WESTERN PACIFIC REGIONAL FISHERY MANAGEMENT COUNCIL

WPRFMC Five-year Research Priorities under the MSRA

October 24, 2008

The reauthorized Magnuson-Stevens Fishery Conservation and Management Act created new responsibilities and authorities for domestic regional fishery management councils and their advisory bodies. Based on recommendations from its Scientific and Statistical Committee, the Western Pacific Regional Fishery Management Council has established the following priorities for consideration in establishing research plans and budgets for the region.

Rank	Table 1. Research Needs – Stocks
1	*Stock assessments and MSY estimates for major species/stocks in risk order ranking*: Risk order ranking refers to the risk (including both the likelihood and the consequences) of overfishing a species/stock. Stock assessments and MSY estimates are needed for federally managed stocks in order to comply with MSRA ACL requirements, and these assessments should be conducted based on a risk ranking of the stocks most likely to be subject to overfishing through to those fish stocks least likely to be subject to overfishing.
1	*Fishery data via logbooks, observers and port sampling*: Many fisheries conducted in federal waters of the WP Region are incompletely monitored through creel surveys and in some cases trip tickets, or sales receipts. Expanded fishery monitoring systems will provide improved data and reduce both scientific and management uncertainty surrounding the establishment and implementation of ACLs and accountability measures. Some ACLs are expected to require real-time monitoring which may be achieved via the daily electronic transmittal of logbook information.
1	*Tagging research to provide (semi) fishery independent information:* Tagging data is required to understand and define stock boundaries for managed stocks. It will also provide demographic information for estimating life-history parameters for MSY and ACL estimates for managed stocks.
2	*Stock structure, especially for bottomfish populations:* Genetic, stable isotope and other analytical data are required to understand and define stock boundaries and the degree of mixing by different stock population segments for managed stocks. These will be essential components for estimating MSYs and ACLs.
3	*Life history and population parameters in risk order ranking:* Life history and population parameters, such as natural mortality rates, age and growth rates, and biomass, are needed to provide information on managed stocks in order to provide essential for estimating MSYs and ACLs.
4	*Species interactions and ecosystem functions:* Determination of trophic interactions will be necessary for understanding the interrelationships between managed stocks and ecosystem components, for identifying stock complexes, and for estimating MSYs and ACLs.
5	*Definition of a "stock", especially for ACLs:* Some stocks are managed based on political and administrative boundaries, although they may be biologically

	contiguous. Identifying and defining appropriate stock boundaries, especially for those stocks with cross-jurisdictional components, will be essential for estimating MSYs and ACLs.
6	*Impacts of global climate change, ocean acidification and sea level rises on marine stocks:* Understanding large scale oceanographic changes in response to climate change will be essential for evaluating likely impacts to habitat such as coral reefs, seamounts and other features such as current systems, and large-scale changes in stock distribution. These studies will also impact the estimation of MSY and ACLs for federally managed stocks in the WP Region.

Rank	Table 2. Research Needs – Human Communities
1	*Transferred effects (including market **changes**) resulting from domestic regulations, as well as from MPAs within archipelagos:* It is essential (and required by law) that resource managers understand and document the full range of likely physical and social impacts before recommending any conservation or management measures directed at fisheries. Domestic regulations and MPAs that constrain fishing can result in transferred effects such as increased pressure on less regulated or less sustainable foreign fisheries. These and other transferred effects of on have been discussed but need further research in order to determine and document their scope.
1	*Patterns of resource utilization and dependence, including sources, uses and distribution of fish in fishing communities:* Analyzing and documenting how fishing communities obtain, utilize and distribute fish will allow science-based consideration of the potential impacts of conservation or management measures prior to their recommendation, approval or implementation. It will also assist in the allocation of ACLs should this become necessary or desirable.
1	*Improve predictions (forecasts) of the likely responses of fishery participants and the impacts of management alternatives, and measure (monitor) new management regimes for their actual impacts on stocks, fisheries and human communities:* Research into the likely (and actual) responses of fishery participants to new fishery regulations will allow science-based consideration of the potential impacts of conservation or management measures prior to their recommendation, approval or implementation. It will also improve our capacity for adaptive management which is predicated upon learning from our past successes and mistakes.
2	*Fishery cost-earnings data:* Fishery managers rely on cost-earnings data to analyze the likely changes in fishery costs and revenues due to result from potential conservation or management measures prior to their recommendation, approval or implementation. The existing lack of information means that measures are often implemented without a clear understanding of their costs or benefits to fishery participants.
3	*Direct and indirect impacts of population/military/coastal buildups on marine resources, beach and fishing access, ports and transportation:* Anticipated population increases in the Marianas Archipelago and elsewhere are expected to increase pressure on fishery resources, access, ports and transportation systems. Forecasting and monitoring these impacts will allow the timely development (and adjustment) of appropriate science-based conservation and management measures.

