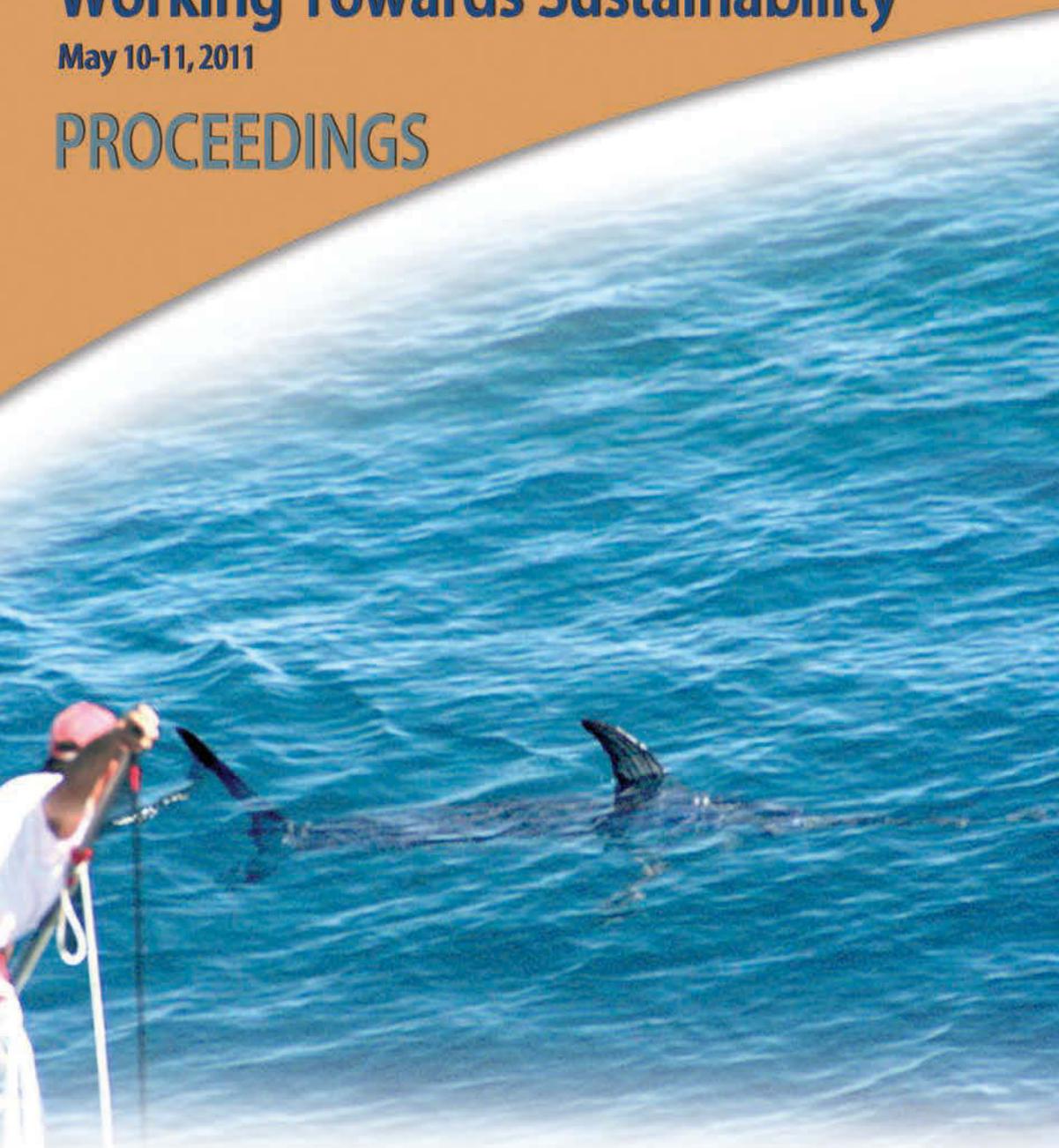


U.S. West Coast Swordfish Workshop: Working Towards Sustainability

May 10-11, 2011

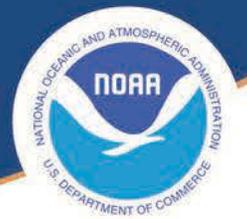
PROCEEDINGS



NATIONAL MARINE FISHERIES SERVICE

NOAA

2012



Front cover images courtesy of Pflieger Institute of Environmental Research (center: harpoon fishing) and Mike McCorkle (side panel, top to bottom: detachable harpoon heads, fisherman with catch, fisherman hoisting a swordfish)

Back cover image courtesy of Bill Boyce of Boyce Images

Reference as:

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PROCEEDINGS OF THE
U.S. WEST COAST SWORDFISH WORKSHOP
Working Towards Sustainability

May 10-11, 2011
San Diego, California



Prepared by
The National Marine Fisheries Service
Southwest Regional Office





Preface

The National Marine Fisheries Service (NMFS), Southwest Region (SWR), convened the **U.S. West Coast Swordfish Workshop: Working Towards Sustainability** on May 10-11, 2011, in San Diego, California (see Appendix A for the agenda). The goals of the workshop were to:

- establish, through information sharing, the current state of knowledge on biological, ecological, and socioeconomic factors of North Pacific swordfish fisheries, and
- achieve a common understanding among stakeholders of the current issues facing, and potential future of, the U.S. west coast swordfish fishery.

Approximately 75 participants attended the workshop, including representatives of commercial and recreational fisheries, state and federal resource agencies, scientific bodies, conservation organizations, research institutions, seafood suppliers, and restaurateurs (see Appendix B for the participant list).

Mark Helvey, NMFS Assistant Regional Administrator for Sustainable Fisheries in the Southwest Region, emphasized that the workshop was intended to be an exchange of information and not a decision-making forum. He commented on the wide range of expertise present among the participants and requested that everyone contribute to the workshop objectives. Specifically, these were to:

- consider the global scale of ecosystem impacts of swordfish fisheries;
- consider the broader ecosystem context of the U.S. west coast swordfish fishery, including the potential consequences of a reduced U.S. west coast swordfish fishery on transfer effects and global capacity building;
- understand the implications of a declining U.S. west coast swordfish fishery, including the impact on coastal community jobs, producer benefits, and consumers choices;
- share information about the global demand for swordfish products relative to U.S. supply; and
- examine the extent to which U.S. west coast-caught swordfish can contribute to regional and global environmental, social, and economic sustainability.

Mr. Helvey's opening remarks were followed by CONCUR's review and confirmation of the agenda, proposed ground rules, and other meeting materials.



Acknowledgements

Each of the individuals involved in the planning and execution of the workshop contributed to the success of this productive and informative event. I'd like to thank each of the participants for coming to the workshop, taking time out of their busy schedules, and traveling to San Diego. Each participant contributed a valuable perspective to the discussion and our overall understanding of the issues and concerns in the fishery. Participants enabled fruitful discussion and enhanced our understanding of the U.S. North Pacific swordfish fishery by sharing their unique and valuable personal histories and experiences. I believe we all left the meeting with an increased awareness of the issues facing California swordfish fishermen and U.S. seafood consumers.

I would also like to thank those involved in planning the workshop. A NMFS Executive Committee was established to provide the workshop vision. Members included myself, Kevin Chu, Kristen Koch, and Heidi Taylor. Using the vision established by the Executive Committee, a NMFS Steering Committee planned the themes, activities, and logistics of the workshop. Members included Christina Fahy, Craig Heberer, Heidi Hermsmeyer, Jennifer Isé, Dale Squires, and Yonat Swimmer. Amber Rhodes helped with workshop logistics. Amber and Jennifer also provided significant support in preparing these proceedings.

Scott McCreary and Bennett Brooks from CONCUR, an environmental dispute resolution firm specializing in marine resource and water issues, served as workshop facilitators. Their expertise in working with stakeholders on complex fisheries issues was essential to the successful facilitation of this workshop. They also contributed to these proceedings by providing a key outcomes memo following the workshop.

Mark Helvey
NMFS Assistant Regional Administrator
for Sustainable Fisheries Southwest Region

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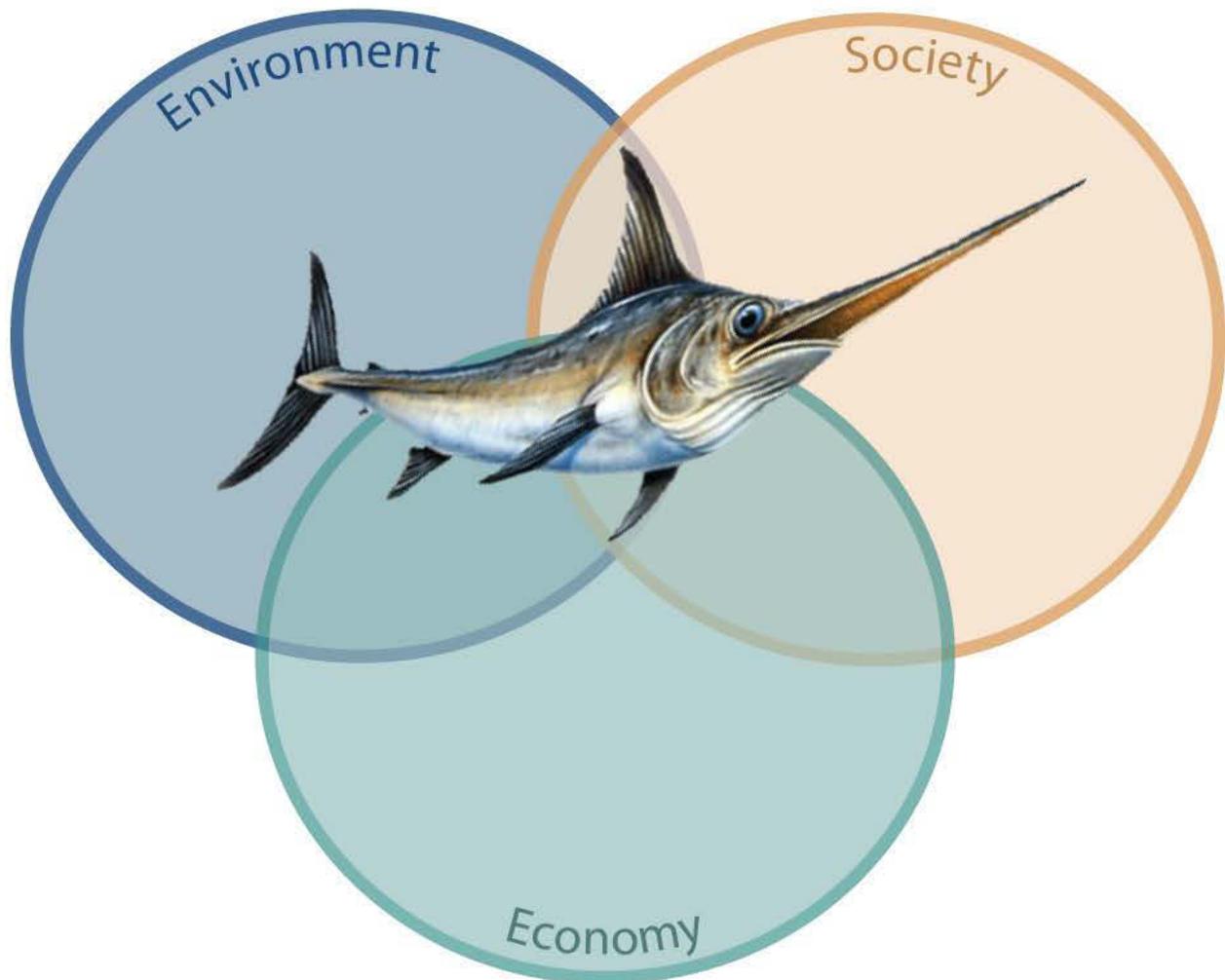
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Glossary of Acronyms

CFSI	California Fisheries and Seafood Institute
CSI	Community Seafood Initiative
DGN	drift gillnet
EEZ	Exclusive Economic Zone
ESA	Endangered Species Act
FAO	Food and Agriculture Organization of the United Nations
FMP	fishery management plan
HMS	highly migratory species
MMPA	Marine Mammal Protection Act
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NESDIS	National Environmental Satellite, Data, and Information Service
NGO	non-governmental organization
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRDC	Natural Resources Defense Council
OPC	California Ocean Protection Council
PFMC	Pacific Fishery Management Council
PIFSC	NMFS Pacific Islands Fisheries Science Center
PIER	Pfleger Institute of Environmental Research
PLCA	Pacific leatherback conservation area
SLUTH	Swordfish and Leatherback Utilization of Temperate Habitat
SWFSC	NMFS Southwest Fisheries Science Center
SWRO	NMFS Southwest Regional Office

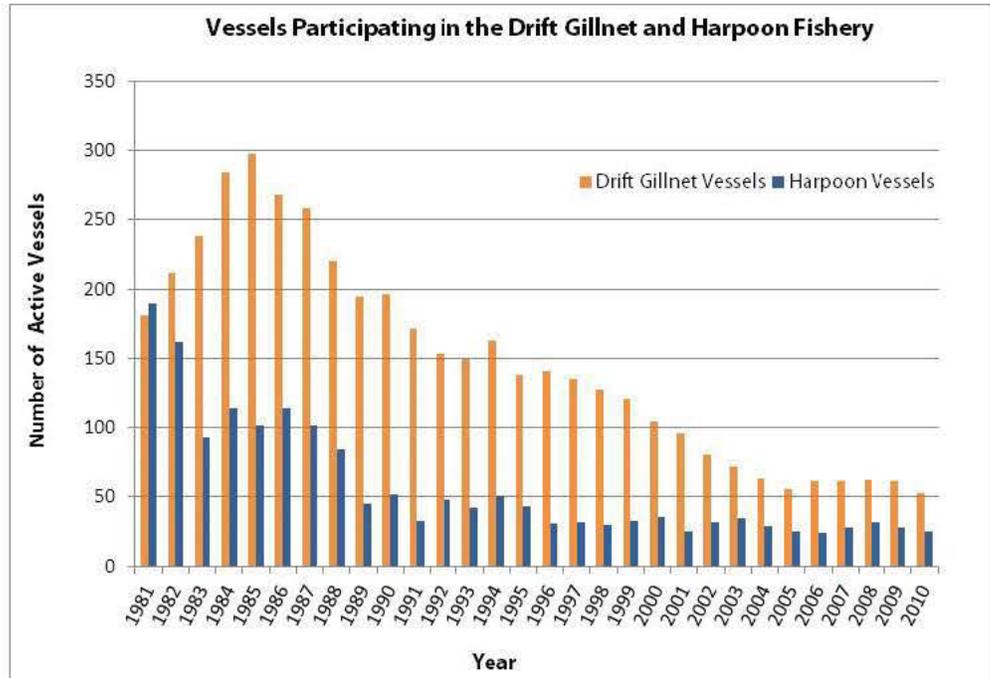


Introduction

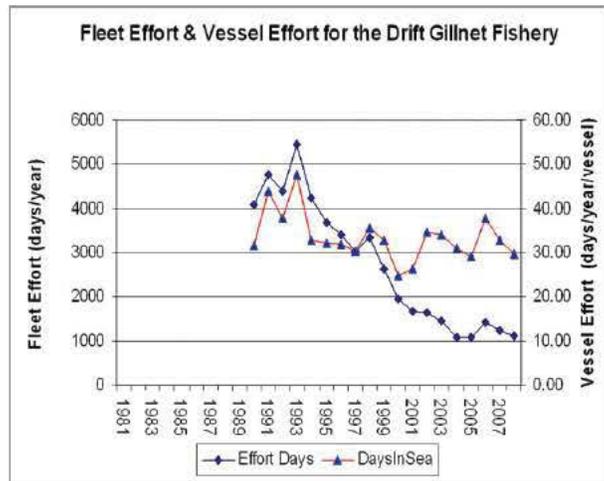
The National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) hosted a stakeholder workshop in San Diego, California, on May 10-11, 2011, to discuss the future of the U.S. west coast swordfish (*Xiphius gladius*) fishery, including the under utilization of this marine resource and the excessive reliance on swordfish imports by U.S. consumers. The implications to coastal communities, protected living marine resources, and seafood consumers were also considered in the two-day event.

Current Trends in the U.S. North Pacific Swordfish Fishery: Based out of Hawaii and California, swordfish in the Pacific have been primarily harvested using longline, large mesh drift gillnet (DGN), and to a lesser extent, harpoon fishing gear. Over the last few decades, there has been considerable attrition in the U.S. west coast swordfish fishery.

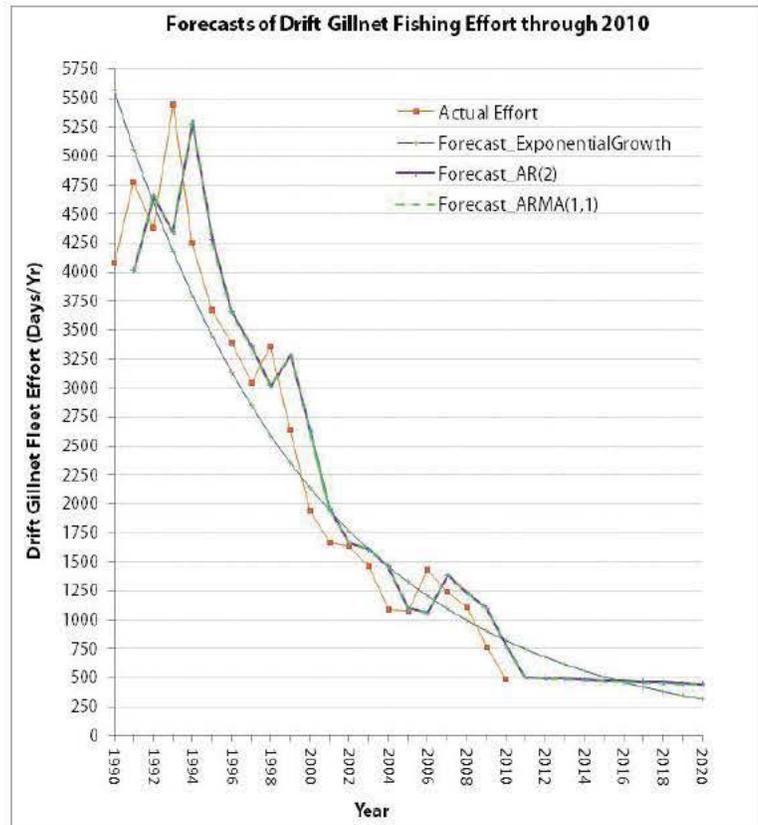
The number of DGN vessels participating in the west coast fishery has declined from a high of 297 active vessels in 1985 to less than 65 active vessels since 2004 with operations now based solely out of California (PFMC, 2011). Similarly, total annual DGN vessel effort has consistently declined since the early 1990s. Using data available in 2011, NMFS forecasts that DGN fleet effort in 2015 will hover around 500 days annually and will further decline to about 300 to 450 fishing days by 2020. The number of active harpoon vessels, which mostly operate in the Southern California Bight, has remained fairly stable over the last two decades. Thus, the focus of the workshop was directed more towards identifying and overcoming factors and constraints that may have caused DGN vessels to exit the fishery.



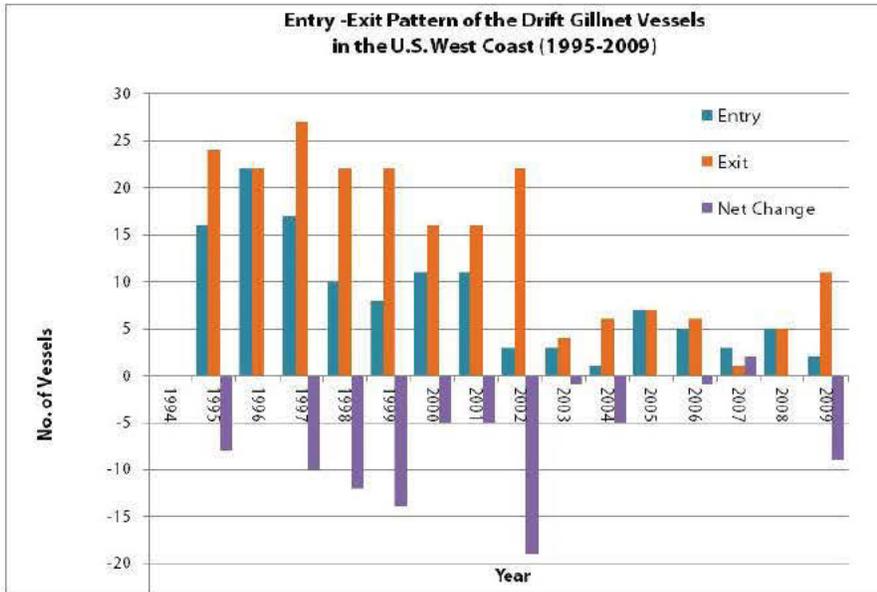
Number of active vessels in the DGN and harpoon sectors of the west coast swordfish fishery (PFMC, 2011).



DGN fleet and vessel effort 1981-2009.



Decline in actual DGN effort from 1990-2010 (orange) with forecasts for DGN effort through 2020 based on three different economic models.



Vessels entry and exit and net change by year in participation in the DGN fishery for 1995-2009.

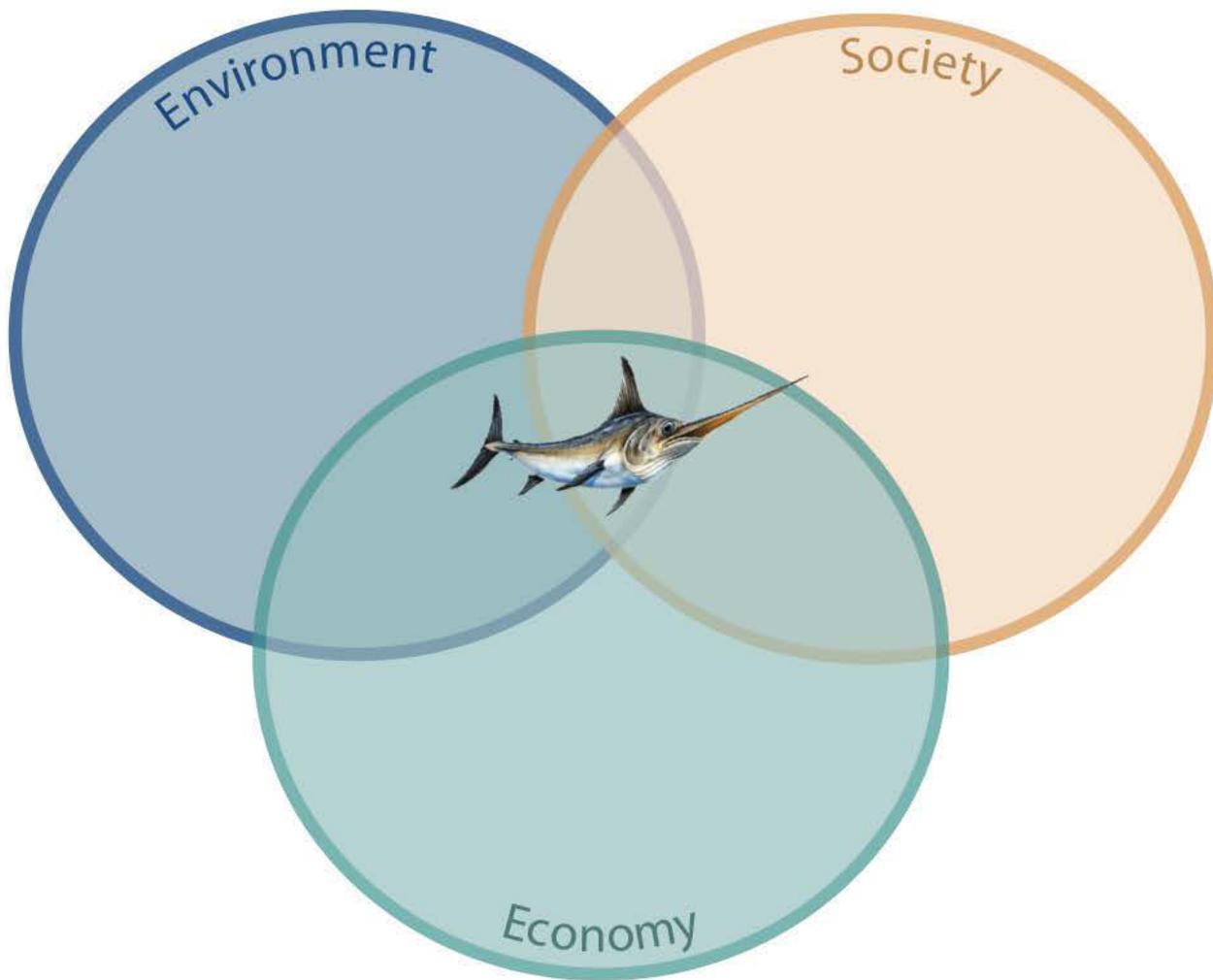
The current decline in DGN effort does not appear to be related to biomass levels of the North Pacific swordfish stock. Results from the 2009 stock assessment indicate that the exploitable biomass of both North Pacific sub-stocks is above biological thresholds necessary to achieve maximum sustainable yield (ISC, 2010). Rather, industry representatives associated with the DGN fleet attribute the decline to regulations, primarily a 214,000 square mile closure to protect sea turtles listed as threatened and endangered under the Endangered Species Act (ESA) (PFMC, 2009).

Swordfish Fisheries and Sea Turtles: While the coastal waters off the U.S. west coast are considered a productive area for swordfish at certain times of the year, the waters are also an important foraging area for endangered leatherback sea turtles (*Dermochelys coriacea*) and occasionally for threatened loggerhead sea turtles (*Caretta caretta*). Currently, there are two sub-populations of Pacific leatherback sea turtles: a western Pacific population and an eastern Pacific population. The sea turtles found off the U.S. west coast are thought to originate from tropical/subtropical nesting beaches in the western Pacific (Benson et al. 2007a) and represent a small proportion of the total western population. Loggerhead sea turtles, while only occasionally found in U.S. waters off of California, originate from nesting beaches in Japan. At times, the DGN fishery has interacted with both species, resulting in the need to impose time and area closures to avoid such interactions.

Consumer Demand for Swordfish: Despite the declining trend in U.S. west coast swordfish production, demand throughout the United States remains strong. Americans consume 2-3 times the total domestic landings (Chan and Pan, 2012). U.S. production is simply unable to meet domestic demand. This imbalance perpetuates a trade deficit with implications for U.S. jobs, west coast communities, and local food production. Economists and fisheries managers are also now beginning to realize the indirect effects to sea turtle conservation and recovery of importing swordfish from countries with higher bycatch rates (Rausser et al., 2009; Chan and Pan, 2012).

Workshop Proceedings: The following sections of this report summarize the primary themes and topics discussed during the workshop. Presentations covered a range of topics including swordfish fisheries, stock status, ecology, and the socio-economic conditions of swordfish-dependent fleets. Two moderated panels and small group discussions allowed participants to share their perspectives about the issues and challenges facing the U.S. west coast swordfish fishery and its future. The workshop concluded with a discussion about potential steps for revitalizing the fishery.





