



## **The Oregon Pink (Ocean) Shrimp Trawl Fishery**

### **Draft Report for Public Review**

Contract Number: 05-04 Oregon Ocean Shrimp  
Version: Draft Report Version 2

Date: August 20, 2007

Client:  
Oregon Trawl Commission (OTC)

MSC reference standards:

MSC Accreditation Manual Issue 4,  
MSC Fisheries Certification Methodology (FCM) Version 6,  
MSC TAB Directives (All)  
MSC Chain of Custody Certification Methodology (CoC CM) Version 6.

Approved Certification Body:  
TAVEL Certification Inc.  
2000 Barrington Street, Suite 701  
Halifax, Nova Scotia, Canada B3J 3K1

Assessment Team  
Mr. Steven Devitt, B.Sc. TAVEL Certification Inc.  
Mr. Donald Parsons, M.Sc.  
Mr. Mark Pedersen, Margenex International Inc.  
Dr. James Wilen, University of California, Davis

## TABLE OF CONTENTS

<b>1. Introduction .....</b>	<b>1</b>
1.1 Unit of Certification .....	1
1.2 The Client .....	2
1.3 Summary .....	2
1.4 Strengths and Weaknesses of Client Operation.....	3
1.5 Conditions .....	3
<b>2.0 Background to the Report.....</b>	<b>4</b>
2.1 Authors and Peer Reviews .....	4
2.2 Previous Assessments .....	6
2.3 Field Inspections .....	6
2.4 Consultations.....	6
<b>3.0 Fishery Background Information.....</b>	<b>8</b>
3.1 The Target Species.....	8
3.2 Candidate Fishery .....	9
3.3 Historical Management Context.....	9
3.4 The Fishery Area of Operation.....	11
3.5 Fleet, gear and harvest controls.....	11
3.6 Catch .....	12
3.7 Bycatch .....	13
3.8 Interactions with Protected, Endangered, Threatened Species .....	14
<b>4.0 Management System.....</b>	<b>15</b>
4.1 Management System Goals and Objectives .....	15
4.2 Management Plan.....	16
<b>5.0 Stock Health Evaluation.....</b>	<b>17</b>
5.1 Stock Health Monitoring.....	17
5.2 Current Stock Status.....	17
<b>6.0 MSC Principles and Criteria for Sustainable Fishing.....</b>	<b>19</b>
<b>7.0 Fishery Evaluation Process .....</b>	<b>23</b>
7.1 Certification Process .....	23
7.2 Other Fisheries in the Area .....	25
<b>8.0 Fishery Performance .....</b>	<b>26</b>
8.1 Interpretation of the MSC Standard .....	26
8.2 Scoring Methodology.....	26
8.3 Submission of Data on the Fishery .....	27
8.4 Performance Evaluations .....	28
<b>9.0 Tracking, Tracing Fish And Fish Products .....</b>	<b>28</b>
<b>10.0 Certification Recommendation.....</b>	<b>29</b>
10.1 Conditions .....	29
<b>11 Assessment Results .....</b>	<b>32</b>
<b>References .....</b>	<b>117</b>

## Appendix 1 - Peer Reviewer Comments

### TABLES

Table 1: Final Agenda for Oregon Ocean Shrimp Fishery Certification Assessment Visit, Jan 21 - 26, 2007 .....	7
Table 2: West Coast Ocean Shrimp Landings (millions pounds) , average count per pound and average ex-vessel prices for Oregon ocean shrimp fishery for period of 1999 – 2006.....	13
Table 3: Catch (kg) and percent composition of the catch by weight in ocean shrimp trawl nets with rigid-grate BRDs with 32 and 19mm bar spacing, June 2005.....	14
Table 4: Final scores allotted to Oregon shrimp fishery and number of conditions issued. ....	29
Table 5: Scoring table for Oregon Pink Shrimp Fishery.....	33

### FIGURES

Figure 1: Areas of candidate fishery. Pie graphs show average ocean shrimp catch (t) for the years 1980–1992 by area of catch, broken out by state or country of landing. (Source: Hannah and Jones, 2007).....	10
Figure 2: Fishing effort (1000's of single-rig equivalent hours: 1 SRE = 1 single-rig hour= 1 double-rig hours x 1.6) for pink shrimp landed in Oregon, 1968 – 2006. ....	18
Figure 3: Annual percent age composition of pink shrimp (#'s of shrimp) landed in Oregon, 1975-2006.....	18
Figure 4: Catch per unit of effort (CPUE=lbs/SREhb) for vessels landing pink shrimp into Oregon, 1968-2006.....	19

### Amendments Issued Since Original Draft

Version	Date	Amendment Description
1	July 31, 2007	First Draft
2	August 17, 2007	Peer Reviewed Draft

## 1. INTRODUCTION

The Marine Stewardship Council (MSC) is a non-profit organization whose mandate is the long-term protection of the world's marine fisheries and the associated ecological components. Through a process of consultation with various stakeholders over a two-year period commencing in 1996, the MSC established its standard for well managed and sustainable fisheries called the "MSC Principles and Criteria for Sustainable Fishing" (MSC P&Cs).

The finalized MSC Fisheries Certification standard was issued in 1998, and has since been used as the basis by which fisheries are evaluated under the MSC program. The fisheries certification methodology (FCM) has since been updated periodically with the current version (FCMv6) issued in September 2006.

The objective of the MSC is to promote fisheries certified as sustainable directly in the marketplace through the use of the MSC Fish-tick eco-label on certified fish products. Ultimately, through educating fish product consumers about the plight of fishing stocks in the world and the MSC Program, it is hoped they will reward sustainable fisheries by choosing those fish products originating from certified sustainable fisheries.

Interested fisheries can submit their candidature to an accredited certification body for comparison against the MSC P&Cs. The comparison is a three part process inclusive of a pre-assessment (data gap analysis of the fishery), a full assessment (measurement of the fishery against the MSC P&Cs) and certification (5 year validity with annual surveillance requirements) for those fisheries that meet the standard. Successfully certified fisheries can claim their fishery is well managed and sustainable through the use of the MSC Fish-tick eco-label on product and marketing materials.

### 1.1 Unit of Certification

The MSC certification methodology defines a candidate fishery unit of certification as follows "The fishery or fish stock (=biologically distinct unit) combined with the fishing method/gear and practice (=vessel(s) pursuing the fish of that stock) and management framework."

The candidate fishery is therefore defined as

<b>Species:</b>	Ocean Shrimp, Pink Shrimp ( <i>Pandalus jordani</i> )
<b>Geographic Area:</b>	West Coast USA, Oregon, Washington, California (WOC)
<b>Method of Capture:</b>	Otter trawl
<b>Fleet:</b>	Oregon permitted vessels fishing in WOC and US EEZ waters, landing in Oregon ports.
<b>Stock:</b>	This certification assesses the west coast ocean shrimp stock which extends from south east Alaska to California waters. This assessment considers the health of the coast

wide stock and the effects of the Oregon permitted harvesters on that stock.

**Management:**

The fishery is managed by the Oregon Department of Fish and Wildlife.

## 1.2 The Client

The client for the assessment is the Oregon Trawl Commission, an Oregon state government agency. The Oregon Trawl Commission (OTC) operates under the umbrella mandate of the Oregon Department of Agriculture Commodity Commissions Program. The commission was formed by a vote of the producers in 1962, and is funded entirely by fishermen from a percentage of their catch. OTC is made up of eight commissioners: five fishermen, one processor, one distributor and one public member. Commissioners are chosen from among the owners and captains of trawl vessels, processors and distributors by the director of the Oregon's Department of Agriculture.

## 1.3 Summary

This assessment was started in April 2005, finalized performance indicators were published in September 2006, a fishery visit was conducted in January 2007. The assessment was conducted using the MSC Principles and Criteria for Sustainable Fishing, Issue 2, November 2002. The MSC Fisheries Certification Methodology (FCM) Version 5, April 2004 was followed for the initial part of the certification assessment, however, the latest version, Version 6, September 2006 was used for all subsequent steps after the finalization of the Performance Indicators and Scoring Guidelines in September 2006.

