MANAGING DATA-POOR FISHERIES

CASE STUDIES, MODELS & SOLUTIONS





1-4 DECEMBER **2008**

SPONSORED BY

RESOURCES AGENCY CALIFORNIA DEPARTMENT FISH & GAME

Sea Grant California

THE DATA-RICHNESS SPECTRUM & SUSTAINABILITY OF CALIFORNIA FISHERIES

LOUIS W. BOTSFORD AND PATRICK KILDUFF

Category	Species /Group	Landings	Effort	Size Composition	Age Composition	Stock Assessed
Nearshore Invertebrates	*Abalone*	*X*	*X*	*X*		
	Spiny Lobster	*X*	*X*	*X*		
	Red Sea Urchin	*X*	*X*	*X*		
	Purple Sea Urchin	*X*				
	Dungeness Crab	*X*	*X*	*X*		
	Rock Crabs (Yellow , Brown and Red)	*X*				
	Sheep Crab	*X*				
	Ocean Shrimp	*X*	*X*			
	Spot Prawn	*X*				
	Ridgeback Prawn	*X*	*X*			
	Red Rock Shrimp	*X*	*X*			
	Coonstripe Shrimp	*X*				
	Sea Cucumbers	*X*	*X*			
	Pismo Clam					
	Sand Crab	*X*				
	Wavy Turban Snail	*X*				
	Rock Scallop	*X*				
	Owl Limpet	*X*		*X*		
	Kellet's Whelk	*X*				
Coastal Pelagic Species	*California Market Squid*	*X*	*X*			
	Pacific Sardine	*X*	*X*	*X*	*X*	*X*
	Northern Anchovy	*X*			*X*	
	Pacific Mackerel	*X*	*X*		*X*	*X*
	Jack Mackerel	*X*				
Highly Migratory Species	*Albacore*	*X*	*X*	*X*	*X*	*X*
	Swordfish	*X*	*X*	*X*	*X*	*X*
	Pacific Northern Bluefin Tuna	*X*	*X*	*X*		*X*
	Skipjack Tuna	*X*	*X*	*X*		*X*
	Yellowfin Tuna	*X*	*X*	*X*	*X*	*X*
	Striped Marilin	*X*	*X*	*X*		*X*
	Shortfin Mako Shark	*X*		*X*		
	Thresher Shark	*X*		*X*		
	Blue Shark	*X*				*X*
	Great White Shark	*X*				
	Basking Shark	*X*				
	Salmon Shark	*X*				
	Opah	*X*				
	Louvar	*X*				
	Dolphin	*X*	*X*	*X*		

The types of fishery data available for California fisheries by fishery and species. This table identifies the California fisheries that have landings, effort, size composition, age composition, or stock assessments.
(Comments and corrections welcome: dpkilduff@ucdavis.edu)

Category	Species /Group	Landings	Effort	Size Composition	Age Composition	Stock Assessed
Nearshore Finfish	*California Sheephead*	*X*	*X*	*X*		*X*
	Cabezon	*X*	*X*	*X*		*X*
	California Scorpionfish	*X*	*X*	*X*	*X*	*X*
	Black Rockfish	*X*	*X*	*X*	*X*	*X*
	Blue Rockfish	*X*	*X*	*X*	*X*	*X*
	Olive Rockfish	*X*		*X*		
	Brown Rockfish	*X*	*X*	*X*		
	Copper Rockfish	*X*	*X*	*X*		
	Canary Rockfish	*X*	*X*	*X*	*X*	*X*
	Quillback Rockfish	*X*	*X*	*X*		
	Calico Rockfish	*X*	*X*	*X*		
	Monkeyface Prickleback	*X*	*X*	*X*		
	Kelp Rockfish	*X*	*X*	*X*		
	Gopher Rockfish	*X*	*X*	*X*		*X*
	Black-and-Yellow Rockfish	*X*	*X*	*X*		
	China Rockfish	*X*	*X*	*X*		
	Grass Rockfish	*X*	*X*	*X*		
	Tree Rockfish	*X*	*X*	*X*		
	Vermillion Rockfish	*X*	*X*	*X*	*X*	*X*
	Lingcod	*X*		*X*	*X*	*X*
	California Halibut	*X*	*X*	*X*	*X*	
	Starry Flounder	*X*	*X*	*X*	*X*	*X*
	Sanddabs	*X*	*X*	*X*		
	Rock Sole	*X*				
	Butter Sole	*X*				
	Fantail Sole	*X*				
	Sand Sole	*X*				
	Slender Sole	*X*				
	Bigmouth Sole	*X*				
	California Tonguefish	*X*				
	Curlfin Turbot	*X*				
	Hornyhead Turbot	*X*				
	Spotted Turbot	*X*				
	C-O Turbot	*X*				

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Category	Species /Group	Landings	Effort	Size Composition	Age Composition	Stock Assessed
Nearshore Finfish Continued	*Diamond Turbot*	*X*	*X*	*X*		
	Arrowtooth Flounder	*X*	*X*	*X*	*X*	*X*
	Pacific Halibut	*X*	*X*	*X*	*X*	*X*
	White Seabass	*X*	*X*	*X*		
	Giant Sea Bass	*X*				
	Yellowtail	*X*	*X*	*X*		
	Pacific Bonito	*X*	*X*	*X*		
	California Barracuda	*X*	*X*	*X*		
	Kelp Bass	*X*	*X*	*X*		
	Barred Sand Bass	*X*	*X*	*X*		
	Spotted Sand Bass	*X*	*X*	*X*		
	Ocean Whitefish	*X*	*X*	*X*		
	California Corbina	*X*	*X*	*X*		
	Spotfin Croaker	*X*	*X*	*X*		
	Yellowfin Croaker	*X*	*X*	*X*		
	White Croaker	*X*	*X*	*X*		
	Barred Surfperch	*X*	*X*	*X*		
	Calico Surfperch	*X*	*X*	*X*		
	Pile Perch	*X*	*X*	*X*		
	Redtail Surfperch	*X*	*X*	*X*		
	Rubberlip Surfperch	*X*	*X*	*X*		
	Striped Surfperch	*X*	*X*	*X*		
	Walleye Surfperch	*X*	*X*	*X*		
	Opaleye & Halfmoon	*X*	*X*			
	Silversides	*X*	*X*			
	Grunion					
	Pacific Angel Shark	*X*				
	Leopard Shark	*X*	*X*			
	Soupfin Shark	*X*				
	Shovelnose Guitarfish	*X*				
	Bat Ray	*X*		*X*		
	Big Skate	*X*				
	Thornback	*X*				
	Longnose Skate	*X*		*X*		*X*