Science and Management Overview: **Swordfish Stocks and the West Coast Swordfish Fishery**

The workshop started with an overview of Pacific swordfish fisheries, touching on swordfish life history and abundance, descriptions of domestic and international fleets, and management history. Session presenters included government and non-government fisheries scientists, as well as California and federal fisheries managers. A short film produced by John Dutton Media described the collaborative efforts among west coast scientists, fisheries managers, and DGN fishermen over the last 13 years to incorporate gear and operational changes to minimize marine mammal interactions. The film also introduced some unique approaches fishermen are taking to address market demand for sustainable and locally produced seafood. Lastly, a stakeholder panel discussed current issues in the fishery, desired scenarios, and challenges to achieving those scenarios.

Session Speakers



David Itano is currently a research associate with the Pelagic Fisheries Research Program of the University of Hawaii and also represents Hawaii as vice-chair to the Western Pacific Regional Fishery Management Council. Previously, he was employed as a fishery scientist and biologist for the Secretariat of the Pacific Community Tuna Programme (Noumea) and with the government of American Samoa since 1984. Earlier in his career, he engaged in full-time and part-time commercial fisheries from Alaska to New Zealand that included troll salmon, albacore troll, shrimp trawl, dungeness crab and the western Pacific tropical tuna purse seine fishery.



Dr. Jon Brodziak is the senior assessment scientist working for the NMFS Pacific Islands Fisheries Science Center doing fishery resource assessments. An itinerant scientist, his published research includes contributions to applied statistics, mathematical modeling, and population ecology of squids, gadids, billfishes, flounders, salmonids, tunas, and rockfishes. His current research interests include ecosystem-based fishery management, stock assessment methods and software, and evaluating impacts of human activities and environmental variation on fish communities, including swordfish.



Marija Vojkovich has been with the Marine Region of the California Department of Fish and Game for over 35 years. Her experience has been almost exclusively with management issues and she spent several years monitoring highly migratory species. On a personal level, Marija has first-hand knowledge of swordfish harpoon fishing.



Rod McInnis serves as regional administrator for the National Marine Fisheries Service, Southwest Region. In this role, he directs approximately 150 employees to manage offshore commercial and recreational fisheries, marine resource protection, and oversees the conservation of marine and estuarine habitat. Rod has over 30 years of experience in conservation and management of living marine resources in the Pacific. He has broad experience as an administrator and regulator in implementing the major federal statutes and policies related to the conservation of living marine resources, including the Magnuson-Stevens Fishery Conservation and Management Act, the Marine Mammal Protection Act, and the Endangered Species Act. Mr. McInnis holds a Master of Arts in Marine Biology from San Francisco State University earned through graduate studies at the Moss Landing Marine Laboratories.

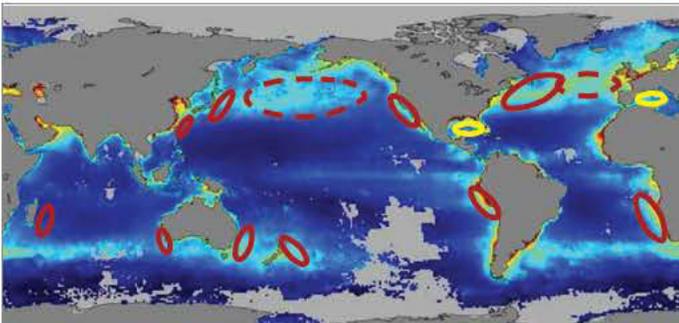


Swordfish Life History, Habitat, and Fisheries Overview

David Itano, University of Hawaii

Life History & Habitat: Swordfish are considered a worldwide species comprised of many independent or semi-independent stocks. The species is fast-growing and productive. Length and age at which 50 percent of the population is estimated to reach maturity is 144 cm fork length and about four years. Swordfish have high fecundity and broadcast spawn throughout the year in the tropics and during summer and fall in temperate regions. Swordfish are highly evolved to feed at depth possessing specialized eye and brain heater organs that promote efficient hunting at depths below 2000 ft and temperatures as low as 41°F. The maximum recorded age and size is over 15 years old and approximately 1400 pounds.

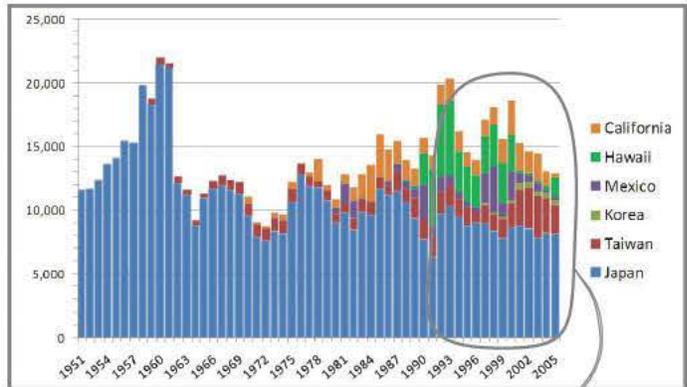
Swordfish distribution correlates with ocean productivity. Therefore, they are often found in oceanic frontal zones as well as coastal areas with relief that promote nutrient rich upwelling. They are opportunistic feeders that track the deep scattering layer. Thus, their location and daytime depth can be predicted based on local productivity, temperature, oxygen concentrations at depth, and water clarity.



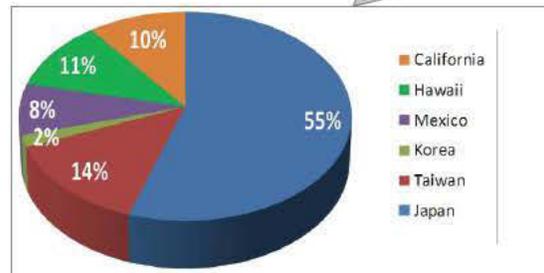
Oceanic frontal zones (dashed red ovals), enriched seas (yellow ovals) and coastal upwelling areas (red ovals) high in net primary productivity define optimal swordfish habitat and the major commercial fisheries.

International Fisheries: Several countries harvest North Pacific swordfish. Primary gear types in order of importance are longline, DGN, and harpoon. The U.S. catch makes up a small portion of the total Pacific-wide catch. Japan is the largest harvester, accounting for 55 percent of the mean catch from 1996 to 2005. The United States accounted for approximately 21 percent of mean catch during that time (all gear types). Of the U.S. portion, the catch was nearly split even (10 and 11 percent

respectively) between the west coast and Hawaii fleets. Over time, however, catch by the west coast fleet has declined.



North Pacific catch by flag 1951-2005.



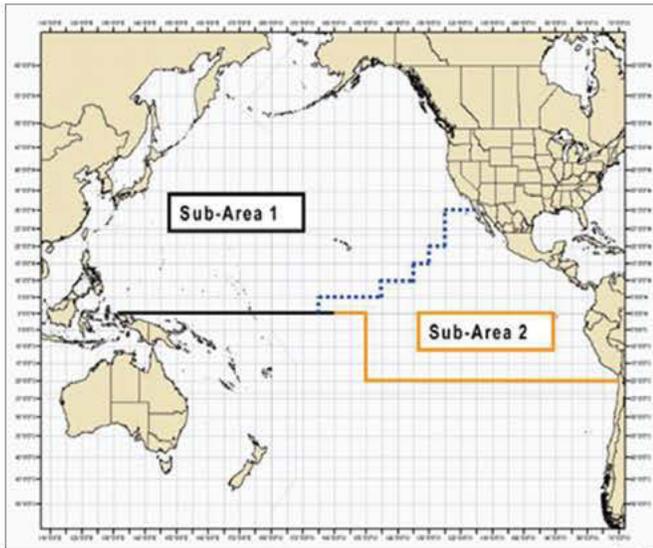
North Pacific catch by flag 1991-2005.

The U.S. swordfish fishery is managed to avoid and minimize interactions with sea turtles, especially loggerhead and leatherback sea turtles. Swordfish frequent high productivity areas that are also used by sea turtles, seabirds, and squid. The North Pacific Transition Zone is one such area. Scientists have long been studying the habitats and behaviors of sea turtles and swordfish and are incorporating their findings into recommendations for improved fishing practices. The use of habitat modeling and prediction and other gear and operational changes in U.S. fisheries have resulted in a significant decline in degree of sea turtles reported as incidental bycatch.

North Pacific Swordfish: Stock Status and Trends

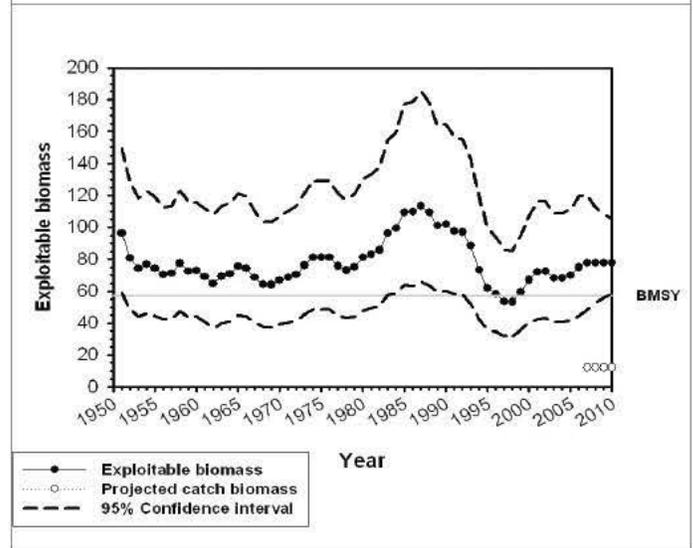
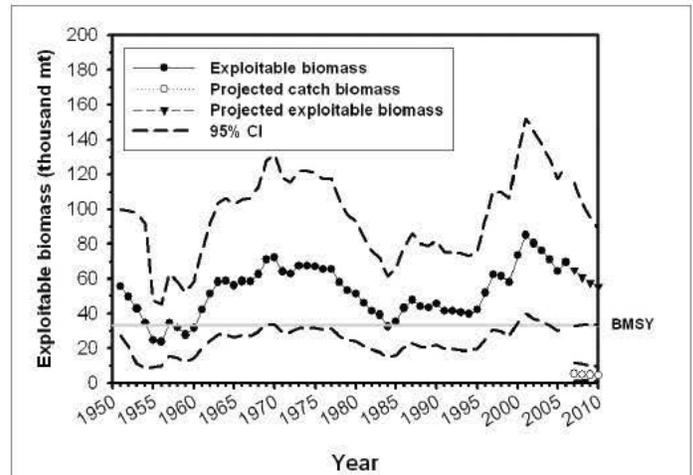
Jon Brodziak, NMFS, Pacific Islands Fisheries Science Center

North Pacific swordfish are comprised of two stocks. The western central stock primarily occurs in sub-area 1, an area stretching diagonally southwest from northern Baja to the equator and across the Pacific Ocean. The eastern stock primarily occurs south of the boundary at northern Baja to the eastern side of the Pacific off Peru. The boundary between the two stocks is not fixed, but loosely defined to exist within a 100 kilometer range. Tagging studies indicate that stock mixing occurs in the California Current off Baja California. Scientists think the boundary may be defined by a dissolved oxygen differential associated with the Intertropical Convergence Zone.



Sub Area 1 and Sub Area 2 reflect the western central and southeast stock structure of North Pacific swordfish.

Recent stock assessments indicate that both North Pacific swordfish stocks are healthy. Biomass is well above levels necessary to produce maximum sustainable yield (B_{MSY}). This has been the case for most years since the 1950s, with the exception of a brief period in the 1990s. Currently, harvest rates in both the western and eastern North Pacific are below the harvest rate to produce maximum sustainable yield and neither stock is experiencing overfishing.



Projected swordfish biomass and catch in the eastern Pacific Sub Area 2 (top) and western central Sub Area 1 (bottom).

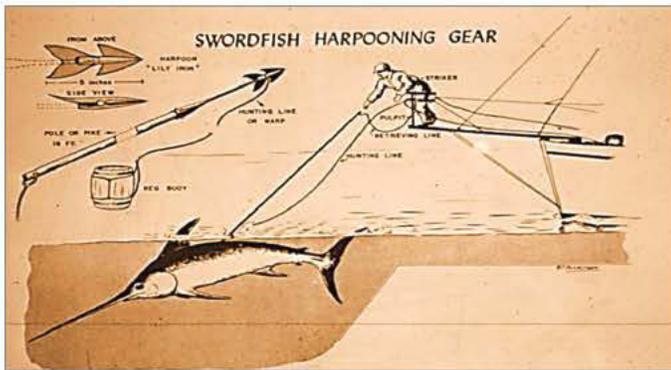
Continued management and monitoring are important to maintain the sustainability of North Pacific swordfish fisheries. Fishermen, consumers, fish stocks, the ecosystem, and management are dynamically linked subsystems of the swordfish fishery system and its assessment. Changes in one subsystem will cause changes in the others. Stock assessment and management measures will likely need to adapt through time to respond to changes in the system.



Swordfish in California: A Brief History of the Fishery

Marija Vojkovich, California Department of Fish and Game

For over 100 years there has been commercial fishing for swordfish off of California. Fishermen first used harpoons to catch swordfish. In the late 1970s, fishermen using DGN gear to catch thresher and mako sharks discovered that they incidentally catch swordfish. Because it was profitable, they pushed to develop a DGN fishery for swordfish. Longline gear has also been used to target swordfish on the high seas beyond the west coast exclusive economic zone (EEZ). Along California, landings peaked in the 1970s for the harpoon fishery, in the late 80s for the DGN fishery, and in the late 90s and early 2000s for longline caught swordfish.

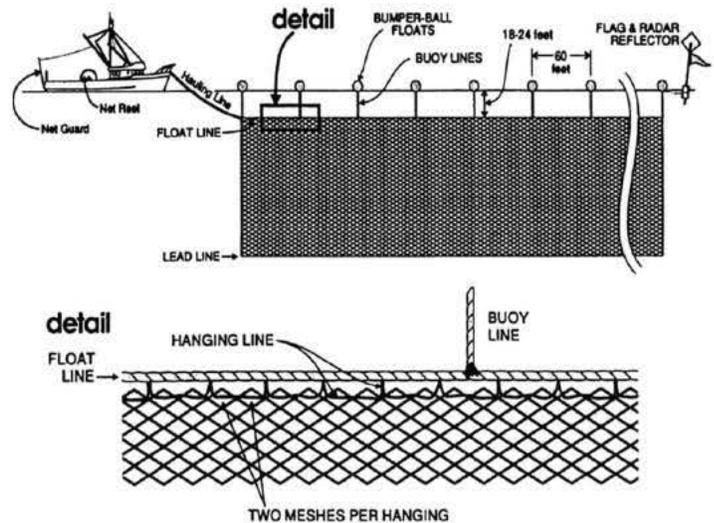


The typical gear used in the swordfish harpoon fishery.

The harpoon fishery is highly selective. While swordfish are basking at the ocean surface, fishermen harpoon an individual fish from a plank on the bow of their boat. Since 1984, spotter planes have been used to locate swordfish for fishermen. Harpoon permits, first required in 1931, were at an all-time high of 310 in 1979 and fell to a low of 25 in 2001.

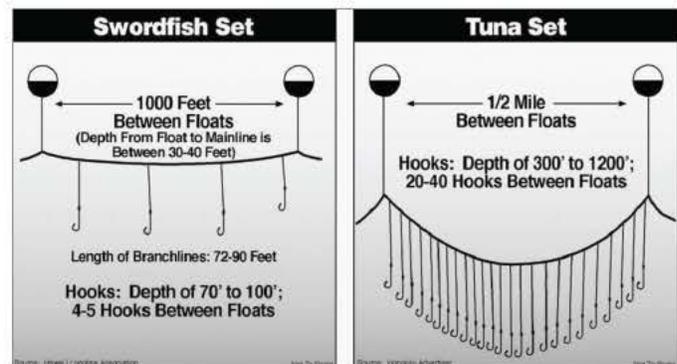
In 1980, the DGN fishery was managed by California Department of Fish and Game with swordfish and marlin quotas, observer coverage, and data collection requirements. In 1982, the quotas were repealed and spatial-temporal management was implemented to avoid gear conflicts and to protect pinnipeds. Between 1985 and 1992, additional time and area closures were implemented to manage thresher sharks and protect gray whales. In the late 1990s, additional gear modifications were required to reduce interactions with marine mammals, including the requirement to use

pingers and extend the buoy lines to deepen the net. In 2001, a large sea turtle conservation area established by NMFS closed a significant portion of coastal California to DGN fishing for three months each year.



The design of a typical net used in the California drift gillnet fishery.

Longline gear has also been used to catch swordfish on the high seas beyond the west coast EEZ, initially spurred by an influx of fishermen to California from the Gulf states in the early 1990s. Due to a court-ordered closure of the Hawaii-based swordfish longline fishery in 2001, a second wave of longline fishermen came over to the west coast and fished the high seas zone.

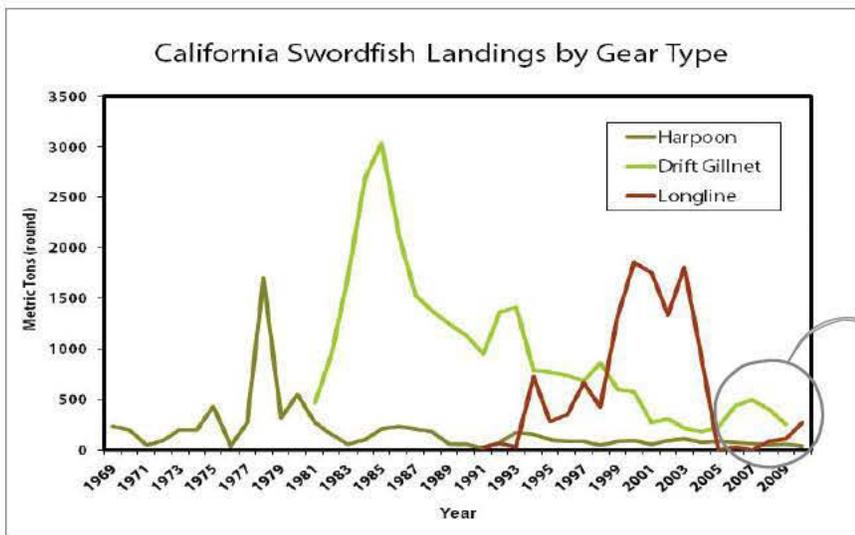


Shallow-set longline gear (left) and deep-set longline gear (right). Source: Hawaii Longline Association.

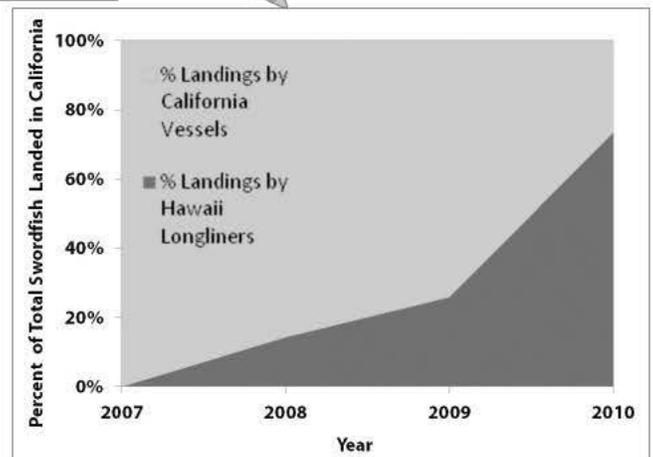
In 2004, to create a more holistic approach to managing transboundary west coast fish species and protected species, the responsibility for the management of swordfish, among other species, was transferred from the state to federal government. Through the Pacific Fishery Management Council (PFMC), the swordfish fishery has since been managed by NMFS together with the States of California, Washington, Oregon, and Idaho; commercial and recreational fishing representatives; and other fishery stakeholders.

Currently, overall west coast effort and landings have significantly declined. Today, there are approximately 30 active DGN vessels, down from nearly 300 in the mid 1980s. West coast swordfish landings have gone from a

peak of approximately 3,400 metric tons, round weight (i.e., total weight including bill, head, and all entrails) in 1985, to roughly under 400 metric tons, round weight (round mt) today. This is a small fraction of what they were in the late 1970s to early 2000s, and most is not landed by west coast fishermen. Approximately 70 percent of swordfish landed in California ports in 2010 were delivered by the Hawaii longline fleet. In 2009, Hawaii deliveries approached 35 percent of California swordfish landings. Some west coast fishermen suggested that this trend is a result of restrictive west coast regulations and a loss of access to productive fishing areas off of California.



California swordfish landings by gear type 1969-2009.



California swordfish landings by vessel origin 2007-2010.



Federal Management of the U.S. West Coast Swordfish Fishery

Rod McInnis, NMFS, Southwest Regional Office

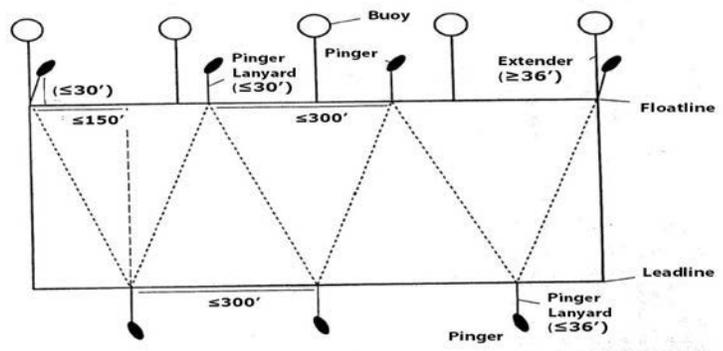
The U.S. swordfish fishery is managed to comply with numerous federal statutes. The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act or MSA) is the primary authority for managing federal fisheries. The *Fishery Management Plan (FMP) for the U.S. West Coast Fisheries for Highly Migratory Species (HMS)* was developed in accordance with extensive requirements of the MSA to ensure the sustainability of the fishery. For example, management measures must prevent overfishing, protect essential fish habitat, minimize bycatch, be based on the best scientific information available, and account for the importance of the fisheries to fishing communities. Federal fisheries must also comply with other federal laws, such as the ESA, the Marine Mammal Protection Act (MMPA), and the National Environmental Policy Act (NEPA).

The MSA established a public and highly participatory fisheries management council process that includes federal and state fisheries managers, commercial and recreational fishermen, and other stakeholders in the management of federal fisheries. Through the PFMC, NMFS manages the west coast swordfish fishery in collaboration with the States of California, Oregon, Washington, and Idaho; west coast fishermen; and other stakeholders, such as conservation organizations. NMFS and the U.S. State Department represent west coast interests in international negotiations as party to international fishery conventions. The PFMC's HMS Management Team consists of state and federal managers and scientists. The HMS Management Team works closely with the PFMC's HMS Advisory Subpanel, whose members represent HMS fishermen, seafood processors and buyers, and the conservation community. These advisory bodies identify issues and help to analyze and recommend management measures to the PFMC.

The MSA and NEPA, among other laws, have requirements for analyzing management options under consideration, standards for the information used in analyses, and processes for public comments. PFMC's Scientific and Statistical Committee (SSC) includes state and federal scientists, academics, and independent experts, who review the scientific information used for management decisions to ensure it represents the best

available science. NEPA requires that all federal actions consider and analyze a suite of alternatives. Impacts to both the human and environmental dimensions must be analyzed, including the cumulative impacts.

To protect marine mammals, many changes have been made in the operations of the west coast swordfish fishery. The MMPA provides authority to NMFS for managing marine mammals and their take. "Take", as defined under the MMPA, means to "harass, hunt, capture, kill or collect, or attempt to harass, hunt, capture, kill or collect." NMFS manages take in fisheries through fishery categorization, reporting programs, and take reduction plans. As a result of the work of the U.S. Pacific Offshore Cetacean Take Reduction Team, the DGN fleet now uses acoustic pingers and net extenders to reduce interactions with marine mammals. The Team consists of fishermen, and fishery scientists and managers who collaborate to design and implement these innovative methods. U.S. fishermen are also required to participate in skipper workshops to learn safe handling and release practices for marine mammals and sea turtles.

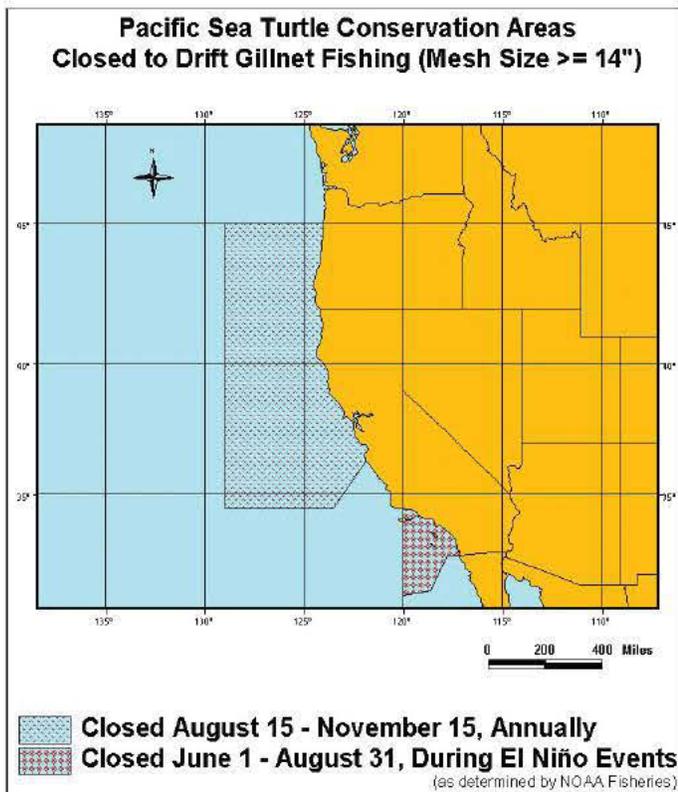


Drift gillnet with pinger devices to deter marine mammals.

Under the ESA, NMFS is required to minimize the impacts of federal actions, such as swordfish fishing, on threatened and endangered species to ensure the actions do not jeopardize their continued existence. Due to the history of interactions between drift gillnets and ESA-listed sea turtles, NMFS has implemented measures and conducted extensive research to reduce the fishery interactions and recover these populations. The fishery has undergone an ESA Section 7 consultation.

In the biological opinion, NMFS analyzed the impacts of the fishery as it currently operates and found that with required mitigation measures, the fishery does not jeopardize these sea turtles.

