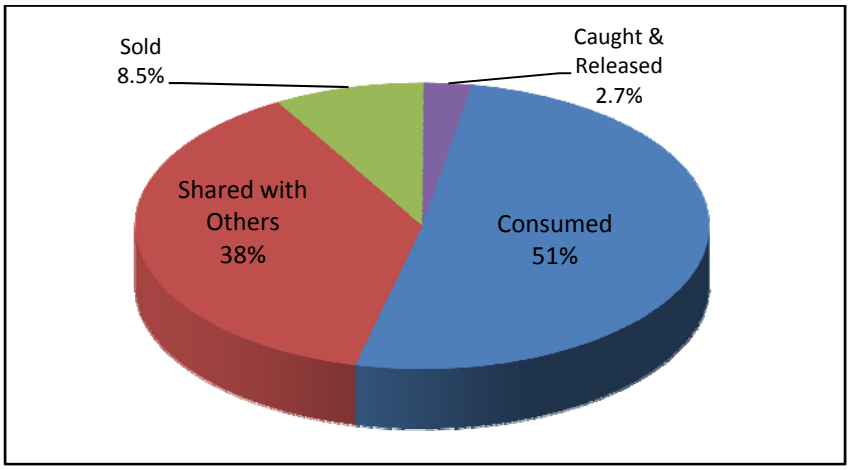


Figure 4-3 Average Disposition of Catch

Respondents were also asked to discuss the location and nature of relationships with persons receiving the seafood they harvest. A heuristic model derived from what is known about distribution of seafood in communities around the U.S. was applied to analysis of the present case. Data collected during the current study fit the model– fishermen's seafood-sharing behaviors are indeed mediated by a series of important factors, including: individual and personal motivations for fishing and sharing seafood; seasonal availability of locally favored species; and social-spatial factors such as proximity between the fisherman's household and the households with whom he or she typically shares seafood. In the case of Hanalei, and by extension in similar communities elsewhere in Hawai‘i, sharing of foods between local families is a particularly important organizing feature of local society.

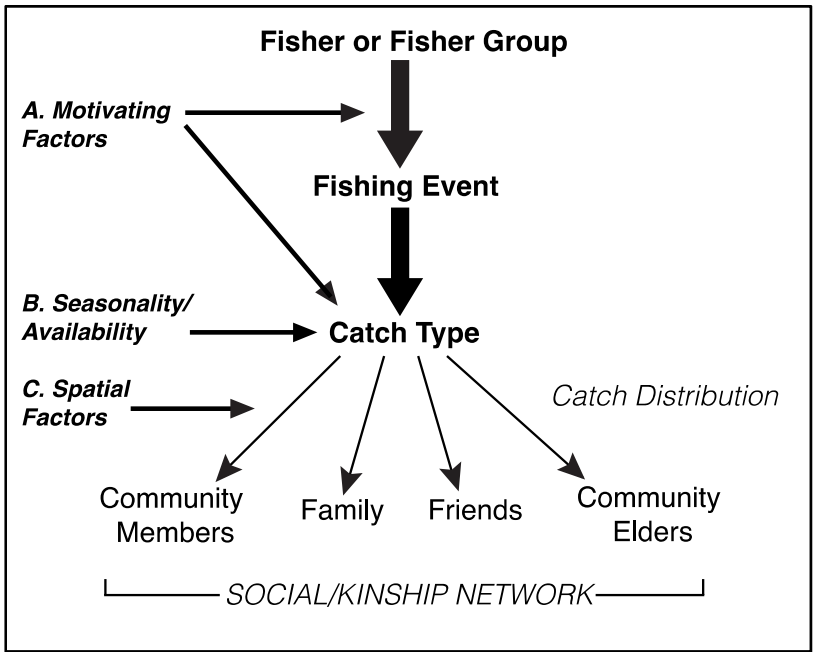


Figure 4-4 Social and Environmental Factors Influencing Distribution of Seafood

The majority of marine resources harvested by Hanalei-based fishermen remain in the community or in the broader north shore region of Kaua‘i, though some reciprocal sharing does occur with families living elsewhere on the island. As noted above, most seafood is consumed by the immediate family. The next most frequent point of distribution is the extended family in Hanalei. Over 60 percent of survey respondents reported that catch "stays in the community (Hanalei)," and 19 percent claimed it "stays in the region (Halele‘a)." One respondent stated that the catch "stays on the island (Kauai)," and one stated that it "goes off island."