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4	*Community structures, connections and resiliency:* Analyzing and documenting the structures, connections and resiliency of fishing communities will allow science-based consideration of the potential impacts of conservation or management measures prior to their recommendation, approval or implementation.
4	*Community perceptions regarding marine ecosystem status, and the reasons for those perceptions:* Understanding of community perceptions is necessary to ascertaining expected levels of voluntary compliance with conservation or management measures. Correcting misperceptions will provide an informed community with the necessary science to act in accordance with their values.
5	*Socio-cultural-economic impacts of ACLs on island communities:* Research and analysis regarding the likely impacts of ACLs on the well-being of fishery participants and communities is required by law prior to the recommendation, approval or implementation of any ACLs.
6	*Understand and balance the cultural needs and long-term aspirations of indigenous populations, with those of the larger and often very diverse island communities*: Well functioning communities are basic to all human endeavors, including fisheries and fisheries management. Communities may develop informal social contracts that would supplant law. Understanding this process will assist policy makers in the development of regulations that support the health of the community.
6	*Indigenous fishing rights, beach access, human safety and MPAs*: The conflicts inherent in these and other social issues may provide opportunities for the development of innovation, changes to the institutional structure and improved outcomes for the community. Documenting the issues and negotiations will assist managers in the development of better policies and regulations.
7	*Impacts of global climate change, ocean acidification and sea level rises on island communities:* Understanding the likely and actual impacts of these pressures will allow fishery managers to develop, recommend, approve and implement appropriate regulatory responses in a timely manner. In addition, conveying this information to fishery participants and communities will allow them to appropriately plan their fishing (and non-fishing) investments and activities.
7	*Basic information/community profiles: demographics, ethnicities, unemployment, income sources, employment opportunities etc. including information from household surveys:* Constructing community profiles will allow science-based consideration of the potential impacts of conservation or management measures prior to their recommendation, approval or implementation.
8	*Valuation of key species, including blue marlin:* Science-based valuation studies will allow explicit consideration and understanding of the trade-offs often encountered when considering conservation or management measures.
9	*Seafood safety and benefits:* A side-by-side scientific analysis of both the potential hazards and benefits of consuming various seafood products will provide consumers with complete information on which to base their dietary decisions.
10	*Potential impacts on marine ecosystems from economic downturns and increased fishing, especially cannery closures:* Economic downturns have been observed to increase fishing pressure as displaced workers seek to feed their families. Understanding the likely extent of such increases will allow fishery managers to

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	develop, recommend, approve and implement appropriate regulatory responses in a timely manner.
10	*Potential for fishery development projects for indigenous communities:* Traditional fishery management is about managing natural resources for the people - for food and sustainability - indigenous communities are under-represented in commercial fisheries and fishery management even though traditional knowledge is becoming viewed as a complex, rational approach to adaptive management of natural resource conservation and utilization.
11	*Traditional fishing methods (including for sea turtles) and related cultural practices, fish names:* Recent examination by researchers and anthropologists found that traditional ecological knowledge has often contributed to environmental conservation and protection. Utilization was part of the fishery conservation and management of native cultures and documenting traditional fishing methods will increase our understanding of successful fishery conservation and management methods.
11	*Role and impact of aquaculture:* Aquaculture is playing a larger role in feeding communities now and will continue to do so in the future. At the same time, it can lead to reduced prices for wild fish caught by the same community. Research into the potential role and impact of aquaculture in and on fishing communities needs to be conducted to determine the appropriate scale and types of aquaculture for various communities.