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Category	Species /Group	Landings	Effort	Size Composition	Age Composition	Stock Assessed
Groundfish	*Bocaccio*	X	X	X	X	X
	Cowcod	X		X		X
	Chilipepper	X	X	X	X	X
	Blackgill Rockfish	X		X		X
	Widow Rockfish	X	X	X	X	X
	Yellowtail Rockfish	X	X	X	X	X
	Longspine Thornyhead	X	X	X		X
	Shortspine Thornyhead	X	X	X		X
	Bank Rockfish	X	X	X		X
	Shortbelly Rockfish	X	X	X		X
	Darkblotched Rockfish	X		X	X	X
	Pacific Ocean Perch	X	X	X	X	X
	Yelloweye Rockfish	X	X	X	X	X
	Dover Sole	X	X	X	X	X
	English Sole	X	X	X	X	X
	Petrale Sole	X	X	X	X	X
	Rex Sole	X	X	X		
	Sablefish	X	X	X	X	X
	Pacific Hake	X	X	X	X	X
Salmon	*Chinook Salmon*	X	X	X	X	X
	Coho Salmon	X	X	X	X	X
	Rainbow Trout (Steelhead)	X	X	X	X	X
	Coastal Cuttrhoat Trout	X		X		
Estuarine Invertebrates	*Bay Shrimp*	X	X			
	Pacific Razor Clam		X			
	Gaper Clams					
	Washington Clams					
	Geoduck					
	Littleneck Clams					
Estuarine Finfish	*Pacific Herring*	X		X	X	X
	Striped Bass	X	X	X		X
	American Shad	X	X	X		
	Green Sturgeon					
	White Sturgeon	X	X	X		
	Cow Sharks	X				
	Delta Smelt	X				
	Surf Smelt	X	X	X		
	Wakasagi					
	Night Smelt	X				
	Longfin Smelt					
	Eulachon					
	Whitebait Smelt	X				

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AGENDA

Managing Data-Poor Fisheries: Case Studies, Models, and Solutions

Monday, 1 December 2008

5:00 - 7:00 p.m. Sign-in, Welcoming Reception

Tuesday, 2 December 2008

8:00 a.m. Convene – *Rick Starr, Carrie Culver, Carrie Pomeroy (California Sea Grant)*

Welcome – *Sonke Mastrup (California Dept. Fish and Game)*

Workshop goals and objectives – *Rick Starr*

8:40 Data-Poor Fisheries in California – *Loo Botsford (UC Davis)*

9:00 More than one way to skin a fish: Alternative management strategies – *Chris Dewees (UC Davis)*

9:20 From Theory to practice: How to change California management – *Kristina Phipps (Environmental Defense Fund)*

9:45-10:15 BREAK

10:15 Examples of Management in Other Parts of the World – Rick Starr moderator

Managing data poor fisheries: Solutions from around the world – *Jeremy Prince (Murdoch University)*
On pre-testing the likely efficacy of suggested management approaches for data-poor fisheries – *Doug Butterworth (University of Cape Town)*
Engineering Management Procedures to achieve multiple objectives in data poor fisheries – *Kevin Stokes (New Zealand Seafood Council)*
Reconciling approaches to the assessment and management of data-poor species and fisheries with Australia's Harvest Strategy Policy – *David Smith (CSIRO)*

12:00 – 1:00 p.m. LUNCH

1:00 Alternative Management Approaches – *Rick Starr moderator*

Applying an ecosystem-based strategy used to restore Maine lobsters (*Homarus americanus*) to manage fish stocks – *Ted Ames (Penobscot East Resource Center)*
A case study in successful management of a data-poor fishery using simple decision rules: the Queensland spanner crab fishery – *Cathy Dichmont (CSIRO)*
Integrating social, economic and biological information in the management of data-poor fisheries – *Michael Harte (Oregon State University)*
Moving from data poor to data sufficient fisheries: the costs of management versus the benefits of management – *Nokome Bentley (New Zealand Seafood Council)*

2:00 – 2:30 BREAK

2:30 – 5:30 Discussion of Alternative Management Strategies

Breakout Sessions

6:00 – 7:30 p.m. SOCIAL

Wednesday, 3 December 2008

8:00 a.m. New Analytical Techniques – *Carrie Pomeroy moderator*

Can we use information from marine protected areas to inform management of small-scale, data-poor stocks? – *Carey McGilliard (UW)*
Application of an index method (AIM) to data rich situations: Can simple methods capture major features of complex assessments? – *Chris Legault (NMFS)*
Application of vulnerability evaluation criteria to data-poor species, a case study of California nearshore groundfish – *Jason Cope (NMFS)*
Using available data to integrate socioeconomic considerations into fishery regulatory analysis – *Cindy Thomson (NMFS)*

9:30 – 10:00 COFFEE BREAK

10:00 – 12:30 p.m. Discussion of New Analytical Techniques

Breakout Sessions

12:30 – 1:30 LUNCH

1:30 New Ways to Collect and Integrate Data – *Carrie Culver moderator*

Figuring out human dimensions: Illuminating models – *Madeleine Hall-Arber (MIT Sea Grant)*
Self-monitoring biological sampling by commercial fishermen in small-scale fisheries in New Zealand – *Paul Starr (New Zealand Seafood Council)*
Collaborative fisheries research: Working together to collect data on nearshore fisheries in California – *Dean Wendt (Cal Poly San Luis Obispo)*
Local-scale ecosystem-based fisheries in a Gulf of Maine estuary: managing for complexity, adapting to uncertainty – *Sherman Hoyt (Maine Sea Grant)*

2:30 – 3:00 p.m. COFEE BREAK

3:00 – 5:30 Discussion of New Ways to Collect and Integrate Data

Breakout Sessions

6:00 – 7:30 p.m. SOCIAL

Thursday, 4 December 2008

8:30 a.m. Reports from Break-out Sessions
1) Alternative management strategies for data-poor fisheries
2) Analytical techniques for guiding management from minimal data
3) New ways to collect and integrate biological and socio-economic data

10:00 – 10:30 COFFEE BREAK

10:30– 10:30 Discussion of Ideas Presented and Recommendations for California

12:00 – 1:30 p.m. LUNCH

1:30 – 3:00 Discussion of Ideas Presented and Recommendations for California

3:00 p.m. Adjourn

ABSTRACTS

Managing Fisheries without Adequate Data: The Multispecies Coastal Shelf Recovery Plan (A Collaborative, Ecosystem-Based Approach)

Ted Ames

Penobscot East Resource Center

An ecosystem-based collaborative management plan for restoring New England's depleted Multispecies Groundfish fishery is under development. The plan would create areas where fine-scale events directly affecting the biological productivity of a stock can be managed more effectively. Inner areas would provide small scale, habitat-friendly, selective inshore fisheries with controlled landings that allow stock recovery and provide substantial numbers for recruitment offshore. Improvements in local productivity under such a plan will help ensure that both inshore and offshore fisheries become sustainable. The plan addresses the inability of traditional system-wide assessments to detect local changes by creating a series of smaller contiguous management areas on the coastal shelf that nest within existing federal and State management systems. Boundaries for each area would be designed to bracket spawning components of key species such as Atlantic cod and would include their spawning grounds, nursery habitats and migration routes to the outer edge of the coastal shelf. Access would be limited to those who agree to restricted landings in the outer area using habitat-friendly, selective fishing gear that minimizes bycatch inshore. Collaborative management would include area advisory councils of fishermen under State administration with regional council oversight in federal waters. Area participants would be enlisted in collaborative efforts to identify additional critical habitats and enhance stock recoveries. The approach is compatible with total allowable catch (TAC) management, but does not rely on a TAC as the primary management tool.