The fishery is managed by the State of Oregon (Oregon Department of Fish and Wildlife) through a limited entry program requiring harvesters have both a license for operating a commercial fishing vessel and a limited entry ocean shrimp harvesting permit. The Oregon Legislature used an Oregon Revised Statute (ORS) to establish the limited entry fishery. The Oregon Fish and Wildlife Commission adopts other rules and regulations through the Oregon Administrative Rules (OARs) setting process.

There is no formalized federal fishery management plan for West Coast ocean shrimp, however, the three states (Washington, Oregon and California - WOC) have adopted a tri-state management process which is used to establish common approaches on issues of fishery control and conservation.

The Assessment Team consisted of three participating members and one lead auditor to provide guidance on the certification methodology as required by the MSC FCM. The team members were, in order of MSC Principle, Mr. Don Parsons, M.Sc. Mr. Mark Pedersen, M.Sc. and Dr. James Wilen. The Lead Auditor for TAVEL Certification was Mr. Steven Devitt, B.Sc.

The Assessment Team developed the subcriteria groupings, performance indicators and scoring guidelines which were used to evaluate the performance of the fishery regarding

its conformance to the MSC Principles and Criteria for sustainable fishing. Through the normal process of public comment, the performance indicators and scoring guidelines (PISGs) were finalized based on comments by the client, the MSC and stakeholders. Stakeholders were contacted personally and/or through the electronic media, and were given the opportunity to make written and oral submissions.

After consideration of all objective evidence presented, the team recommends that the fishery be certified with conditions.

#### **1.4 Strengths and Weaknesses of Client Operation**

The Oregon shrimp fleet has a long history of actively working with the fishery managers to improve the fishery through innovation. The fleet has participated actively to; identify solutions to increase CPUE through net experiments in the early fishery, identify biologically important periods and supported a fishery season to improve stock health and to reduce the bycatch of fishery through the introduction, testing and continual improvement of the bycatch reduction devices.

There is a significant amount of latent effort in the fleet. There are approximately 135 shrimp permits issued in the Oregon fleet and for the last few years active permits have averaged between 37 and 50 permits. Return of latent effort into the fishery presents a real risk to both the economic and biological health of the fishery.

Shrimp biology and oceanographic conditions provide challenges to biologists in terms of developing a predictive capacity for stock abundance. These challenges have left the fishery without predictive precautionary reference levels which can be used for managing harvest levels.

#### **1.5 Conditions**

##### **Performance Indicator 1.1.2.1**

The client must meet the requirements of the 80 scoring guidepost prior to the first annual surveillance audit. Discards are to be accurately recording in log books. Discards are to be well estimated for adult and juvenile shrimp.

##### **Performance Indicator 2.1.1.4**

Within one year, the client must document the main elements of the ecosystem affected by the fishery. Within two years the client must have started a study which will demonstrate their understanding of the affected ecosystem elements by providing a convincing scenario of how the ecosystem would recover from the fishery related impacts.

### **Performance Indicator 3.1.3**

Prior to the first annual surveillance audit, the client must prove that the management system estimates all commercial catches, landings and by-catch and annually assesses the status of the stock.

### **Performance Indicator 3.6.1**

Within one year, the client shall subject the fishery monitoring program to an independent outside review to identify gaps. The review shall verify that the monitoring program covers all indicators of stock health and management performance.

The review must be undertaken by a credible management expert.

## **2.0 BACKGROUND TO THE REPORT**

### **2.1 Authors and Peer Reviews.**

The assessment team consisted of four individuals. They are as follows:

**Mr. Don Parsons, M.Sc.** – Retired shrimp population biologist from Fisheries and Oceans Canada, Newfoundland Region. Mr. Parsons was the Principle Scientific Investigator for the biology, ecology and population dynamics of northern shrimp (*Pandalus borealis*) and fisheries research in the Newfoundland and Labrador Region from 1978 through to 2006. He has represented Canada at several international fora on *pandalus* species. He has published extensively on the biology and population dynamics of northern shrimp.

**Mark Pedersen, M.Sc.** - A Senior Marine Scientist and President of Margenex International, founded in 1992. Mr. Pedersen has extensive experience in marine and aquatic environmental issues; biology and habitats of economically important marine fishes, shellfish, halibut, and salmon species; fishery management policy and regulations; seafood business and statistics for Pacific Northwest fisheries; Alaska offshore fisheries and Pacific Fishery Management Council issues; and calculation of lost fishing revenues and potential fisherman earnings due to mishaps. He has directed, managed, and/or participated in numerous projects involving fish migrations, resource stock assessments, fishery characterization, marine habitat impact assessment, enhancement, and mitigation. His work also involves assessment of environmental impacts, the Endangered Species Act, and planning and design of natural resource related projects. Mr. Pedersen worked with the Washington Department of Fisheries and Wildlife from 1973 to 1991, his last position there was as Deputy Assistant Director, Marine Fish and Shellfish Branch.

Mr. Pedersen was contracted as a peer reviewer of the US Alaska halibut long line fishery certification conducted by Scientific Certification Services in 2006.

**Dr. James Wilen** – A Professor at the Department of Agricultural and Resource Economics at the University of California Davis campus. His primary areas of interest and research are natural resource economics and environmental economics. He was named a Distinguished Fellow of the American Agricultural Economics Association in 2001. He has written and presented on various issues associated with West Coast fisheries policy. His work has focused on examination of bioeconomic modeling of fisheries policy, assessing marine policy analysis capabilities, examination of the limited entry prospects in multispecies fisheries on the West Coast,

### **Lead Auditor – Certification Process**

Mr. Steven Devitt, B.Sc. – Mr. Devitt is the Operations Manager and Lead Auditor for TAVEL Certification Inc since 2000. His principle responsibilities include management of the project, verification of proper MSC Fisheries Certification Methodology (FCM) procedural implementation during the full assessment, preparation of report and client contact. Mr. Devitt brings a broad environmental and fisheries background to the project, he is a trained ISO 14000 lead auditor. He also has a strong working knowledge of anthropogenic causes of disturbance to coastal zones.

### **Peer Reviewers**

As required by MSC Fisheries Certification Methodology, version 6, the client reviewed report must be peer reviewed by two individuals. The peer reviewers for this report are as follows:

**Dr. Donald Gunderson** - Donald Gunderson is a retired Professor from the School of Aquatic and Fishery Sciences at the University of Washington. He joined the School of Fisheries in 1978, after working as a research fisheries biologist with the Washington State Department of Fisheries and then the National Marine Fisheries Service. Don's research interests are in population dynamics, habitat requirements and recruitment of marine fish. He received his Ph.D. in Fisheries from the University of Washington in 1975.

**Dr. Susan Hanna** – Susan Hanna is professor of marine economics at Oregon State University, affiliated with Oregon Sea Grant and with the Coastal Oregon Marine Experiment Station. Her research and publications are in the areas of fishery economics, fishery management, history of fishery policy and property rights. She has served as a scientific advisor to the Pacific Fishery Management Council, Northwest Power Planning Council, National Marine Fisheries Service, Minerals Management Service and National Oceanic and Atmospheric Administration. She has been a member of the National Research Council's Ocean Studies Board and several NRC Committees.

## **2.2 Previous Assessments**

This is the first full assessment of conformity of the Oregon ocean shrimp fishery to the MSC Principles and Criteria for Sustainable Fishing.