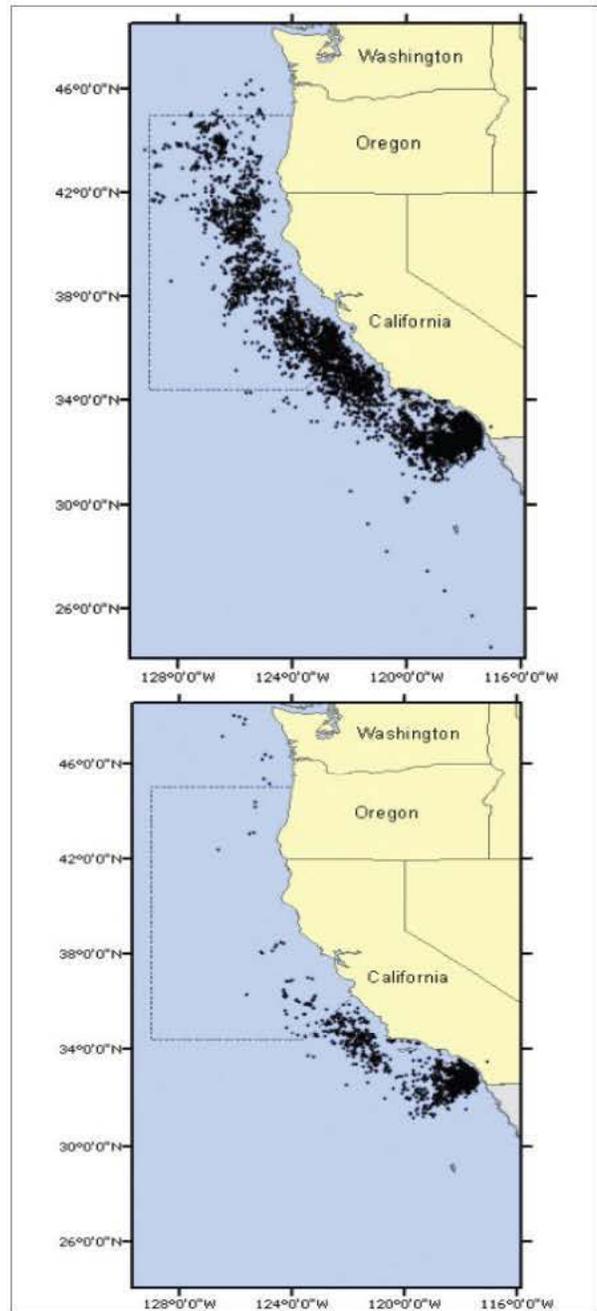
The mitigation measures included two time-area closures to protect the sea turtles. In 2001, the Pacific Leatherback Conservation Area (PLCA) was implemented to minimize interactions between leatherback sea turtles and the DGN fishery. The area extends from the coast of central California over 213,000 square miles of ocean and is annually closed from August 15 to November 15 (henceforth PLCA or leatherback closure). A separate closure may be implemented in the Southern California Bight to minimize interactions between loggerhead sea turtles and the DGN fishery. This closure could take place during the months of June, July, and/or August, depending on the oceanographic conditions. Because the peak season for swordfish fishing off of California generally occurs in October, the PLCA has greatly restricted swordfish fishing opportunity off the central California coast.



PLCA closed to the drift gillnet fishing with mesh sizes greater than or equal to 14 inches.

NMFS continually works to improve the science and methodology used to make fishery management

decisions. Since 2001 when the fishery was constrained to the Southern California Bight, there has been increasing concern about the fate of the west coast swordfish fishery and the ability of the U.S. to harvest this important resource. Protections for some sensitive and vulnerable species come at the expense of harvesting a healthy fish stock that could provide benefits to the nation, including jobs, food security, and recreational opportunities. The challenge now is to find new ways to balance these two important mandates and create a truly sustainable fishery.



DGN sets from July 1990-May 2001 before the Pacific sea turtle conservation areas (top) and DGN sets from August 2001-January 2010, after the closures were established (bottom).



Session Summary

Key points made by presenters in this session included:

- The biology and life history characteristics of the North Pacific swordfish stock indicate that it is a relatively productive fishery resource. Swordfish are apex predators that exhibit rapid growth, early maturity, and high fecundity.
- Swordfish location and depth distribution can be fairly well predicted based on ocean productivity and environmental factors.
- North Pacific swordfish stocks are healthy. Overfishing is not currently occurring on either stock. The biomass of both the eastern and western stocks are estimated to be well above the level resulting in maximum sustainable yield.
- Many fishing nations target North Pacific swordfish, including Japan, Taiwan, Korea, Mexico, and the United States. The Japanese distant water longline fleet dominates the swordfish fishery in the North Pacific, accounting for over half of the annual landings. The U.S. fleet accounts for less than a quarter of the landings.
- Pacific-wide, the majority of North Pacific swordfish is caught with longline gear (as opposed to DGN and harpoon). The U.S. west coast swordfish fleet primarily uses DGN gear, largely because longlining is prohibited in the west coast EEZ. The recent increase in U.S. west coast swordfish landings is the result of increased offloading by the Hawaii-based longline fleet.
- Overall, the U.S. west coast DGN swordfish fleet has declined considerably in the past decade in terms of landings, value, effort (fishing days), and participating vessels. Declines in DGN fishing days per year are projected to continue. The PLCA, established to protect leatherback sea turtles from DGN interactions, combined with the ban on longline gear in the west coast EEZ, has significantly restricted access to some of the most productive swordfish fishing grounds off of California and greatly limited opportunity for the United States to harvest an abundant stock in its waters.
- Foreign countries have become the dominate suppliers of North Pacific swordfish, including to U.S. consumers. Foreign fisheries interact with many of the same protected species as U.S. fisheries, such as endangered leatherback sea turtles, and generally have higher bycatch rates than U.S. fisheries.

Forming Partnerships: Spotlight on U.S. West Coast Fisheries

A film by John Dutton Media



This film highlights the U.S. west coast swordfish fishery. Faced with closure in the mid 90's, DGN fishermen, scientists, and regulators worked together in hopes to reduce the potential for interactions with marine mammals. They modified the DGN gear with extenders to deepen the nets and pingers to alert marine mammals to the presence of the nets in the water column. The film also profiles an entrepreneurial longline fisherman who created a direct-from-boat fish market, attracting thousands of visitors from all over southern California and opening new income avenues not only for himself, but also for the harbor and businesses in the area. Interviews with scientists and seafood consumers address sustainable fishing issues as well as considerations for buying U.S. caught fish versus imported fish.

To watch the video on YouTube, visit:

<http://youtu.be/GGdztOYFDCA>

To find more information about John Dutton Media, see:

<http://johnduttonmedia.com/videochannel/>



Stakeholder Perspectives: Issues and Challenges in the U.S. West Coast Swordfish Fishery

Panel Session

This panel brought together fisheries managers, scientists, fishermen, seafood distributors, and conservationists to share their perspectives on the current issues in the fishery.

Discussion Questions

- **What do you see as the key issues occurring in the west coast swordfish fishery at this time? What issues are most important to you?**
- **What are the advantages to reversing the current trends and to have a viable U.S. west coast swordfish fishery?**
- **What obstacles or challenges do you see to improving the viability of and revitalizing the U.S. west coast swordfish fishery?**
- **What is your ideal future scenario for the U.S. west coast swordfish fishery and for a viable local west coast supply of swordfish?**

Panelists



Bill Sutton started fishing commercially at the age of sixteen. He had the fishing vessel "Aurelia" built when he was twenty-four. Bill has fished for different species on the west coast, from San Diego to Alaska, but primarily fishes for swordfish. Bill opened a seafood restaurant, Sea Fresh Ojai, in 1985 and a second location, Sea Fresh Channel Island Harbor, in 2000. He is an ex-board member of the California Gillnet Association and ex-President of the Ventura

County Fisherman's Association. Presently, Bill sits on the PFMC HMS Advisory Subpanel and has been a part of that panel for the past eight years. Bill has also worked with legislators in California to enhance other fisheries for long-term benefits and sustainability.



Marija Vojkovich has been with the Marine Region of the California Department of Fish and Game for over 35 years. Her experience has been almost exclusively with management issues and she spent several years monitoring highly migratory species. On a personal level, Marija has first-hand knowledge of swordfish harpoon fishing.



Dave Rudie, a professional sea urchin diver, transformed his day job into the thriving seafood enterprise Catalina Offshore Products Inc. Diving for sea urchins and seaweed during the day, he and his wife Kathy would process them in their garage in the evenings. Thirty years later, Catalina Offshore Products has over eighty employees working in the San Diego plant and the product line has expanded to include a wide range of high quality fresh and frozen fish bought directly from reputable fishermen in Southern California and Baja California. Dave is also an underwater photographer and the board president of the San Diego Oceans Foundation.



Chuck Cook, a 30-year veteran of The Nature Conservancy, is a marine and fisheries conservation practitioner that works in tropical and temperate ocean environments with a strong focus on fisheries reform and habitat protection. Over the past 15 years, Chuck concentrated his efforts on improving the economic and environmental performance of the west coast groundfish fishery, anchoveta fishery

in the Humboldt Current, and coral reef fisheries in Indonesia and Micronesia. In 2005, Chuck led The Nature Conservancy's efforts in forming an alliance with non-governmental organizations, fishermen, and government regulators to execute a privately funded buyout of bottom trawling permits and vessels from California fishermen who wanted to leave the industry. From 2007 to 2010, Chuck was the project leader for the Sustainable Fisheries Group at the University of California, Santa Barbara, which encouraged the use of emerging market based tools that better align the economic interests of fishermen with the health of the ocean.



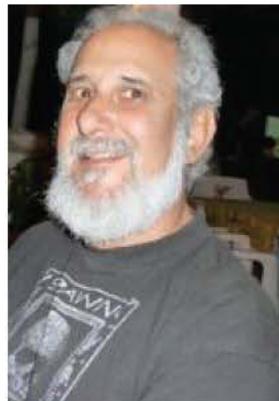
Tina Fahy is a fisheries biologist with NMFS, Protected Resources Division. Her experience over the last 12 years has been ensuring that federal and private actions off the coast of California are permitted, monitored, or mitigated to result in the least effect to protected species as allowed under the Marine Mammal Protection Act and

the Endangered Species Act. In this work, the major challenge Tina faces is allowing industries to continue operating to meet the demands of the U.S. consumers and ensure a healthy domestic economy (e.g., domestic fisheries, power plants, retrofitting bridges to meet seismic safety concerns, dredging to allow safe passage of large vessels into ports, etc.) while providing allowable protections to marine species at the individual level, population level, and species levels.



Taryn Kiekow is a staff attorney at the Natural Resources Defense Council (NRDC), an environmental nonprofit, where she works primarily to protect marine mammals and their habitat. With regard to swordfish, she is involved in a petition asking NMFS to enforce Section 101(a)(2) of the Marine Mammal Protection Act, which would require

the United States to ban swordfish imported from foreign countries whose fishing practices harm and kill more marine mammals than allowed by U.S. standards. She is also involved in an effort to protect the wild salmon fishery of Bristol Bay, Alaska from foreign mining interests. Prior to joining NRDC, Taryn was a litigation associate at Cadwalader, Wickersham & Taft and McKenna Long & Aldridge in Washington D.C., as well as a dolphin trainer at Sea World San Diego and the Miami Seaquarium.



Todd Steiner is the founder and executive director of Turtle Island Restoration Network and its primary projects: the Sea Turtle Restoration Project, Salmon Protection And Watershed Network (SPAWN), and GotMercury.org. Working with U.S. shrimpers in the 1990s, Todd launched the

Turtle-Safe® Shrimp Certification program. Prior to founding Turtle Island Restoration Network, Todd was the director of Earth Island Institute's Save the Dolphins Project (1986-89), which focused on reducing marine mammal mortality in the tuna purse-seine fishery. Todd currently serves as a member of the International Union for Conservation of Nature Marine Turtle Specialist Group, Cordell Bank National Marine Sanctuary Advisory Council, Lagunitas Watershed Technical Advisory Committee, and as a member of Turtle Island Restoration Network's Board of Directors. Todd has a M.S. from Florida International University in Biology and a B.S. from the University of Maryland.



1. Current Issues

Economic viability of the fishery

- Reduced access to fishing grounds due to time and area closures
- Reduced fleet size and lack of new fishermen
- Lowered market prices for swordfish
- Increased fuel prices

Protections for endangered sea turtles

- Resulted in reduced west coast fishing opportunity to protect turtles
- Migratory turtles are impacted by foreign fleets throughout the Pacific Basin
- Impacts to nesting beaches in the Indo-Pacific are one of the most significant threats to turtle populations

Uneven playing field with other swordfish fisheries and imported swordfish products

- Harvest by foreign fleets occurs under less restrictive conservation measures
- Hawaii fleet has structural advantage of hard caps on incidental takes of sea turtles in large action area
- Imported swordfish undercuts prices of locally caught swordfish

2. Benefits & Advantages of Creating a More Viable Fishery

Ability to develop more sustainable fishing practices

- Achieved through focused research and development of cleaner gear and fishing methods
- Would generate greater income for U.S. fishermen
- Would increase the flow of goods to port communities along the west coast

Advancing sea turtle protections and other bycatch minimization practices on a global rather than local scale

- Export new sustainable fishing practices to other countries and fleets
- Lessen the global fishing and habitat impacts on sea turtles to improve recovery

Potential to leverage U.S. experience for greater success in international negotiations on conservation measures

- Legitimize the United States as a stronger stakeholder in the international fisheries management and conservation arena
- Greater influence on fishing practices of foreign fleets with demonstrated U.S. success

3. Obstacles & Challenges

Feasibility of regulatory changes

- Reconsidering time-area closures
- Changing management regimes such that they provide for more fishing opportunity

Ability to “keep our eye on the big picture” (i.e., Pacific Basin)

- Establishing allies for the U.S. west coast swordfish fishery
- Considering the use of MMPA import provisions to encourage foreign fleets to adopt more turtle protections

Building local success

- Obtaining exempted fishing permits to test gear modifications and new gear
- Accessing the PLCA off the central coast of California/southern Oregon
- Building awareness and markets for the U.S. west coast swordfish fishery to serve consumers interested in locally caught seafood

4. Ideal Future Scenario

A revitalized U.S. west coast swordfish fishery

- Increased access to the resource with lower operational costs. *“We need to fish where the fish are.”*
- Regulations and management regimes support fishing opportunities

Strong protections for sea turtles throughout their range

- No increased take of sea turtles in U.S. waters
- Foreign fishing fleets held to the same standards and protections as U.S. fleets
- Partnerships formed and actions taken in areas where adverse impacts to sea turtles and their habitats are greatest

Innovation and research ongoing and applied

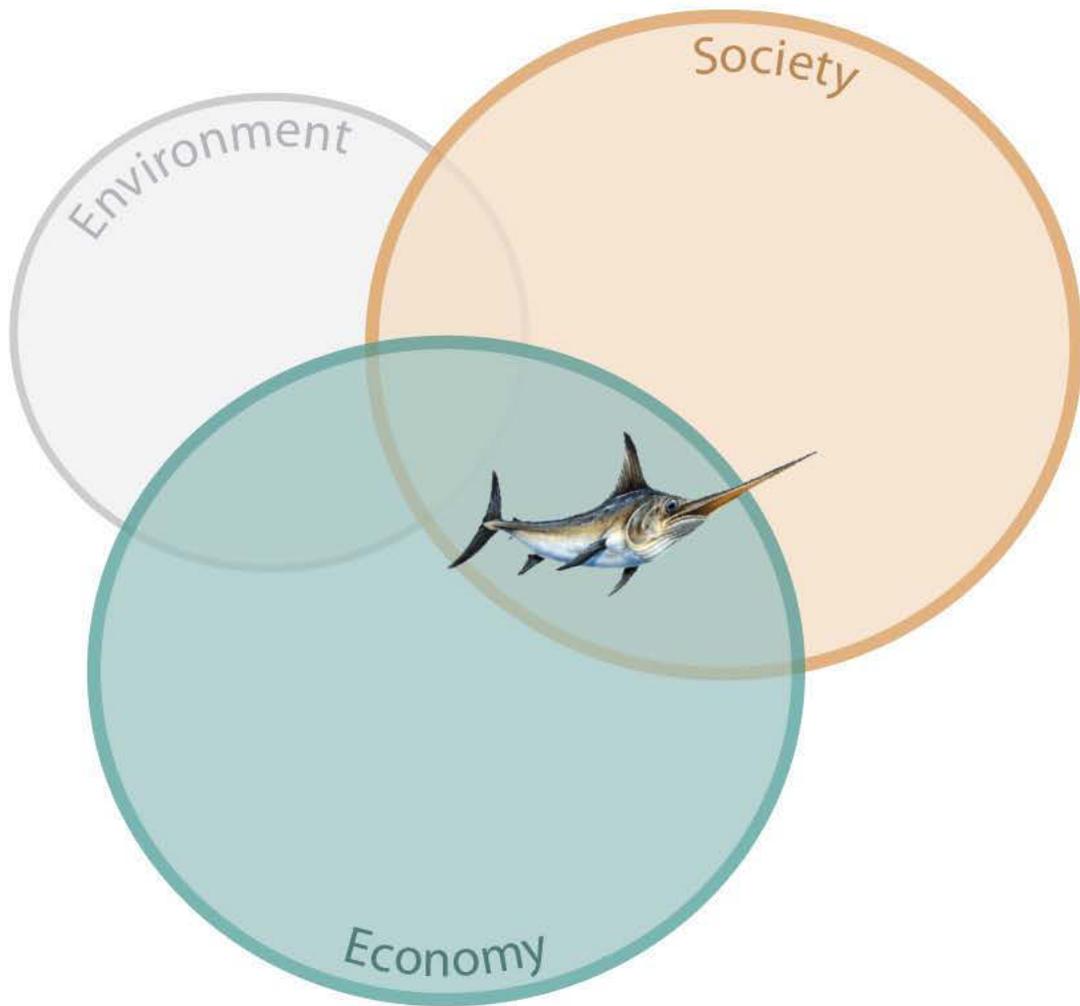
- Recent findings and fishing experience on swordfish and sea turtle behavior used to prioritize research and/or develop tools to assist with avoidance of leatherbacks (i.e., particularly within the PLCA)
- Experiments with different bycatch-reducing gear, fishing depths, and bait types
- Partnerships formed between industry, environmental organizations, and others that jointly promote the advantages of locally caught swordfish



Panel Summary

This summary captures key points and perspectives during the panel and following discussions; it does not represent consensus views.

- **The U.S. west coast swordfish fishery struggles to maintain economic viability.** Speakers emphasized the crippling effects of fishing ground closures; shrinking fleet size and lack of a new generation of fishermen; an uneven playing field with imports harvested under less restrictive regulations; and other factors such as increasing fuel prices.
- **Sea turtles experience significant impacts outside of U.S. waters.** Several speakers emphasized the importance of addressing management of the entire North Pacific ecosystem when considering possible efforts to revitalize the U.S. west coast swordfish fishery. Several participants stressed that actions outside of the United States – unsound fishing practices by foreign fleets and impacts to nesting beaches and hatchlings in the Indo-Pacific – pose much greater risks to sea turtles than U.S. fisheries. Others mentioned that further restricting the already highly regulated U.S. west coast fishery will only serve to further cripple the fishery and coastal economies while delivering marginal environmental benefits. Many said that it was a better strategy if fishermen and environmental non-governmental organizations (NGOs) joined forces and took action where the benefits to sea turtles and other protected species would be more significant. Others acknowledged the disparate impact but said that was not justification for increasing sea turtle interactions in U.S. waters.
- **U.S. west coast fishermen operate at a competitive disadvantage.** Panelists broadly agreed that U.S. swordfish fishermen experience an uneven playing field compared with foreign fleets that export swordfish to the United States and operate under less stringent turtle conservation measures than their U.S. counterparts. These foreign fisheries may not only cause more harm to sea turtles, several speakers said, but their imports may also affect the market as they undercut locally caught swordfish and drive prices down. The U.S. west coast fleet, other speakers suggested, is also disadvantaged relative to the Hawaii shallow-set longline fishery because they are allowed to fish with hard caps on a higher number of turtle interactions.
- **The regulatory regime should be revisited.** Several speakers stressed the need to take a fresh look at existing time and area closures and management regimes, with a focus towards adapting regulations to reflect new information on swordfish and sea turtle behavior and recent developments in bycatch-reducing gear and methods elsewhere. Panelists strongly endorsed the importance of fostering opportunities for innovation and research; with several speakers pressing for gear testing with exempted fishing permits within the PLCA off of California.
- **Important benefits are tied to a revitalized west coast fishery.** Panelists noted that new opportunities for experimentation and research in the fishery will help the United States develop more sustainable fishing practices, which could be shared with other countries to help reduce international bycatch. A strong, sustainable U.S. fishery provides legitimacy and leverage for the United States in international fisheries negotiations. On the domestic side, a strong fishery would generate additional revenues to port communities and provide added quantities of local, sustainable seafood for U.S. consumers.
- **Consumer power and interest in sustainable seafood is of growing significance.** Many speakers suggested that the growing interest in sustainable and locally caught seafood offers an opportunity for the U.S. west coast swordfish fishery to build allies, awareness, and markets for its products. Panelists recommended industry look to creating new partnerships with NGOs and others to jointly promote the advantages of locally caught swordfish, while pressing for the use of MMPA import provisions. Several speakers noted the irony that consumer interest in locally caught seafood is increasing at a time when U.S. west coast fisheries are contracting overall.



Social and Economic Factors: **Influences on the Fishery and Coastal Communities**

This session focused on key socio-economic factors impacting the fishery and coastal communities, including likely economic impacts to the United States from swordfish imports; the prevailing view that current regulations on the U.S. fishery only transfer and magnify sea turtle bycatch problems elsewhere; and the impact of a declining fisheries sector on west coast ports and coastal communities.



Session Speakers



Dr. Dale Squires is a senior scientist at the NMFS Southwest Fisheries Science Center and an adjunct professor of economics at the University of California, San Diego, and on the Scientific Committee of the International Seafood Sustainability Foundation. Squires has worked on fisheries management for over 25 years, was co-chair of the Pacific Fishery Management Council's Highly Migratory Species (HMS) Fishery Management Plan (FMP) Development Team and HMS Management Team, has worked with the World Bank, Organization for Economic Development, Food and Agriculture Organization, WorldFish Center, Western Pacific Fishery Management Council, and other organizations. He is the author of about 80 peer-reviewed publications and co-author of six books, including the forthcoming Conservation of Pacific Sea Turtles (with Peter Dutton and Mahfuz Ahmad).



Dr. Carrie Pomeroy, a marine advisor with the California Sea Grant Extension Program and a Research Associate with the University Of California Santa Cruz Institute of Marine Sciences, is an applied social scientist whose work focuses on the social, cultural, and economic aspects (the human dimensions) of fisheries and fishing communities. Through her work, she seeks to build information and understanding of the human systems associated with fisheries, and how these systems interface and interact with the ecological systems on which they depend. Carrie serves on local, state, and regional advisory committees, and holds a M.A. in Marine Policy from the University of Miami and a Ph.D. in the Human Dimensions of Fisheries from Texas A&M University.



Dr. Steve Stohs is an industry economist at NMFS Southwest Fisheries Science Center who currently serves as Chair to the Pacific Fishery Management Council's Highly Migratory Species Management Team. His research is currently focused on the economic impact of regulation on commercial HMS fisheries. He holds a Ph.D. in Agricultural and Resource Economics from the University of California, Berkeley.

Transfer Effects and Economic Welfare

Dale Squires, NMFS, Southwest Fisheries Science Center

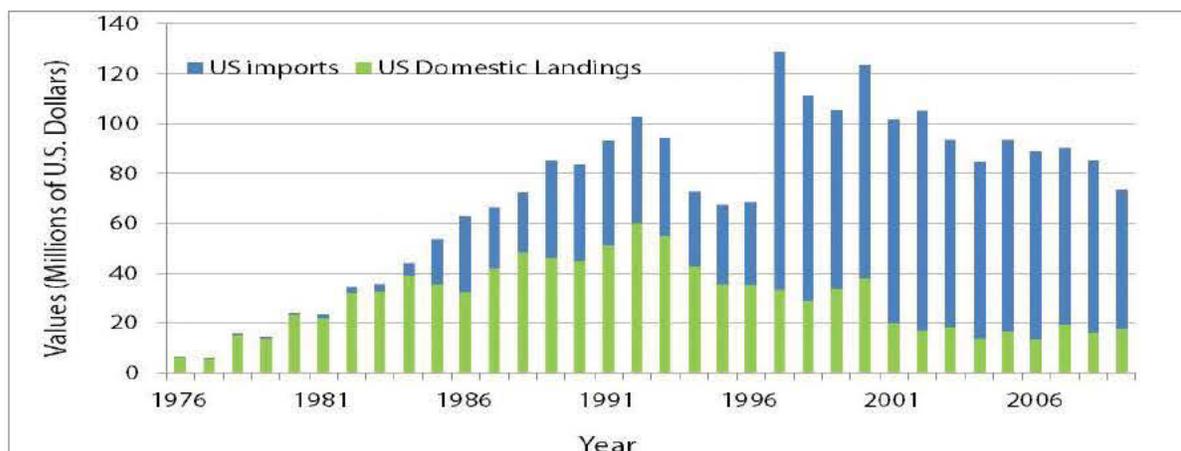
Consumption of swordfish is rising worldwide. Catch by the U.S. west coast fleet, however, is declining despite increased demand and an abundant swordfish stock. The NMFS Southwest Fisheries Science Center (SWFSC) is conducting research on the implications of this divergence between the U.S. supply and global demand for swordfish. They are investigating the effects on U.S. consumer and producer welfare, employment, and communities; whether local harpoon-caught swordfish alone can fill the consumption gap; and whether this results in net gains or net losses for the United States, including effects on Pacific Basin sea turtle mortality.

Imports are supplying the majority of the U.S. swordfish demand. Fifty-five percent of swordfish imports are frozen, thus do not provide the local and fresh quality desired by many U.S. consumers. Hawaii-caught swordfish fills some of the consumption gap. At the same time, west coast fishermen are experiencing a loss in employment and profits, and some coastal communities and ports are experiencing reduced viability; lower west coast-origin swordfish landings could potentially contribute to this situation.

The net impact on sea turtle mortality of a reduced west coast swordfish fishery is a conservation benefit only if the net fishery interactions with sea turtles have not been transferred to other fleets and increased as a result. Both the U.S. west coast and Hawaii fleets operate in compliance with required U.S. measures to prevent and minimize impacts to sea turtles, but the

foreign fleets do not. In addition, leatherback sea turtle populations are much lower and closer to extinction in the eastern Pacific Ocean than in the western central Pacific Ocean. Consequently, this population is more fragile and vulnerable to constant or increased fishing pressures. Forty percent of the swordfish imported to the United States is caught by foreign fleets in the eastern Pacific Ocean. In 2008, Singapore, Panama, and Canada were the top three sources of U.S. imports, representing 58 percent of the swordfish imports by product weight. Brazil, Mexico, and Chile contributed another 15 percent. The net impact to sea turtles is unknown, but there is reason to caution that the transfer effect may have resulted in more interactions between foreign fishing fleets and sea turtles throughout their range in the Pacific.

Net gains to the United States of a reduced west coast fleet are unlikely. Lower west coast landings fail the cost-benefit test for U.S. gains unless they result in a net decline in sea turtle mortality throughout the Pacific and unless there is a gain in the existence value of sea turtles that offsets any U.S. consumer and producer welfare losses. Restricting imports could result in further losses for the United States if: (1) a net gain in sea turtle existence value does not offset the effect of reduced fish availability in U.S. markets, (2) foreign fleets do not reduce their sea turtle mortality, and (3) foregone U.S. imports are redirected to other growing markets. The net gains question hinges on the size and direction of transfer effects.



U.S. swordfish landings values and imports values.