Discussion: The Importance of Marine Resources to the Household Economy

A small percentage of those interviewed during this project indicated that they rely on fishing as an occupation and/or sell some of their catch in order to recover trip costs and/or contribute to their household economy. Among fishermen who reported selling fish, the average sale generated $343.75 per trip (range = $175 to $500). All fishermen who sold their catch or some portion thereof were primarily trolling in the offshore/pelagic zones and used part of the proceeds to offset trip costs.

Two individuals included in the household survey reported selling fish on a consistent basis. These fishermen sell consistently to local restaurants, small retail markets, and in some cases to individuals and families in Halele‘a Moku. On a good trip, the value of the catch reportedly is worth as much as $1,000. This income is not insignificant, considering that reported monthly household incomes among the group were around $2,000. However, these types of households made up less than one percent of the surveyed population.

Most persons who described fishing activities during the household survey were engaged in fishing for purposes of consumption and sharing. On average, such fishermen reported catching around one to ten pounds of fish during each trip, and they average about two trips per month. Overall, fishermen generally land about 10 to 20 pounds per month per eight hours of total effort. This type of fishing occurs around respondents' work schedules. Respondents indicated that this source of wild food offsets food they would otherwise have to purchase from the store, and that its quality often exceeds that of store-bought goods. Consumption-oriented fishing thus generally contributes about $150 per month to household economies in terms of value of the fish, and enhanced quality in terms of freshness. The dollar equivalent is conservatively estimated as approximately ten percent of most respondents' household incomes.

Consumption- and sharing-oriented fishing activities generate sociocultural benefits related to family and community cohesion, individual health, and collective well-being. These extend beyond actualized economic benefits. McGregor (2007) has characterized the importance of such activities for Native Hawaiians around the islands

> A [contemporary] subsistence economy emphasizes sharing and redistribution of resources, which creates a social environment that cultivates community and kinship ties, emotional interdependency and support, prescribed roles for the youth, and care for the elderly. Emphasis is placed on social stability rather than on individual efforts aimed at income-generating activities.

4.2 Qualitative Results

Hanalei as a Fishing Community

Most of the fishermen interviewed during the course of this research reported familial ties to the community and larger region. Several were of Native Hawaiian ancestry and their families are either from Hanalei, Hāʻena, or elsewhere in Haleleʻa Moku. Others were from kamaʻaina families that settled in the region in historic times. Almost all interviewees learned to fish in family settings. In most cases, a father or close relative such as an older brother or uncle acted in an instructional capacity, teaching the keiki how to fish and how to interpret information available in the marine environment. One person was the sole exception to this and was entirely self-taught. Respectful teaching and learning are important aspects of local society, and in this case, resident fishermen of multiple generations often work together to harvest, clean, distribute, and consume local marine resources.

Fishing was described as important to local families both in terms of a source of food and as an important element of local heritage and tradition. Fresh seafood has long been a staple in many local households, beginning in historic times when the community was relatively more isolated and self-sufficient, and when resources reportedly were more abundant.

Fishermen discussed their motivations for fishing. Responses tended to vary extensively, though at some point most respondents discussed fishing as a something that was done for enjoyment and relaxation. In some cases, it was stated that the catch is a secondary reward for the effort, but this may be because a successful harvest is never guaranteed, while an enjoyable trip often is. Several interviewees discussed fishing in terms of its capacity to perpetuate local traditions and ecological knowledge; such traditions and knowledge continue to be handed down across generations in certain local families.