## **2.3 Field Inspections**

Field visits into the fishery were made once during the pre-assessment and on two occasions during the full assessment. The pre-assessment visit was conducted in February 2004 with visits to the client's office, then in Astoria, and to ODFW offices in Newport, Oregon. The first full assessment visit was conducted in March 2006. Two members of the assessment team met with the client and staff from the Oregon Department of Fish and Wildlife (ODFW). The objective of the meeting was to educate the client and ODFW staff on the assessment process and to discuss the initial draft performance indicators. There were also discussions about the general areas of concern in the fishery raised during the pre-assessment process.

The primary fishery assessment visit was conducted during the period of January 21 to 25, 2007 with meetings held in Newport and Astoria on January 23 and 24. These meetings included the client, harvesters, processors, ODFW scientific and management staff, an observer of the West Coast Groundfish Observer Program and a member of the Oregon State Police. The primary objective of the assessment visits was to confirm issues of the candidate fishery performance.

## **2.4 Consultations**

Stakeholder participation was very low during the full certification assessment. TAVEL Certification made multiple attempts to encourage stakeholder participation during the full assessment, to no avail. TAVEL used a number of methods to contact potential stakeholders within the fishery including posting of all official notifications through the MSC email notification list. TAVEL also posted the fishery notification via electronic bulletin boards (Heads Up a electronic bulletin board for the west coast fishing industry) and email news services (Marine Fisheries Conservation Network). Finally, emails were sent directly to a number of identified representatives for environmental or conservation groups in on the west coast. This included individuals from the following groups; the pink shrimp fisheries managers in California and Washington, Environmental Defence, Marine Fisheries Conservation Network, Monterey Bay Aquarium, Natural Resources Defense Council, Oceana, Pacific Fishery Management Council, Pacific Marine Conservation Council, Pacific States Marine Fisheries Commission and World Wildlife Fund. A list of details of the stakeholder consultations undertaken during the full assessment follows in Table 1.

Two types of stakeholders were met during the consultation process. Those who were specifically invited by the assessment team with the objective of attaining specific information about the fishery and its management. This group included harvesters, the client and their contractor hired to prepare the PISG response submission, ODFW

personnel, Oregon State Police personnel, and a observer from the West Coast Groudfish Observer Program.

The second group of stakeholders included those parties whose information was not specifically requested by the assessment team but who chose to present information about the fishery, the stock health science, fishery impacts and the fishery management system. This group of stakeholders would generally include all other parties who have a concern about some aspect of the fishery and its management. Two groups made specific requests to meet with the assessment team, both groups represented companies involved in processing pink shrimp. The main points of interest which were discussed was the certification assessment process, potential implications of a certified fishery on processing companies and the chain of custody certification process.

The assessment team and the client surmise that the lack of stakeholder participation is generally attributable to the conscientious management of the fishery by ODFW, specifically on the positive efforts to reduce bycatch of fish species in the fishery.

**Table 1: Final Agenda for Oregon Ocean Shrimp Fishery Certification Assessment Visit, Jan 21 - 26, 2007**

Date	Location	Activity	Facilities
21-Jan-06	Portland, OR	Arrival	No
22-Jan-06	Portland, OR	PI&SG Weighting (Closed to client and stakeholders)	<u>Hotel</u> Red Lion Conference Center
23-Jan-06	Newport, OR	10:30 - Arrive in Newport 11:00 - Client Opening Meeting - B. Pettinger, J. Golden 12:00 - ODFW - B. Hannah, S. Jones 13:00 - Working Lunch 13:45 - Harvesters Meeting - J. Boardman, others 14:30 - ODFW Manager - P. Burke 15:00 - ODFW 16:00 - OSP - Sgt. T. Thomson 16:30 - WCGOP - R. Shama	<u>Meeting Venue</u> Old Library Room Educational Wing Hatfield Marine Science Center <u>Hotel</u> La Quinta
24-Jan-06	Astoria, OR	Drive to Astoria (0700 - 10:30) Stakeholder Meeting - Borenstein's - Doug Heater Scoring After scheduled meetings	<u>Meeting Venue</u> OSU Seafood Lab 11:00 - 18:00 <u>Hotel</u> Comfort Suite
25-Jan-06	Portland, OR	Drive to Portland (0730 - 10:00) Scoring (11:00 - ?) Closed to client and stakeholders	<u>Hotel</u> Red Lion 102nd St
26-Jan-06	Portland, OR	Wrap UP	<u>Hotel</u> Red Lion 102nd St

### **3.0 FISHERY BACKGROUND INFORMATION**

#### **3.1 The Target Species**

The fishery targets ocean or pink shrimp (*Pandalus jordani*). Most pandalid shrimp are protandrous hermaphrodites, which are animals that undergo a change of sex, starting out as males and then becoming females in the final years of their lives. The time spent in each life stage (larval, juvenile males, mature males and females or primary females) varies by location. Although this is the general pattern, individuals of some species can bypass the male phase completely and function only as females. These individuals are known as primary females.

Female ocean shrimp usually carry between 1,000 and 3,000 eggs. Small individuals in their second year have been found carrying as few as 900 eggs, whereas larger shrimp in their third or fourth year of life have been found with up to 3,900 eggs. Mating takes place during September and October, and the external fertilization of the eggs takes place when the females begin extruding eggs in October. The female carries the eggs between the posterior swimming appendages until the larvae hatch. The peak of hatching occurs during late March and early April. Ocean shrimp go through a larval period that lasts 2.5 to three months. The developing juvenile shrimp occupy successively deeper depths as they develop, and often begin to show in commercial catches by late summer.

Shrimp grow in steps by molting or shedding their shells. Growth rates for ocean shrimp vary according to region and also by sex and year class. There is a clear pattern of seasonal growth despite the variations mentioned, with very rapid growth during spring and summer and slower growth over the winter. The growth rate decreases as the shrimp age. Ocean shrimp may reach 5.5 inches in total length, but the average catch size is about four inches. In California, few shrimp survive beyond their fourth year. Studies on natural mortality estimate that the survival between fishing seasons (over winter) is 46 percent, 76 percent, and 43 percent for ocean shrimp during their first, second, and third winters of life, respectively.

Shrimp must shed their exoskeleton to grow. As a result, no permanent body structures are retained, and aging the animals using conventional ring-counting techniques is impossible. Instead, an analysis of length data that incorporates the animal's sex and maturity condition is used. Sex and maturity are important factors in the analysis because males and females have different growth patterns. Males continue to grow and moult throughout the year, while females cease moulting while carrying eggs. The abundance of females cannot be extrapolated from age/ size composition alone, because some animals can skip the male phase completely.

Ocean shrimp have been found from Unalaska to San Diego in waters from 37 to 460 meters in depth. Commercial concentrations are typically found between 90 and 180 meters depth. Shrimp congregate over green mud or mixed green mud - sand substrates called beds. Dependent upon food availability in the water column, shrimp demonstrate a

diurnal vertical migration pattern, rising in the water column during the night to feed and settling back close to bottom during the day. It is during daylight hours that the shrimp are harvested using trawls.

The habitat, behavior and migration of shrimp are important criteria used in stock assessments. Different species generally prefer different habitats, from rocky bottom to mud and sand. Some species prefer to remain on the bottom, while others will move upward into the water column. Shrimp may rise off the bottom at night and will not be as available to bottom-fishing trawl gear.