Rank	Table 3. Research Needs – Ecosystems
1	T*rophic interactions and food webs , including impacts of large predator removals. Expand and update ECOSIM* and encourage the development of alternative models: Develop and evaluate ecosystem or trophic models for use in ecosystem management; characterize the trophic dynamics of the ecosystem relevant to key fisheries species; and assess temporal dynamics of reef fish structure and examine recovery rates and yields following removal of large fish biomass.
2	*Impacts of forcings, humans, and natural biological cycles on nearshore habitat:* Improve understanding of the importance of large oceanographic forcings such as ENSO events, typhoons, seismic events, anthropogenic inputs (including pollution), and natural biological cycles or variability on nearshore reef resources and habitats over extended time scales.
3	*Functions and tradeoffs of MPAs:* Evaluate the effectiveness of MPAs, including no-take reserves and other marine zoning schemes, taking into account: - Abundance of ecologically and economically important species. - Spillover of fishery species into adjacent habitats. - Improvements in the condition of the sessile benthic community and abundance of mobile invertebrates. - Cascading effects on non-target species. Develop useful science-based indicators (biophysical and socioeconomic) of management effectiveness. Such indicators must be clearly articulated, measurable and related to conservation or management objectives.

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4	*Status and factors of marine ecosystem resiliency*: Identify potential environmental and anthropogenic factors that may influence the long term resilience of coral reef ecosystems and assess the resistance and resilience of specific populations, locations, and habitats to episodic events (e.g., coral bleaching), emphasizing areas that may serve as sources of reproductive propagules.
5	*Impacts of societies on ecosystems:* The impacts of fishing, land-based sources of pollution and climate change have been identified by NOAA as the three priority threats to coral reef ecosystems of United States. Studies to determine place-based research and management needs to address these three priority threat areas should be conducted.
6	*Connectivity within and between island/archipelago ecosystems:* Investigate the connectivity of fish populations and other ecosystem factors between/within island or archipelago systems to assess whether changes in fisheries and/or fishery management actions in one area have an effect on fish populations/ecosystems in other areas.
7	*Impacts of global climate change, ocean acidification and sea level rises on marine ecosystems*: Establish long-term monitoring programs in the U.S. Pacific islands to assess the impacts of global warming, ocean acidification and sea level rise on marine ecosystem resources and Pacific Island communities. This program should provide for timely analysis and public dissemination of the results and consider the socio-economic-cultural dimension of Pacific island fisheries as well as the physical, chemical and biological impacts on the marine environment.
8	*Condition factor (energy stores) of top predators:* Condition factor refers to a mathematical formula for determining the physiological state of a fish, including its reproductive capacity. It is calculated by dividing fish weight by length cubed (W/L^3). The heavier a fish for a given length, the higher its condition factor (K). Research is needed to calculate condition factor of apex predators for stocks in each island area.
9	*Tourism/non-use impacts (jet skis etc.):* Tourism in the Western Pacific region continues to grow resulting in increased usage of the coastal ocean environment for non-consumptive recreational purposes such as surfing, snorkeling, para-sailing, jet sking, kite surfing, whale watching and many other activities. Direct competition for ocean space among fishermen and non-consumptive users should be identified and quantified to better understand impacts to fishery resources and the ecosystem.
9	*Impacts of alien and invasive species:* Invasive and alien species impacts to marine ecosystems have been identified by State and Federal agencies and other non-governmental organizations as one of the major threats to Pacific Island ecosystems. The public and fishing community continue raise this issue as a major problem at public forums and meetings. Limited research on the impacts of introduced species such as taape, roi, gorilla ogo, and mudweed, has been completed to date.
9	*Carrying capacity:* Determining the carrying capacity of most management unit species in the Western Pacific region is yet to be completed. Carrying capacity is one of the basic parameters needed to produce stock assessments for these species.
10	*Develop and support decision tools for ecosystem management (e.g. CAMEO):* Improve understanding of marine ecosystem processes to support ecosystem