Local Perspectives on Changing Social and Environmental Conditions

Most interviewees reported that fewer local residents are fishing now than in years past, and that certain important marine resources are now relatively less abundant in the region. Most interviewees believe that this relates to the way fishing has been practiced in recent decades. For instance, some assert that commercial net fishing has been more detrimental to the marine environment over the years than has pole and line fishing, though the hukilau is widely seen as beneficial to the human component of that environment. But hukilau is less frequently practiced today than in past eras, when akule and/or ʻōpelu were harvested on a more regular basis to feed residents who contributed to the community and/or its individual families in various ways including, but not limited to: generalized fishing and gathering activities, hunting, agricultural production, and input of cash. This basic system of reciprocal interaction remains active in certain quarters, and at times sharing is truly altruistic, with no hesitation among some residents to offer kōkua, assistance, and/or hospitality to fellow residents and visitors alike.

Local kūpuna often assert that fishing activities formerly involved important conservation mechanisms and that almost all marine resources were carefully utilized by the local community. This contrasts with what is said by some to be the current situation: many fishermen are not from the area, do not necessarily practice local-traditional use-conservation-oriented fishing, and take the catch out of the community. Similarly contentious perspectives and situations have been noted by the analysts elsewhere in the islands and around the coastal zone of the U.S., and thus there is nothing categorically unusual about the situation. Yet, the cultural context in which such interactions occur can be instructive to natural resource planners and policy-makers.

Of note, various maritime anthropological accounts (e.g., Impact Assessment, Inc. 2006), and direct observation of maritime societies around the nation's coastal zone make clear that newly arriving residents and visitors who consistently harvest resources from (or recreate in) ocean space that is regularly used by tenured residents will: (a) encounter such residents, and (b) some such residents who are knowledgeable of local ecological conditions and resources will be willing to discuss (and possibly enforce) a local code of conduct regarding use of those resources. This in itself often diminishes space-use conflicts without the need for formal governance. Additional ethnographic research would be needed to generate thorough description and analysis of space-use interactions in Hanalei Bay.

Many persons involved in the present study reported that significant changes in the abundance of certain marine resources had occurred since they first started fishing in Hanalei Bay. Reported changes were often described in some detail and most discussions related to species about which the respondent had developed a long-term understanding. For example, one middle-aged resident described how he and his father caught 300 to 400 pounds of ʻoʻopu every summer for many years, but that in recent years he rarely lands any significant quantity of the fish. Another respondent stated that Hanalei was once famous for heʻe and lobster, but that these species are now harder to find. He said that "people [formerly] came from all over to catch… used to get four-to-five-pound octopus all the time."

Most respondents believe that irresponsible fishing methods and water pollution constitute the most significant threats to the health and productivity of Hanalei Bay. It is widely believed that runoff negatively affects coral reef ecosystems, reef-associated resources, and the status of rivers and estuaries that terminate in Hanalei and other embayments around the islands. Some informants assert that increased use of Hanalei Bay by non-local fishermen along with an increase in general recreational usage of the area has detrimentally affected the local ecosystem. These perspectives contradict the findings of Friedlander and Parrish (1997), though it is certainly possible that certain ecological conditions have been altered since the prior study.

Habitat changes were discussed by long-time residents participating in the in-depth interview phase of the project. Some discussants highlighted the role of fishponds and other estuarine habitats in providing nursery areas for certain fish species, and many stated that a decline in the health and frequency of such habitats has subsequently caused problems for those species. An elderly research participant who was familiar with the historic location and status of various seagrass beds and staghorn coral stands reported that declining water quality had negatively affected these areas over recent decades.

Changes in Fishing Practices

Local values, knowledge, and traditions persist among many residents of Hanalei, despite recent demographic changes, land-based pollution events, and incursions by anglers and other recreationalists from outside the community. This is evinced by the fact that many persons involved in this study often relate challenges in the present to wisdom generated in the past– that is, to understanding of how local resources were utilized and managed "in the old days." This is the nature of tradition – knowledge and instructive stories of days past are related to an ever-changing present and to new challenges and solutions to challenges generated in the present. The content and context of local traditions and ecological knowledge are always evolving among members of a given society and yet essential lessons and understanding are very often retained and passed along to the next generation, usually by those who identify most closely with and/or care most sincerely about the cultural group in question.