Overview of the Drift Gillnet Fishery and Regulation

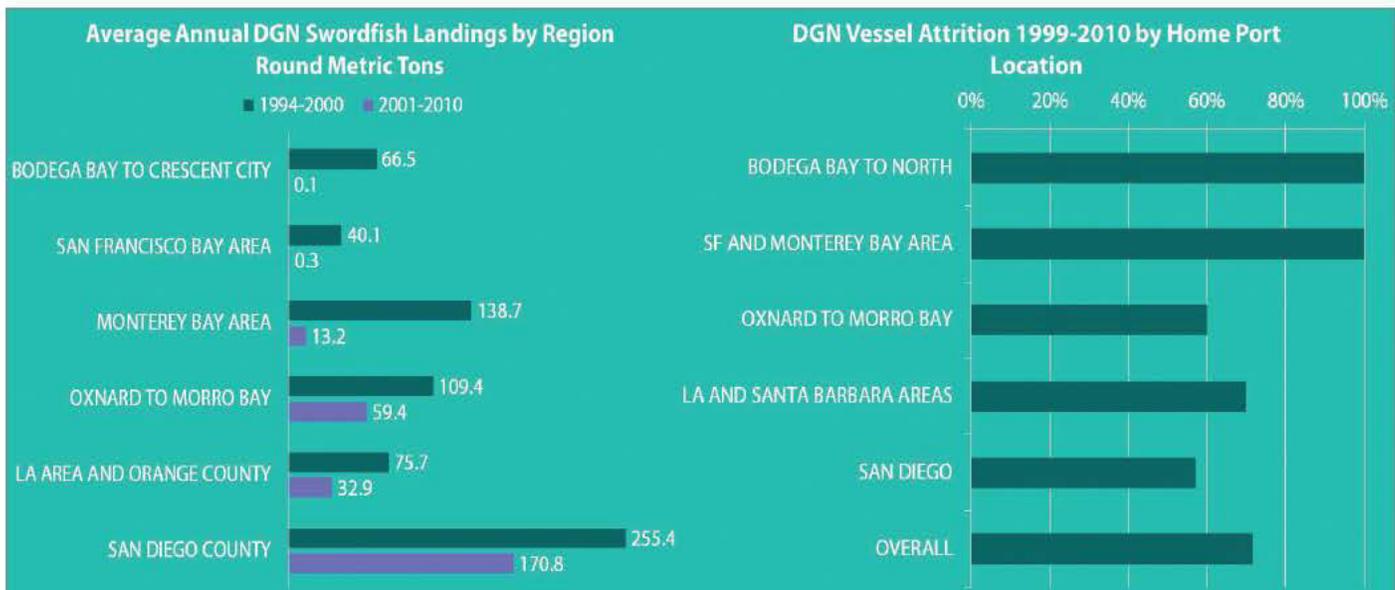
Stephen Stohs, NMFS, Southwest Fisheries Science Center

The DGN fishery developed in the late 1970s to target common thresher shark. In the mid-1980s, the fleet switched targets to swordfish and has experienced steady attrition ever since. The history of regulations has, among other factors, contributed to a decline in fishery participation. Attrition is defined as permanent exit from participation in the DGN fishery. Following the establishment of the large time-area closure (i.e., PLCA) in 2001, attrition was severe.

Over time, the permits and regulations became increasingly restrictive. In 1980, while under state management, a limited entry permit system was established by the California Department of Fish and Game. A permit moratorium was implemented in 1982. A 75-mile area closure was established in 1986 to protect common thresher sharks. In 1990, concerned about bycatch of marine mammals, NMFS began placing observers on the fishing vessels pursuant to MMPA authority. In subsequent years, collaborative work between the fishery scientists, managers, and fishermen on the Pacific Offshore Cetacean Take Reduction Team led to innovative gear

and operational changes to reduce bycatch. After changes proved effective, the use of pingers, 36-foot extenders, and mandatory skipper workshops became requirements for the fishery in 1997. In 2001, the PLCA was implemented off of central California to minimize the fishery's interactions with leatherback turtles. Regulations were established in 2003 to implement a time-area closure in the Southern California Bight depending on oceanographic conditions, but this closure has never been implemented.

The 2001 PLCA closure served as an implicit control for the effect of regulating effort on attrition. The attrition rate was largely explained by home port proximity to the PLCA. Other factors considered included skipper age, the date a vessel entered the fleet, vessel-level landings, revenue, and participation in other HMS fisheries. Post-2001 attrition was 100 percent in Northern California ports, including the San Francisco Bay area; it ranged between 55-75 percent in ports to the south of the PLCA.

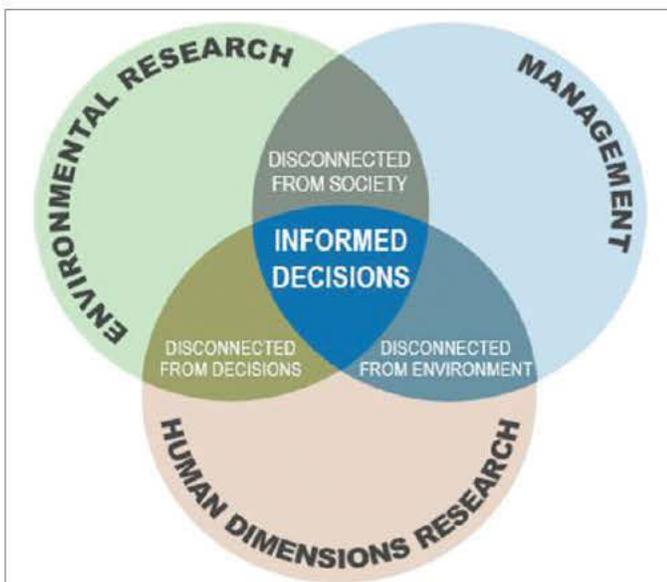


Reduced participation in the drift gillnet fishery denoted by a decline in swordfish landings by region (left) and attrition by home port location (right).

Socio-economic Factors Influencing West Coast Fishing Communities

Carrie Pomeroy, California SeaGrant

Fisheries are integrated social-ecological systems. Their social or human dimensions include people and practices, social and economic activity and relationships, community structure and organization, perceptions and beliefs, governance processes, etc., and how these features are connected and interact with the ecological system. Moreover, it is important to understand these connections and interactions within and across scales (local to international), and their context.



The three components of integrated and informed resource management (Adapted from Michigan Sea Grant, 2005).

The MSA requires that social and economic factors be considered in fishery management decisions. Specifically, National Standard 8 requires that management consider the importance of fishery resources to fishing communities in order to provide for their sustained participation in fisheries and to minimize the adverse economic impacts on those communities. NEPA further requires that federal actions be assessed for their social and economic, as well as their broader environmental impacts. This is important for achieving social and economic goals, but also for avoiding negative, unintended consequences for ecological and social systems.

The NMFS National Standard 8 Guidelines define *fishing communities*, in part, as place-based entities (e.g., the San Diego fishing community). However, the reality in fisheries is that they are also defined in terms of occupation and/or interest. For example, the California swordfish fishing community comprises places, fishermen, buyers, processors and others business operators who support and depend on swordfish fishery activities. Moreover, fishing communities often span multiple localities and operate on multiple scales from the local to the global. The interplay of scale and context require careful consideration in designing management actions affecting fishing communities and measuring the impacts.



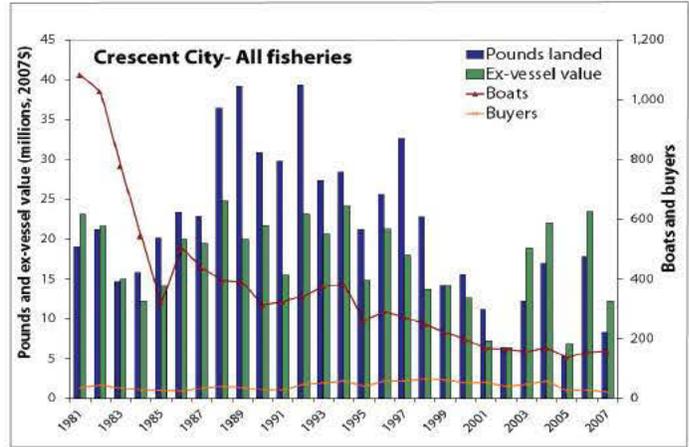
Local, place-based fishing communities and their key components in spatial context

In a project focusing on California's North Coast fishing communities, with collaborators NMFS economist Cindy Thomson and research assistant Melissa Stevens, we started with the concept of place-based communities, and characterized their key features and connections within and beyond those places in terms of occupation and interest. Focusing on Crescent City, California as an example, and using a few common indicators of fishing activity, one can see that local and statewide trends differ (see graphs on the following page). For example, landings at Crescent City were higher in the early 1990s than for the rest of the 1981-2007 period, and even as statewide landings were among their lowest. Moreover, trends differ markedly among fisheries – and for different, though at times inter-related, reasons.

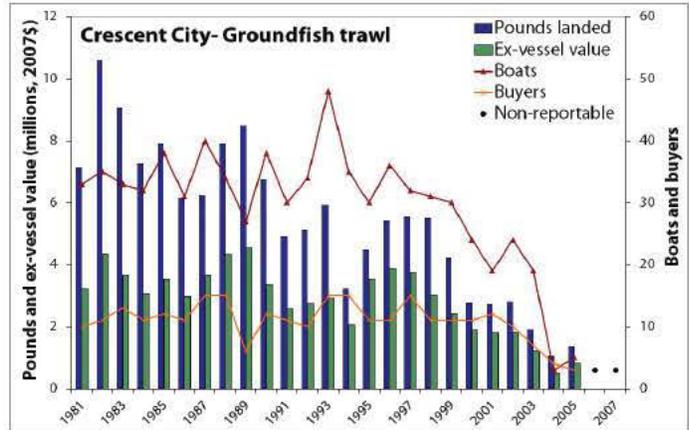


We then identified key factors – social, economic, environmental, regulatory, and more – that affect communities, and used this information to build historically grounded profiles of those communities. Decisions or actions taken in one part of the social system (within or beyond a given community) can have far-reaching effects, producing different outcomes in different communities and at different scales. The resulting information describes and explains how and why things have changed, and provides insights into how future regulatory, economic, environmental, or other events are likely to affect the community both individually and cumulatively. This information is intended to support management and better position fishing communities to proactively and effectively address challenges (e.g., reduced activity at a given port) and opportunities (e.g., growing interest in locally caught seafood). In the case of Crescent City, local conditions coupled with broader scale regulatory and economic factors, have created particular challenges to the maintenance of infrastructure, as has occurred at many California ports (and elsewhere in the United States). The community has a history of meeting diverse challenges, but the cumulative effect of historic and future challenges likely will test the community's resilience and adaptability.

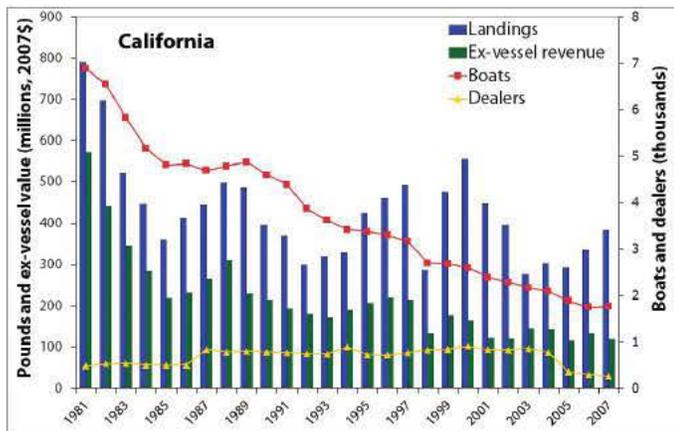
Given their history and context, as California fishing communities look forward, they are or soon will need to address important human dimensions and fisheries system questions, including: What does a viable fishery look like? What does a viable fishing community (or communities) look like? How do you get there? Finally, who decides?



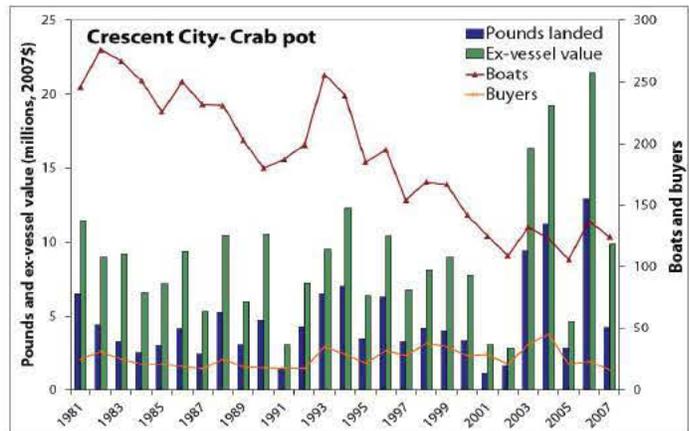
Commercial fishery activity in Crescent City, CA, 1981-2007 (PacFIN data; Pomeroy et al. 2010).



Commercial groundfish trawl fishery activity in Crescent City, CA, 1981-2007 (PacFIN data; Pomeroy et al. 2010).



Commercial fishing activity in California, 1981-2007 (PacFIN data; Thomson 2009).



Commercial crab pot fishery activity in Crescent City, CA, 1981-2007 (PacFIN data; Pomeroy et al. 2010).

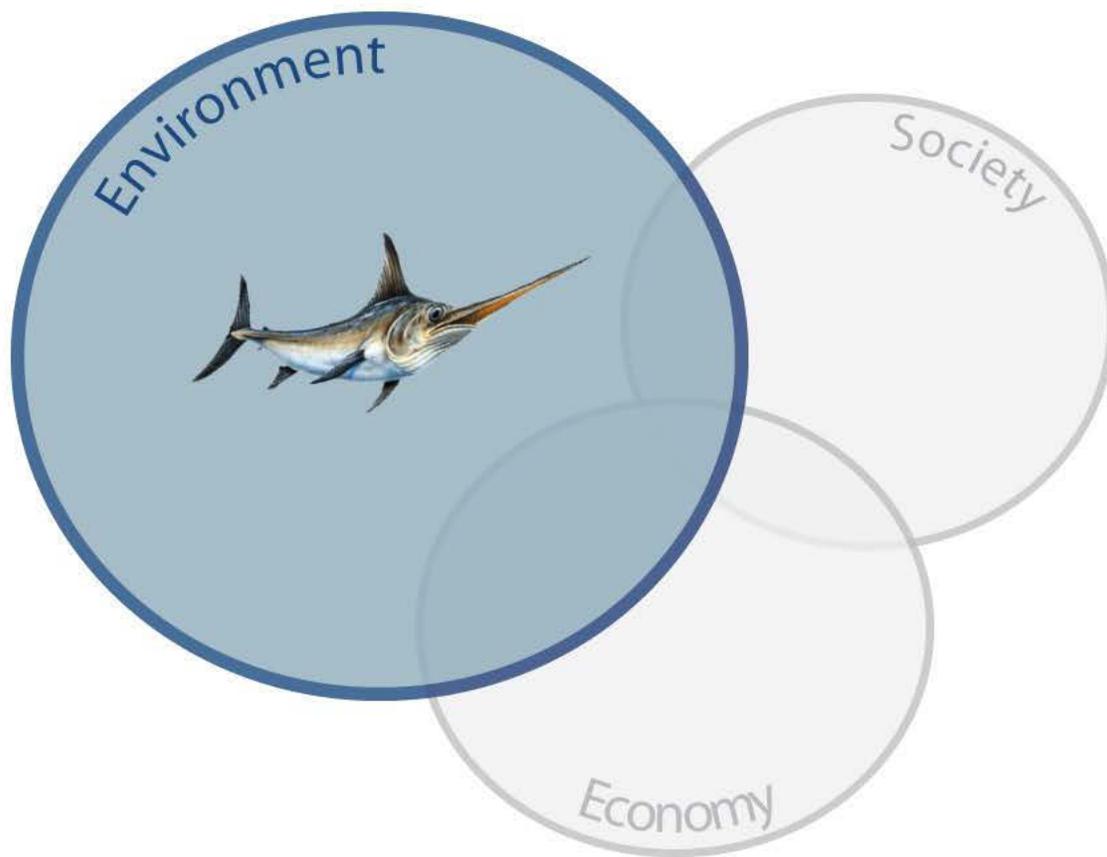
Session Summary

Key points made by presenters in this session included:

- Seafood imports represent a significant portion of the U.S. seafood market. The majority of swordfish consumed in the United States is imported. Landings by the U.S. west coast swordfish fishery are dropping while global consumption is on the rise.
- The west coast PLCA appears to be a major factor in the decline of the U.S. west coast swordfish fishing effort. Caps on DGN permits and restrictions in the fishery, combined with higher fuel costs and other regulatory measures, also likely contributed to this decline.
- The potential to expand the local supply of harpoon-caught swordfish is limited due to the need for calm seas and the inefficiency of targeting swordfish on the surface with a handheld spear. Harpoon-caught swordfish also serves a distinct market segment of individuals willing to pay a higher price for premium quality. Therefore, it cannot serve as a feasible substitute for DGN or longline gear to meet demand.
- A reduced U.S. supply of swordfish to the domestic market allows foreign sources to fill the gap with a product that is less sustainably harvested than U.S. caught swordfish.
- A transfer of swordfish effort from U.S. domestic producers to foreign producers, due to regulatory limits on U.S. effort, could reduce the economic benefits of the fishery to U.S. consumers, producers, fishing communities, and conservationists, and harm endangered and threatened sea turtle populations, through the following channels:
 - decreased U.S. fishing effort reduces producer surplus due to lower domestic swordfish fishing profits;
 - reduced spillover benefits from domestic fishing activity and profits results in lost production value to U.S. ports;
 - increased domestic reliance on foreign imports to meet domestic swordfish demand reduces U.S. consumer surplus through some combination of reduced product availability, lower product quality, or higher prices of imports compared to domestic product prices; and
 - effort transferred to less regulated foreign fisheries increases endangered and threatened sea turtle mortality, reducing non-market economic value of sea turtles due to their population decline.

A net decrease in U.S. economic benefits of the swordfish fishery results if the sum of these effects is negative.

- Fisheries are integrated social-ecological systems. There are critical legal and practical needs for understanding and considering fisheries' social – or human – dimensions. Historically grounded and integrated understanding of fisheries and associated communities, as well as the connections within and among them and across multiple scales, is needed to inform management decisions, avoid unintended consequences, and support adaptation to change.
- Fishing communities are dynamic, requiring a complex set of inter-connected economic and social activities to insure their viability and vibrancy. Greatly diminished fishing opportunities and other changes present significant challenges, but also opportunities.
- As fishing communities and managers look forward, bearing in mind a new reality of limited landings, fewer participants, and the involvement and/or consideration of more diverse interests compared to past decades, they must address important social questions about how to achieve viable fisheries and communities.



Ecological Factors: **Fishery Interactions and Minimizing Ecosystem Impacts**

This session reviewed current information about the ecological factors in the fishery. Topics included tools and strategies used to assess the risk of various marine activities to protected species; developing more selective fishing gear and methods; shark bycatch rates and susceptibility to the fishery; and a summary of a 2008 NMFS workshop that focused on the shared habitat of swordfish and leatherback sea turtles along the U.S. west coast.

Session Speakers



Dr. Jessica Redfern leads the Ecosystem Studies Program in the Protected Resources Division at the NMFS Southwest Fisheries Science Center. The modelers, marine ecologists, and oceanographers in this group use ecosystem data to interpret trends in marine mammal abundance and predict the location of these animals. Jessica's research investigates the factors influencing marine mammal distributions in the eastern Pacific Ocean.



Dr. Suzanne Kohin is a fishery biologist and leads the Highly Migratory Species Research Program at the NMFS Southwest Fisheries Science Center. Her research group focuses on fishery data management, population status, and life history of tunas, billfish, and pelagic sharks encountered in U. S. and international marine fisheries for tuna and tuna-like species. Suzanne obtained her doctorate in biology and physiological ecology at the University of California, Santa Cruz.



Dr. Chugey Sepulveda is the senior research biologist at the Pflieger Institute of Environmental Research in Oceanside, California. Chugey specializes in pelagic fish biology and is especially interested in sustainable domestic fisheries. His laboratory focuses primarily on pelagic fish movement patterns and how they can be used to better understand regional fisheries. He holds an M.A. in Biology from California State University, Fullerton, and a Ph.D. in Marine Biology from Scripps Institution of Oceanography, University of California, San Diego.



Dr. Heidi Dewar is a fisheries research biologist at the NMFS Southwest Fisheries Science Center in the Fisheries Resources Division. After receiving her Ph.D. at Scripps Institute of Oceanography on tuna physiology, she has worked on the development and application of tools that allow us to ask more complex questions about fish in their natural environment. Her research interests center on the physiological ecology of large pelagic fish including tuna, sharks, and billfish. In recent years, she has used a range of electronic tagging technology to document movements and behaviors that are then linked to oceanography to understand patterns.

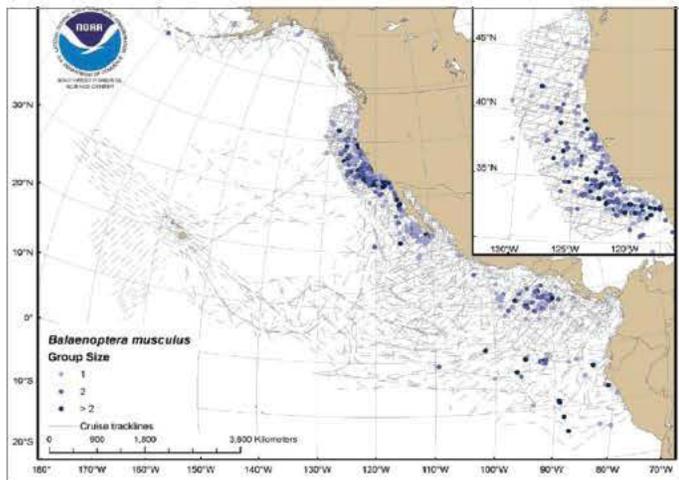


Synthesizing Protected Species Data: Tools to estimate density and their application

Jessica V. Redfern, NMFS, Southwest Fisheries Science Center

The ESA and MMPA require federal agencies to coordinate with users of the marine environment to assess the potential impact of their activities. The problem with estimating impacts on protected species is that the number of individuals in a particular area is frequently either unavailable or is summarized for a much larger geographic region. To facilitate obtaining the best possible estimates, the NMFS SWFSC has been working on developing tools to estimate cetacean densities in any user-defined region.

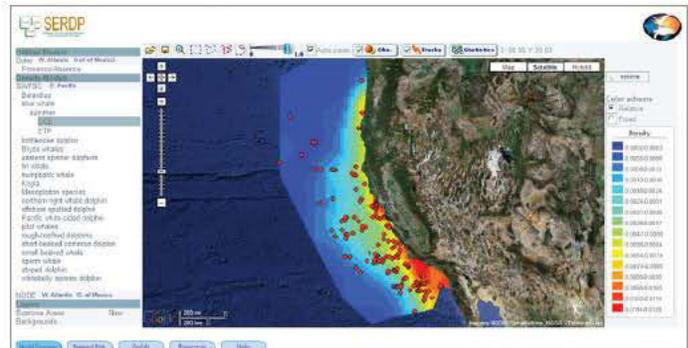
The SWFSC has been conducting cetacean and ecosystem assessments in eastern Pacific waters for over 20 years. During this time, 16 ship surveys have been conducted, comprising over 400,000 linear kilometers of survey transects, over 17,000 cetacean sightings, and ecosystem data including physical oceanography, midtrophic species, seabird species, and other apex predators. These data were used to develop habitat models for 12 cetacean species in the California Current ecosystem.



Record of blue whale sightings during NOAA ship surveys.

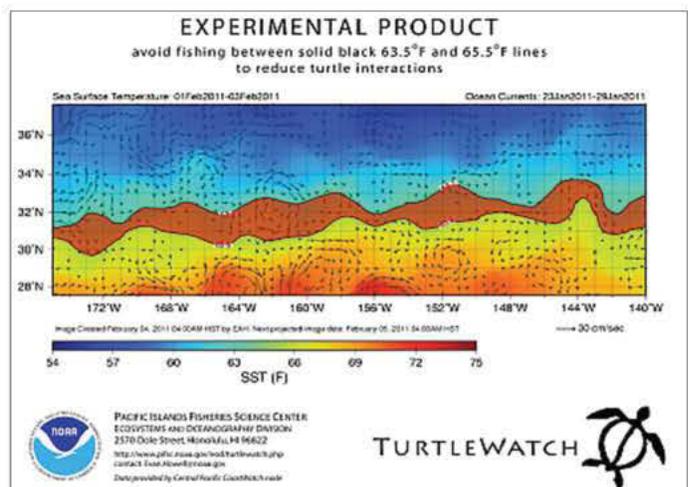
Many components of habitat modeling were explored to obtain the best possible models: model framework (e.g., general linear versus general additive models), sources of habitat data (e.g., remotely sensed versus in situ oceanographic data), the error structure of the model (e.g., Poisson versus quasi-likelihood), and model selection (e.g., Akaike information criterion and cross validation). The models were also validated using a novel data set. The models have been published in a number of peer-reviewed papers and represent the best available science for estimating the number of cetaceans

using any user-defined region along the U.S. west coast. The densities predicted by the models have been made available online. At this web site, users may obtain estimates of cetacean density and the associated variance in their region of interest (see Appendix C for the link).



User interface of the marine animal model mapper based on density estimation models developed by Southwest Fisheries Science Center scientists.

The NMFS SWFSC is also working to estimate seabird density and understand sea turtle habitats. The NMFS Pacific Islands Fisheries Science Center (PIFSC) developed a tool (i.e., *Turtlewatch*) to help reduce inadvertent interactions between Hawaii-based longline fishing vessels and loggerhead turtles. This tool is based on the preferred thermal habitat of loggerhead turtles (see Appendix C for link). In partnership with the PIFSC, the SWFSC is exploring the possibility of developing a similar tool for leatherback sea turtles. Habitat drivers for leatherbacks may include sea surface temperature, productivity, and jellyfish abundance.



TurtleWatch is a tool for identifying areas with a high potential for sea turtle interactions. It is based on the strong relationship between sea surface temperature and incidental catch of loggerhead sea turtles interactions.