NOTES

Engineering Management Procedures to Achieve Multiple Objectives in Data-poor Fisheries

Nokome Bentley[1] & Kevin Stokes[2]

[1] Trophia Ltd.
[2] SeaFIC

We contrast two paradigms for fisheries management decision making: the 'assessment' paradigm, based around stock assessments, and the 'procedural' paradigm, based around management procedures. The assessment paradigm has difficulty in providing management for data-poor stocks and we illustrate this in the New Zealand context. In contrast, the procedural paradigm has the potential to be useful for the data-poor stocks, but to date, most of the work on developing management procedures has focused on high value, data-rich stocks. This may be because several aspects of the procedural paradigm seem to be misunderstood or neglected. Giving appropriate attention to these aspects will improve the application of fisheries management procedures, particularly for data-poor stocks. Specifically, we argue that the design, evaluation and selection of management procedures should be treated as an exercise in engineering by applying generic solutions in cases where specific solutions are not currently available, and giving appropriate attention to how trade-offs are made amongst multiple management objectives.

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ABSTRACTS

Moving Fisheries from Data Poor to Data Sufficient: Evaluating the Costs of Management versus the Benefits of Management

Nokome Bentley[1] & Kevin Stokes[2]

[1] Trophia Ltd.
[2] SeaFIC

Fisheries are data-poor usually because they are low in value and as such are the lowest priority for funding. But there is often no formal evaluation of the cost of data collection versus the benefits it brings. In this paper, we describe how the costs and benefits of data collection can be evaluated within the context of fisheries management procedures. We provide an illustration, based on a data-poor fishery in New Zealand, of how to evaluate the utility associated with simple management procedures that incorporate no monitoring, fixed monitoring or adaptive monitoring. We demonstrate that it is feasible to do formal evaluations of alternative data collection regimes by including their costs in a utility function that incorporates other performance measures. Our particular example demonstrates the potential benefits of monitoring even in low value fisheries and, in principle, the gains that can be made through the use of management procedures that include adaptive monitoring.

NOTES

A Workshop on Alternative Tools for Nearshore Fisheries Management and a Case Study of the Port Orford Stewardship Area and Plan to Implement Community Based Fisheries Management

Jennifer Bloeser[1], Leesa Cobb[2] & Jim Golden[3]

[1] Pacific Marine Conservation Council
[2] Port Orford Ocean Resource Team
[3] Golden Marine Consulting

Current fisheries management is characterized by stock assessments and regulatory action that are applied on a large spatial scale. In the West Coast groundfish fishery, overfished species have required plan amendments to minimize harvest and allow rebuilding of stocks. Rockfish Conservation Areas (RCAs) have forced fleet effort both inshore and offshore. Growing markets for nearshore live and fresh market continue to put pressure on nearshore fisheries but the stock status remains unknown for many of them as insufficient data exist to carry out assessments. Small coastal communities and agencies are beginning to see the need to acquire more data and manage on a smaller spatial scale to address local concerns about resource sustainability and economic viability of smaller nearshore fisheries. In this paper we report on the results of a workshop on alternative tools for determining stock status and management of nearshore resources and a case study of a small fishing community's efforts to implement a Community Based Fisheries Management (CBFM) model in Port Orford, Oregon.

NOTES

ABSTRACTS

The Data-Richness Spectrum and Sustainability of California Fisheries

Louis W. Botsford & Patrick Kilduff

Department of Wildlife, Fish and Conservation Biology, University of California Davis

One approach to representing the current state of an ecosystem would be to describe the data available for each of its fisheries in terms of their usefulness in assessing sustainability and managing for optimum yield. The "data richness spectrum" for California's 149 marine fisheries indicates that 92 percent have landings data, but many of those have landings data only, hence would have no ability to track depletion in abundance, a minimal requirement for assessing risk. Sixty percent have catch and effort data, hence could possibly track depletion, depending on the quality of the effort data. Half of these (30 percent of California fisheries) also have sufficient age or size structure data to have had a stock assessment. A slightly greater number have not had stock assessments but have either size or age data, hence some potential for development of data poor methods for some level of assessment. The data richness spectra vary among the different specific fishery types, with nearshore invertebrates having no age distribution data, nearshore fish having a higher fraction of size structured data, and groundfish having a greater fraction of age structure data. We recommend development of data gathering and analytical methods that provide some means of improving the ability to at least track sustainability, possibly through collaborative efforts with the fishing industry.

NOTES

Deriving Management Reference Points without Fisheries Data

Elizabeth N. Brooks[1], Todd Gedamke[2] & Katherine A. Sosebee[1]

[1] Northeast Fisheries Science Center
[2] Southeast Fisheries Science Center

Assessment of skate species in the Northwest Atlantic Ocean has proven to be difficult due to the aggregated nature of commercial landings and the paucity of information on discards. We illustrate a method to derive biological reference points using only data from the research surveys conducted by the Northeast Fisheries Science Center, thereby avoiding the potential problems associated with disaggregating the commercial catches or attempting to estimate or hindcast discards. Time series of spawners and recruits were derived from the research surveys based on length of full vulnerability to the gear ("recruits") and length at maturity ("spawners"). Beverton-Holt curves were fit to pairs of spawner-recruit observations, after appropriate lagging to account for the age of recruits. SPR-based reference points were then derived from life-history parameters and the fitted Beverton-Holt stock recruit relationships. Overfishing reference points are given as $F_{\%SPR}$ and overfished reference points are expressed in terms of spawning stock depletion from unexploited conditions (i.e., $S_{F\%SPR}/S_{F=0}$). The ability to express the reference points explicitly in terms of survival, maturity, and fecundity allows the proxy SPR level to be tailored to the species of interest rather than applying a generic, 'one-size-fits-all' value. The appropriateness of the SPR level can be evaluated by inspection of the individual components to determine whether they are biologically realistic. The sensitivity of the method to the assumed age-constant natural mortality (M) was explored for a reasonable alternative range. The errors in variables problem was ignored in fitting the stock recruit relationship (*status quo*).

NOTES

ABSTRACTS

On Pre-Testing the Likely Efficacy of Suggested Management Approaches for Data-Poor Fisheries

Doug Butterworth, Susan J. Johnston & Anabela Brandão

MARAM (Marine Resource Assessment and Management Group)
Department of Mathematics and Applied Mathematics, University of Cape Town

The thrust of this paper is that decision rules for the management of data-poor fisheries cannot be based on expert judgment alone. Such rules need to quantify the extent of a management response to the values of the indicators available for the fishery and their trends. Prior simulation testing is needed to confirm that the application of any rules suggested is likely to achieve the objectives sought for the fishery. The management procedure (MP) approach (alternatively termed management strategy evaluation or MSE), which provides a framework for such testing, is summarized briefly. An example is presented of how this approach could be used to develop a decision rule (empirical MP) for a data-poor fishery for which the only indicator available is the mean length of the catch. The extent to which performance in meeting objectives could be improved if an unbiased index of relative abundance was available, and an MP based on a fitted population model applied, is illustrated. An MP developed for the fishery for Patagonian toothfish off the sub-Antarctic Prince Edward Islands is summarized. This illustrates how the MP testing framework can be used in circumstances where available indicators conflict, leading to considerable uncertainty about the present resource status. The information content of indicators is closely related to the extent to which they vary about trends in related underlying resource attributes (e.g. CPUE about underlying abundance). The compilation of lists of the statistical properties, such as CVs and autocorrelations, of residuals about detrended time series of indicators for fisheries worldwide is suggested. This would provide a sound basis to specify error structure in the simulation tests advocated for both generic and case-specific decision rules for data-poor fisheries.