In the case of Hanalei and Hanalei Bay, local kūpuna often state that fishermen formerly limited their catch based on a sense of personal responsibility to the larger community, "taking only what you need." While many fishermen behave in relation to this basic principle in contemporary times, some do not always do so, irrespective of place of residence. In reality, some deviation from norms and customs is observable in all human societies, and while self-regulation and formalized marine management policies condition present day fishing activities in Hanalei Bay, social interaction can also serve to encourage a change in behavior among fishermen who harvest juveniles, overwork certain habitats, or violate other elements of the overarching principle of malama i ke kai (taking care of the sea). Flagrant disregard for such principles are quite often addressed *in situ* without incurring the involvement of formal governing or enforcement entities, for, as Firth (1961:73) explains:

> Social organization, the handling of interpersonal relations, includes mechanisms for dealing with such frictions . . . In small a community with a high degree of interpersonal contact between all members, comparatively informal procedures can be very effective [in settling conflict– in this case social conflict resulting from violation of local norms regarding proper treatment of marine resources].

Our interviewees also emphasized a strong tradition of maintaining and refining local knowledge of the marine environment surrounding the community. As one respondent stated, "people had good knowledge, knew when to eat and how, based on the best time to catch a particular fish." All indications are that such knowledge is being retained among certain persons in the community. For instance, some participants use local and traditional ecological knowledge to inform the timing of fishing events such as the hukilau, and one elderly man continues to construct nets in traditional fashion with modern materials. Some such nets are designed for use only in certain areas or to catch only certain species. Many interviewees discussed their own perspectives, experiences, and understanding regarding connections between elements of the marine environment.

Recollection of Communal Fishing Events

Respondents have differing recollections of the Hanalei Bay hukilau, but all recall how the process of fishing on a communal basis brought people together to: prepare for the event, spot

the fish, set and pull the net, clean and distribute the fish, and consume some amount of the catch pau hana (when the work was finished). Many hukilau events occurring in the post-World War II years were conducted from the Black Pot area and were overseen by a tradition-oriented Hanalei ʻohana. Regular hukilau events ended sometime in the 1960s, and have since been relatively sporadic. One research participant provided an entry from his family's memoirs describing the historic Hanalei Bay hukilau in some detail:

> "Every summer during the late 1930s and 1940s we would have hukilaus. The man who owned the boat and nets would stand on the hill, guiding the men on the boat to let out the nets to surround the school of fish [ʻōpelu]). Meanwhile, news got around town and people flocked to the beach. All present would help pull the nets in – some people on one side and some on the other side. As the nets got close to shore a basket net was used to concentrate the catch. Fish vendors from other areas of the island would be there to buy the catch. Some of the catch was saved to be passed on to all those who helped pull the nets in. Usually the catch was probably 3,000 to 5,000 pounds or more…. The proceeds were divided as follows: the boat owner got half and the other half was divided equally, more or less, to the regulars who waited for days, passing their time repairing the nets."

Elderly residents recalled hukilau as it occurred in the 1930s and 1940s. It was commonly asserted that akule and ʻōpelu were relatively abundant during these years. One informant asserted that akule were so abundant that "they washed up in waves on the shoreline." Once caught, some of the catch was sold to plantations workers or to markets around the island; the remainder was kept for use by those running the operation who, in turn, distributed a part to the participants. One respondent stated that one group conducted hukilau from the Black Pot side of the bay and another from the Waikoko side.

Another historical fishing practice involved the harvest of aku in the pelagic zone outside of the bay. Vessels were owned by local families and local residents worked as crew members. Part of the catch was consumed and shared among the participants, and some was sold, with proceeds paying for the operation and/or contributing to household incomes.