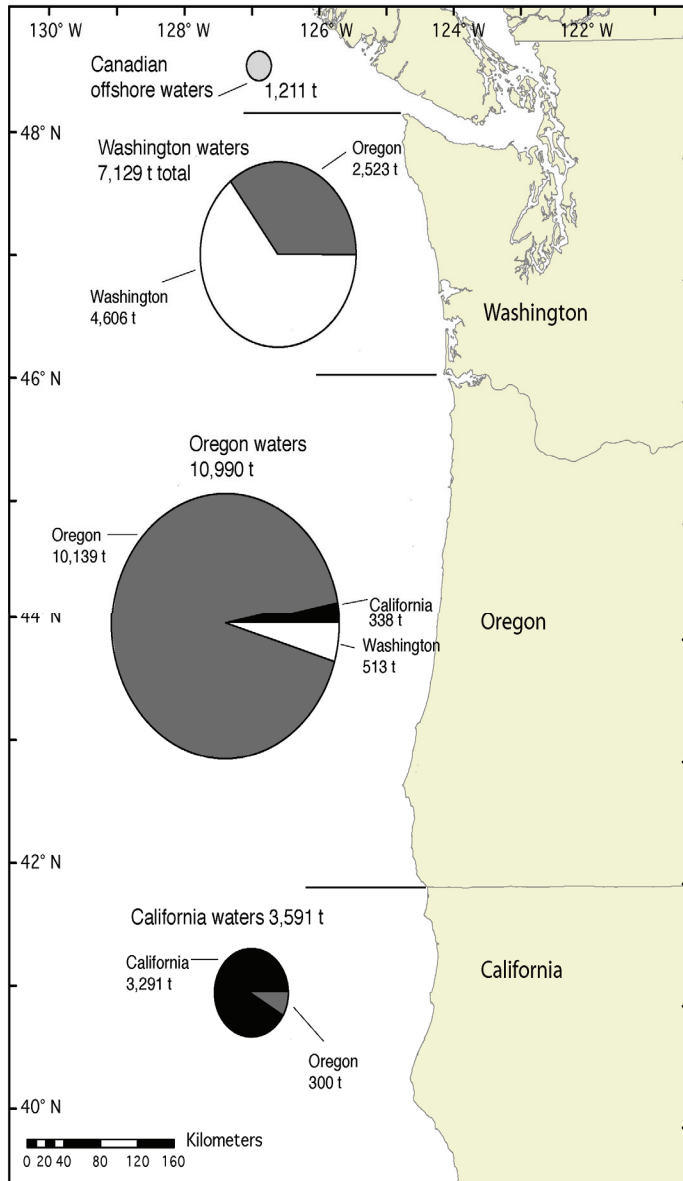
### **3.2 Candidate Fishery**

The specific scope of this full certification assessment is the commercial ocean shrimp fishery conducted by Oregon's permitted harvesters within the coastal and federal waters off the states of Washington, Oregon and California with the product landed in Oregon ports. Federal waters include waters beyond the three nautical mile state water limits out over the shelf and slope to the 200 nautical mile line. Figure 1 (following page) displays the general area of the fishery.

### **3.3 Historical Management Context**

A draft Fishery Management Plan for the ocean Shrimp Fishery off Oregon, Washington, and California was developed in 1981 through the Pacific Fishery Management Council to consider management measures in compliance with the Magnuson Fishery and Management Act of 1976. The fishing industry and government became concerned about the rapid increase in fishing effort coupled with a coastwide decline in catch per unit effort for ocean shrimp. Since most of the fishery occurs outside of 3 miles within the U.S. Exclusive Economic Zone (EEZ) it was thought a federal plan would best serve the interests of the public and resource. The plan development process provided an opportunity for stakeholders, state fish and wildlife agencies, and the federal government to collaborate, share information, and develop alternatives for coastwide fishery management.

The management system adopted elements of the draft FMP for the Ocean Shrimp Fishery prepared for the Pacific Fishery Management Council which employs an adaptive and responsible exploitation strategy. Five alternative management and exploitation strategies were evaluated in the context of potential Council jurisdiction, and a sixth alternative was considered which presumed state implementation of the plan.



**Figure 1: Areas of candidate fishery. Pie graphs show average ocean shrimp catch (t) for the years 1980–1992 by area of catch, broken out by state or country of landing. (Source: Hannah and Jones, 2007)**

The Council recommended adoption of the 6<sup>th</sup> alternative and the states appropriated a management regime most similar to alternative IV in the FMP. Alternative IV had a coastwide winter closure, a 1 3/8 inch minimum mesh size with no codend liners, a maximum average count/pound, and no in-season closures. Of the measures outlined in Alternative IV, mesh size was not uniformly implemented coastwide. Alternative IV was

nearly as restrictive as the most restrictive alternative (I) which also included in-season closures. Other alternatives considered different combinations with and without a year-round season, mesh regulations, maximum count/pound and in-season closures. In addition, all three states have adopted limited entry programs and require mandatory excluders.

Although none of the five alternatives that would have resulted in a federal FMP were adopted, the states were able to agree on several compatible management measures which reduced interstate conflicts. Subsequently, all three states developed and implemented limited entry programs to control fishing effort. The spirits of cooperation between the states as well as cost considerations were also factors in the Council's decision not to implement a federal FMP. The Pacific States Marine Fisheries Commission and state agencies have continued worked together to address emerging fisheries resource and management issues. Formal agreements have been implemented through Memoranda of Understanding and/or reciprocal rule making.

### **3.4 The Fishery Area of Operation**

The United States West coast commercial ocean shrimp fishery is conducted from the international US/ Canada border with British Columbia, south into California waters. The US west coast fishery is conducted by fishers permitted to fish and land in one (or more) of the three state jurisdictions. All three states, Washington, Oregon and California have a limited entry permit system to control the effort within the fishery. The fishery occurs predominantly beyond the three nautical mile state jurisdiction line within federal waters of the USA Exclusive Economic Zone (EEZ). As a result, harvesters are allowed to fish anywhere within US federal waters beyond state limits but are required to land only in the states for which they have landing permits.

The fishery concentrates on areas of commercially sustainable populations, called beds. The beds exist in areas where the bottom is relatively flat and smooth and the substrate is predominantly a green mud/ sand. In Oregon, the fishery has historically concentrated on four beds. These beds have increased and decreased in size, dependent upon the population at the time.

### **3.5 Fleet, gear and harvest controls**

The fishery is controlled through a variety of input controls including:

- mandatory commercial fishing vessel licensing;
- limited entry shrimp fishing permitting system;
- maximum count per pound requirements for each vessel load; and
- closed fishing season which avoids the reproductive period of the shrimp stock .

Total fishing effort in terms of the number of vessels is constrained by a limited entry program implemented by Washington, Oregon, and California. In Oregon, the number of participants was capped at 150 by statute. The federally sponsored groundfish trawl buyback program has further reduced the number of potential vessels to 142. Market has

played an even larger role in reducing effort and the current active fleet size in Oregon is about 40 vessels. All commercial fishing vessels used in the state must hold a current Commercial Fishing Boat License.

In 2007, it was confirmed by OTC that there is little effort by fleets in other states: about 5 boats fished in California, and 10 to 12 in Washington (B. Pettinger, Pers Comm.).

The commercial ocean shrimp fishery has existed in Oregon since 1957. The early fishery was dominated by a semi-balloon style trawl fished from vessels ranging up to 70 feet long. The primary constraint of the early fishery was the lack of processing capacity in the tri-state area. This changed during the 1960s with the introduction of peeling machines. Double-rigged vessels also appeared in the fishery during this period. Since the late 60's, the coast wide fleet has continued to evolve and has grown in both capacity and fishing power.

Today, the majority of the fleet operate vessels less than 100 feet, using a double rigged system of box trawls with mandatory (as of 2004) hard or soft bycatch reduction devices.

All Oregon permitted vessels are required to complete and submit logbooks which capture information on the fishing areas, amount of effort and landed catch. Vessels are required to land shrimp with a maximum count of 160 shrimp (head on, unbroken) per pound. This is verified through port sampling conducted by state employees and by the individual processing plants buying the product. Vessels found to bring in shrimp that exceed the maximum count are reported to the Oregon State Police, who provide enforcement support for ODFW. Vessels fishing and landing in California ports are required to fish with a minimum trawl mesh size of 1 3/8" mesh size. Oregon and Washington do not have a mesh size requirement for the ocean shrimp fishery.

The ocean shrimp-fishing season usually starts on April 1<sup>st</sup> and proceeds to October 31<sup>st</sup> of each calendar year. The season period has specifically been adopted to avoid the reproduction period of shrimp.