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	considerations in fisheries management by developing decision support tools that will better enable ecosystem approaches to ocean and coastal ecosystem management.
11	*Aqua/mariculture impacts*: Offshore aquaculture can impact ecosystems by acting as a fish aggregation device (FAD) and causing fish to congregate in areas where they might normally not occur. Other impacts such as pollution (via fish feed or waste), habitat degradation (site selection and placement), entanglement with protected species, effect of escapes on native species and habitat, and species selection (native vs non-native; use of wild species for brood stock) needs to be researched

Rank	Table 4. Research Needs – Protected Species
1	*Evaluate fishery interactions and post-hooking mortality rates:* NMFS' existing post-hooking mortality rates are based on outdated and incomplete information that needs to be updated so as to provide science-based assessments of conservation or management measures under consideration..
2	*Population and status assessments and evaluation of risk factors affecting stock recovery:* To date NMFS has emphasized fishery regulations to recover protected species however research has shown that in many cases terrestrial or non-fishing impacts to protected species are greater then fishery impacts. Understanding the relative sources of various impacts will allow the development of the most effective (and cost-effective) recovery plans and actions.
3	*Genetic structuring of key species to allow a scientific definition of a "discrete population segment":* Most existing recovery plans for sea turtles address each species as one stock (Pacific and Atlantic combined). A science-based legal process is required to separate these species into appropriate discrete population segments in order to allow for tailored approaches to their assessment, conservation and management.
4	*Examine conservation banking and offsets (credits):* As recognized by the USFWS, conservation banking and credits can encourage improved monitoring, conservation and management of listed species by allowing the public to offset some of the adverse impacts of their actions on these species. Failing to allow such offsets has been observed to result in the destruction of protected species or the denial of interactions with them. Research into this issue will determine whether positive impacts would be likely to result for listed species under the purview of NMFS.
5	*Impacts of global climate change, ocean acidification and sea level rises on protected species:* Research is needed on the potential impacts global change, such as sea level rise; increase in average ocean temperatures; and ocean acidification, may have on the ocean environment such as changes in trophic structure and prey base, alteration in oceanographic patterns, changes in feeding and migratory pathways, among others and linking these to changes in fish resources.
6	*Shark population, status and effects on Mariana Archipelago fisheries:* Research into shark depredation and bycatch in Mariana Archipelago fisheries with regards to decreasing shark bycatch and reducing shark depredation on target stocks.

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6	*Potential for cultural takes of sea turtles:* It is conjectured that the prohibition on cultural takes of sea turtles is needed for recovery of sea turtle populations. Traditional communities see the prohibition on cultural takes as cultural exploitation. It needs to be determined whether limited cultural takes of sea turtles would significantly affect the recovery of sea turtle populations.
7	*Interaction reduction and mitigation methods:* Further experimental research into reducing interactions between protected species and fishery activities and gears. Reducing incidental take rates of green sea turtles while maintaining target species catch rates in the American Samoa longline fishery is an important short-term priority.
8	*Evaluation/improvement of turtle conservation projects:* A scientific evaluation of the effectiveness of terrestrial turtle conservation projects is needed to identify data gaps, successes or failures and priority projects to be continued or established. This would include developing and identifying science-based success criteria for the appropriate populations and would allow identification of the types of projects that provide the best conservation benefits in the most cost effective manner.