Community Changes and Implications for Fishing and Ecological Knowledge

Key informants noted that relatively few of the older Hanalei fishermen are now actively involved in fishing. Moreover, many kūpuna who were known have possessed extensive ecological knowledge have recently passed on or are increasingly difficult to contact. Notably, as property values and associated tax rates have increased in the Hanalei area, certain tenured families have moved to other parts of Halele'a Moku or different parts of the island where economic conditions are more amenable. Their Hanalei properties have typically been purchased either by persons desiring to live in Hanalei during part of the year and off-island during the remainder of the year, or by brokers and property managers who maintain vacation homes and manage associated rental activity.

Part-year residents often rent their island homes *in absentia*, thereby recouping some investment costs. Some such persons gradually acculturate to local society, though to greater and lesser

extents. The brokers and property managers typically bring vacationers who exhibit only a passing interest in local society.

In the words of one interviewee, recent demographic and economic changes have led to a "balkanization of the community." Another discussant, who had lived her entire life in Hanalei, asserted that some tenured families had effectively been "overthrown" by recent changes. She described how some individuals had become disenfranchised by recent changes and had withdrawn from active community life, and how certain kamaʻāina families that had long been at the core of the community were now on its figurative and literal margins. Given that some such individuals and families were historically involved in fishing and possess extensive local and traditional ecological knowledge, their absence would be a significant detriment to any prospective local fishery management processes.

Although some discussants described situations in which traditional ecological knowledge is not being communicated across generations of Hanalei residents, it should be kept in mind that this is not universally the case and that in some instances pressures arriving from outside the community are forcing residents to hold on to traditions with greater tenacity. In vernacular terms, it may be said that traditional knowledge is going "underground" in some quarters. It can be argued that this has long been the case in Hawaiʻi. For instance, elderly Native Hawaiians often describe days when educators prohibited use of the Hawaiian language (and Hawaiian Creole English, or pidgin) in educational settings around the islands. But by all accounts, this encouraged many individuals to use the language(s) more avidly at home. Thus, in some cases, resistance to forced change actually served to preserve language and culture. Although interviewees report that few young people in Hanalei are becoming fishermen, some fathers and uncles *are* teaching keiki how to fish, and some youth are accumulating knowledge of the marine environment. For instance, one younger fisherman is actively working to build relationships with kamaʻāina families in the community, and he consistently distributes some part of his catch to local kūpuna.

Local Participation in Fishery Management Processes

Many of the older, more tenured fishermen living in the study community retain deep ecological knowledge of Hanalei Bay, but are not actively involved in formalized community functions. Informal and casual social interaction is often in line with their preferences. Some of the younger fishermen, however, report that they often participate in community-based programs and initiatives. Many attend fishery meetings on Kauaʻi, and indicate awareness of natural resource management programs and important fishing-related issues around the state. Notably, more than 70 percent of residents responding to the household survey were involved in community-based programs and/or local volunteer groups. Several respondents report that they are highly engaged in local and/or regional marine resource management processes.

5.0 Summary Conclusions

This study has provided an overview of community life and historic and contemporary patterns of use of the ocean and its living resources in and around Halele'a Moku on the island of Kaua'i. Following is a brief summary of major project findings and their relevance for ocean planning in the Hawaiian Islands.

Summary of Major Findings

A significant number of families and individuals residing in the small community of Hanalei continue to use the adjacent marine environment for purposes of sustenance and recreation. As was the case in centuries and decades past, fishing activities continue to function in a way that serves to organize local society while also providing an important source of fresh seafood and/or income to residents.

Today, it obviously is not possible to subsist on the natural resources of sea and land alone. Rather, fishing, small-scale farming, hunting, and other food-gathering strategies must be seen as elements of a larger suite of activities and economic inputs that ensure survival in the often-challenging economic context of modern Hawai'i.[14] Most fishermen now hold full- or part-time jobs and fish when they can, and households are typically maintained through the collective efforts of those who can work and find gainful means of employment. This does not diminish the economic or social importance of traditional food-gathering activities; indeed, such activities and the foods they generate are critically important in household settings throughout the community.