### **3.6 Catch**

The following table illustrates fishery for the last eight years for all US West Coast jurisdictions and British Columbia, Canada. The table also displays the average annual count per pound and average season ex-vessel real prices for Oregon. The British Columbia landings are displayed to demonstrate the size of overall removals from the west coast stock.

**Table 2: West Coast Ocean Shrimp Landings (millions pounds) , average count per pound and average ex-vessel prices for Oregon ocean shrimp fishery for period of 1999 – 2006.**

	1999	2000	2001	2002	2003	2004	2005	2006
<b>British Columbia *</b>	5.9	5.8	5.3	3.8	2.5	1.8	2.0	1.6
<b>Washington</b>	3.7	5.1	7.2	10.7	8.4	6.0	6.8	6.5
<b>California</b>	4.2	2.5	3.6	4.1	2.1	2.2	NA	NA
<b>Oregon</b>	20.4	25.5	28.5	41.5	20.5	12.2	15.8	12.2
<b>Oregon Average Count per pound</b>	NA	112	116	128	136	111	144	106
<b>Oregon Average Season Ex-vessel real prices (\$)</b>	0.47	0.40	0.26	0.27	0.25	0.39	0.44	0.37

\*British Columbia landings include all shrimp species. \*\* Sources, DFO Pacific Region Commercial Fisheries Data, PACFIN Reports, ODFW Annual Shrimp Newsletters.

### 3.7 Bycatch

Bycatch of non-target species is monitored through ongoing studies by ODFW and by NMFS. Landings and discard rates of bycatch are monitored by NMFS to estimate fishing mortalities. Several species of rockfish have been declared overfished and the PFMC has adopted rebuilding plans. The PFMC's rebuilding measures for 2007-2008, adopted at the same time as the PFMC's adoption of Amendment 16-4 of the Groundfish Management Plan, continue the strategy of constraining overfished rockfish total mortality by restricting fishing on co-occurring healthy stocks and preventing fishing in areas where rockfish may be taken incidentally. Caps for bycatch (Optimal Yield - OY) are established by the PFMC based on stock assessment and fishery evaluations (SAFEs). For example, darkblotched rockfish OY was set at 172 mt in 2003. Catch was estimated at 146 mt. Additionally, the Council has adopted rockfish bycatch limits for the Pacific whiting fishery, which has some rockfish incidental catch.

Historically, retained bycatch of finfish species made up an important component of the overall catch by shrimp trawlers. The retained catch of finfish species has been documented in landing records (ODFW Pounds and Value Reports, PacFIN database). Selective studies are available on bycatch of finfish and bycatch reduction through gear modification and fish excluder devices (Hannah and Jones, 2007, Hannah et al. 1996). More recently, the WCGOP (NMFS 2003a, Hannah and Jones 2006a) began monitoring the bycatch of non-target species. WCGOP studied the shrimp fishery from 2002-2005 as shrimp excluders were implemented. The mandatory use of bycatch reduction devices (BRDs) has demonstrated significant reductions in bycatch and, as Table 3 demonstrates, bycatch can be reduced further by lowering the space between grate bars on the BRDs.

**Table 3: Catch (kg) and percent composition of the catch by weight in ocean shrimp trawl nets with rigid-grate BRDs with 32 and 19mm bar spacing, June 2005.**

Species	Catch (kg) with 32mm BRD (n = 24)	Percent composition with 32mm BRD (n = 24)	Catch (kg) with 19mm BRD (n = 24)	Percent composition with 19mm BRD (n = 24)
Ocean Shrimp	2727.9	94.22	2532.9	97.96
Pacific Hake	62.2	2.15	36.2	1.4
Hagfish	4.8	0.16	3	0.12
Arrowtooth flounder	9.6	0.33	0	0
Dover sole	5.2	0.18	0.6	0.02
Slender sole	13.5	0.47	5.6	0.22
Rex sole	7.3	0.25	1.7	0.06
Misc. flatfish	0.4	0.1	0	0
Juvenile rockfish	55.4	1.91	3.2	0.12
Miscellaneous fish	9.1	0.32	2.5	0.1
Total catch (kg)	28.954	100	2585.8	100
Total fish bycatch (kg)	167.5		52.9	
Bycatch percentage	5.8 (1.5)		2.0 (0.7)	
Bycatch catch rate (kg/h)	11.6 (2.4)		3.7 (1.2)	

Sample size (n) refers to the number of hauls, with one haul representing the catch from one net of a double-rigged shrimp trawl vessel. Standard error (S.E.) of ratio estimates is shown in parentheses.

(Source: Hannah and Jones, 2007).

### 3.8 Interactions with Protected, Endangered, Threatened Species

Of the 56 species listed as threatened or endangered in Oregon, only a few occupy habitats in the Pacific Ocean. Listed species of Pacific salmon, the Northern Stellar sea lion, and marbled murrelet have been evaluated with respect to potential interactions with fisheries in Oregon. No significant interactions with the trawl fisheries for ocean shrimp have been identified for listed marine species of birds, mammals, or fish.

Commercial fisheries in the United States are classified by the level of threat to marine mammals into three categories. The Marine Mammal Protection Act (MMPA) requires registration of vessels if they participate in a category I or II fishery. Registered vessels must obtain a marine mammal authorization to legally incidentally take a marine mammal. The shrimp trawl fishery is classified as a category III fishery and no documented taking of marine mammals has been listed for shrimp trawl gear, however vessel operators must report mortalities or injuries of marine mammals to the NMFS Office of Protected Resources (See pages 48802-48823 of CFR Vol. 71, No. 162, August 22, 2006). Reporting of mortality or injury of marine birds is voluntary for category III fisheries. Groundfish trawl fisheries (also category III) are thought to have minimal interactions with marine birds, even though they are seen feeding on offal (NMFS 2003b). Shrimp trawl gear is operated in a similar fashion on grounds which overlap the groundfish fishery.

Several depleted species of groundfish are known to interact with the ocean shrimp fishery. Species of particular concern are bocaccio, canary rockfish, widow rockfish, and yelloweye rockfish. Since the implementation of mandatory excluders, however, bycatch

of these species has been minimized (Hannah and Jones 2006b, Hannah et al. 1996). Allocation of bycatch mortality as a part of the federal annual specifications for fishing reflect this – a bycatch mortality in the shrimp fishery of 0.1 metric ton or less has been projected for each species (PFMC 2006). This level of mortality is at a trace amount (less than 0.1%) compared to the total catch mortality.

The WCGOP evaluates each fishery for which there is groundfish bycatch. The shrimp fishery was studied from 2001-2005 using methods outlined in the WCGOP program documentation (NMFS 2003a).

## **4.0 MANAGEMENT SYSTEM**

### **4.1 Management System Goals and Objectives**

Management goals and objectives were developed for the ocean shrimp fishery as a part of the Council's plan development process leading up to the 1981 draft FMP for ocean shrimp. The overall goal of the plan was to achieve and maintain, on a continuing basis, the optimum yield from the ocean shrimp fishery. Objectives, as crafted in 1981, were based on National Standards set forth in section 301 of the MSFCMA (1976). These were:

- Prevent long-term biological damage to the stock.
- Maximize the long-term value of the shrimp catch.
- Minimize the costs of fishing for and processing ocean shrimp.
- Minimize the cost of managing the ocean shrimp fishery.
- Avoid regulations which may cause intra-fishery conflicts.
- Minimize adverse impacts of regulations on the social structure of coastal communities.
- Avoid an unfair distribution of income and wealth from ocean shrimp fishing and processing.

The three states continue to uphold these goals and objectives. Recent concerns regarding overfished groundfish species have lead state fishery managers to implement additional conservation measures to minimize by-catch in the shrimp fishery.