NOTES

Managing-Data Poor Fisheries by Paying Attention to Managing Relationships

Flaxen Conway[1], Caroline Pomeroy[2] & Madeleine Hall-Arber[3]

[1] University of Cape Town
[2] University of California Cooperative Extension Sea Grant Program
[3] MIT Sea Grant College Program

Long before multi-million dollar NOAA Fisheries vessels were built, fisheries scientists relied on traditional or local ecological knowledge and valued the information that fishermen gathered during their daily life on the water. The information was eclectic, and included observations about a wide range of conditions and interactions of various species. Reflecting back upon these times, both fishermen and scientists have commented that the relationships between them were also very important. Later a "great gulf" between scientists and fishermen developed, as scientists focused more on hiring fishing vessels to use as research platforms and less on engaging and learning from fishermen to develop research ideas or test hypotheses. Over the last decade, the tide has turned again, and there is growing interest and activity in cooperative fisheries research (CFR). Some fishermen are growing increasingly comfortable with science, and more scientists have realized that there is untapped potential for mutual learning. Others have addressed the procedural considerations for effective CFR. This paper expands that work by highlighting the importance of the relationships among partners, the costs and benefits to everyone involved in CFR, and how these are actually critical factors for the establishment and achievement of sound scientific goals. Managing these relationships could be an important key to understanding how to manage data-poor fisheries.

NOTES

ABSTRACTS

Length-Based Reference Points for Data-Limited Situations: Applications and Restrictions

Jason M. Cope[1,2] & André E. Punt[2]

[1] Fishery Resource Analysis and Monitoring Division, Northwest Fisheries Science Center, NOAA Fisheries
[2] School of Aquatic and Fishery Sciences, University of Washington

Current fisheries management policies often require assessing stock status, a difficult task when population and fisheries data are limited. Froese (2004) offered three simple metrics (P_{mat}, P_{opt}, P_{mega}) based on catch length compositions by which to monitor population status relative to exploitation that avoids growth and recruitment overfishing. However, it is unknown how these measures relate to stock status and thus, how to apply them to inform future catches. We attempt to make this connection by exploring the relationship of these measures (collectively referred to as P_x) to fishing mortality and spawning biomass. The relationships are compared specifically to current target (0.4 SB_0) and limit (0.25 SB_0) reference points used for the U.S. west coast groundfish fishery using simulations based on a deterministic age-structured population dynamics model. Sensitivity is explored to fishery selectivity, life history traits and recruitment compensation (steepness). Each P_x measure showed a wide range of possible values depending on fishery selectivity, steepness, and the ratio of the length at maturity (L_{mat}) to the optimal fishing length (L_{opt}). The values of P_x suggested by Froese (2004) as being compatible with sustainable fishing are not always sufficient to insure stock protection from overfishing. Moreover, values for P_x cannot be interpreted adequately without knowledge of the selectivity pattern. A new measure, P_{obj} (the sum of P_{mat}, P_{opt}, and P_{mega}) is introduced to distinguish selectivity patterns and construct a decision tree to develop indicators of stock status. Heuristic indicator values are presented to demonstrate the utility of this approach. Although several caveats remain, this approach builds on the recommendations of Froese (2004) by giving further guidance related to interpreting catch length composition data under variable fishery conditions without collecting additional information. It also provides a link to developing harvest control rules to inform proactive fisheries management under data-limited conditions.

NOTES

Essential Fishery Information for Trap-Based Fisheries; Development of a Framework for Collaborative Data Collection

Carolynn S. Culver[1,2], Stephen C. Schroeter[2], Henry M. Page[2] & Jenifer E. Dugan[2]

[1] University of California Cooperative Extension Sea Grant Program
[2] Marine Science Institute, University of California, Santa Barbara

The availability of detailed up-to-date information needed for managing marine resources, including those that support fisheries, is limited throughout the world. In California, this lack of data is hindering the implementation and evaluation of two recent State laws, the Marine Life Management Act and the Marine Life Protection Act. The inability to meet the objectives of these laws is particularly acute for large cryptic benthic species (e.g., crabs, lobster, spot prawns) that play important roles in nearshore ecosystems and support valuable trap fisheries. These species are not readily quantified using conventional methods and thus are not usually included in existing monitoring efforts. Data collection programs, where fishery participants, managers and scientists collaboratively design, collect and analyze data, have the potential to provide essential fishery information needed to manage marine resources in a cost-effective way. However, broad application of this type of program requires development of a framework that facilitates the use of effective and efficient sampling methods and protocols, as well as the management of collected data.

Using the rock crab trap fishery as a model system, we conducted field sampling and held discussions with fishing partners and others involved in data collection efforts to investigate the feasibility of using a collaborative data collection approach to collect essential fishery information for trap fisheries in California. We explored methods and protocols that could be integrated into fishing practices to efficiently collect accurate data for the rock crab fishery, and potentially other trap fisheries. Our findings suggest that collaborative data collection programs are well suited for trap fisheries, particularly those that include multiple species or practice high rates of selectivity (i.e., sorting of the at-sea catch). Resulting recommendations for ensuring the process is transparent and the data are accurate and integrated into the management process, include the development and use of 1) scientifically sound data collection methods and protocols that are accepted by fishery managers, 2) hands-on training and re-certification programs for participants, 3) validation of the collected data, 4) well defined procedures for handling confidential data, 5) sufficient compensation and an adequate funding source, and 6) timely and consistent reviews of the data with subsequent actions as needed. While additional administrative, infrastructure and regulatory procedures are needed to successfully integrate this method into the management process in California, our results support the use and development of collaborative data collection programs, particularly for cryptic benthic species targeted in trap fisheries, for providing scientifically robust data for managing marine resources.

NOTES

ABSTRACTS

More Than One Way to Skin a Fish: Identifying Approaches to Managing California's Data-Poor Marine Fisheries

Christopher M. Dewees

University of California, Sea Grant Extension Program
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This paper introduces workshop participants to California fisheries and challenges them to identify applicable, feasible management approaches for fisheries in data-poor situations. Biological and human dimension approaches to fisheries management are listed along with key variables for both. I define seven key elements needed for improved management in data-poor situations.

NOTES

A Case Study in Successful Management of a Data-Poor Fishery Using Simple Decision Rules: The Queensland Spanner Crab Fishery

Cathy M. Dichmont[1] & I.W Brown[2]

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The Queensland spanner crab (*Ranina ranina*) is the target of a relatively data-poor, low value fishery that has been managed for the last decade using Total Allowable Catches in an Individual Transferable Quota system. Despite the fact that this management system is usually applied to data-rich fisheries, it has been successfully used on a data-poor fishery. The key ingredient has been the use of harvest strategies that consisted of only simple decision rules that were appropriate given the size of the fishery and knowledge of the resource. These strategies were tested in a Management Strategy Evaluation (MSE) framework. The MSE was not traditional in that a) the operating model (or "true" resource to be managed) was not conditioned to data but set to parameter ranges seen as appropriate for the resource and b) the TAC was not set using a stock assessment model so the magnitude of the stock biomass was unknown. The important test was whether one could develop harvest strategies that were robust to this large uncertainty in knowledge using only commercial catch rates. The management system had to be adaptive over time as more was learnt about the biology of the species and how the harvest strategies affected the management of the fishery. This meant that the TAC was almost always set using the harvest strategies, but that modifications to the decision rules were able to be made on several occasions as more was learned about the fishery. The transparency and simplicity of the rules mean that the industry is empowered to make significant contributions to fine-tuning the harvest strategies. As a result, the process does not rely only on scientific advances, but also on the pooled knowledge of scientists, industry and managers in a cooperative environment.