- Local Fishing effort:
    - Between 42 to 70 fishermen live in Hanalei and access coastal fisheries in the bay; such activities involve some 15 to 40 percent of local residents;
    - Kaua'i residents from other communities often harvest fish from Hanalei Bay; certain residents believe that some such persons are not ideal stewards of the local environment;
- Types of gear most typically used by residents include shoreline-based pole and line, troll gear, and throw nets;
- Local fishermen report utilizing a variety of habitats in Hanalei Bay, from the shoreline out to the pelagic zone;

[14] Notably, previous research in fishery settings around the islands (Glazier 2009) clearly indicates that part- and/or full-time commercial fishing activity in the region tends to increase during periods of economic recession.

- Based on interview and survey data collected during the current study, the average catch of non-pelagic species is about 10 to 20 pounds for about one to five hours of effort, with average CPUE of 6.7 pounds per hour; this varies by gear type, species, and season;

- Pelagic fishing involves relatively extensive effort and higher trip costs than other forms of fishing. But the yield is typically greater and thus the approach is attractive to those who can afford to purchase and operate a fishing vessel;

- Disposition of catch:

    - Most local fishermen keep a portion of their catch (average: 34%) and give away a substantial amount in the extended family settings that are typical of social life in the community;

    - The majority of the marine resources harvested by fishermen remains in the community or in the broader north shore region of Kaua‘i;

- Consumption-oriented fishing generally contributes about $150 per month to local households in terms of the dollar value of the fish; this is conservatively estimated as approximately ten percent of most respondents' monthly household incomes;

- Most of the fishermen interviewed during the course of the study report familial ties to the study region;

- Respondents describe fishing as very important to local families both in terms of a source of food and in terms of perpetuating heritage and tradition;

- Seafood (and/or meat gathered by hunting in the mountains) is very often the dietary focus of local celebrations, with foods prepared in local fashion and by local experts;

- Many interviewees reported that fewer people are fishing in Hanalei than in years past, and that marine resources are relatively less abundant than in historic times; respondents often believe this is due in part to the way fishing is practiced today– that is, without certain of the strictures that were applied in years past. However, most local fishermen continue to adhere to norms regarding appropriate use of marine resources and some are prepared to communicate the nature of these norms to others;

- It is said that few older fishermen are now actively fishing in Hanalei Bay, and that a diminishing number of young people actively maintain social ties to tenured fishermen in the community. This is not universally the case, however, and intergenerational transmission of ecological knowledge is still occurring in the community.

Critique of Project Methodology

Household Survey

One of the major limitations involved in the household survey was the physical inability of the research team to reach certain households due to access restrictions. Many homes could not be accessed given various fences, gates, and property signage. It is believed that some such properties are owned by local families who are involved in fishing activities in Hanalei Bay (Henly-Shepard, pers. comm. 2012). Persistent ethnographic work in the community would likely have overcome this limitation, with implications for what could be understood about fishing in the area. Such work is time consuming, however, and could not be undertaken given limited project resources.

Intercept Interviews

While seven fishermen participated in the intercept interview component of the project, at least six other visiting fishermen declined to participate. Many visiting fishermen were hesitant to interact with project researchers. Again, while persistent ethnographic work would likely have increased the sample size, limited time and resources precluded this outcome.

In-Depth Interviews

Local knowledge about fishing practices and ecological conditions was graciously shared by residents involved in the in-depth interview process. However, as noted in Section Two of this report, outsiders tend to be viewed with suspicion; this is very typically the case in small communities around the nation's coastal zone. Once again, persistent ethnographic work would likely have enabled researchers to better address this problem.

Toward a Valid Typology of Fishing and Gathering in the Study Area

It is difficult to define or formally classify the diversity of fishing activities in Hawai‘i and in similar Pacific island settings in which fishing incorporates multiple and interacting recreational, consumptive, commercial, and cultural motivations and outcomes. The current study makes clear that local fishing activities are varied and intersecting in nature. Moreover, disposition of the catch remains an imperfect method for post-factum classification of fishing activities. A potentially viable approach is to delineate fishing activities by the primary zone of exploitation, rather than by the disposition of catch into formal and informal venues of distribution in Hanalei and surrounding communities.