Oregon's overall management system is well documented by ODFW and is consistent with management in other states. The Oregon State Legislature adopted Oregon Revised Statutes (ORSs) establishing a limited entry system for the Oregon ocean shrimp fishery in 1979. The Oregon Fish and Wildlife Commission sets other rules and regulations in the form of Oregon Administrative Rules (OARs).

Since 1981, the Pacific States Marine Fishery Commission (PSMFC) informally sponsors the tri-state management process for the ocean shrimp fishery. The PSMFC was established in 1947 to help states coordinate interstate research and management issues. Under some circumstances, the three states coordinate rule-making directly without PSMFC sponsorship. The most recent example emerged out of the PFMC's process in

response to by-catch concerns related to overfished stocks of groundfish. Informal coordination of the states was needed to implement by-catch reduction gear (BRDs) changes in the shrimp fishery as recommended by the PFMC. While informal, this coordination process appears to be effective at implementing necessary conservation and management measures.

Compliance with rules is monitored principally shore-side by the Oregon State Police, ODFW staff, and fish processing plants. A federally sponsored at-sea observer program (WCGOP) was implemented in 2001 for the limited entry groundfish trawl permits. Coastwide observer levels for the trawl fleet have ranged from 16% to nearly 30% in 2004. Observers were deployed in the pink shrimp fishery in 2002. During the period of 2002 to 2005 a total of 86 shrimp trips were conducted with observer coverage, representing 2.5 % of the 3,246 shrimp trips conducted during that period.

#### **4.2 Management Plan**

The Pacific Fishery Management Council (PFMC) prepared a draft management plan for the Washington, Oregon, and California (WOC) ocean shrimp management area in 1981. The plan was considered by the Council but was not adopted as a federal fishery management plan (FMP). State fish and wildlife agencies from the three states agreed to implement the plan through formal tri-state agreements. Plan implementation consists of separate state limited entry programs with fishing reciprocity agreements, along with gear, shrimp size, and fishing seasons set by state laws. The participation level (number of permits) and other rules and regulations vary from state to state. Differences within each state's program are mutually accepted by other states and reflect proportional differences in stock abundance, size and growth of shrimp.

An informal tri-state scheme is used to review past management agreements and propose new changes to regulations. The draft management plan included a coast-wide (WOC) analysis of maximum sustainable yield (MSY) using a Schaefer production model. The plan did not recommend the use of a numerical optimum yield because the high cost of population surveys necessary to provide input into the stock assessment model and the difficulty in using the model to establish accurate population levels necessary for determining quotas. More contemporary analysis of stock dynamics within a subset of the WOC area by the Oregon Department of Fish and Wildlife indicates that the population health of ocean shrimp is largely dependent on environmental variables.

The plan, as implemented by the states, contains much of the framework that will be required to ensure sustainability of the fishery. A non-numerical optimum yield season to protect egg bearing females, shrimp count per pound or mesh size regulations to protect small shrimp remain central features of the plan.

ODFW also retains the right to exert additional controls on the fleet, particularly should a significant effort increase result from a change in economic conditions which greatly influence the amount of activity in the fishery. ODFW monitors market conditions specifically because a drastic change could cause return of latent effort into the fishery.

Specific measures could include effort reduction or limitation or a spatial rotation of the fleet activities. The active members of the fleet are also concerned about the issue of latent effort and have discussed possible mechanisms to reduce effort as well.

## **5.0 STOCK HEALTH EVALUATION**

### **5.1 Stock Health Monitoring**

A comprehensive coastwide stock assessment for ocean shrimp was conducted and documented in the Fishery Management Plan for Ocean Shrimp (Abramson et al., 1981). Coastwide assessments were made using a Schaefer-type production model for Washington, Oregon, and California and for catch years from 1959-1980 (Abramson and Tomlinson, 1972). Attempts have been made to use age, CPUE, and environmental data to explain and forecast abundance. To date, production and catch-at-age models have been largely unsuccessful in establishing meaningful reference limits for the ocean shrimp fishery. Environmentally based models have been useful in retrospective studies of environmental impacts on an apparent recruitment stock relationship, however none have shown any consistent impact of the fishery on future stock abundance (e.g. no consistent stock-recruitment relationship).

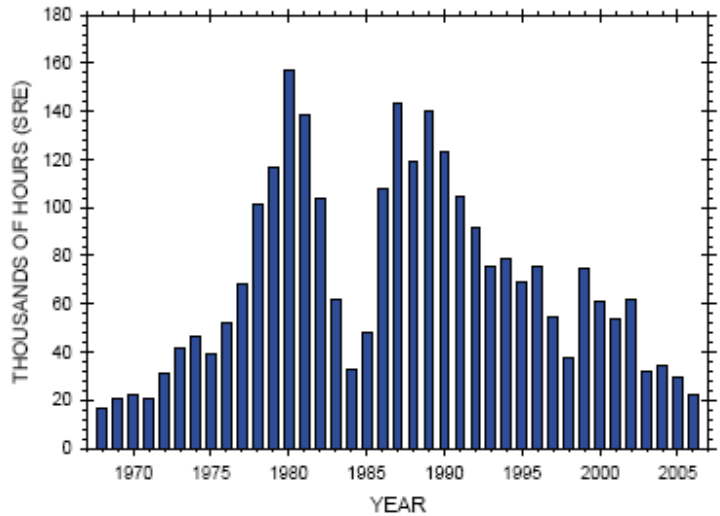
The more recent application of environmentally based models has been accomplished over a more restricted range than coastwide using the most complete sets of information available. For the most part, the analyses were restricted to the portion of the stock off Oregon representing slightly more than 50% of the geographic area and historical biomass. Thus, inferences made from these studies regarding biomass and recruitment trends are considered representative of shrimp stocks over a wider area.

Assessments presently take the form of in-season and annual analysis of CPUE data and biological samples collected from the Oregon fleet. CPUE, year-class strength, and geographic distribution of catch is compared to historical data and indicators of Biological Concern listed in the draft shrimp Fishery Management Plan (FMP). Environmental models are updated yearly with the previous seasons data. Findings from retrospective studies using the environmental models are published in peer reviewed journals periodically. Sampling is representative of a large portion of the stock area as boats landing into Oregon fish off of Washington and California. In addition, the Oregon landed catch was historically more than 60% of the WOC area catch. More recently, the Oregon contribution to WOC landed catch has approached 70%.

### **5.2 Current Stock Status**

Although fishing mortality reduces the spawning stock, subsequent recruitment has not shown to be consistently affected by the fishery. Current market conditions have constrained fishing effort to less than 30,000 hours in single rig equivalents (SRE) in

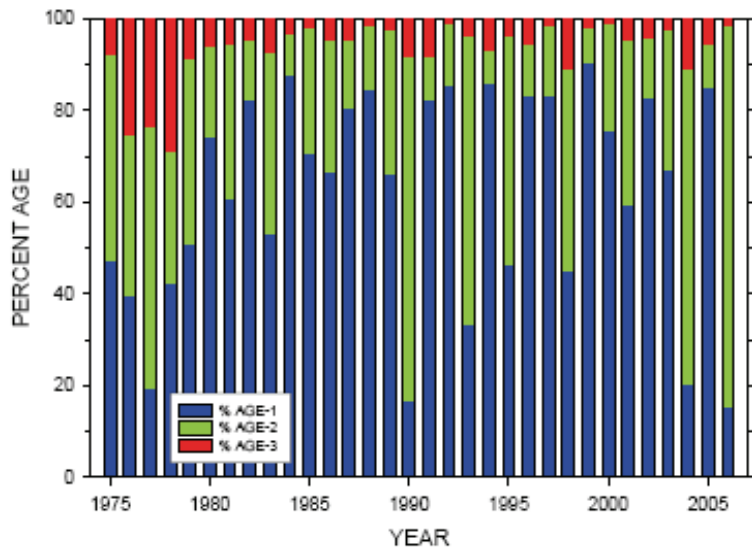
2006 approximately 1/5 of the historical high which peaked at nearly 160,000 hrs (SRE) in 1980, see Figure 2 below.