NOTES

ABSTRACTS

A Descriptive Example of Applying Vulnerability Evaluation Criteria to California Nearshore Species

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In light of ongoing crises in fisheries and marine ecosystem management, a growing body of literature has highlighted the need for biologists and resource managers to develop and apply methodologies that are capable of identifying species or populations at greater risk of overexploitation and extirpation. One increasingly popular approach is a productivity and susceptibility analysis (PSA), originally developed for Australian prawn fisheries, in which the vulnerability of a given stock is based on a combination of the estimated or perceived productivity of the stock plotted against the susceptibility to overfishing. This manuscript provides an example of this type of analysis developed for the 19 species included in the California Nearshore Fishery Management Plan (NFMP). The methodology is based on a version of the PSA approach being developed by the NOAA Fisheries Vulnerability Evaluation Working Group (VEWG), which is currently in the process of preparing draft technical guidance for conducting vulnerability assessments for species managed under Fishery Management Plans implemented by the regional Fishery Management Councils. Results of this case study in particular indicate that the more vulnerable species in the NFMP include China, copper, quillback and blue rockfishes, of which only the latter has been evaluated in a formal stock assessment. More importantly, we suggest that additional and more rigorous analysis of these or of other species managed by either (or both) the State of California and the Pacific Fishery Management Council, may aid managers and stakeholders in setting research and assessment priorities, considering management alternatives and strategies, developing or revising species assemblages for multispecies management systems, and evaluating how precautionary catch limits should be based.

NOTES

Figuring out the Human Dimensions of Fisheries: Illuminating Models

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Both natural scientists and economists commonly use quantitative data to create models of the systems that interest them, and then use these models to inform fisheries management. Other social scientists rely on lengthier, descriptive texts based primarily on qualitative data to assess the human dimensions. To their dismay, fisheries social scientists find that much of their rich narrative with keen insights ends up filling pages that are neither read nor meaningfully integrated into decision-making in fisheries management. Yet what all scientists, practitioners, and managers want and need is information that will lead to a better understanding of the ecosystem (comprised of interdependent ecological and human systems) and therefore, to fisheries management that benefits the whole system. Believing that only a combination of high quality quantitative and qualitative data will provide both the numbers and the context needed for success in ecosystem-based management, in this paper we discuss efforts to present social and cultural information in forms more familiar to those who rely on models for a representation of reality in the fisheries context. We point out how the designers of these models (or how we) think the models might be applied to fisheries management, noting how each model attempts to incorporate qualitative data to depict context essential for grounding the more commonly used biological and economic models. We also assess the benefits and limitations of these models, including the constraints on both their development and use.

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ABSTRACTS

Integrating Social, Economic and Biological Information in the Management of Data-poor Fisheries

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Fisheries management is a complex undertaking and the management of fisheries that are information limited is doubly so. Using two fisheries case studies from the west coast of the United States, the application of a structured Bayesian-based multi-criteria assessment (MCA) to data-deficient fisheries management issues is demonstrated. Managing the bycatch of yelloweye rockfish and minimizing the impact of commercial fishing on essential fish habitat requires fishery managers and stakeholders to evaluate and choose between management strategies that have different biological, social and environmental outcomes. A deficiency of biological, social and economic information to support such evaluations means the role of uncertainty must also be addressed in the decision-making process. The case studies show the major benefits of the Bayesian-based MCA to be the ability to: 1) Integrate biological, social and economic information measured in incommensurate units; 2) engage managers and stakeholders in the decision process increasing the probability of stakeholder buy-in for the decisions made; and 3) explicitly take into account uncertainty when evaluating alternative management strategies. Adoption of a structured MCA by fisheries managers improves decision-making in data-poor fisheries by making the selection of management strategies analytically robust, inclusive and transparent.

NOTES

What Can We Learn from Historic California Fisheries Data?

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Current stock assessment models require extensive sets of data. In addition to many life history parameters, they rely on time series of catch from fisheries to calculate total removals and to estimate historic biomass levels. Recent assessments have constructed catch series for various recreational, and commercial fisheries. California commercial landings are stored in several databases, which differ in time period, spatial coverage and spatial resolution. Information on type of fishing and an estimation of species composition from port sampling programs are available in more recent data. The longest series of California marine recreational data is the Commercial Passenger Fishing Vessel (CPFV) logbook series, but it groups all rockfish together. The Marine Recreational Fisheries Statistical Survey, which began in 1980, surveys all types of marine recreational fisheries in northern and southern California for catch disposition, effort, species size and weight. To create estimates for CPFV rockfish species catch before 1980, several sources of data must be integrated and assumptions made about similarity of species composition from different eras. Several recent assessments have used catch per unit effort from the recreational fisheries as an indicator of abundance. As catch of some species is restricted, other indices of recruitment are being explored including larval and juvenile abundance in trawl surveys, power plant impingement time series and observations from scuba and manned submersibles.

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ABSTRACTS

A Depletion Estimator for Within-Season Management of Yellowfin Tuna

Mark N. Maunder

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A depletion estimator is developed to estimate annual abundance from annual time series of catch data and an index of abundance. The method is applied to weekly data for yellowfin tuna in the eastern Pacific Ocean. The estimates of abundance from the depletion estimator are similar to estimates derived from a full stock assessment. The method can be applied to estimate abundance when only partial data are available for a given year, and the estimates of abundance can be used for within-season management. Cross-validation tests show that the method performs well (less than about 15% error) even in a situation when only a quarter of a year's data are available. Information from the stock assessment about the fishing mortality levels corresponding to maximum sustainable yield suggest that the catch quota should be set at about 60% of the abundance estimate at the begging of the year.

NOTES

Video-Based Electronic Monitoring of Fishing Operations

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Credible catch monitoring of landings plus discards is becoming a necessary condition for demonstrating that a commercial fishery is environmentally sustainable. Monitoring of at-sea discards and at-sea interactions with sensitive animals and habitats requires that on-vessel monitoring systems be employed. These monitoring systems must be independent third party systems, as opposed to self-reporting systems, in order to provide reliable and credible data. Over the past decade, video-based electronic monitoring (EM) technology has been developed, piloted and implemented to provide third party at-sea oversight of fishing operations. EM systems, consisting of up to four closed circuit television cameras, a GPS receiver, a hydraulic pressure sensor, a winch sensor, and a system control box, can be deployed on fishing vessels to monitor a range of fisheries issues including fishing location, catch, catch handling, fishing methods, protected species interactions, and mitigation measures. This paper first provides a general description of the EM technology and then presents the EM case study application to the groundfish hook & line fishery of Pacific Canada. In comparison with observer programs, EM has a number of advantages including suitability across a broad range of vessel sizes and operations, creation of a permanent data record, lower cost, higher scalability, and the ability to audit self-reported information from industry. In particular, EM has a compelling cost advantage - EM costs can be less than one third of a 100% observer program. Third party monitoring of total catch provides needed transparency in fishing practices and this in turn instills public confidence and trust in the commercial fishery. And 100% monitoring is the gatekeeper to economic sustainability through greater fishing opportunities, access to markets and needed industry rationalization.