Both commercial and non-commercial harvesting occurs in Hanalei Bay, with non-commercial consumption-oriented fishing by far the most dominant type of activity. This is in line with the findings of Friedlander and Parrish (1997). For the purposes of this report, fishing has been

defined in terms of gears used, habitats accessed, and species pursued. Using a habitat-based system of classification, three principal local fisheries can be delineated for the study area:

1. *The Pelagic Fishery*: A relatively large percentage of local fishermen are active in the open ocean, where they target highly migratory pelagic fishes. While this fishery occurs primarily on the outskirts of Hanalei Bay and in more distant waters, pelagic landings are important to residents of Hanalei in terms of dietary, sociocultural, and economic value. This fishery involves the following elements:

    a. *Gears*: Small vessels, troll gear, and handline gear;
    b. *Species*: Pelagic (ʻahi, aku, ono, mahimahi, marlin, other)
    c. *Habitat*: Open ocean, suitable bottom features, thermoclines, koʻa (reef structures), fish-aggregating devices (FADs);

2. *Surround Net Fishery for Coastal Pelagic and Neritic Species*: Hanalei Bay has a rich history associated with hukilau, particularly for akule and ʻōpelu. These species were pursued through extensive community effort. While greatly diminished in terms of frequency, the fishery is still an important aspect of life in Hanalei, occurring primarily in the summer and fall months before large swells preclude such activity. Commercial surround net fishing is also conducted in the area on occasion. This general method of fishing includes the following elements:

    a. *Gears:* Small-boats and surround nets;
    b. *Species:* Coastal pelagic/neritic, primarily akule and ʻōpelu;
    c. *Habitats:* Sandy bottom to inshore areas; species are pursued during seasonal runs and are captured by pulling the net to shore;

3. *Coral Reef and Estuarine Fisheries*: This is the most diverse fishery in terms of gears used, habitats accessed, and species landed. The fisheries are conducted in nearshore and shoreline areas, including coral reefs, fore-reef/reef slopes, sandy bottom, and estuarine zones. Fishermen use throw nets, pole-and-line, hand-spears, spear guns, and traps, depending on the species sought. The coral reef fisheries typically involve opportunistic pursuit and landing of a variety of species. Some fisheries involve pursuit of only one species, such as crab. Seasonal runs of species such as ʻoama, oʻopu, and halulū can spark intensified effort among local fishermen. This type of fishing involves the following elements:

    a. *Gears*: Multiple, including throw net, pole-and-line, hand-spears and spear guns, and traps;
    b. *Species*: Nearshore, coral reef-associated, and estuarine; seasonal aggregations for key species are especially important;
    c. *Habitats*: Coral reef, fore-reef/reef slopes, sandy bottom, estuarine.

Commercial fishing can be defined as the harvesting of fish, either in whole or in part, for sale, barter or trade; the legal definition in Hawaiʻi defines the activity as: "fishing that results in or can be reasonably expected to result in sale, barter, trade or other disposition of fish for other

than personal consumption" (NOAA 2010). By the latter definition, relatively little full-time commercial fishing is currently being conducted in Hanalei Bay. Only a few research participants identified themselves as commercial fishermen, though nearly a dozen persons are known to fish on at least a part-time commercial basis in the area in recent years. Of these individuals, most are focused on pursuit of pelagic species rather than inshore resources.

Several part-time commercial fishermen sell some portion of the catch, partly so that fresh fish can be provided to local families at a reasonable cost, and partly to offset fishing-related expenses. This appears to be much more common for pelagic fishermen than for those who access the nearshore habitats. Among persons who reported selling a portion of their catch, the proceeds comprised a considerable percentage of total income (~10-15 percent). It is important to note that customary trade or bartering of fish and seafood is embedded in local informal economies and cultures in the Hawaiian Islands. Although few informants discussed the specifics of this activity during the current study, it is known to occur in this and other communities around the islands (Glazier 2009; Severance 2010). Additional ethnographic work in the area would serve to advance understanding of such transactions in the modern context.