Selectivity of the U.S. West Coast Swordfish Fishery

Chugey Sepulveda, Pflieger Institute of Environmental Research

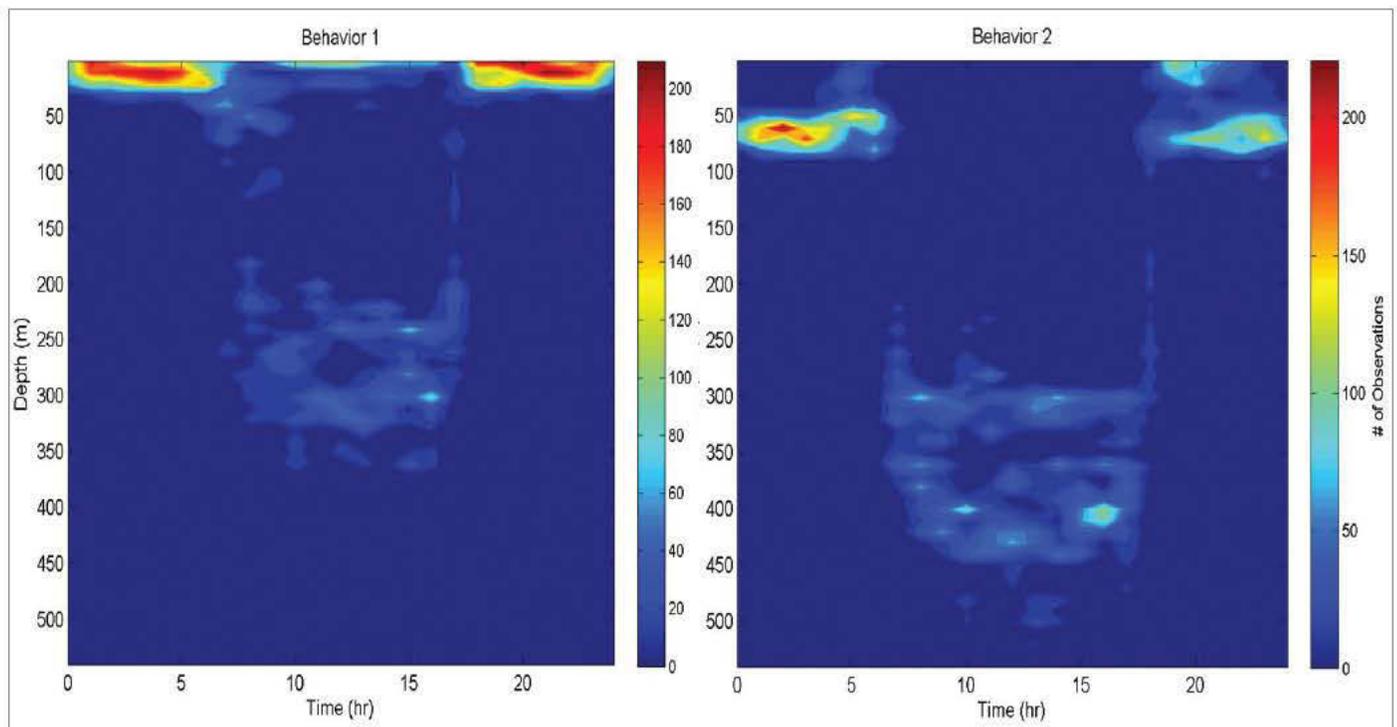
The Pflieger Institute of Environmental Research (PIER) is dedicated to the advancement of sustainable fisheries management through applied field research and public education. PIER research has focused on the movements of swordfish in the Southern California Bight in an attempt to identify times and depths that swordfish segregate from other species. The findings from these studies are now being used to develop and test more selective types of fishing gear and methods that avoid protected and other bycatch species. Recently, PIER began experiments to test the efficacy of deep-set buoy gear to catch swordfish off of southern California.

Because of the high selectivity of harpoon fishing, PIER researchers recently examined the vertical distribution of swordfish to determine the factors that influence their basking rates, and whether there are specific times in which basking events are more prevalent. From these studies it was found that basking only represented about 8 percent of the depth records during the day and that the average bask duration was about 17 minutes. However, in some cases, longer basking periods were

observed as well as extended periods (up to 2 weeks) with no daytime basking activity.

PIER swordfish movement studies have also been used to assess DGN fishing with regards to net depth and the targeting of swordfish. To reduce cetacean interactions, a minimum of 36 feet (~11 meters) subsurface net submersion requirements were established for DGN fishing practices in 1997. From the movement studies it was found that at night, swordfish spent 53 percent of the time above the minimum suspender length. Further increases in net depth decreased catch significantly. When coupled with movement studies for other species (i.e., secondary targets), it is evident that the deeper the nets are set, the less likely they are to catch both swordfish and other marketable species.

In the summer and fall of 2011, PIER researchers trialed the use of deep-set buoy gear off the California coast to test the efficacy of targeting swordfish at significant depth (300-500m) during the day. Because few bycatch species of the swordfish fishery have the

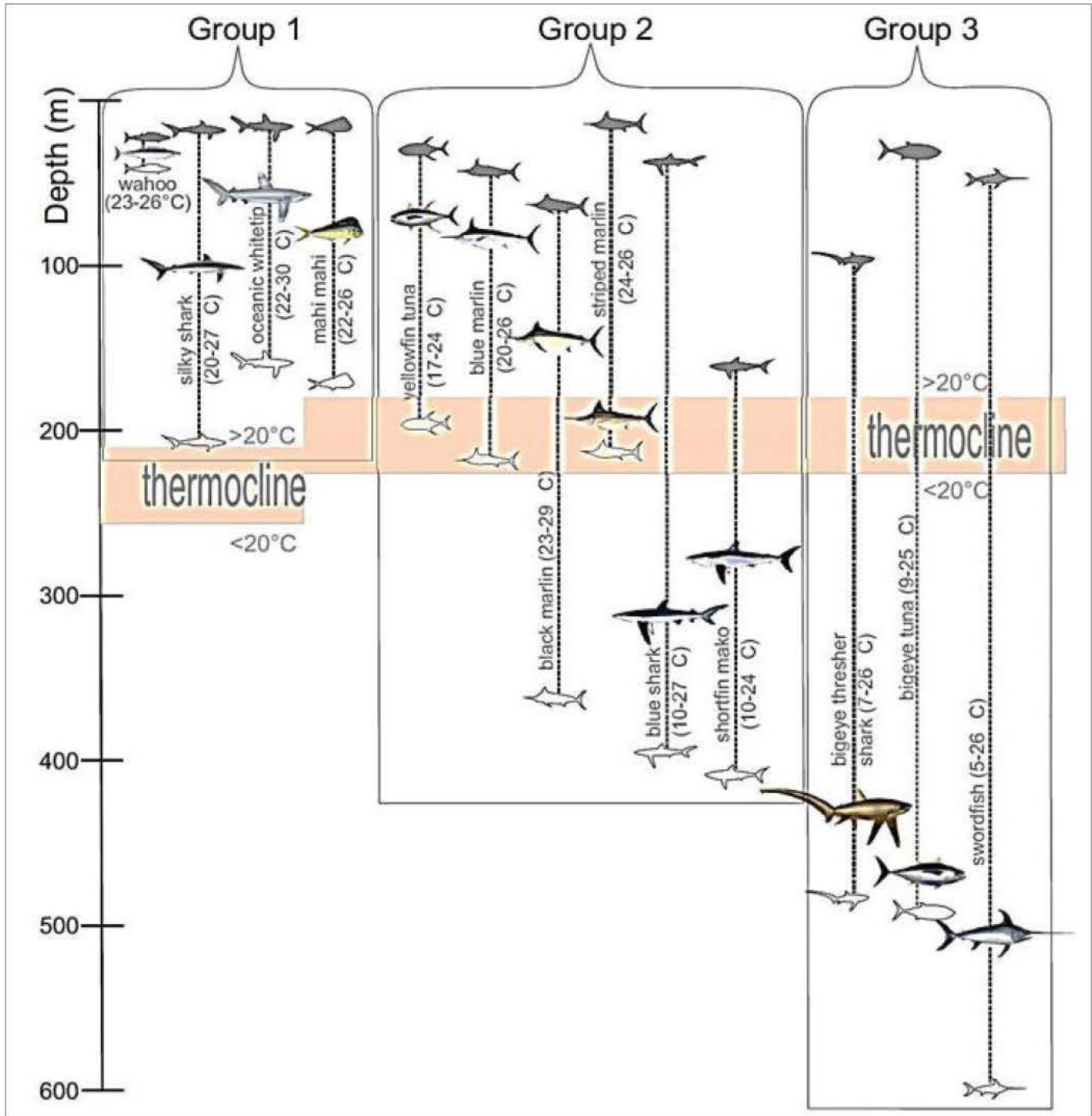


Depth distribution of swordfish plotted over a 24 hour period. Left panel represents typical diurnal behavior with periodic basking during the day. Right panel shows a similar diurnal distribution with no basking activity.



capacity to spend extended periods at depth, the PIER team proposed that deep-set buoy gear may prove to be highly selective in targeting swordfish in southern California. Initial development and trials of

the experimental gear have proven to be successful in selectively targeting swordfish and avoiding bycatch species of concern.



Vertical distribution of highly migratory species adopted from Bernal et al., 2009.

Shark Bycatch in the U.S. West Coast Swordfish Fisheries

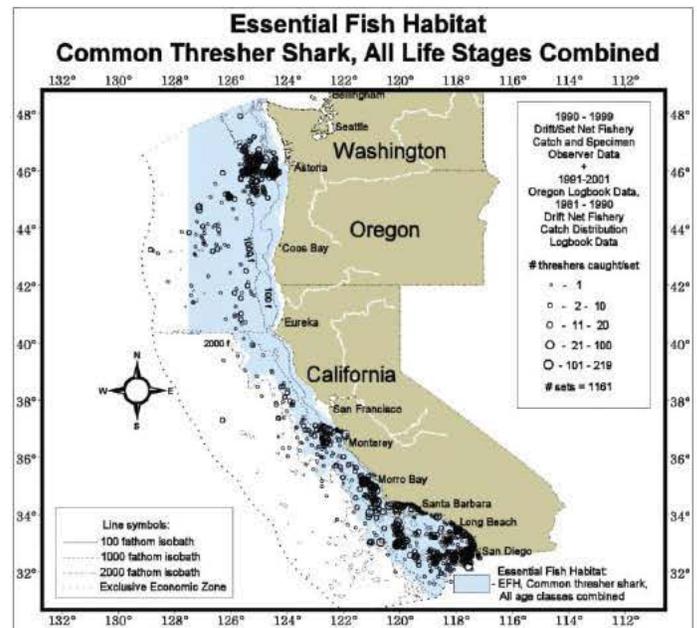
Suzanne Kohin, NMFS, Southwest Fisheries Science Center

Monitoring and ensuring sustainable levels for shark populations is an integral part of managing the swordfish fishery. For those fishing with DGN gear, common thresher shark (*Alopias vulpinus*) is a secondary target species, caught along with swordfish; shortfin mako shark (*Isurus oxyrinchus*) is caught incidentally and landed; blue shark (*Prionace glauca*) is bycatch and is discarded. There is significant bycatch of blue shark in the shallow-set pelagic longline fishery that operates off Hawaii. The harpoon fishery is highly selective and rarely catches a mako or thresher shark. Since 2000, annual landings of HMS shark species by harpoon gear have averaged about one round mt.



Blue shark. Photo by Mark Conlin.

U.S. west coast mako and thresher shark harvests are considered sustainable and the North Pacific blue shark population is above maximum sustainable yield, based on recent assessments, fishery data, and trend analyses. To ensure their populations remain sustainable, management measures are in place to minimize shark bycatch in the swordfish fishery. For instance, to protect thresher sharks, each year from May 1 through August 15 DGN fishing is not permitted within 75 miles of the west coast. Washington banned DGN fishing in its state waters. Oregon banned the targeting of thresher sharks, which effectively shut down the DGN fishery in its state waters as well. While the catch of blue shark is significant in the shallow-set longline fishery off of Hawaii, the catch of mako shark is low and common threshers are rarely caught. The Hawaii fishery currently operates under set limits, circle hook, and mackerel bait requirements. There is no shallow-set longline fishery off of California, as it was closed in 2004.



Essential fish habitat of common thresher shark, all life stages.

The trends in catch and nominal catch per unit effort for shortfin mako have been stable in the west coast DGN fishery. A precautionary harvest guideline based on an estimated local optimal yield for shortfin mako was established at 150 mt. The precautionary harvest guideline established for thresher shark is 340 mt, which is set 110 mt below an estimated local maximum sustainable yield to account for the vulnerability of pelagic sharks due to life history characteristics and catch by foreign fishing fleets. Estimated biomass of blue sharks in the north central Pacific declined in the late 1970s-80s, but appears to have recovered to early 1970s levels with current fishing effort lower than effort at maximum sustainable yield.

Continued research on gear and bait types and shark species associations with environmental features is needed to minimize bycatch and increase selectivity in the swordfish fishery. Researchers question if bait type may be more important to avoiding blue sharks than hook changes because catch rates were higher with squid bait, and the use of circle hooks had no consistent effect on catch rates. Additionally, examination of fine scale movement patterns of sharks may reveal important information about their habitat use so they can be spatially differentiated from swordfish.

Overview of the 2008 SLUTH Workshop

Heidi Dewar, NMFS, Southwest Fisheries Science Center

The Swordfish and Leatherback Use of Temperate Habitat (SLUTH) Workshop was held on May 28-29, 2008, at the University of California, San Diego, Scripps Institution of Oceanography. The purpose was to share the current state of knowledge among stakeholders and identify data gaps associated with developing a holistic approach to sea turtle conservation and a more dynamic approach to management for the west coast swordfish fishery (i.e., not large, static time-area closures).

The leatherback sea turtle is listed as endangered under the ESA in the Pacific Ocean. Due to the extensive migratory nature and complex life history of leatherback sea turtles, their population recovery requires a coordinated international effort that will boost reproductive output on nesting beaches while reducing bycatch of juveniles and adults in coastal and pelagic fisheries throughout their range. NMFS implemented the PCLA in 2001 to assist the U.S. west coast swordfish fishery in avoiding interactions with leatherbacks, but this closure contributed to a decline in fishing vessels, landings, and revenue. To discuss management and conservation issues with a range of stakeholders, NMFS convened the SLUTH workshop in 2008. There were approximately 40 participants, including scientists from the United States and Mexico; DGN, longline and harpoon fishermen; seafood processors; importers/exporters; and state and federal fisheries managers. Participants discussed the need for a strong, well-regulated U.S. swordfish fishery coupled

with a broad cooperative research program to help inform management and a more holistic approach to sea turtle conservation that addresses multiple sources of mortality.

Participants discussed the following topics:

- Science relevant to leatherback and swordfish movement patterns, habitat utilization, trophic dynamics, population status, and management concerns.
- Approaches to promote a sustainable and an economically viable west coast-based swordfish fishery while minimizing impacts on leatherback turtles and other non-target species.
- Data gaps, available tools, and practical next steps towards the development of a more holistic approach to sea turtle conservation, as well as further exploration of fishery management options.

Two themes that surfaced throughout the workshop were the concepts of an “ecological footprint” and “transfer effects”. Participants discussed the ecological footprint as related to the bycatch and mortality of leatherback turtles, primarily, in the swordfish fisheries. Transfer effects relate to the shift of bycatch to foreign fleets when the supply of domestic swordfish decreases. Foreign fleets tend to be less strictly regulated and likely take more turtles per unit effort.

Scientists and fishermen also spent considerable time discussing the behaviors and shared habitat of swordfish and sea turtles. Both agreed that these species may use separate habitats and that a better understanding of those differences may offer an opportunity to develop an adaptive management strategy to provide for more fishing opportunity while minimizing interactions. Participants strongly supported continued research efforts to determine fine-scale habitat use of both species to identify areas of least overlap. Since the SLUTH workshop, many of the participating researchers and government staff, primarily, have come together for focused discussions on follow-up research projects.



Leatherback sea turtle. Photo by Scott Benson.

Key Recommendations from the SLUTH Workshop:

Including some research updates from the SWFSC Fisheries Resources Division (FRD)

- A cooperative research program to obtain data needed to develop a model-based adaptive management strategy, such as temporal and spatial patterns in habitat use of both swordfish and leatherback sea turtles with an emphasis on the influence of oceanography.

Update:

1. FRD and the SWFSC PRD conducted a joint cruise in the PLCA to simultaneously characterize the habitats of swordfish and leatherbacks.
 2. FRD tested a new satellite tag design that will improve habitat characterization for swordfish. The next step is to deploy these tags north of Point Conception.
 3. PRD and FRD have been working together on modeling approaches to identify what factors most influence the distribution of swordfish and leatherbacks.
- Evaluate and compare the economic viability and ecological footprint, or bycatch rate, of DGN and shallow-set longline fishing for turtles and other species, including sharks.
 - Test the effectiveness of gear modifications to DGN and shallow-set longline gear to reduce bycatch of both sea turtles and other non-marketable finfish species if possible.

Update:

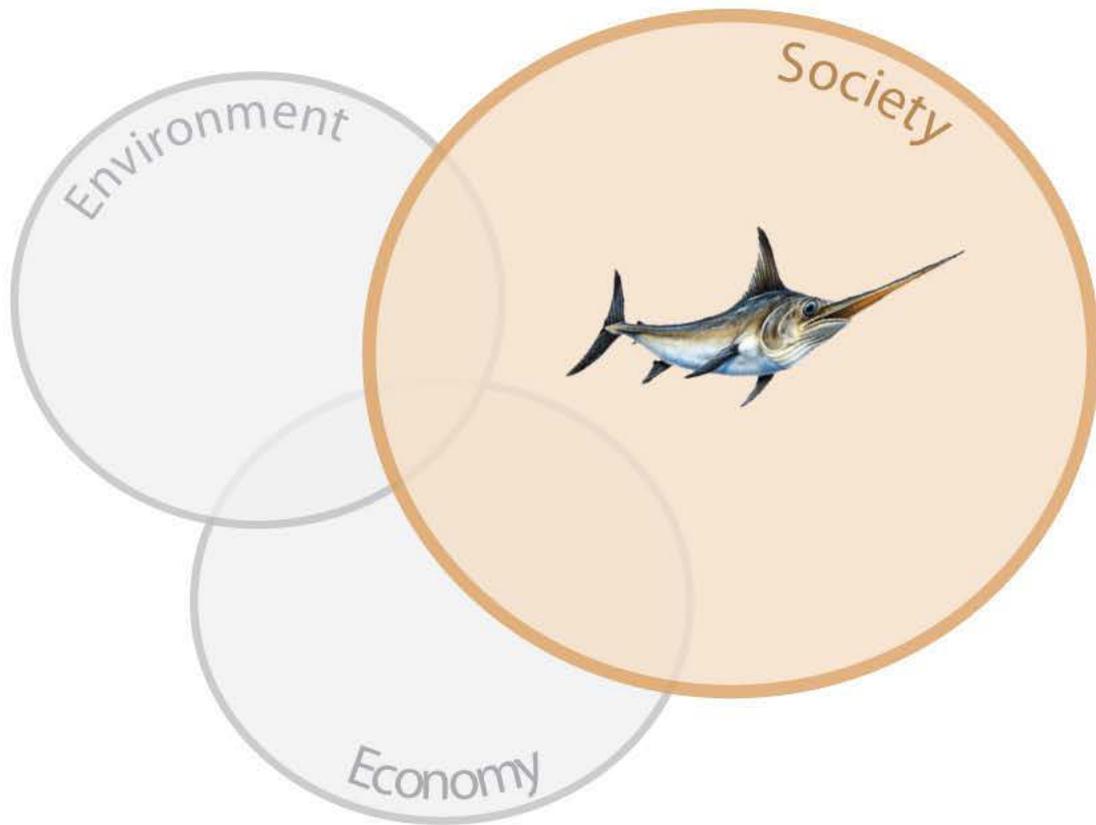
- During annual shark surveys, FRD tested shark deterrents to reduce shark bycatch on longline gear.
- Conduct economic studies to: 1) determine if there were transfer effects when the west coast based fishery was reduced; 2) estimate the cost of management measures in relation to transfer effects; 3) quantify comparative viability of harpoon, DGN, and longline fleets; and 4) identify and evaluate the most efficient international management measures to promote conservation while supporting a viable U.S. fishery.
 - Evaluate conservation investments by which producers and consumers inflicting sea turtle mortality can improve the status of the species. Protections at sea turtle nesting sites and the reduction of bycatch in coastal, small-scale, and artisanal fisheries provide natural focal points for conservation biodiversity investments.
 - Expand the education and outreach effort to improve the scientific quality of the public policy debate and to engage broad stakeholder participation.



Session Summary

Key points made by presenters in this session included:

- The NMFS SWFSC has developed a software tool to estimate cetacean density in any user-defined region of the California Current. Estimation of the number of protected species impacted by proposed marine activities, such as adopting new fishing regulations, conducting offshore drilling, or designating commercial shipping lanes, is required by the ESA and MMPA.
- Research on swordfish behavior is providing insights into swordfish catchability and different fishing gear types that may prove to be more selective. With this information, NMFS aims to explore the possibility of predicting leatherback sea turtle use of habitat. These predictions could potentially be used to help reduce leatherback sea turtle bycatch similar to what has been accomplished with loggerhead sea turtles in the northern Pacific Ocean.
- Because of the limited time swordfish spend basking at the ocean surface (~8 percent), coupled with the weather constraints associated with the harpoon fishery, it is likely unfeasible for the harpoon fishery alone to fully meet west coast swordfish demands.
- Additional research on other low-impact gear types (e.g., deep-set buoy gear) may provide alternative options for increasing fishing opportunities that have minimal interactions with non-target species.
- Incidental catch of sharks in the swordfish fishery varies by fishing gear and methods. Modifications in the DGN gear, such as using extenders and areas restrictions, have helped to reduce shark bycatch. The DGN fleet incidentally catches primarily common thresher, shortfin mako, and blue sharks; shallow set longlines tend to catch shortfin mako and blue sharks. Thresher and shortfin mako sharks are landed. Overall, thresher, shortfin mako, and blue shark catch levels for the U.S. west coast swordfish fishery are considered sustainable.
- The 2008 NMFS SLUTH workshop identified the need to further examine potential separations in the use of habitat (e.g., depth) by swordfish and leatherback sea turtles, explore possibilities for dynamic management models (e.g., *Turtlewatch*), and better understand transfer effects associated with U.S. west coast regulations. This information would offer opportunities for creating a holistic plan for protecting leatherback turtles while achieving a more sustainable swordfish fishery.



Understanding the Marketplace: Consumer Trends and Perceptions

This session explored consumer trends and perceptions in the seafood marketplace to understand how they affect the west coast swordfish fishery. Speaker presentations and a panel discussion addressed marketplace issues, such as the sustainable seafood market trend. Speakers and panelists in this session represented government, environmental and community-based non-profit organizations, advocacy groups, restaurateurs, wholesalers, and direct marketers.

Presentations focused on various standards and methods used for identifying sustainable seafood, understanding the role and influence of campaigns in the marketplace, and innovative marketing of sustainable seafood. The panel of restaurateurs, seafood processors, seafood marketers, and fisheries-related entities focused on consumer-related issues, i.e., the current trends, perceptions, innovations, and present needs in the seafood market.



Session Speakers



Dr. John Kaneko, M.S. D.V.M., is the program manager of the Hawaii Seafood Council, a nonprofit organization that addresses the quality, safety, and sustainability of Hawaii seafood produced by Hawaii's

responsible fisheries through education, outreach, and research. His team efforts include the comprehensive application of the Food and Agriculture Organization's Code of Conduct for Responsible Fisheries as a scoring tool and the preparation of the Sustainability Platform for the Hawaii Longline Fishery with NOAA support.



Dr. Robin Pelc, as the fisheries research manager at the Monterey Bay Aquarium's Seafood Watch program, manages generation of the Aquarium's sustainable seafood recommendations for wild fisheries. Before joining the

Aquarium team in June 2009, Robin completed a Ph.D. in marine ecology at the University of California, Santa Barbara, where she studied the effects of marine protected areas. She has conducted field work in the intertidal in South Africa, worked as a coastal resource manager on the Pacific island nation of Palau, and researched the impacts of ocean energy technologies for the Environmental Defense Fund.



Dawn M. Martin joined SeaWeb in 2004, first as executive director and then as president and chair of the board for the organization. For more than 25 years, Martin has utilized creative communication strategies to advance policy and conservation goals.

She brings a multidisciplinary approach that builds on her organizational management experience and skills as an attorney, negotiator, strategic policy professional and communications specialist. Engaged from the beginning of the sustainable seafood movement, SeaWeb manages the Seafood Choices Alliance, and

with its partner the Natural Resources Defense Council, launched the groundbreaking *Give Swordfish A Break* campaign in the 1990s that in many ways provided a foundation for the modern day sustainable seafood movement.



Dave Anderson was a seafood officer with the Seafood for the Future Program of the Aquarium of the Pacific. Before working with Seafood for the Future, Dave completed his graduate work in genetics at the University of Southern California

and was an aquaculture consultant for University of Southern California's Wrigley Marine Science Center on Catalina Island. Dave has extensive experience with a variety of aquaculture species in a variety of places including the Marshall Islands, Washington state, and Florida.



Heather Mann has close to 20 years of experience working in and for the commercial fishing industry. She is the director of the Community Seafood Initiative and the lead developer for the North American and Pacific Fish Trax programs aimed at supporting sustainable

fisheries with creative real-time tools that track seafood products, link consumers and fishermen, and improve science, management, and marketing.



Valerie Termini works for the California Ocean Protection Council as a project manager. Some of her projects include developing a California sustainable seafood eco-labeling program and working on projects which help to foster more sustainable fisheries along

the coast of California. She holds a Master's degree from the Monterey Institute of International Studies.

What Makes Hawaii Seafood Sustainable?

John Kaneko, Hawaii Seafood Council

Sustainable, wild-caught seafood is produced by responsible fisheries that are well-managed. In essence, the sustainability of wild seafood is determined by:

1) the effectiveness of the fishery management system, 2) the stock status, and 3) fishery ecosystem impacts.

Ultimately it is the performance of the management system that ensures that fisheries operate at sustainable harvest levels with adverse ecosystem impacts controlled.



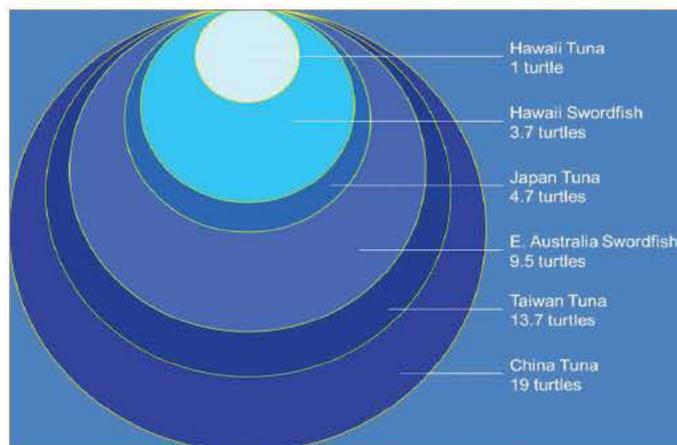
High-quality, fresh swordfish filets (left) and Hawaii-based swordfish longliner in the Port of Honolulu (right). Photos by John Kaneko.

What constitutes a responsible fishery? The United Nations Food and Agriculture Organization Code of Conduct for Responsible Fisheries (FAO Code) is the comprehensive non-binding international agreement of what nations should have in place to be capable of developing and managing responsible fisheries and sustainable harvests (see Appendix C for more information on the FAO Code). To answer the question of what makes Hawaii swordfish sustainable, the Hawaii longline swordfish fishery (and its management regime) was evaluated against the detailed provisions of the FAO Code. The responsible fishery assessment process addresses each Code provision by describing the regulations, the policies, the agencies and their responsibilities and actions, the scientific support for management, and the inclusive and adaptive process by which fishery regulations are created, implemented, and enforced. In 2008, the Hawaii longline fishery scored 94 percent against the FAO Code, documenting that the fishery is well-managed for sustainability.