NOTES

ABSTRACTS

Local-Scale Ecosystem-Based Fisheries in a Gulf of Maine Estuary: Managing for Complexity, Adapting to Uncertainty

Slade Moore[1] & John Sowles[2]

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Ongoing development of a Comprehensive Resource Management Plan for the Taunton Bay Estuary, Maine is intended to put resource-uses in the larger context of supporting the estuary's capacity to accommodate those uses without degrading ecosystem integrity or resilience. The initial phase of this plan targets issues of immediate concern regarding environmental alteration and stock depletion associated with fisheries for four benthic species. Having no dedicated funding, our overall approach for developing ecosystem-based fisheries for this estuary relies heavily on thrift and efficiency, two attributes not intuitively associated with managing for ecosystem complexity. Specific elements of the approach include integrating the participation and guidance of local resource-users, prioritizing key information needs, conducting local research and monitoring to identify objectives and track progress and creating mechanisms for adaptive management. Despite making inroads towards better understanding specific ecological attributes, processes and vulnerabilities of this estuary, the complexity of ecosystem components and unpredictability of responses to management actions nevertheless leaves much uncertainty. Advancing a nascent, ecosystem-based management effort under such uncertainty requires adoption of coping strategies, or project-crippling inertia is risked. Depending on the circumstances, we approach uncertainty by using alternative knowledge systems to their best advantage, affording ourselves with opportunities for making prompt management shifts, encouraging a long-term process of positive, incremental change in management and erring on the side of equability and precaution where sensitive species, ecologically influential community types, and the livelihoods of resource-users are at risk.

NOTES

Socioeconomic Profiling of Marine Dependent Communities on the Northwest Coast of the U.S.

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This article summarizes two different research elements of a fishing community profiling effort for the U.S West Coast. The first such element involves a quantitative model, Data Envelopment Analysis (DEA), for ranking commercial fisheries involvement by communities and describes the experiences of the joint Northwest Fisheries Science Center (NWFSC) and Alaska Fisheries Science Center (AFSC) social science teams in applying this model to West Coast and North Pacific fisheries. The breadth and robustness of the data available for this model allowed for a novel approach to characterizing communities according to their involvement in fishing. A list of communities most involved in fishing, according to the model employed, then allowed for 125 brief community profiles to be produced and distributed to fisheries managers. The strengths and weaknesses of the Data Envelopment Analysis (DEA) modeling approach are discussed. In describing the second element of our research, the article summarizes the effort to work in detail with some of the communities from the initial analysis. In order to ameliorate the lack of depth in the profiles, a subset of the communities selected by the DEA model were identified for further, more detailed profiling. Although this second element subsequently limited the geographic scope, the detailed profiles were designed to provide additional community information in a data-poor environment. A much different selection approach was employed in determining which communities to profile in-depth, and was generated both by the goal of providing community examples, and the desire to respond to short and long term policy needs.

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ABSTRACTS

Groundfish Management in Puget Sound: Managing Many Species and Fisheries with Limited Information

Wayne A. Palsson, Tien-Shiu Tsou, Chuk-Wang Cheng & Robert E. Pacunski

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Puget Sound includes the inland marine waters of Washington State and once provided for thriving recreational and commercial fisheries for groundfish species in Washington State. Primary species of interest include Pacific halibut (Hippoglossus stenolepis), a variety of flatfishes (Pleuronectidae), rockfishes (Sebastes), and codfishes (Gadidae), and lingcod (Ophiodon elongatus). Annual harvests from the commercial fishery peaked at 12,000 metric tons in 1979, and annual harvest from the recreational fishery peaked at 800 mt in 1986. Currently, only 250 mt of fishery are harvested by commercial fishers and only 100 mt are harvested by recreational fishers. The management and stock assessment of groundfish stocks has been uneven during the past three decades, varying from intensive monitored, surveyed, and assessed populations and fisheries to passive management primarily relying upon fishery-dependent information with ancillary surveys to examine specific fisheries or species. Because recreational and commercial harvests have been incomplete or lacked species composition information, formal stock assessment has not been possible in recent years. Currently, a precautionary management policy guides groundfish management in Puget Sound, and fisheries are co-managed between the Washington Fish and Wildlife Commission and the Treaty Tribes of Washington. The stock assessment of Puget Sound groundfish depends upon the evaluation of trends from fishery-dependent catch rates and fishery-independent surveys. These indices are evaluated for gross changes over time and categorized into several stock conditions based upon the degree of change. This approach generally suffers from poor precision in survey estimates, the influences of fishery regulations, and not directly relating changes to biological reference points. The challenges of managing Puget Sound groundfishes has led to several attempts to list several as endangered or threatened.

NOTES

Fishery Management, Monitoring Systems, and Data Layering in Data-Poor Environments

John S. Petterson & Edward Glazier

Impact Assessment, Inc.

Using the example of California's MPA monitoring program, we demonstrate how multiple, independently-derived, data sets can be assembled and analyzed, within low-information environments, to identify use areas, gear, seasonal, and social conflicts, and re-concentration of effort, resulting from past and present regulatory and fishery management actions. The paper examines, in particular, two methodological approaches intended to resolving both the issue of data inadequacies and data abundance (in the form of GIS data layering and analysis), and the issue of informant selection and reliability (through careful, replicable, informant network analysis). The results represent the basic requirements of a robust system for tracking changes over time in response to MPA constraints, and for "adaptive management" to a multitude of complex and overlapping regulatory controls on fisherman behavior.

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ABSTRACTS

From Paper to Practice: Incorporating New Data and Stock Assessment Methods into California Fishery Management

Kristina E. Phipps[1], Rod Fujita[1] & Tom Barnes[2]

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Conventional data collection and stock assessment methods, which require large amounts of time and resources, have become a bottleneck in California Fishery Management Plan (FMP) implementation, and in the transition of fisheries to science-based management. New, alternative methods that are less time and resource intensive could address this problem. However, clarity regarding how the California Department of Fish and Game ("the Department") will vet and accept new data collection and stock assessment methods is needed in order to spur the development and use of new methods and ensure that the results can be applied to fisheries management. This paper elucidates the Department's expected approach regarding the use of new stock assessment methods under existing FMPs and in the development of future FMPs, and sets forth a vetting process for stock assessment development and potential incorporation into management. The Department is open to considering – on a case-by-case basis – new, peer-reviewed approaches to estimating stock status and sustainable yield that produce quantitative results. The Department likely will review alternative stock assessment proposals in light of a set of established output criteria, including, for example, whether the assessment produces a quantitative estimate of vulnerability to fishing and quantitative sustainable harvest reference points. Once incorporated into FMPs or otherwise used for management decisions, peer-reviewed alternative analyses likely will allow fisheries to transition to science-based management from unmanaged states, or from precautionary management that is not based on quantified uncertainty.