**Figure 2: Fishing effort (1000's of single-rig equivalent hours: 1 SRE = 1 single-rig hour= 1 double-rig hours x 1.6) for pink shrimp landed in Oregon, 1968 – 2006.**

Source: ODFW 18<sup>th</sup> Annual Pink Shrimp Review.

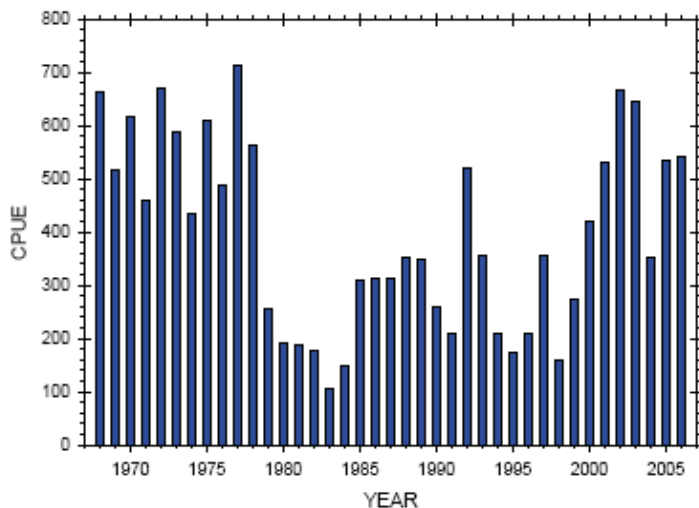
Market samples indicate a shift back towards a fishery on multiple age classes rather than on primarily 1-year-old shrimp, see Figure 3 below.



**Figure 3: Annual percent age composition of pink shrimp (#'s of shrimp) landed in Oregon, 1975-2006.**

Source: ODFW 18<sup>th</sup> Annual Pink Shrimp Review.

CPUE, an indicator of relative abundance, was in excess of 500 pounds per hour for 2006 compared to a historical low of 106 pounds per hour in 1983 and an average of 392 pounds per hour (1968-2005).



**Figure 4: Catch per unit of effort (CPUE=lbs/SREhb) for vessels landing pink shrimp into Oregon, 1968-2006.**

Source: ODFW 18<sup>th</sup> Annual Pink Shrimp Review.

A permanent fleet reduction in all three states, low price paid for shrimp, and the high cost of fuel are thought to be the primary reasons for lowered effort. Thus, it is highly likely that current spawning stock levels are not significantly affected by the fishery.

## 6.0 MSC PRINCIPLES AND CRITERIA FOR SUSTAINABLE FISHING

At the centre of the MSC is a set of *Principles and Criteria for Sustainable Fishing* which are used as a standard in a third party, independent and voluntary certification programme. These were developed by means of an extensive, international consultative process through which the views of stakeholders in fisheries were gathered.

### PRINCIPLE 1

**A fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery<sup>1</sup>:**

<sup>1</sup> The sequence in which the Principles and Criteria appear does not represent a ranking of their significance, but is rather intended to provide a logical guide to certifiers when assessing a fishery. The criteria by which the MSC Principles will be

Intent:

The intent of this principle is to ensure that the productive capacities of resources are maintained at high levels and are not sacrificed in favour of short term interests. Thus, exploited populations would be maintained at high levels of abundance designed to retain their productivity, provide margins of safety for error and uncertainty, and restore and retain their capacities for yields over the long term.

Criteria:

1. The fishery shall be conducted at catch levels that continually maintain the high productivity of the target population(s) and associated ecological community relative to its potential productivity.
2. Where the exploited populations are depleted, the fishery will be executed such that recovery and rebuilding is allowed to occur to a specified level consistent with the precautionary approach and the ability of the populations to produce long-term potential yields within a specified time frame.
3. Fishing is conducted in a manner that does not alter the age or genetic structure or sex composition to a degree that impairs reproductive capacity.

**PRINCIPLE 2:**

**Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends.**

Intent:

The intent of this principle is to encourage the management of fisheries from an ecosystem perspective under a system designed to assess and restrain the impacts of the fishery on the ecosystem.

Criteria:

1. The fishery is conducted in a way that maintains natural functional relationships among species and should not lead to trophic cascades or ecosystem state changes.
2. The fishery is conducted in a manner that does not threaten biological diversity at the genetic, species or population levels and avoids or minimizes mortality of, or injuries to endangered, threatened or protected species.

---

implemented will be reviewed and revised as appropriate in light of relevant new information, technologies and additional consultations

3. Where exploited populations are depleted, the fishery will be executed such that recovery and rebuilding is allowed to occur to a specified level within specified time frames, consistent with the precautionary approach and considering the ability of the population to produce long-term potential yields.

### **PRINCIPLE 3:**

**The fishery is subject to an effective management system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable.**

#### Intent:

The intent of this principle is to ensure that there is an institutional and operational framework for implementing Principles 1 and 2, appropriate to the size and scale of the fishery.

#### A. Management System Criteria:

1. The fishery shall not be conducted under a controversial unilateral exemption to an international agreement.

The management system shall:

2. demonstrate clear long-term objectives consistent with MSC Principles and Criteria and contain a consultative process that is transparent and involves all interested and affected parties so as to consider all relevant information, including local knowledge. The impact of fishery management decisions on all those who depend on the fishery for their livelihoods, including, but not confined to subsistence, artisanal, and fishing-dependent communities shall be addressed as part of this process;
3. be appropriate to the cultural context, scale and intensity of the fishery – reflecting specific objectives, incorporating operational criteria, containing procedures for implementation and a process for monitoring and evaluating performance and acting on findings;
4. observe the legal and customary rights and long term interests of people dependent on fishing for food and livelihood, in a manner consistent with ecological sustainability;
5. incorporates an appropriate mechanism for the resolution of disputes arising within the system<sup>2</sup>;

---

<sup>2</sup> Outstanding disputes of substantial magnitude involving a significant number of interests will normally disqualify a fishery from certification.

6. provide economic and social incentives that contribute to sustainable fishing and shall not operate with subsidies that contribute to unsustainable fishing;
7. act in a timely and adaptive fashion on the basis of the best available information using a precautionary approach particularly when dealing with scientific uncertainty;
8. incorporate a research plan – appropriate to the scale and intensity of the fishery – that addresses the information needs of management and provides for the dissemination of research results to all interested parties in a timely fashion;
9. require that assessments of the biological status of the resource and impacts of the fishery have been and are periodically conducted;
10. specify measures and strategies that demonstrably control the degree of exploitation of the resource, including, but not limited to:
  - a) setting catch levels that will maintain the target population and ecological community's high productivity relative to its potential productivity, and account for the non-target species (or size, age, sex) captured and landed in association with, or as a consequence of, fishing for target species;
  - b) identifying appropriate fishing methods that minimise adverse impacts on habitat, especially in critical or sensitive zones such as spawning and nursery areas;
  - c) providing for the recovery and rebuilding of depleted fish populations to specified levels within specified time frames;
  - d) mechanisms in place to limit or close fisheries when designated catch limits are reached;
  - e) establishing no-take zones where appropriate;
11. contains appropriate procedures for effective compliance, monitoring, control, surveillance and enforcement which ensure that established limits to exploitation are not exceeded and specifies corrective actions to be taken in the event that they are.

## B. Operational Criteria

Fishing operation shall:

12. make use of fishing gear and practices designed to avoid the capture of non-target species (and non-target size, age, and/or sex of the target species); minimise

- mortality of this catch where it cannot be avoided, and reduce discards of what cannot be released alive;
13. implement appropriate fishing methods designed to minimise adverse impacts on habitat, especially in critical or sensitive zones such as spawning and nursery areas;
  14. not use destructive fishing practices such as fishing with poisons or explosives;
  15. minimise operational waste such as lost fishing gear, oil spills, on-board spoilage of catch, etc.;
  16. be conducted in compliance with the fishery management system and all legal and administrative requirements; and
  17. assist and co-operate with management authorities in the collection of catch, discard, and other information of importance to effective management of the resources and the fishery.