Other key indicators of sustainability included the stock status of central North Pacific swordfish (currently harvested below maximum sustainable yield) and ecosystem impacts such as fishery interactions with sea turtles. The Hawaii swordfish longline fishery developed and adopted management measures that have reduced the sea turtle bycatch rate by nearly 90 percent. These highly effective measures

included: 1) the adoption of large circle shaped hooks and fish-type bait, 2) mandatory yearly protected species training, 3) a required set of onboard handling methods and specialized gear for the safe removal of fishing hooks and line from hooked or entangled sea turtles, 4) 100 percent observer coverage, and 5) real time enforcement of an annual fishery cap on sea turtle interactions. The efficacy of these measures is monitored by federal fishery observers and verified by data analysis by NMFS scientists.

Hawaii swordfish with its relatively low rate of sea turtle interactions is not only sustainable, but is the preferred choice over swordfish from less-well managed fisheries competing in the U.S. market. Sea turtle bycatch-to-fish catch ratios (BC ratio) are useful for comparing sources of seafood based on bycatch impacts. The low sea turtle BC ratio of the Hawaii bigeye tuna fishery set the benchmark for the Pacific pelagic longline fisheries. The Hawaii swordfish fishery had the lowest sea turtle BC ratio among the swordfish fisheries compared. Because of the intensive observer coverage in the Hawaii fishery, there is substantially stronger confidence in its BC ratio estimates than those for some other Pacific longline fisheries. Therefore, substitution of Hawaii swordfish by swordfish from less well-managed fisheries with higher BC ratios likely constitutes adverse market transfer effects and a net increase in sea turtle bycatch impacts.



Estimates of longline fisheries bycatch to catch ratios (sea turtle interactions per 190,000 kilograms of target fish). Source: Bartram, P., J. Kaneko and K. Nakamura. 2010. Sea turtle bycatch to catch ratios for differentiating longline-caught seafood products. *Marine Policy* 34: 145-149.



Monterey Bay Aquarium Seafood Watch

Robin Pelc, Monterey Bay Aquarium, Seafood Watch

The Seafood Watch program provides recommendations to consumers and businesses about seafood choices through its scale of *Best Choice*, *Good Alternative*, and *Avoid*. Many Americans are familiar with “sustainable seafood” and identify “eating local” as a part of sustainability. Seafood Watch is premised on the concept that Americans may pay more and favor stores and restaurants that carry sustainable seafood. The program’s goal is to provide incentives for fisheries to move up the its recommendation scale. Seafood Watch recognizes that the majority of seafood consumed in the United States, roughly 84 percent, is imported, and produces recommendations for both domestic and imported seafood. Seafood Watch believes that market forces can help level the playing field in the marketplace for U.S. fisheries whose products are more sustainable than foreign fisheries products.

The Seafood Watch methodology for making recommendations for wild-caught seafood relies on available science for fish stocks, their environment, and management. The data are assessed against the program’s five criteria for wild-capture fisheries: inherent vulnerability, stock status, bycatch, habitat and ecosystem effects, and fisheries management. A level of conservation concern is rated for each of the criteria as low, moderate, high, or critical. If the level of conservation concern is critical for any of the criteria, then the recommendation will be *Avoid*. The data used are referenced in reports produced by the program staff or contractors and are reviewed by independent third party scientists. They also conduct collaborative ranking sessions before the final reports are released.

Inherent vulnerability	Stock status	Bycatch	Habitat & ecosystem effects	Fisheries management
<ul style="list-style-type: none"> • Age at 1st maturity • Reproductive potential • Lifespan 	<ul style="list-style-type: none"> • Health of current fish stocks • Occurrence of overfishing • Trends in population abundance 	<ul style="list-style-type: none"> • Quantity relative to targeted landings • Species of special concern • Population consequences 	<ul style="list-style-type: none"> • Impacts to sea floor • Ecosystem alteration 	<ul style="list-style-type: none"> • TAC, Scientific monitoring & data collection • Bycatch reduction plan • Enforcement & mitigation of destructive gear

Five criteria used by Seafood Watch to assess wild-capture fisheries.



Seafood Watch program methodology for producing seafood recommendations.

Currently, Seafood Watch recommends U.S. swordfish products as *Best Choices* and *Good Alternatives* and warns consumers to *Avoid* most imported swordfish. The U.S. and Canadian harpoon or handline fisheries are ranked *Best Choice* because they are highly selective. Because U.S. regulations dramatically reduce bycatch in the California DGN and Hawaii longline fisheries, they are recommended as a *Good Alternative*, as are international harpoon and handline fisheries. Seafood Watch recommends consumers *Avoid* buying products from international longline and South American DGN fisheries, due to the high occurrence and “critical” nature of bycatch.

To keep its recommendations up-to-date, Seafood Watch is always making improvements. For instance, now there is a mobile phone application to address the problem of people carrying out dated wallet cards. The application includes a mechanism for users to share information about restaurants and markets.

The program also distributes six U.S. regional pocket guides with seafood scores listed according to the product availability in each region (see Appendix C for more Seafood Watch information).



Seafood Watch phone application allows users to map places where they found sustainable seafood.

Social Marketing: A Paradigm for Shifting Behavior

Dawn Martin, SeaWeb

SeaWeb is the only international nonprofit organization exclusively dedicated to using the science of communications to fundamentally shift the way people interact with the ocean. SeaWeb develops social marketing strategies to amplify the voices of community leaders, connect audiences, and forge collaborative and innovative approaches to address ocean issues. Social marketing is an effective means to transform market behavior. Alan R. Andreasen, Ph.D, describes social marketing as “...the application of commercial marketing techniques to the analysis, planning, execution, and evaluation of programs designed to influence the voluntary behavior of target audiences in order to improve their personal welfare and that of their society” (1995).

Many people still recall SeaWeb’s powerful *Give Swordfish A Break* campaign of the late 1990s. The campaign attracted significant media attention and generated a powerful new constituency in support of ocean and fisheries conservation. The campaign started as a partnership between SeaWeb and the Natural Resources Defense Council (NRDC) to relieve market pressure on the North Atlantic swordfish stock, which was “overfished” at that time. Since then, NMFS determined that North Atlantic swordfish has successfully rebuilt, but unfortunately some consumers still believe that it is bad to buy swordfish. The campaign provided the lesson that negative impressions can stick around for a long time, so you can never talk enough about successes and how changed behaviors can result in a positive outcome for the ocean!

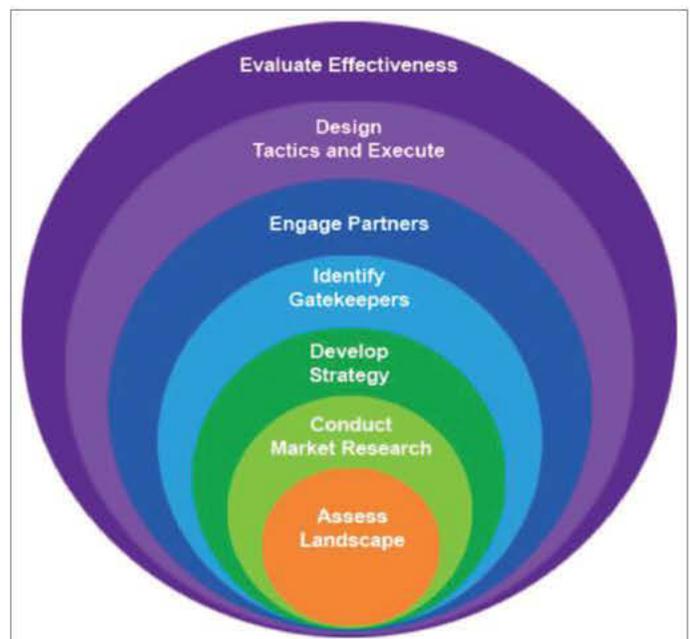
SeaWeb’s initial market research in the 1990s revealed that despite consumers feeling that scientists are the most credible messengers, consumers needed more than scientific information to feel compelled to make behavior changes. Further, the research uncovered that

the ocean-to-plate connection with fish (i.e., seafood) resonated more strongly with consumers than fish as wildlife, even though half of the adults surveyed said they were environmentally inclined. Thus, SeaWeb and NRDC began to campaign on the issue of sustainable seafood at a time when few NGOs were talking about fish as seafood. Shortly thereafter, over 700 chefs and retailers agreed not to sell or serve North Atlantic swordfish.

SeaWeb creates social marketing strategies using a seven-step approach. First, assess the landscape and gather relevant information on the issue that the marketing campaign aims to address. Next, conduct market research to identify and better understand the target audiences and how to gain traction with them. Develop a strategy based on this research. Identify and engage with gatekeepers and potential partners. For example, for the *Give Swordfish a Break* campaign, SeaWeb identified restaurants and retailers as the primary gatekeepers because 91 percent of consumer spending on seafood passed through these nodes of the seafood supply chain. Finally, design and execute the tactics and evaluate their effectiveness. In this example, SeaWeb and the NRDC elected to encourage a short-term “break” from the consumption of the North Atlantic Swordfish based on research that Americans



The *Give Swordfish a Break* Campaign brochure cover.



SeaWeb’s strategic communications approach.



were willing to take personal action to protect swordfish. While 65 percent of Americans surveyed indicated a willingness to boycott the fishery, only 31 percent indicated a willingness to ask their grocer not to sell its products, and 27 percent were willing to ask their favorite restaurant not to sell them.

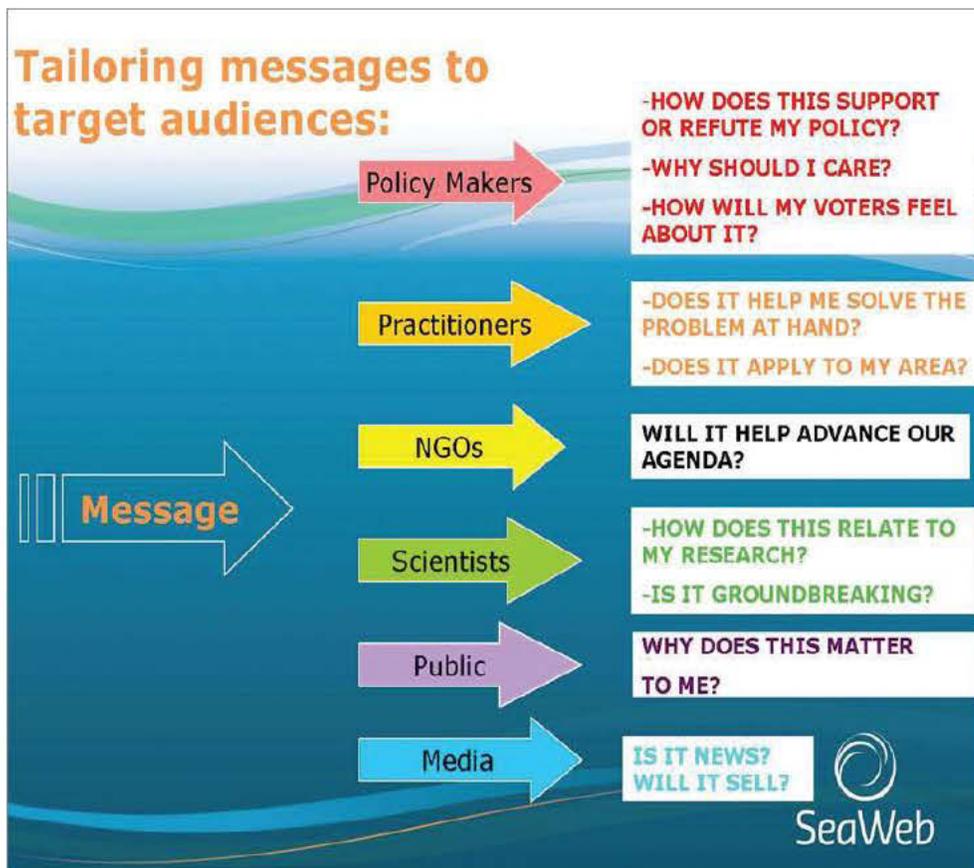
Over the years, SeaWeb has learned how to effectively tailor sustainable seafood messages to target audiences. They began hosting a Seafood Summit, starting in 2002, and attendance has steadily increased and diversified beyond the NGO community and the seafood industry to also include the scientific community and journalists. In 2009, NGOs accounted for only 30 percent of attendance while businesses accounted for 40 percent, suggesting an increasing interest in sustainability among the private sector. Likewise, the Marine Stewardship Council (MSC) has experienced a compound annual growth rate of 103 percent with their eco-label seafood products over the last 11 years. In 2009, the Hartman Group published their findings that 32 percent of people who buy seafood were willing to pay 20 percent more for sustainable products in a report titled, *Sustainability: The Rise of Consumer Responsibility*.

In designing successful social marketing strategies, there are some key points to keep in mind:

- **Positive messaging is more successful in achieving social change than negative messaging.** People are receptive to easy, positive things they can do. Clearly, the 1990s *Give Swordfish A Break* had results – it gave consumers a clear and easy action they could take.
- **Tell a good story.** The root of all successful marketing is in telling a good story about your product or issue.
- **Know what is important to your target audience.** Design messages around the information that is relevant to the people you want to reach. What do they care about? What motivates them to take action and what obstacles may stand in the way? Who do they trust as messengers?

The *Give Swordfish A Break* campaign was successful in achieving its objective and there have been many lessons learned. One such lesson was that when addressing specific regional fisheries, it is important to avoid consumer confusion by providing tools the public

can use to differentiate between fisheries that seem similar. In addition, although victory was declared when campaign objectives were reached and media efforts focused on the fact that the fishery was rebuilt, unfortunately negative public perceptions about the fishery still linger. Also, while distinctions were made between the North Atlantic and North Pacific stocks in outreach efforts, the generalization of the campaign name as *Give Swordfish A Break* likely stimulated some confusion among consumers with the Pacific swordfish fishery. This may well have had an unintended consequence of negatively affecting the market for North Pacific swordfish stocks, which were and continue to be healthy.



Interests of SeaWeb's target audiences.

The Role of Seafood Advisory Programs in Influencing Seafood Consumers

Dave Anderson, formerly with the Aquarium of the Pacific, Seafood for the Future

The Seafood for the Future program has both environmental and economic objectives. In working to meet these objectives it hopes to advance and promote:

- ecosystem protection,
- well-managed fisheries,
- support for the U.S. domestic industry, and
- a sustainable seafood supply for consumers.

Some other NGO consumer seafood programs have similar objectives and when evaluating any these programs to determine if their goals are being achieved, these programs must be willing to take a hard look at their inputs relative to actual and potential outputs. To date, the three most common inputs of NGO consumer seafood programs are product boycotts, wallet cards, and eco-labels, but what are the outputs?

Given the material presented and discussions at this Workshop, it is clear that there is room to improve the approaches of NGO consumer seafood programs for more positive impacts on the sustainability of our domestic fisheries and markets. The three drivers of markets are supply, quality, and price point. Only later do consumers concern themselves with sustainability, management, variety, and trade restrictions. Perhaps consumer seafood programs should not be asking how to get consumers to request sustainable products and make the "right" choices (i.e., the choices the programs want them to make), but how to drive the market to provide predominantly sustainable seafood products.

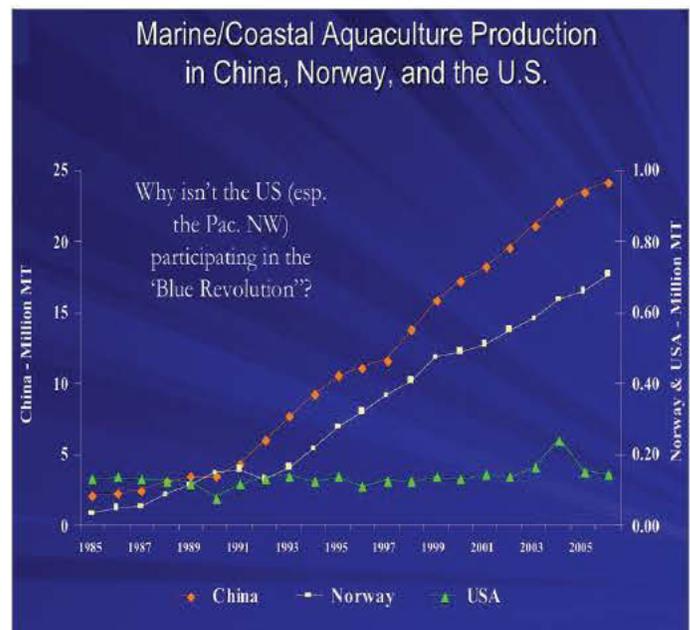
To drive markets to provide mostly sustainable seafood products, consumer seafood programs should seek to answer new questions. How can the programs increase the ability for sustainable products to be competitive in the marketplace? How can the programs increase the willingness of consumers to purchase sustainable products at higher prices? Programs should be mindful of potential unintended consequences, like C.R. Wessels' warning suggests in a FAO technical paper about the potential for eco-labeling to create incentives for less sustainable products.

"At a particular equilibrium price, if the proportion of consumer demand for the environmentally-friendly good is smaller than the proportion of supply of that good, then eco-labeling may lead to increased prices for unlabeled goods, and hence increased outputs of products produced by methods detrimental to the environment."

— C.R. Wessels

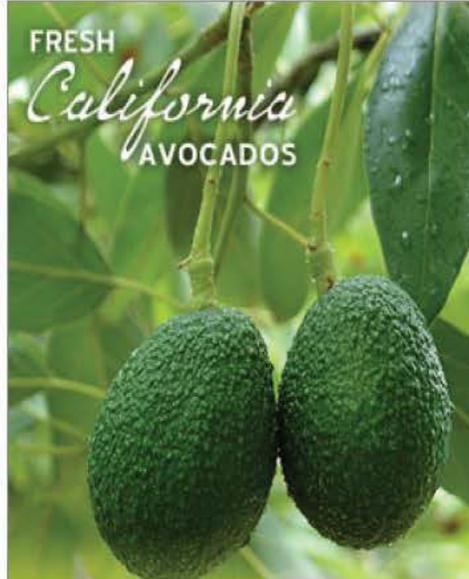
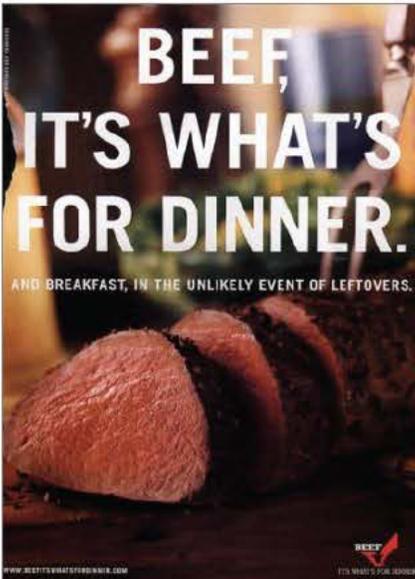
Consumer seafood programs should pay more attention to consumer behavior. The result of not paying enough attention to market drivers has hampered the ability of domestic seafood production to compete with that of other countries. In the United States, seafood is the second largest contributor to the trade deficit (after oil). More than 80 percent of seafood being consumed in the country is coming from other countries.

Marine and coastal aquaculture is in a favorable position over wild capture fisheries with supply, quality,



Marine and coastal aquaculture production in China, Norway, and United States. (left axis: China-million metric tons, right axis: United States and Norway- million metric tons). Source: FishSTAT 2008.





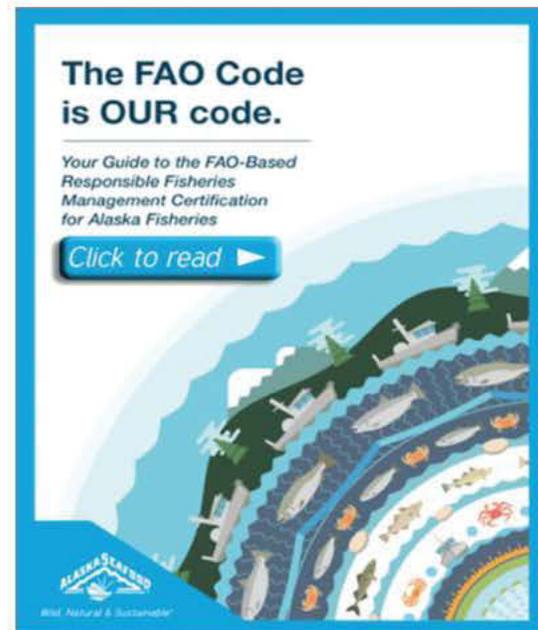
Examples of positive, targeted marketing campaigns in the beef, avocado, and milk industries.

and price point driving markets. In 2006, aquaculture products accounted for nearly 50 percent of the world fish production for food, an increase from 15 percent of the world fish production for food in 1984. Yet, the United States is lagging far behind other countries in its aquaculture production, only slightly increasing production since 1985.

U.S. seafood needs a strong, positive, and targeted marketing campaign by industry and NGOs. For example, sustainability is not similarly scrutinized by consumer groups for poultry, beef, and pork. There are many successful examples of positive and unifying campaigns in the agriculture industries. U.S. seafood from federal fisheries are managed to ensure sustainability in accordance with the MSA 10 National Standards, among other laws. Despite this, much of the seafood information consumers receive focuses on the negative. Seafood is being held to a higher standard than other U.S. industries.

Sustainability of seafood should be measured by and praised for incremental progress. This is the case in other industries (e.g., hybrid cars, use of some portion of alternative energy) where consumers understand that it takes time to develop new and cleaner technologies that are feasible and efficient. Seafood marketing messages need to align industry, both wild capture fisheries and aquaculture, rather than fragment it into sectors, target species, and gear types. Seafood marketing should strive to be consumer and food-service oriented. Product information should

be available at multiple levels of detail so that the consumer can access the highly technical detailed information, if they desire. The Alaska Seafood Marketing Institute serves as a good example.



The cover of the Alaska Seafood Marketing Institute's consumer-oriented guide for their FAO-based certification program.

Fish Trax

Heather Mann, Community Seafood Initiative

The Community Seafood Initiative's (CSI) programs are designed to support the seafood industry by providing access to relevant information and services resulting in successful fishing-related businesses and fishing communities. CSI is a 501c(3) non-profit organization established in 1998. Headquartered in Oregon and serving the west coast and North America, the organization operates as a unique partnership with Oregon State University and Enterprise Cascadia, a community development financial institution, to service five programmatic areas: preserving seafood-related working waterfronts, 45° Northwest fisheries reports, electronic fishery information systems, seafood health facts, and Fish Trax.

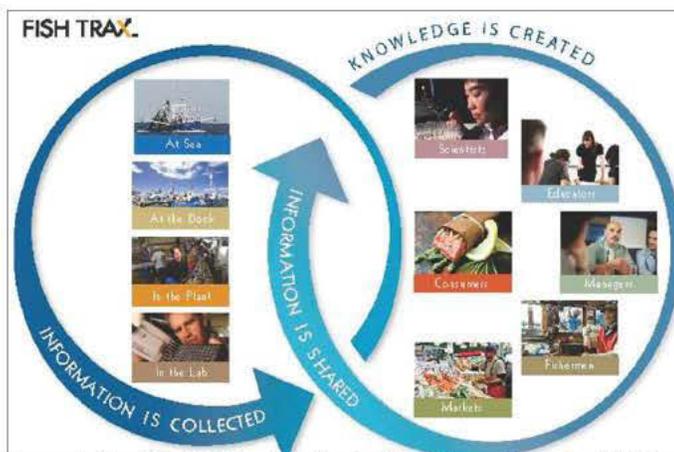
The Fish Trax program is an information-sharing system for supporting sustainable fisheries targeting a variety of fisheries and seafood interests including those of those of fishermen, scientists and managers, and consumers. Fisheries data is collected, analyzed, and shared using creative tools that improve industry performance, resource management, seafood marketing, and consumer and public education. Envisioned and designed by fishermen, the system assists their industry in gaining more input on the use of data and information for seafood consumers. Fish Trax serves as a neutral third party and safe keeper of information. Stakeholders can decide which data to share and who can utilize it. Through Fish Trax, users can display one piece of data in a variety of ways to meet different audiences needs (e.g., consumer, marketer, general public, science, management).

In the Gulf of Mexico, CSI provides the technology to power Gulf Fish Trax to improve the traceability of seafood for consumers with a unique brand called Gulf Wild. Consumers that buy seafood caught by Gulf Wild fishermen can go online and type in a unique tag number associated with the fish they purchased.

Once online, they can see who caught their seafood, where it was caught in the Gulf of Mexico, and learn about the science and management that ensures the fishery is sustainable. On the U.S. west coast, Pacific Fish Trax works with both the salmon and albacore fisheries. The "Find your Fish" feature of Fish Trax is proving to be a powerful tool that empowers both fishermen and consumers.

Fish Trax is also helping fishermen collaborate with scientists and managers to experiment with new technologies to improve the sustainability of their fisheries. For example, the west coast salmon fishery works in partnership with Project CROOS (Collaborative

Research on Oregon Ocean Salmon). The main goal of this project is to identify real-time spatial patterns of salmon stocks in the ocean so the data can be used for dynamic management. Because a variety of salmon stocks co-mingle in the ocean and cannot be harvested independent of one another, less abundant stocks often limit the harvest of target stocks.



Conceptual model of Fish Trax's electronic fishery information network. Fish Trax is revolutionizing the way fisheries information is collected, analyzed, viewed, and shared.

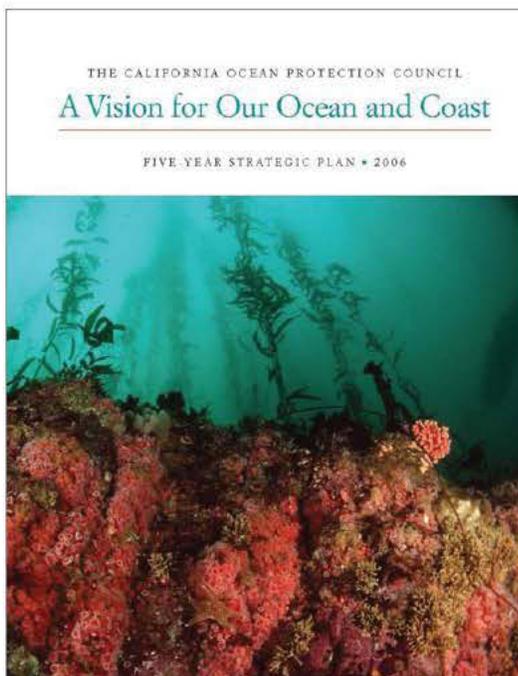
Pacific Fish Trax provides a platform to convey a variety of data, such as oceanographic, atmospheric, and catch data in multiple user formats allowing users to study where stocks are based on these conditions. In the fishermen's portal, fishermen can view catch areas on maps by date and overlay that with aggregate catch. They can track their fishing patterns and overlay that with bottom contour and sea surface temperature. The genetic information gathered in the project can help inform fishermen and managers and help them avoid less abundant stocks and target healthy ones. The platform also serves a fisheries management portal, a science portal, and a public portal to support information gathering and knowledge creation for management needs, fishery dependent analysis, and consumer confidence in seafood marketed by origin.