NOTES

Managing Data-Poor Fisheries: Solutions from Around the World

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Biospherics P/L

Most of the world's fisheries are data-poor fisheries and this and across Latin America, Oceania, Asia and Africa and over the last 2-3 decades there has been considerable investment and success with their management. This paper provides a synthesis of this body of experience which arrives out a general consensus about the factors needed to manage data-poor and spatially complex fisheries. At its core the formula is: property rights, local fisher involvement, local communities managing for conservative levels of spawning per recruit and Simple Transparent assessment structures using basic data provided by fishers. Two case studies are presented illustrating how transparent assessment structures based around the managing local SPR are being used in Australia to foster fine scale management and data-collection. In the case of Australian abalone fishery divers are being taught to visually assess abalone reefs using shell morphology to distinguish newly emerged sub-adult abalone from fully fecund adult abalone. A decision tree codifies these qualitative assessments and is used by the diver's association to broker agreement on voluntary reef-scale catch caps and size limits. In the second case a quantitative decision tree is presented which uses size-based catch rates to incrementally determine the catch level that stabilizes a population around any target level of SPR. Developed for use with local stocks of finfish with uncertain levels of linkages to larger meta-populations I believe it has great application to rockfish assessment and management in California.

NOTES

ABSTRACTS

Application of An Index Method (AIM) to Data Rich Situations: Can Simple Methods Capture Major Features of Complex Assessments?

Paul J. Rago & Christopher M. Legault

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One of the core problems in fisheries science is the estimation of the scaling factor between estimates of relative abundance and true population size, called the catchability coefficient. Traditional stock assessment approaches to estimate these scaling factors rely on the ability to track cohorts using age data or on knowledge of fish biology and fishery characteristics. Fish stocks without age data and severely limited biological and fishery information are encountered all too frequently due to limited resources to collect data. In this paper we explore the general trends in abundance and fishing mortality deducible from only a time series of catch and a survey index. The model is named AIM (An Index Method) and is readily available on the NOAA Fisheries Toolbox website (http://nft.nefsc.noaa.gov). We define the relative fishing mortality rate as the ratio of catch to survey index and relate it to what we call the replacement ratio. The replacement ratio is an analytic, although heuristic, tool for examining the historical behavior of a population and any potential influences of removals due to fishing activities. We compare this simple method to results from more complex assessments of the same stock to examine whether AIM can capture major features of complex assessments in a data rich environment. In general, AIM correctly tracked the population trend and identified the relative impacts due to fishing, which supports the inference that AIM can be used in many data poor situations. However, manifestations of problems in complex assessments can sometimes be seen in the AIM results, which suggests that simple models are not immune to the pathology of misspecification.

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Moving from Data Poor to Data Rich; A Case Study of Community-Based Data Collection for the San Diego Red Sea Urchin (*Strongylocentrotus Franciscanus*) Fishery

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The San Diego Watermen's Association has developed a community based sampling program in cooperation with University scientists and the California Department of Fish and Game. The primary elements of the program include: (i) design of scientifically valid sampling protocols; (ii) implementation of these sampling protocols by working sea urchin divers; (iii) data quality assurance and control by scientists in cooperation with fishing partners; (iv) calibration studies to determine accuracy and precision; and (v) visualization and dissemination of data and results. Data have been collected by divers, both during normal fishery activities and in ancillary surveys using these protocols since 2003. We compare data quality and quantity to current state agency protocols and demonstrate some uses for stock assessment. In addition we discuss incremental changes in protocols that would facilitate monitoring of associated biological communities. Some results of the 6-year ongoing program for fishery dependent and independent data are briefly summarized.

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ABSTRACTS

Reconciling Approaches to the Assessment and Management of Data-Poor Species and Fisheries with Australia's Harvest Strategy Policy

David C. Smith[1], A.E. Punt[1,2], N.A. Dowling[1], A.D.M. Smith[1], G.N. Tuck[1], & I.A. Knuckey[3]

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There is an increasing expectation for decision makers to use robust scientific advice on the status of exploited fish stocks. As such, Australia has recently implemented a Harvest Strategy Policy for federally managed fisheries that sets limit and target biomass reference points. In common with most fisheries jurisdictions, however, Australia has many data-poor species and fisheries. Consequently, the challenge for those tasked with providing management advice for Australian fisheries has been reconciling the need to achieve specific risk-related sustainability objectives, given the reality of the available data/assessments for data-poor species and fisheries. Using case studies from two multi-species trawl fisheries, some general recommendations are drawn. Control rules for data-poor species should recognize that sufficient data may never be available for some species to enable quantitative assessments to be conducted. The lack of data on which to base quantitative stock assessments using population dynamics models, however, does not preclude the development of objective harvest control rules. Evaluation of harvest control rules using, for example, the Management Strategy Evaluation (MSE) approach is ideal, but implementation before rigorous testing is sometimes a necessary reality. Information from data-rich species and fisheries can be used to inform 'assessments' for data-poor species and thereby develop appropriate control rules. This can be done through formal methods such as the 'Robin Hood' approach or less formally by grouping species into "baskets" and basing management decisions on one appropriate member of the group. Stakeholder knowledge and buy-in to the process is essential when species or fisheries are data-poor. Use of this information, however, needs to be constrained by policy decisions such as pre-specified performance standards. There will always be a trade-off between the cost of data collection and the value of a fishery; in this paper we highlight that this does not have to be a major impediment to the development of realistic and sufficiently precautionary controls rules for the management of data-poor species and fisheries.

NOTES

The Accuracy of Catch Estimates from the British Columbia Groundfish Integration Project

Richard D. Stanley & Norm Olsen

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The British Columbia fishing industry and the Department of Fisheries and Oceans Canada introduced 100% monitoring of the commercial groundfish hook-and line fisheries in April 2006. The monitoring system was introduced as part of a three year pilot integration project. Among other elements, the system includes cameras and GPS-linked winch sensors mounted on all boats, 100% dockside monitoring of piece counts and weights, and 100% retention of all rockfish. Using catches of yelloweye rockfish as an example, this study examines the accuracy of the catch estimates produced by the monitoring program from April 2007-March 2008. The monitoring provides two separate official estimates of total catch in pieces (retained and discarded) by adding the catches for all trips as recorded in either the fisher logs or validated during dockside monitoring. We derived a third and independent catch estimate from the data output of the random review of the video footage. This review process randomly selects 10% of the events from each trip and enumerates the catch of each species from these events. Originally intended as an audit check on the veracity of the fisher logs, the review data can be used to provide an unbiased estimate of the mean and the variance of catch per event which can then be expanded to total catch. Since the data are collected at the moment of capture, unlike the official estimates from fisher logs or dockside monitoring, the video-based estimate is unaffected by misreporting of discards or dumping. Fortunately, the analysis indicated close agreement among the three estimates. This allows managers and industry to assume that the official estimates, which are essential for the day-to-day accounting in the fishery, provide reasonable estimates of catch and that there is negligible unreported discarding and dumping overall. The video-based estimate provides an unbiased catch estimate, rare in fisheries monitoring, which can capture the extent to which official catch accounting system is biased.

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ABSTRACTS

Fisher-Collected Sampling Data: Lessons from the New Zealand Experience

Paul Starr

New Zealand Seafood Industry Council

The New Zealand fishing industry has adopted a strategy of using fishers to collect biological sampling data from their fisheries, usually on a voluntary basis. This is an approach which can be adopted by data-poor fisheries to obtain data that would otherwise be not available. This paper describes the history of this approach over the 15 years that it has been used, including the types of fisheries where this approach has been applied. It also describes the designs employed, how these data have been used in stock assessment and fisheries management situations, and some of the problems encountered in administering these programmes. The paper concludes that, while these programmes need supervision and support in order to succeed, the benefits which can accrue are considerable. These include an inherent dynamic design which should ensure good representation of the fishery and the involvement of the fishers in collecting the data which are used to manage their fishery.