It should be noted that certain interviewees described illegal fishing activities occurring in estuaries and streams around Hanalei. In some cases, gill/lay nets have been deployed illegally by outsiders, as has electric fish shocking (e.g., by using a car battery). These practices are by no means commonplace, but were described as particularly detrimental to local fishery resources since a relatively small group of offenders can generate significant impacts on local stocks. Some discussants indicated that some such activities were linked to drug use, and that offenders were trading fish for drugs, especially batu (ice or methamphetamine) in a cash-less transaction. This reportedly has occurred in relation to certain species with a particularly high market value. Again, persistent ethnographic research could serve to generate a better understanding of this situation, with the resulting analysis of potential utility for understanding relationships between marine fisheries and *sub-rosa* activities elsewhere in the state.

Social Benefits of Local Fisheries

The benefits of fishing to residents of the study community were regularly stated by residents involved in this project. The capacity of local residents to capture and distribute fresh seafood in nuclear and extended family settings is often highly valued in subjective terms, with recipients experiencing various dietary and social benefits. Indeed, fresh, locally caught seafood provides substantial health benefits to Hawaiian communities (Prescott et al. 2008), and the exchange of fresh seafood perpetuates traditions here and elsewhere in Hawai‘i and the larger Pacific. Exchange of fish between fishermen and community members often occurs through kinship networks and provides a mechanism that can enhance relationships between family, friends, and community (Glazier 2007, 2011; Kittinger & Kittinger 2011; Severance 2010). Fishing expertise and the ability to catch fish for others can also serve to escalate one's social status and solidify one's reported identify in this setting (Glazier 1999b, 2007).

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Relevance of Results for Fisheries and Ocean Planning

A central challenge in building community-based conservation programs is effective engagement with the diversity of persons who have some stake in the status of ocean ecosystems. Understanding important social, economic, and cultural aspects of fishing communities is critical to effective management of the marine resources upon which small coastal and island societies depend (McGoodwin 2001; Impact Assessment 2005; Ingles and Sepez 2007). Some authors envision that engaging the fishing community is a critical step in developing strategies for equitable regulation of fishing activity (White and Vogt 2000; Helvey 2004; Basurto 2005). Conversely, some authors assert that failure to productively engage the diversity of resource users can lead to mistrust and conflict in resource decision-making, and subsequently to diminished resilience of marine ecosystems and adjacent human communities. According to White and Vogt (2000) and Aswani and Lauer (2006), cooperation between communities and resource management entities can be regarded as essential to sustainable management of coral reef ecosystems.

The descriptive information and analysis generated during this pilot study may be seen as constituting a preliminary social and economic baseline that addresses trends and current conditions in local fishing activities, other ocean use patterns, distribution and utilization of captured marine resources, and local perspectives on marine environmental and social change. The work may be used to inform development of valid and theoretically pertinent research questions and instruments applicable to future assessment of fisheries-related social, economic, and demographic change in Hanalei and Hanalei Bay. The methodological approach and findings may also be used for conceptual planning purposes and development of community-

based fishery management programs locally and elsewhere in the islands.[15] Finally, the study may be used to inform a growing understanding of food-oriented fishing and hunting and linkages to other food- and income-producing activities common in the Hawaiian Islands.[16]

Though it is beyond the scope of this report to provide specific management recommendations, the foregoing analysis makes clear that many residents of Hanalei possess extensive fishing skills, deep ecological knowledge of the marine environment and its living resources, and means for conserving and using those resources in a prudent manner. This knowledge and the experiences and observations of local fishermen should be seen as significant resources in themselves, and critically important sources of ʻike (knowledge) and naʻauao (wisdom) for the generations to come.

[15] As described, for instance, by Poepoe et al. (2003).

[16] Readers are also referred to the work of Matsuoka et al. (1994) who conducted a detailed study of food-oriented social and cultural practices on the island of Molokaʻi during the early and mid-1990s.

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