California Ocean Protection Council: Sustainable Fisheries

Valerie Termini, California Ocean Protection Council

Established in 2004 by the California Ocean Protection Act (COPA), the California Ocean Protection Council (OPC) is a non-regulatory body with the overarching goal of improving the way that California manages and protects its coastal and ocean resources. The OPC consists of the Secretary for Natural Resources (current chair), the Chair of the State Lands Commission (currently the Lieutenant Governor), the Secretary for Environmental Protection, two public members, and two state legislators. The OPC's priority areas are described in its five-year strategic plan, *A Vision for Our Ocean and Coast*. Under this plan, the OPC has built partnerships with fishing communities and invested funds in innovative projects that promote less environmentally-harmful fishing practices, encourage sustainable fishing, and help revitalize coastal ports. Sustainable fishing remains a priority area as the OPC updates its strategic plan to guide the next five years. The OPC is committed to basing its decisions and actions on the best available science, and works closely with its Science Advisor (i.e., the Executive Director of the California Ocean Science Trust), who in turn may engage the expertise of interdisciplinary experts who make up the OPC's Science Advisory Team.



California Ocean Protection Council's five-year strategic plan. For more information, see Appendix C.

Legislation passed in 2009 (AB 1217, Monning) requires the establishment of a California sustainable seafood certification program. The statute directs the OPC to:

- develop a protocol to guide entities on how to be independently certified to internationally-accepted standards for sustainable seafood;
- develop a competitive grant and loan program (in years in which funds are appropriated by the Legislature) to help qualifying fisheries become certified as sustainable;
- design a label or labels that may be used exclusively to identify seafood caught sustainably in California; and
- implement a marketing assistance program for such seafood in cooperation with the California Department of Food and Agriculture.

The program is non-regulatory and completely voluntary.

To develop this program, the OPC worked with a Sustainable Seafood Advisory Panel to discuss certification models and outline core elements of the new program. The OPC considered the Marine Stewardship Council (MSC) process as a basis for sustainability certification. The OPC planned to add California a traceability component that would indicate the port in which a fish was landed and where it was caught, gear type, vessel or captain, and company involved in making the catch. As of January 2012, the OPC adopted a California Voluntary Sustainable Seafood Program Protocol.

The OPC continues to promote and develop California's Sustainable Seafood Program. The program protocol can be viewed on the OPC website (see Appendix C for the link). Future marketing aspects might include "Friends of California Fish" web and social media sites with lists of nearby restaurants that sell California fish, links to a California Seafood mobile application, research on fisheries issues, and recipes.

Session Summary

Key points made by presenters in this session included:

- Sustainable wild seafood comes from well-managed, responsible fisheries. The FAO Code of Conduct for Responsible Fisheries provides assessment criteria. The Hawaii swordfish fishery and its management system scored a 94 percent under the Code based on:
 - its fishery management system,
 - stock status and absence of overfishing, and
 - control of ecosystem impacts.
- There are many consumer awareness programs that assess and rank seafood sustainability. The criteria used vary but generally focus on impacts to the marine environment (e.g., status of the stock, impacts of fishing gear, and bycatch rates), and may consider management factors.
- Consumers, restaurants, and retailers increasingly use NGO seafood recommendations to make decisions. With multiple sources of varied information, however, they often become confused about what information to depend upon.
- The seafood market, like other markets, is influenced primarily by price, availability, and quality. Only producers who supplied a quality product, year-round, at stable or declining prices, saw significant growth in the past two decades. To make sustainable seafood products more competitive, these factors should be considered. Targeted marketing campaigns developed for agricultural products may provide helpful examples.
- U.S. seafood currently lacks a positive and cohesive marketing message. The message should be unified, including wild capture and aquaculture; highlight incremental steps in reducing environmental impacts; and provide multiple layers of information to consumers, from simple overall messages to detailed technical information.
- Social marketing is a powerful tool that can drive consumer choices and behaviors. Campaigns need to be very specific and clear to avoid consumer confusion and be based on current empirical data to encourage NGO and industry partnerships.
- Industry needs to understand what motivates consumers and tailor their message to *“tell the story of the fishery.”* Restaurants and chefs are important allies in conveying the story and providing sustainable seafood information.
- Traceability of seafood through the supply chain is an increasingly significant issue. The effectiveness of marketing sustainable seafood depends on the ability to validate product origins.
- To improve consumer confidence and knowledge about fisheries, some in industry are partnering with NGOs and using new technologies to independently provide this information to consumers. In addition, there is a need for government to help prevent seafood fraud (i.e., mislabeling).

Innovative Approaches in Sustainable Seafood: Addressing Consumer Trends and Perceptions

Panel Session

This panel focused on consumer-related issues and included a diverse panel of restaurateurs, seafood processors, seafood marketers, and fisheries-related entities to comment on trends, perceptions, innovations, and current needs in the seafood market.

Discussion Questions

- **What is most important to the seafood consumers you work with (either your specific consumers, or in general). Are your consumers asking about sustainable seafood?**
- **How have you provided or addressed what consumers are asking for? If they are not asking you about sustainable seafood, how are you informing them about or promoting sustainable seafood? How and why do you think your approach has been successful?**
- **What challenges did you face and how did you address them? What challenges remain and what obstacles do you see to addressing them?**
- **Based on your experience, what parallels do you see with the challenges facing the U.S. west coast swordfish fishery and what insights can you offer?**

Panelists



Andrew Spurgin has designed and prepared menus and events honoring dignitaries and glitterati for over three decades, throughout the United States, in England, Canada, and Mexico. He grew up in London, working in his relative's restaurant and butcher

shop until his family moved to San Diego, California, in 1974. Andrew was formerly the executive chef and director of Waters Fine Catering & Event Design. His involvement in the sustainable seafood movement includes being the co-founder of Passionfish.org and Cooks Confab, a developer of the Blue Ocean Institute's "Green Chefs Blue Ocean" program, an associate board member of the Slow Food Urban San Diego convivium, and past member of the Director's Cabinet for the Scripps Institute of Oceanography. Andrew regularly lectures to the industry and public (including youth audiences) on sustainability, cooking, event design, culinary responsibility, and entertaining.



Joe Ciaramiterno is president of J & D Seafoods, Inc. in San Pedro. His father and grandfather were both commercial fishermen. He has been working in the industry in different facets for over 30 years. He started at Galletti Brothers in 1981 and worked in sales,

purchasing, and management before starting J & D Seafoods with his partner, Dino Lauro, in 1990. J & D Seafoods, Inc., grew from the ground up to one of the largest swordfish distributors nationwide. Joe also served on the PFMC's Highly

Migratory Species Advisory Subpanel, the board of the California Seafood Council, and the Fishing Task Force of the City of Los Angeles. Joe recognizes the importance of protecting the seafood industry along with sustainability of our environment and sea-life.



Steve Foltz is the director of sales and marketing for Chesapeake Fish Company. Chesapeake Fish has a dockside location in San Diego, California, which is hub to a modern processing facility and a fleet of refrigerated delivery trucks. Steve is

also chairman of the board of California Fisheries and Seafood Institute (CFSI), the nation's largest regional organization representing members of the consumer seafood supply industry. Steve's role with CFSI is to improve, preserve, and promote the seafood industry movement.



Sam King is president and chief executive officer of King's Seafood Company, which has developed and currently operates eighteen restaurants in southern California, Arizona, and Nevada. These include six signature restaurants, twelve King's Fish House's, and a seafood distribution operation. Sam is also the

co-founder of the Sustainable Seafood Forum and serves on several boards, including the Aquarium of the Pacific and the University of Southern California's Wrigley Institute for Environmental Studies.



Valerie Termini serves as staff to the California Ocean Protection Council as a project manager. Some of her projects include developing a California sustainable seafood eco-labeling program and working on projects that help to foster more sustainable fisheries along the coast of California. Valerie holds

a Master's degree from the Monterey Institute of International Studies.



Heather Mann has close to 20 years of experience working in and for the commercial fishing industry. She is the director of the Community Seafood Initiative and the lead developer for the North American and Pacific Fish Trax programs aimed at supporting sustainable fisheries with creative

real-time tools that track seafood products, link consumers and fishermen, and improve science, management, and marketing.



Dawn M. Martin joined SeaWeb in 2004, first as executive director and then as the organization's president and chair of the board for the organization. For more than 25 years, Martin has utilized creative communication strategies to advance policy and conservation goals.

She brings a multidisciplinary approach that builds on her organizational management experience and skills as an attorney, negotiator, strategic policy professional and communications specialist. Engaged from the beginning of the sustainable seafood movement, SeaWeb manages the Seafood Choices Alliance and, with its partner the Natural Resources Defense Council, launched the groundbreaking *Give Swordfish A Break* campaign that in many ways provided a foundation for the modern day sustainable seafood movement.



1. Experiences

Consumer awareness programs are shaping consumer seafood preferences

- Seafood recommendations and scoring schemes (e.g., wallet cards)
- Eco-labels and sustainability certifications

NGO campaigns and boycotts have powerful market effects

- Effective at identifying a course of action for consumers to follow
- Restrict consumer choices

Restaurants play a pivotal role in informing consumers about seafood

- 67% of all seafood consumed in the United States is consumed in restaurants
- Many chefs are interested in learning about and serving sustainable seafood

Product labels are becoming essential in the seafood marketplace

- Enables product differentiation
- Empowers consumers to choose sustainably and locally harvested seafood

Imported seafood is prolific

- Approximately 84 percent of seafood in the United States is imported
- Distributors and restaurants have to fill the supply gap; *"people want to eat fish so [we] have to import seafood."*

2. Challenges

Outdated and inaccurate seafood scores and recommendations can have unintended negative effects

- Fishermen suffer economic penalties when negative scores and impressions lag behind positive changes in the fishery
- Negative scores based on oversimplified and generalized information can be unfair to local or regional fisheries operating under responsible management regimes

Campaigns and boycotts based on misinformation can be harmful

- Fisheries are highly susceptible to boycotts based on misinformation (e.g., thresher shark boycott in 2010)
- It can be difficult for retailers not to succumb to the pressures

Retailers are challenged to maintain a consistent and current knowledge-base about seafood data and issues

- Generally, only one or two employees in a retail establishment are aware of sustainable seafood issues and lead consumer awareness and education efforts
- Staff turnover can greatly impact a business's ability to maintain a commitment to informing their consumers about seafood sustainability

Quality assurance and control for seafood products

- Demand for product labels creates a need for tracing seafood through the supply chain
- Seafood mislabeling and fraud in the marketplace is an issue
- Distributors need reliable product and fisheries information

Not enough U.S. seafood available

- Hard for chefs, restaurateurs, and retailers to find enough domestic seafood to supply their customers
- Suppliers are willing to promote local, domestic seafood, but must do so while continuing to promote other imported menu items

3. Obstacles to Addressing Challenges

Barriers exist to increasing consumer awareness about seafood sustainability

- This trend is still young
- Various opinions and evaluation criteria about what constitutes “sustainable seafood” is creating confusion for consumers
- *“When Americans get confused about seafood, they eat chicken.”*
- Consumer willingness to pay a premium for sustainable seafood is questionable. Without a greater appreciation of the product, *“price point drives all.”*

There is not a strong culture of seafood consumerism in the United States

- Not all consumers will be keenly interested in learning more about sustainable seafood
- Most Americans do not cook seafood at home even though *“fish are easy to cook.”*
- Need to help consumers learn about and prepare seafood “beyond the basics of tuna, salmon, and shrimp”

Capacity to trace seafood products through the supply chain

- Lack of mechanisms to: (1) enforce claims of origin, and (2) ensure that retailers truly selling sustainable products are not economically hurt by unscrupulous competitors
- Labels, such as MSC, are very expensive for fishermen to pursue

More fishing opportunities are needed to supply local, sustainable U.S. seafood

- Creating demand for local and sustainable seafood will only be effective if there is a supply
- Fishermen will need to have access to productive fishing grounds to meet demand

4. Insights & Potential Solutions

Ensure seafood scores are up-to-date

- Revise scores and recommendations often to keep them current
- Use new technologies that can widely distribute updated information more quickly than printed wallet cards

Adopt positive seafood messages based on facts

- NMFS, through NOAA FishWatch, could play a helpful leadership role in providing the facts (see Appendix C for FishWatch link)
- Any campaign must be based on solid data and address any lingering bycatch and mercury issues
- Coordination and communication is needed between consumer awareness efforts and NGOs, industry, and government (e.g., the positive thresher shark workshop experience)

Tell the story of the fishery

- Tell consumers the *“story of the swordfish fishery”* to differentiate U.S. west coast swordfish products from others in the marketplace
- Embrace the images and stories of individual fishermen, as that is seen to be very effective with customers
- *“When there is a story attached to a seafood product, all of a sudden it has value and is no longer just a fish.”*
- Make personal connections (e.g., FishTrax)

Take steps to enhance traceability of seafood products

- Need enforcement of labeling requirements
- Determine whether traceability is a role for the government or if non-government entities can adequately provide such a mechanism
- Explore existing systems (e.g., Food and Drug Administration)

Build credibility with consumers and stakeholders

- Consider a self-imposed industry “turtle conservation tax” to acquire and protect nesting beaches throughout the Pacific Basin and demonstrate a commitment to an environmentally sustainable fishery
- Collaborate with NGOs that can support the fishery’s sustainability message
- Build authentic partnerships among fishermen, NGOs, and others to launch a campaign (i.e., fishermen have the story to tell, but typically do not have the marketing expertise or networks)



Panel Summary

This summary captures key points and perspectives during the panel and following discussions; it does not represent consensus views.

- **Consumer awareness about sustainable seafood is growing, but significant challenges remain ahead.** Panelists see significant growth in consumer awareness of and interest in sustainable seafood, pointing to increased interest among retailers, “buy local” campaigns, and the proliferation of “scoring” cards. However, speakers noted, the trend is still emerging, but the majority of consumers unaware or uninformed and the barriers to deepening awareness are significant. Several speakers questioned consumer willingness to pay higher prices for sustainable seafood. Without a deeper understanding and appreciation for the product, consumer decisions are driven by cost. One panelist reiterated several times that consumer awareness is only effective and worthwhile if there is a supply of domestic seafood to meet demand.
- **Numerous sustainable seafood marketing campaigns exist, but they lack a unified approach and common definition for sustainable seafood.** Programs addressing sustainable seafood (e.g., Monterey Bay Aquarium scorecard, Marine Stewardship Council certification, NOAA FishWatch) are helping consumers to generally become more aware of the topic. However, the variety of approaches and criteria used to define “sustainable seafood” is confusing to customers. Because parts of the United States do not have a deeply-rooted seafood-consuming culture and history, this confusion can become a significant barrier to effective seafood marketing and lead consumers to instead opt for familiar staples, like chicken. Several speakers suggested that NMFS, through NOAA FishWatch, could play a helpful role in clarifying the disparate seafood messages and perhaps become a leading source for sustainable seafood information.
- **Seafood product labeling creates opportunities, but also challenges.** Labeling is essential to meet consumer demand for sustainably and locally harvested seafood. Labeling is also necessary for the U.S. west coast swordfish fishery if it is to differentiate its products. However, as the demand for labeling spreads, more challenges arise in verifying the labels.
- **The ability to trace seafood through the supply chain is emerging as a significant problem.** Panelists explained that there are few effective mechanisms to:
 - enforce claims of origin (e.g., country or fishery), and
 - ensure that those selling truly sustainable seafood products are not economically hurt by competitors selling fraudulent and mislabeled products.

One participant suggested that the existing Food and Drug Administration’s Hazard Analysis and Critical Control Points system may provide an efficient platform for tackling these traceability considerations.

- **Consumers may shy away from certain seafood products based on lingering impressions from past boycotts and/or unknowingly avoid sustainable products based on out-of-date seafood scorecards.** New technologies such as social media websites and smart phone applications have the potential to quickly distribute changes in recommendations due to fishery status updates. Fishermen say they suffer an economic penalty when new scores and impressions lag behind what is truly happening in the fishery. Fisheries have been highly susceptible to negative campaigns and boycotts, many of which have been based on misinformation. For example, in December 2010, several southern California retailers temporarily stopped carrying thresher shark due to an NGO boycott based on misinformation. When distributors were unable to move thresher shark products to retailers, the market glut that resulted reduced fishing opportunities and profits.

- **Proactive, collaborative, and positive marketing seafood efforts are needed.** Panelists broadly agreed that marketing campaigns should embrace the images and stories of actual fishermen. The west coast swordfish fishery has a compelling story to tell, several panelists said, and the industry must tell it widely if they are to effectively distinguish their products in the marketplace.
- **Authentic partnerships among fishermen, NGOs, and government were seen by all as an essential and effective way of moving forward to tackle this significant challenge.** Fishermen have a positive story to tell but typically do not have the marketing expertise or networks to effectively communicate and disseminate it. Partnerships with NGOs can be particularly effective, as they can lend credibility to support the sustainability message of a fishery. One speaker noted that any campaign must confront, with solid data and research, any lingering concerns related to both bycatch and mercury issues.

The panel raised several other issues and considerations:

- There are concerns that negative rankings are unfair to fisheries operating under highly regulated and responsible management regimes. If a fishery is taking steps to improve its sustainability and is in compliance with current laws, some speakers said, it should not be penalized.
- There are often only one or two employees in a retail establishment or restaurant that understand the issues related to sustainable seafood. Therefore, turnover in staff can greatly impact a business's ability to maintain a commitment to carrying sustainable seafood and informing customers.
- Some industry members suggested that the fishery self-impose a "turtle conservation tax" to acquire and protect sea turtle nesting beaches in other countries as a way to demonstrate its commitment to an environmentally sustainable fishery.
- Speakers recognized the need to enforce labeling requirements, but they had mixed views on a strategic approach. Some suggested these were an essential role for government and others preferred a non-government mechanism.
- Restaurants play a pivotal role in educating consumers about seafood. Approximately 67 percent of all seafood in the United States is consumed in restaurants as opposed to purchased in supermarkets and prepared at home.



Consuming Swordfish: Health Risks and Benefits

Luncheon Speaker

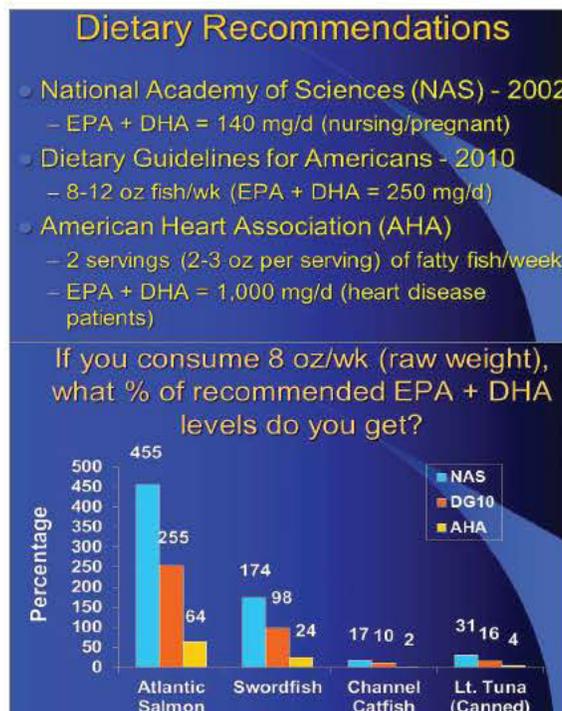


Charles R. Santerre is a Professor of Food Toxicology in the Department of Nutrition Science which is in the College of Health and Human Sciences at Purdue University. He recently served as an American Association for the Advancement of Science (AAAS) Science & Policy Technology Fellow and was sponsored by the USDA, Food Safety Inspection Service, Office of Public Health Science, Risk Assessment Division. He holds degrees in Human Nutrition (B.S.), and Environmental Toxicology & Food Science (Ph.D.) from Michigan State University. Prior to this, he served as an Adjunct Associate Professor in the Environmental Sciences Program at Ohio State University and as an Assistant Professor in the Environmental Health Science Program and the Interdepartmental Toxicology Program at the University of Georgia.

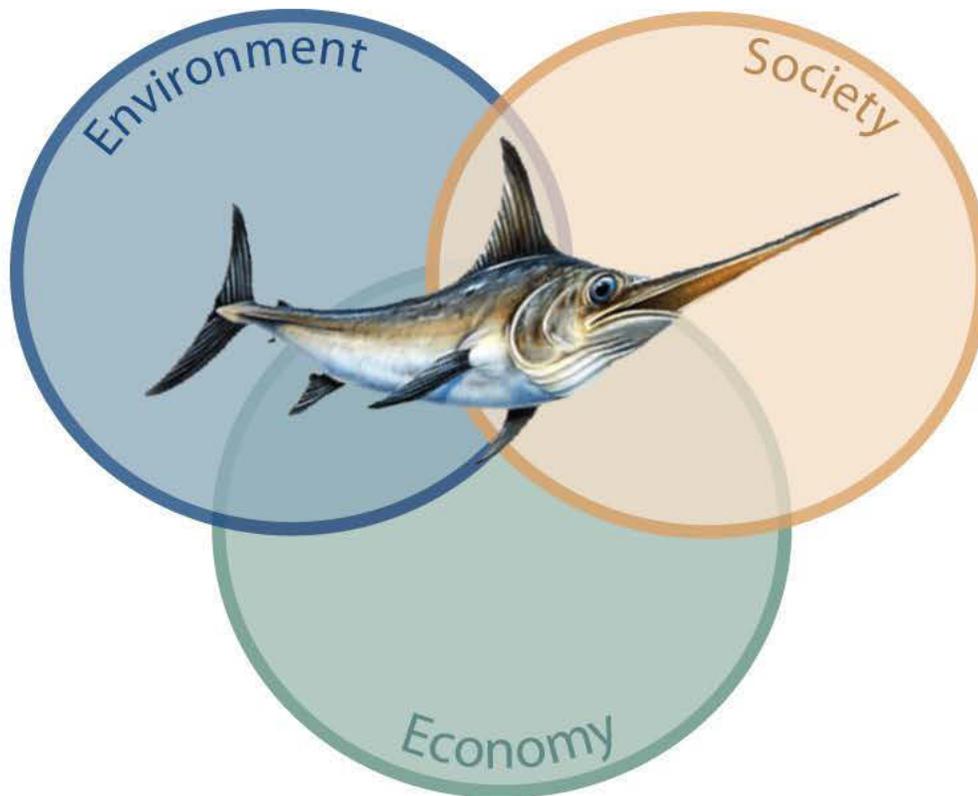
There is much concern about the safety of consuming seafood, especially by pregnant or nursing women and young children, because certain types of seafood can contain environmental pollutants. Fetuses and infants are exceptionally sensitive to the adverse long-term health effects resulting from exposure to environmental toxicants. Exposure to methylmercury, a developmental toxicant found primarily in some fish species, has been predicted to negatively impact the health of 400,000 newborns every year in the U.S., with adverse effects (e.g., abnormal memory, attention, and language skills) possibly lasting past childhood. However, pregnant or nursing women need to consume seafood because it provides nutritionally important lipids which promote healthy brains and eyes during perinatal development. Since maternal transfer of mercury and omega-3 fatty acids are the primary routes for fetal (placental transfer) or infant (maternal milk) exposure/nourishment, there is a critical need to communicate specific advice to women of childbearing-age so they can make informed decisions about their seafood consumption.

The best advice for pregnant or nursing women is to: consume 8-12 ounces of seafood per week; avoid eating certain types of commercial or recreationally-caught seafood that is high in mercury or other environmental pollutants; avoid eating raw seafood when pregnant or serving infants/children; and include species that are a good source of omega-3 fatty acids. We developed Fish4Health that provides specific information that can help sensitive populations to make informed decisions about their seafood consumption. Fish4Health includes free iPhone & Android apps that women can use to track their seafood, mercury, and omega-3 fatty acid intake (see Appendix C for the link to these tools).

When consumed in moderation, swordfish can be part of a healthy diet for non-sensitive populations. Our research has demonstrated that swordfish below 300 pounds in size will typically have a mercury concentration that is below the Action Limit of 1,000 parts per billion as established by the Food and Drug Administration (FDA). Swordfish that is greater than 300 pounds can contain mercury which is twice the FDA limit. The FDA has not done any further testing of commercial seafood for mercury and the Agency also has not limited the size of the swordfish allowed in domestic markets. Swordfish should be avoided prior to and during pregnancy, by nursing women, or when feeding a young child. It can be introduced back into the diet after this time.



Dietary recommendations for consuming fish with essential omega-3 fatty acids (DHA and EPA) (top) and the associated levels of intake for various types of seafood (bottom).



Achieving a Common Understanding: Current and Future State of the West Coast Swordfish Fishery

Group Discussion

The afternoon of the second day involved small group discussions using the questions below to explore perspectives on the information presented. Highlights were shared with the full group. Everyone then discussed overall impressions, outcomes, and ideas on moving forward.

Discussion Questions

- **Is the current state of the swordfish fishery both socio-economically and environmentally sustainable?**
- **What gear and operational changes could increase the viability of the swordfish fishery and coastal communities while minimizing impacts to protected marine species and the marine environment?**
- **What can be done to increase the demand for local and sustainable swordfish products and decrease U.S. reliance on foreign imports?**



Discussion Summary

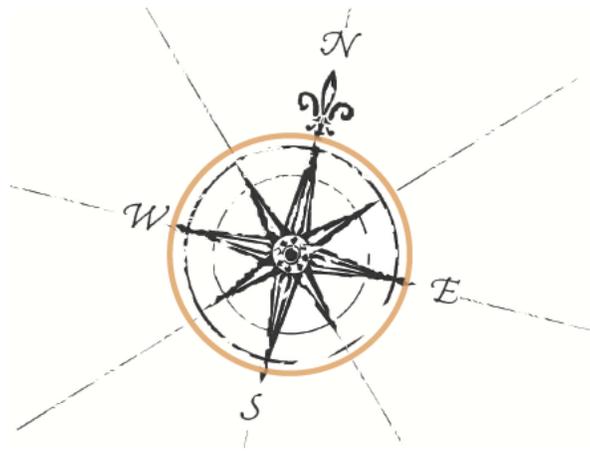
The cross-cutting themes are summarized below. See Appendix D for more detail.

- All groups agreed that the U.S. west coast swordfish fishery is not economically sustainable. The PLCA time and area DGN closure was cited as being particularly damaging because it reduces access to some of the most productive swordfish fishing grounds during times when swordfish are most abundant off the California coast. Other reasons include: increased fuel costs; safety at sea issues associated with fishing farther offshore; compounding regulatory burdens; and no succession plan for the next generation of fishermen.
- Those involved in the fishery agreed that the U.S. west coast swordfish fishery is environmentally sustainable as it relates to the target swordfish stock with minimal impact to non-target species, such as sea turtles and marine mammals. However, some workshop participants voiced ongoing concerns over discard mortality rates for blue sharks and ocean sunfish (*Mola mola*).
- Participants identified a range of possible gear and operational changes to improve the viability of the fishery. All groups put forward variations on the following three recommendations:
 1. Re-examine dimensions of the PLCA based on current information.
 2. Pursue exempted fishing permits in the PLCA to test DGN, longline, and buoy gear using updated conservation measures successfully applied in other U.S. fisheries.
 3. Conduct more research to better understand the temporal-spatial overlap between sea turtles and swordfish and the possible implications for new practices and management approaches (e.g., dynamic area management).