NOTES

Complementary Sampling Methods to Inform Ecosystem-Based Management of Nearshore Fisheries

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Area-based fishery management and ecosystem-based management strategies are presented as beneficial marine resource management tools, but require finite information about the structure and function of ecosystems to evaluate populations and describe ecosystem effects of fishing. The required information is not likely to be obtained from sporadic, fishery-dependent data collected from data-poor fisheries, and it is unlikely that there will be funds in the near future to conduct extensive fishery-independent surveys. This situation has led to an interest in relating or combining information from a variety of disparate sampling methods. From 2003–2006, we investigated relationships between estimates of catch-per-unit-effort (CPUE) and abundance generated from typical nearshore commercial fishing operations and estimates of density and abundance derived from SCUBA surveys in the same locations. Relationships among CPUE estimates from different sampling methods were found to be statistically significant in the case of many of the common species sampled across sites in Carmel Bay, CA. The compounding effects of within-sample variance and the error associated with regression equations, however, would result in poor confidence in values translated from one sampling method to another. Our results indicate that different sampling methods may each provide reasonable estimates of population trends, but are sufficiently different and variable so as to preclude the use of a scaling factor to standardize population estimates among sampling methods. A sampling program that benefits from the complementary strengths of both fishing gear and SCUBA sampling will likely result in the most comprehensive description of nearshore fish assemblages.

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ABSTRACTS

Improving Compliance and Enforcement in Data-Poor Fisheries

Jon G. Sutinen

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One of the principal challenges of fishery management is securing acceptable levels of compliance with the regulations and management measures implemented in a fishery. A major part of the challenge is that fishery enforcement is expensive, accounting for a quarter to over a half of all public expenditures on fisheries management. This raises two key questions: Are there are ways to improve the cost-effectiveness of traditional enforcement in data-poor fisheries? Are there ways to secure compliance without heavy reliance on costly enforcement? To address these issues, this paper explains the framework for assessing the performance of fisheries compliance and enforcement programs, and for identifying ways to improve compliance and to strengthen enforcement. Based on this framework and supporting evidence, we derive a set of general policy prescriptions for smart compliance policy. Smart compliance policy involves promoting voluntary compliance, targeting frequent violators, maximizing the deterrent of sanctions, accounting for non-compliance in setting regulations, and implementing of enforceable regulations.

NOTES

Data Requirements for Integrating Socioeconomic Considerations into Regulatory Analysis: Examples from California Commercial Fisheries

Cynthia J. Thomson

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An important role of fishery regulatory analysis is to provide managers with information regarding potential implications of their decisions before those decisions are made. The ability to diagnose management problems, devise customized solutions to these problems and anticipate the implications of alternative solutions is highly contingent on the types of data available. This paper describes various commercial fishery data sources – landings receipts, observer and logbook programs, port sampling programs, vessel registration files, State and Federal permit files, and socioeconomic data collections – and potential enhancements to these sources that may be beneficial for evaluating socioeconomic effects in the context of regulatory analysis. For illustrative purposes, California fishery data sources are used as a framework for considering uses of available data and contemplating future data possibilities. Various types of vessel and dealer behavior that may be relevant to regulatory analysis are depicted using landings receipt data. Recommendations are made regarding the need for additional data elements that could expand the scope and depth of current regulatory analysis and suitable venues for their collection.

NOTES

ABSTRACTS

Collaborative Research: An Effective Way to Collect Data for Stock Assessments and Evaluate Marine Protected Areas in California

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Collaborative fisheries research (in contrast to cooperative research) is based on the intellectual partnership between scientists and fishermen, and is an effective way to collect data for stock assessments and evaluate marine protected areas. Collaborative fisheries research is discussed in the context of co-management of marine resources and how it contributes to a more democratic form of fisheries management. Many benefits result from working together including 1) the incorporation of fishermen knowledge and expertise into the management process, and 2) the development of shared perspectives on the status of marine resources. The California Collaborative Fisheries Research Program was formed in 2006 to participate in the monitoring of marine reserves established through California's Marine Life Protection Act. This program can serve as a model for other areas on how to implement collaborative research, and that doing so will contribute significantly to the realization of community-based, co-management of marine resources.

NOTES

Setting Harvest Guidelines for Sedentary Nearshore Species Using Marine Protected Areas as a Reference

Jono R. Wilson[1], Jeremy D. Prince[2] & Hunter S. Lenihan[1]

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Classical approaches to fisheries management rely on methods that are not conducive to assessing stocks for which little historical data on catch and effort exist. Moreover, most nearshore rocky reef species exhibit spatial variation in harvest pressure and demographic rates, further limiting traditional stock assessment approaches. With the ever increasing implementation of Marine Protected Areas (MPAs), there is great potential for improving decision-making in management through comparisons of fished populations with those in MPAs. Here we conduct a management strategy evaluation (MSE) of a novel approach using MPAs as a reference area to set sustainable harvest levels in a decision tree framework. We examine this model for a hypothetical population of grass rockfish (Sebastes rastrelliger) in California by introducing process, observation and model uncertainty for a variety of possible scenarios, and compare these scenarios with the current precautionary approach now used to manage this species. Our model consistently improves total catch while maintaining total biomass and potential egg production at levels well within acceptable thresholds of management. We suggest further exploration of this MPA-based management approach and outline a collaborative research program in the California Channel Islands that may well be suited for testing an experimental management procedure.

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ABSTRACTS

Developing British Columbia's Inshore Rockfish Conservation Strategy

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[1] Fisheries and Oceans Canada, Pacific Biological Station
[2] Fisheries and Oceans Canada, Regional Headquarters

The inshore rockfish hook and line fishery in British Columbia is diverse with participants in directed commercial, recreational and Aboriginal fisheries, as well as other incidental fisheries coastwide. Expansion of the fishery outpaced management's effort controls and catch quotas were implemented in the early 1990's. Conservations concerns largely based on life history traits, resulted in restrictions to the directed fishery but other fisheries remained unmanaged. A growing mismatch between the demands of fishery management and the difficulties of inshore rockfish stock assessment led to the development of a conservation strategy in 2001. The strategy included four components: comprehensive catch monitoring, dramatically reduced fishing mortality, extensive fishery closed areas and improved stock assessment and monitoring. Targets were met by reducing fishing mortality by 50% and 75% by 2002 and 2003 for the harvesting sectors. Research survey programs were reinstated by the provision of funds in 2003. An intricate catch accounting and monitoring proposal from industry set the rules in a pilot groundfish licensing integration program launched in 2006. Progress continues to be made on this difficult task. Closed areas were implemented in 20% and 30% of rockfish habitats coastwide in 2007. Key to the development of the strategy was the consultation process. Consensus-based decision making within DFO and the organization and commitment of industry participants contributed to this success. Open communication and respectful conduct brought participants to the table and kept them engaged. Without the consultation process and the benefits from this exchange, the conservation strategy would not have been possible.

NOTES

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