Other suggestions included revamping the fisheries permit system and exploring other incentives to facilitate the recruitment of new fishermen. At least one group noted that nearly all the concepts identified have the potential for downsides, from increased cost and political battles to possible target and non-target catch per unit effort changes.

- All groups suggested strategies for increasing demand for locally caught swordfish and decreasing U.S. reliance on imports. Two common strategies centered on forming partnerships between industry, NMFS, NGOs, restaurateurs:
 1. Better educate consumers about the benefits of buying U.S. west coast-caught swordfish (versus other less sustainably harvested swordfish) and about the story of the swordfish fishery.
 2. Press to implement federal MMPA provisions to identify and restrict the import of non-sustainably harvested seafood.

Other ideas included: involving fishermen in marketing campaigns; partnering with the California Sustainable Seafood Initiative; developing a turtle-safe brand or label for west coast-caught swordfish; imposing a industry self-tax to fund restoration of sea turtle nesting beaches; supporting NOAA FishWatch as a reliable data source for sustainability information; and revitalizing the California Seafood Council.



Moving Forward: Identifying Future Actions

The workshop concluded with participants engaging in a brief discussion on the key outcomes of the workshop, new insights they gained, and potential next steps to pursue. More than a dozen workshop participants offered ideas, and their comments underscored the broad interest present in exploring opportunities for all the stakeholders to come together around what one attendee characterized as “authentic collaboration.”

Future actions mentioned by participants included:

- Establishing multi-stakeholder workgroups to target specific issues raised during the workshop, including:
 - identifying threats to Pacific Basin sea turtle nesting grounds;
 - pursuing exempted fishing permits within the PLCA; and
 - developing effective sustainable seafood and swordfish communication and marketing efforts.
- Launching a comprehensive public education and marketing effort with emphasis on the following themes:
 - the healthy status of the North Pacific swordfish stock; and
 - sustainable fishing practices of the U.S. west coast swordfish fleet.
- Undertaking collaborative research efforts to better understand the overlap between swordfish and protected species and to apply those findings to the management of the fishery.
- Identifying the U.S. west coast fishery as a pilot program for OPC’s California Sustainable Seafood Initiative.
- Examining equity issues within the swordfish fishery along the U.S. west coast and Pacific Islands, as well as pressing for full enforcement of existing import provisions under the MMPA.
- Taking advantage of the full range of ongoing and future initiatives, such as the annual SeaWeb Seafood Summits, the Alliance for Sustainability of Fishing Communities, and the OPC funding for collaborative fisheries research.
- Collaborating on initiatives to preserve working waterfronts on the U.S. west coast and the communities they support.



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- Pacific Fishery Management Council. 2011. Status of the U.S. west coast fisheries for highly migratory species through 2010. Prepared by the Pacific Fishery Management Council in conjunction with the National Marine Fisheries Service, Southwest Region under National Oceanic and Atmospheric Administration award number NA10NMF4410014.
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Appendices



Appendix A: Workshop Agenda

U.S. West Coast Swordfish Workshop: Working Towards Sustainability

May 10 & 11, 2011 at the Westin Hotel in San Diego, California

Day 1, May 10

- 8:30 am Purpose and Origin of this Workshop, Desired Outcomes - Mark Helvey (NMFS)
Welcome, Agenda Review, and Ground Rules - Scott McCreary and Bennett Brooks (CONCUR)

Overview of Swordfish Fisheries

- 9:00 – 9:45 History, Evolution, and Current Status of Swordfish Fisheries: U.S. and International Fisheries
1) David Itano - Life History, Habitat and Fisheries Overview (University of Hawaii)
2) Jon Brodziak - North Pacific Swordfish: Stock Status and Trends (NMFS)
- 9:45 – 10:10 A film by John Dutton Media, "Forming Partnerships: Spotlight on U.S. West Coast Fisheries"
- 10:30 – 11:30 Overview of the U.S. West Coast Swordfish Fishery
1) Marija Vojkovich - Swordfish in California: A Brief History of the Fishery (CA Dept. Fish and Game)
2) Rod McInnis - Federal Management of U.S. West Coast Swordfish Fishery (NMFS)

Panel 1 and Group Discussion

- 12:45 – 2:00 Stakeholder Perspectives on Issues and Challenges in the U.S. West Coast Swordfish Fishery
Bill Sutton, Marija Vojkovich, Chuck Cook, Dave Rudie, Todd Steiner, Tina Fahy, Taryn Kiekow

Social and Economic Factors: Influences on the Fishery and Coastal Communities

- 2:15 – 3:15 Domestic and International Swordfish Supply and Demand and Pacific-wide Ecosystem Consequences
1) Dale Squires - Transfer Effects and Economic Welfare (NMFS)
2) Steve Stohs - Overview of the Drift Gillnet Fishery and Regulations (NMFS)
3) Carrie Pomeroy - Socio-economic Factors Influencing West Coast Swordfish and Fishing Communities (CA Sea Grant)

Ecological Factors: Fishery Interactions and Minimizing Ecosystem Impacts

- 3:30 – 4:00 Protected Species: Pacific Sea Turtles, Strategic Marine Mammals, and Seabirds
1) Jessica Redfern - Synthesizing Protected Species Data (NMFS)
- 4:00 – 4:45 Non-Target Finfish: Billfish and Sharks
1) Chugey Sepulveda - Selectivity of the U.S. West Coast Swordfish Fishery (Pfleger Institute)
2) Suzy Kohin - Shark Bycatch in the U.S. West Coast Swordfish Fisheries (NMFS)
- 4:45 – 5:15 The 2008 Swordfish and Leatherback Use of Temperate Habitat (SLUTH) Workshop
1) Heidi Dewar - Overview of the 2008 SLUTH Workshop (NMFS)

Day 2, May 11

8:30am Review of Day 1 and Overview of Day 2 - Mark Helvey, Scott McCreary, and Bennett Brooks

Consumer Trends and Perceptions

- 8:45 – 9:40 Sustainable and Local Seafood
- 1) John Kaneko - What Makes Hawaii Seafood Sustainable? (Hawaii Seafood Council)
 - 2) Robin Pelc - Monterey Bay Aquarium Seafood Watch (Monterey Bay Aquarium, Seafood Watch)
 - 3) Dave Anderson - The Role of Seafood Advisory Programs in Influencing Seafood Consumers (Aquarium of the Pacific, Seafood for the Future)
- 9:45 – 10:15 Innovative Approaches to Address Consumer Trends and Perceptions
- 1) Dawn Martin - Social Marketing: A Paradigm for Shifting Behavior (SeaWeb)
 - 2) Heather Mann - Fish Trax (Community Seafood Initiative)
 - 3) Valerie Termini - California Ocean Protection Council: Sustainable Fisheries (California Ocean Protection Council)

Panel 2 and Group Discussion, moderated by CONCUR

10:30 – 11:45 Innovative Approaches in Sustainable Seafood: Addressing Consumer Trends and Perceptions
Dawn Martin, Heather Mann, Sam King, Steve Foltz, Andrew Spurgin, Joe Ciaramitaro, Valerie Termini

Luncheon Talk

Charles Santerre - Health Risks and Benefits of Eating Swordfish (Purdue University)

Group Discussions: Exploring a Sustainable Supply of Swordfish

- 1:00 – 2:30 Trigger Questions 1-3 (for small group discussion at tables)
- 1) *Is the current state of swordfish fisheries sustainable both socioeconomically and environmentally?*
 - 2) *What gear and operational changes could increase the viability of the swordfish fishery and coastal communities while minimizing impacts to protected marine species and the marine environment?*
 - 3) *What can be done to increase the demand for local and sustainable swordfish products and to decrease U.S. reliance on foreign imports?*
- 3:00 – 3:40 Report Out
- 3:40 – 4:00 Trigger Question 4 (plenary)
- 4) *What next steps are needed to carry this conversation forward? How are you willing to participate?*

Wrap Up and Closing Remarks

- 4:00 – 4:30 Participants' Perspectives: Key Outcomes, New Insights, and Potential Next Steps
- 4:30 – 4:45 Closing Remarks by Mark Helvey, Scott McCreary, and Bennett Brooks



Appendix B: Workshop Participants

U.S. West Coast Swordfish Workshop: Working Towards Sustainability

May 10 & 11, 2011 at the Westin in San Diego, CA

Participant Name	Affiliation
1. Scott Aalbers	Pfleger Institute of Environmental Science
2. Rick Algert	City of Morro Bay
3. Dave Anderson	Aquarium of the Pacific (formerly)
4. Buzz Brizendine	F/V Prowler and Pacific Fishery Management Council (PFMC)
5. Jon Brodziak	NMFS Pacific Islands Fisheries Science Center (PIFSC)
6. Bennett Brooks	CONCUR, Inc.
7. Gary Burke	Burke and Sons
8. Kevin Chu	NMFS Southwest Regional Office (SWRO)
9. Joe Ciaramitaro	J & D Seafoods
10. Chuck Cook	The Nature Conservancy
11. Kit Dahl	PFMC
12. Roger Dang	Pacific Fishing, Inc.
13. Heidi Dewar	NMFS Southwest Fisheries Science Center (SWFSC)
14. Pete Dupuy	Ocean Pacific Seafood
15. Peter Dutton	NMFS SWFSC
16. John Dutton	John Dutton Media
17. Lyle Enriquez	NMFS SWRO
18. Christina Fahy	NMFS SWRO
19. Judson Feder	NOAA General Counsel
20. Steve Foltz	Chesapeake Fish Co.
21. Steven Fosmark	Seeadler Enterprises LLC
22. Kathy Fosmark	Seeadler Enterprises LLC
23. Svein Fougner	Hawaii Longline Association
24. Zeke Grader	Pacific Coast Federation of Fishermen's Association
25. Mario Guardado	H & N Foods International
26. Greg Haas	Aid to U.S. Congresswoman Lois Capps
27. Jonathon Hardy	LJ Hardy Consulting
28. Bob Harman	NMFS Pacific Islands Regional Office (PIRO)
29. Craig Heberer	NMFS SWRO
30. Mark Helvey	NMFS SWRO
31. Jennifer Ise	NMFS SWRO
32. Dave Itano	University of Hawaii, Pelagic Fisheries Research Program
33. Rex Ito	Prime Time Seafoods
34. John Kaneko	Hawaii Seafood Council
35. Taryn Kiekow	Natural Resources Defense Council
36. Sam King	King's Seafood Company

	Participant Name	Affiliation
37.	Kristen Koch	NMFS SWFSC
38.	Logan Kock	Santa Monica Seafood
39.	Suzanne Kohin	NMFS SWFSC
40.	Don Krebs	F/V Goldcoast
41.	John LeGrange	Trans World Marine
42.	Arthur Lorton	F/V Sea Haven
43.	Heather Mann	Community Seafood Initiative
44.	Dawn Martin	SeaWeb
45.	Mike McCorkle	F/V Pieface
46.	Scott McCreary	Concur, Inc.
47.	Rod McInnis	NMFS SWRO
48.	Amber Rhodes	NMFS SWRO
49.	Tim Mulcahy	F/V Calogera
50.	Peter Nelson	CFR West
51.	Jeremiah O'Brien	Morro Bay Commercial Fishermen's Association
52.	Rick Pearson	NMFS Headquarters
53.	Robin Pelc	Monterey Bay Aquarium
54.	Carrie Pomeroy	California Sea Grant
55.	Naresh Pradhan	NMFS SWRO
56.	Jessica Redfern	NMFS SWFSC
57.	Dave Rudie	Catalina Offshore Products
58.	Charles Santerre	Purdue University
59.	Cyreis Schmitt	Oregon Department of Fish and Wildlife
60.	Jeff Seminoff	NMFS SWFSC
61.	Chugey Sepulveda	Pfleger Institute of Environmental Science
62.	George Shillinger	Center for Ocean Solutions
63.	Candan Soykan	NMFS SWFSC
64.	Andrew Spurgin	Campine (formerly with Waters Fine Catering)
65.	Dale Squires	NMFS SWFSC
66.	Matt Stein	King's Seafood Distribution
67.	Todd Steiner	Sea Turtle Restoration Project
68.	Stephen Stohs	NMFS SWFSC
69.	Bill Sutton	F/V Aurelia
70.	Yonat Swimmer	NMFS PIFSC
71.	Heidi Taylor	NMFS SWRO
72.	Valerie Termini	California Ocean Protection Council
73.	Galen Tromble	NMFS Headquarters
74.	Russ Vetter	NMFS SWFSC
75.	Marjia Vojkovich	California Department of Fish and Game
76.	Tom Weseloh	California's Joint Committee on Fisheries and Aquaculture
77.	Michelle Zetwo	NOAA Enforcement



Appendix C: List of Links

California's Sustainable Seafood Program protocol can be viewed on the Ocean Protection Council's website: opc.ca.gov/2010/03/california-sustainable-seafood-initiative/

California Ocean Protection Council's five-year strategic plan is available at: opc.ca.gov/strategic-plan/

Fish4Health is a website developed by Dr. Charles Santerre and partners that provides specific information about seafood health risks and benefits particularly for women of childbearing age, pregnant and nursing mothers, and for parents feeding young children. fish4health.net

FishWatch is a NOAA website that provides easy-to-understand science-based facts to help consumers make smart sustainable seafood choices. U.S. seafood profiled on the website is responsibly harvested under strict regulations to keep marine ecosystems and fish populations healthy and to support our seafood industry and coastal communities. FishWatch.gov

Keeping Hawaii Seafood Sustainable explains how Hawaii seafood is sustainable based on science-based fisheries management and a strong track record of managing healthy fish stocks while controlling ecosystem impacts. hawaii-seafood.org

Monterey Bay Seafood Watch distributes the Monterey Bay Aquarium's seafood recommendations with pocket guides, a website, mobile applications, and outreach to seafood consumers, restaurants, distributors, and purveyors. seafoodwatch.org

Strategic Environmental Research and Development Program (SERDP)'s Marine Animal Model Mapper includes Cetacean density estimate tools for the eastern Pacific Ocean. seamap.env.duke.edu/prod/serdp/serdp_map.php

TurtleWatch is an online tool that displays sea surface temperature, ocean current conditions, and the predicted location of waters preferred by loggerhead sea turtles in the Pacific Ocean north of the Hawaiian Islands. pifsc.noaa.gov/eod/turtlewatch.php

The United Nations Food and Agriculture Organization's Code of Conduct for Responsible Fisheries (the FAO Code) sets out principles and international standards of behavior for responsible fishing practices to ensure the effective conservation, management, and development of living aquatic resources with due respect for the ecosystem and biodiversity. fao.org/docrep/005/v9878e/v9878e00.HTM

The 2007 report, *Using questionnaires based on the FAO Code of Conduct for Responsible Fisheries as diagnostic tools in support of fisheries management*, by Caddy et al, provides a series of questionnaires to evaluate compliance of national or local fisheries with the FAO Code. Although the 1995 FAO Code is not a legally binding instrument, it represents a consensus between countries as to the features that should characterize systems designed to ensure sustainable use of fishery resources. The general questionnaire approach parallels the procedures used by the International Organization for Standardization and provides a way of converting statements of principle in a global instrument, including a legal framework, into a semi-quantitative form that can be used in a multidisciplinary fisheries evaluation of management performance. fao.org/docrep/010/a1449e/a1449e00.htm

Appendix D: Summary Responses from Break-out Groups

Perspectives on the Sustainability of the West Coast Swordfish Fishery:

Is the current state of the swordfish fishery both socio-economically and environmentally sustainable?

Environmental Sustainability

Swordfish stock is healthy

- Distribution is variable in time and space
- Swordfish stocks are not overfished
- Overfishing is not occurring
- North Pacific swordfish stock is underutilized
- Total catch is projected to remain below maximum sustainable yield
- PFMC HMS FMP is a framework for effective management and monitoring of the stocks

Sea turtles are protected species in the United States

- Regulations are adequate to protect sea turtles in U.S. waters
- There are very conservative incidental take limits in U.S. fisheries
- Sea turtles are migratory and subject to adverse impacts beyond U.S. waters

Other species interactions are monitored

- For shark stocks that have been assessed, none were found to be overfished, and overfishing is not occurring
- The current harvest guideline is likely to ensure continued sustainability of shark stocks
- Concerns exist about the bycatch of blue sharks and mola mola (ocean sunfish, mostly released alive)

Ongoing monitoring and research needed to ensure sustainability

- Data collection is necessary for accurate assessments
- It is important to regularly assess stocks
- Tagging studies are critical for fine tuning fishing and management practices

Socio-economic Sustainability

Need more data and analysis to make good decisions for the fishery and the environment

- Misinformation creates misconceptions about the fishery
- Political and regulatory climate restricting fishing opportunity and markets
- Seafood boycotts threaten the fishery's sustainability
- Industry is fragmented by negative campaigns with diminished ability to carry a unified message and influence outcomes
- ESA and MMPA procedures improved, but fishermen feel more can be done
- Litigation is always a risk with incidental take of sea turtles in the United States

Uneven playing field with foreign swordfish fisheries

- Most swordfish consumed in the United States is imported from other countries
- U.S. swordfish fishery is more regulated than in other countries
- Foreign fleets have access to subsidies and training programs
- U.S. west coast permits may not be sufficiently matched to the scale of fishery issues (i.e., DGN permits are state, not federal)
- Management should ensure that regulations are fair and effective Pacific-wide, especially with regard to incidental take of sea turtles
- Decision-making should be made more efficient, not more complicated

Reduced vitality of west coast fishing communities

- Collapse of the northern DGN fishery
- Fewer fishermen and permits overall
- Suffering infrastructure, especially at the community level
- Loss of working waterfronts that support fisheries

Safety at sea risks exist

- Fishing farther offshore
- Contending with more challenging sea conditions
- Retrieving gear from deeper depths

No succession plan for the fishery

- Few new entrants
- No plan to encourage the next generation of fishermen to enter the fishery
- Fishing knowledge, skills, and permits may lapse if not transferred
- Current fishermen likely to relocate for opportunity to earn better wages

Despite challenges, maintaining a positive outlook

- Demand for swordfish and the health of the stock is strong
- Some believe the PFMC is receptive to considering changes in the existing management structure
- Industry is in need of marketing tools and approaches to communicate with and educate decision-makers, including legislators and staffers
- Industry is encouraged to develop pro-active programs to address sea turtle research and conservation issues and to inform management efforts for obtaining regulatory relief

Compounding regulatory burdens

- PLCA cited as particularly damaging to industry
- Fishing seasons reduced when swordfish move into closed areas
- Cumulative effects of bycatch avoidance measures made the fishery financially untenable

Increased costs to fish

- Lost access to productive fishing grounds (lower volumes of fish)
- Use of bycatch reduction devices and avoidance tactics
- Increased fuel costs
- Longer transit times to distant offshore sites

Reduced revenue from swordfish

- Competition with imports
- Low market prices for DGN compared to longline
- Inability to provide a consistent supply
- Reduced control of timing supply to markets

Supplemental income is necessary, but restricted

- Dependence on other local fisheries is necessary to make a living fishing now
- A diminished shark market with negative campaigns

U.S. swordfish supply not meeting U.S. demand

- Supplying domestic demand with imports transfers impacts on protected species overseas
- The harpoon fishery is high cost and cannot fill the gap between U.S. demand and supply
- Eastern U.S. buyers prefer longline caught fish over net caught

Importing swordfish lowers net national benefits

- Other nations have high per-unit-effort impacts on protected species
- U.S. west coast swordfish fishery operates with a lower per-unit-effort impact on protected species



Examining Gear and Operational Changes:

What gear and operational changes could increase the viability of the swordfish fishery and coastal communities while minimizing impacts to protect marine species and the marine environment?

Gear Changes

Recognize that the fleets have already made extensive gear and operational changes

- Using pingers in DGN
- Using light bars on nets
- Dropping DGNs to greater depths
- Employing different fishing strategies based on experience with sea turtles
- Using circle hooks and mackerel bait on longlines

Consider switch to longline gear

- Consider the ability of deeper sets to reduce bycatch
- Test the viability of deep-set longline gear
- Look at options for using deep-set longline gear to catch swordfish during daylight hours
- Plan for the costs associated with converting from DGN

Test the viability of buoy fishing

- Consider as a means to expand fishing opportunities
- Anticipate lower catch volumes than with longline or DGN gear
- Must overcome monitoring challenges

Operational Changes

Improve science in biological opinions

- Provide quality assurance with an independent peer review
- Create a STAR-type panel review of ESA consultations
- Re-evaluate the impacts of the existing closed area on the fishery and overall bycatch resource dynamics
- Use the science about non-target species to improve ecosystem understanding

Revisit seasonality and geographic scope of DGN fishery

- Reassess the size and timing of the PLCA
- Consider research-supported dynamic area management
- Address safety-at-sea issues with access to low wind areas
- Increase revenue potential with access to areas with high swordfish catch rates
- Scale the time and cost involved to industry capacity

Consider an exempted fishing permit for DGN in the closed area

- Re-evaluate bycatch in the closed area
- Test different DGN configurations and locations
- Use pingers and lower drop lines
- Use oceanographic data for sea turtle avoidance

Revisit exempted fishing permits for longlines

- Use the gear tested and configured to reduce bycatch in the Hawaii longline fishery
- Allow longline gear inside the EEZ under an exempted fishing permit
- Plan experiments to prepare a longer-term operation plan and inroads for longline fishery development
- Consider time and area closures to separate commercial and recreational fisheries in time and space (i.e., recreational fishing occurs mainly in the summer while commercial fishing occurs mainly in the fall and winter)

Further sea turtle and fishery interaction research and tools

- Use tools, like TurtleWatch, to help the fishery avoid turtles
- Gather better information on sea turtle distributions in relation to environmental conditions
- Determine comparative catch and bycatch rates between longline and DGN gear within the west coast EEZ

Revamp the fisheries permit system

- Create long-term incentives for fishermen to enter and stay in the fishery
- Facilitate the recruitment of new fishermen and young people
- Consider hiring more staff to help lower the hurdles of getting new entrants into the fishery
- Caution against new fishermen's inexperience with bycatch avoidance practices
- Consider strategy of targeting fishermen who moved to Hawaii to fish as it may be economically feasible for them to move back to the U.S. west coast
- Reduce permit costs through federalization
- Provide resources needed for start-up

Explore trade regulations

- Hold imported fish to the same conservation standards as those harvested in the United States
- Use expertise and knowledge from shrimp fishery, which is required to use TEDs

Making the Transition

Make the exempted fishing permit proposals politically tractable

- Place greater limits on effort (sets and boats)
- Require 100% observer coverage and monitoring
- Establish a fixed bycatch cap
- Engage NGOs as partners to develop the proposals
- Coordinate comparable results across gear types (e.g., DGN, longline with daytime deep-sets, and buoy gear)
- Results of alternative gear testing should be evaluated and reported

Continue research

- Use exempted fishing permits to fill recognized data gaps
- Acquire a better understanding of spatial overlap between sea turtles and swordfish
- Determine sea turtle migratory patterns
- Consider research recommended at the SLUTH workshop

Proceed with caution

- Recognize that legislative backing for longline fishing off the U.S. west coast is needed to garner support from state representatives on the PFMC
- Industry cannot endure increased costs to fish
- Political battles could be time-consuming and have negative impacts on catch rates

Set priorities

- Focus on actions to avert the loss of the DGN fishery (i.e., highest risk)
- Reassess biological opinions on turtle take
- Address political resistance to restructuring or eliminating the closed area

Addressing Demand and Reducing Reliance on Imports:

What can be done to increase the demand for local and sustainable swordfish products and decrease U.S. reliance on foreign imports?

Increase Demand for U.S. Harvested Swordfish

Increase outreach and education on sustainable seafood

- Improve NMFS capacity to communicate how well U.S. fisheries are managed
- Reach out to all sectors of the seafood supply chain (e.g., fishermen, processors, wholesalers, restaurants, public)
- Target large retailers on the facts about swordfish and U.S. fisheries management
- Explain what “sustainability” means
- Clarify the requirements for “sustainable certification”
- Improve recognition of FishWatch as an information resource
- Use outreach devices (e.g., televisions) at retail locations to educate consumers

Create a positive marketing campaign for west coast swordfish

- Increase public awareness about the status of swordfish (i.e., not overfished; overfishing not occurring)
- Demonstrate the merits of local fisheries
- Highlight the value and benefits of buying U.S. west coast swordfish, including product quality, port and community viability, and support for clean fishing gear and technologies
- Identify the right spokespeople
- Address negative connotations and misconceptions about mercury
- Target NGOs for their power to influence consumer demand
- Target seafood buyers as the gatekeepers to markets

Tell the story of U.S. west coast swordfish

- Feature U.S. fishermen in marketing campaigns
- Focus on success stories
- Connect consumers to the fishermen through festivals, fishermen or farmer’s markets, or approaches like Fish Trax
- Point out the seasonal nature of the fishery

Decrease Reliance on Imports

Level the playing field between foreign and domestic suppliers

- Encourage the FAO Code of Conduct to foreign fishing operations
- Enforce compatibility of foreign conservation measures with MMPA requirements 101(a)(2)
- Impose tariffs on imported seafood that does not meet the U.S. conservation standards for harvest
- Provide subsidies to domestic fishermen

Increase U.S. swordfish supply to markets

- Provide the domestic fleet greater access to fish
- Reduce costs to fish with relaxation of some regulatory measures
- Create an industry self-tax to support sea turtle conservation on beaches
- Dedicate the funds collected on import tariffs to support sustainable U.S. fisheries
- Revitalize the fishery with incremental approaches so as not to exceed conservation limits

Seek pathways for market differentiation

- Present a unified image highlighting good national practices among U.S. fisheries
- Articulate “transfer effect” to consumers in a marketing format that garners support for U.S. swordfish and fisheries
- Couple with pro-active turtle research and conservation measures to boost consumer confidence

Press NOAA to label U.S. fishery products

- Defend U.S. fishery products as sustainable
- Provide an alternative to third party labels and certifications
- Create an accountability mechanism for compliance with the MSA 10 National Standards

Consider product labels for U.S. North Pacific swordfish

- Develop a turtle-safe brand or label for California or U.S. west coast swordfish products
- Support NOAA FishWatch as a reliable data source for sustainability labels

Strategies

Re-initiate a fishing industry association

- Unify public relations efforts
- Augment industry profiles

Build partnerships between NMFS, industry, NGOs, restaurateurs, and others

- Ensure all seafood recommendations have a strong scientific basis
- Partnerships may reduce costs to develop strategic communications
- Solicit NGO help in funding experiments (e.g., WWF International Smart Gear competition)

Partner with California Sustainable Seafood Initiative

- Revitalize the California Seafood Council
- Support the California Sustainable Seafood Initiative pre-assessment of California swordfish fisheries
- Recognize funding opportunities through California Sustainable Seafood Initiative for seafood certification

Set priorities

- Focus on swordfish first
- Expand marketing campaign to other California or west coast-based fisheries



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This report and more information on the workshop are available online at:

NMFS SWRO Sustainable Fisheries Division Website

or at:

<http://swr.nmfs.noaa.gov/sfws/index.html>

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