## **7.0 FISHERY EVALUATION PROCESS**

### **7.1 Certification Process**

#### **Pre-Assessment**

TAVEL Certification Inc. conducted a pre-assessment of the Oregon ocean shrimp fishery in 2004 as required by the MSC program. After review of the pre-assessment, the applicants for certification authorized the formal, full assessment of the fishery. All aspects of the assessment process were carried out under the management of TAVEL Certification Inc., an approved MSC certification body, and in direct accordance with MSC requirements (MSC Fisheries Certification Methodology Version 6).

#### **Full Certification Process**

In order to ensure a thorough and robust assessment process, and a process in which all interested stakeholders could participate, TAVEL used a number of different tactics to identify stakeholders and encourage their participation

As required by MSC methodology, TAVEL Certification provided opportunities for input at all mandated stages of the assessment process. The general steps followed were:

## **Team Selection**

At this first step of the assessment process, TAVEL issued advisories through direct email, fax, listing on email listservers, and posting on select web sites requesting comment on the nominations of persons capable of providing the expertise needed in the assessment. A final team of 3 scientists was chosen to serve as assessment team members.

## **Setting Performance Indicators and Scoring Guideposts**

As required by the MSC assessment process, the assessment team drafted a set of performance indicators and scoring guideposts (PISGs) to correspond to the MSC Principles and Criteria. The team met in Seattle in April 2006, the PISGs were drafted using the MSC standard (Principles and Criteria for Sustainable Fishing), as well as examples of other performance indicators that had been previously developed for other fisheries.

These were posted for the required 30 day comment period from May 18 to June 17, 2006 to allow stakeholders to provide comments on the performance indicators. TAVEL specifically requested comments from the environmental and conservation stakeholder community as well as from the client and management agency, the Oregon Department of Fish and Wildlife.

PISGs were finalized on September 11, 2006, at that point TAVEL requested that the client applicant, Oregon Trawl Commission (OTC) compile and submit written information to the assessment team illustrating the fishery's compliance with the required performance indicators. To accomplish this activity, OTC contracted a consultant to aid in the preparation of that submission. The client provided most of the information needed prior to the actual interviewing process. However, additional information was provided during the assessment and reporting process.

As required by MSC methodology, the team met prior to the fishery visit meetings to conduct a meeting to weight the performance indicators. TAVEL Certification obtained a variance from the MSC to allow the weighting session to be conducted prior to the fishery visit meetings.

## **Meetings with industry, managers, and stakeholders**

TAVEL Certification planned for and conducted meetings with stakeholders, industry, fishery managers, and fishery scientists as required. The meetings were held in Newport and Astoria, Oregon on the dates of January 23 and 24, 2007.

## **Scoring fishery**

The assessment team scored the fishery using the required MSC methodology and without input from the client group or stakeholders. The initial scoring session was

conducted in Astoria and Portland, Oregon on January 24 and 25. There were subsequent scoring discussions held as the client provided additional information to the certification team to all scores to be reviewed.

### **Drafting report**

The assessment team in collaboration with the TAVEL lead auditor, drafted the report in accordance with MSC required process.

### **Selection of peer reviewers**

As required, TAVEL released an announcement of potential peer reviewers soliciting comment from stakeholders on the merit of the selected reviewers. The nominated peer reviewers were Dr. Don Gunderson, retired Professor from the School of Aquatic and Fisheries Science at the University of Washington and Dr. Susan Hanna, Professor of Marine Economics at Oregon State University. No comments were received other than from the client who supported the nomination of the proposed peer reviewers.

### **Public Comment on Draft Report**

The MSC requirements are that the draft report be made available for public comment for a period of no less than 30 days. Under the MSC Certification Methodology (version 6, September 2006) there is a formal requirement that the public comment period be held after the peer review process.

## **7.2 Other Fisheries in the Area**

The Pacific halibut longline fishery (*Hippoglossus stenolepis*) conducted in the waters of Alaska, British Columbia, Washington and Oregon was certified to the MSC Standard in 2006. Currently, there are no Oregon managed fisheries currently certified under the MSC program. The Dungeness crab trap fishery (*Cancer magister*) in Washington and Oregon and the coastwide Pacific hake mid-water trawl fishery (*Merluccius productus*) are currently undergoing MSC certification.

There are also fisheries in Oregon and US EEZ waters for a variety of species such as salmon, albacore, groundfish, crustaceans, and rockfish. In addition to the Pacific hake fishery, there are other trawl fisheries that can fish on or near shrimp grounds. Small-footrope trawls (primarily after flatfish) are commonly fished shoreward of the inside boundary of the Rockfish Conservation Area (RCA). The inside boundary of the RCA has been changed frequently in the past and varies by region, but at times has been deep enough in some areas to include some or most of some shrimp beds. Other non-trawl fisheries that occur over shrimp grounds can include longline halibut, troll salmon and albacore and longline-pot for hagfish (S. Jones, Pers. Comm).

## **8.0 FISHERY PERFORMANCE**

### **8.1 Interpretation of the MSC Standard**

The MSC Principles and Criteria provide the overall requirements necessary for certifying that a fishery meets the Marine Stewardship Council's environmental standard for being well-managed and sustainable.

The certification methodology adopted by the MSC involves the application and interpretation of the Principles and Criteria to the specific fishery undergoing assessment. This is necessary, as the precise assessment of a fishery will vary with the nature of the species, capture method used etc.

Accordingly, the assessment team for the Oregon ocean shrimp fishery has developed, based on the MSC Principles and Criteria, a structured hierarchy of 'Performance Indicators' and 'Scoring Guideposts' in order to carry out the assessment. Performance indicators represent separate areas of important information (e.g. Indicator 1.1.1.3 requires a sufficient level of life history information on the target species and stock, 1.1.2.1 requires information on the effects of the fishery on the stock and so on). These indicators therefore provide a detailed framework of performance attributes necessary to meet the MSC Criteria in the same way as the Criteria provide the factors necessary to meet each Principle.

Individual 'Scoring Guideposts' (60, 80 and 100) are identified for each performance indicator. It is at this level that the performance of the fishery is measured. It is important to note that the absolute numeric values assigned to each of these guideposts are not intended to reflect any type of percentile scoring system but were established by the MSC to help the assessment teams facilitate weighting and combining different performance indicators.

### **8.2 Scoring Methodology**

For each Performance Indicator, the fishery's management characteristics are compared with the requirements of the pre-specified attributes for each of three Scoring Guideposts (60, 80, 100) to establish a score. A performance score of 60 is intended to reflect 'a pass with condition', a score of 80 represents 'pass without condition', while a 100 score reflects 'perfect performance.' In order for a fishery to be certified it must accomplish three things:

- Achieve a score of 60 or greater for every performance indicator
- Each MSC Principle must achieve an aggregated score of 80, or pass without conditions.
- A contractual commitment to performance improvement for each indicator that has a score less than 80.

In fisheries where any given indicator scores below 60, a fishery cannot pass the evaluation process and be awarded certification until the performance issue(s) identified can be corrected to the satisfaction of the certification body and its expert evaluation team.

The evaluation framework described above is referred to as the fishery assessment tree. It represents a hierarchical application of the Principles and Criteria. The 60, 80, 100 scoring guideposts used to evaluate a fishery's performance for an indicator are meant to be hierarchical in that to meet a particular score, the scoring guideposts of all lower scores should also have been met.

For any given MSC criterion, sub-criteria and performance indicators are identified as appropriate to the nature of the fishery. All sub-criteria and indicators are weighted indicating their relative importance in setting the overall scores for the fishery.

The fisheries certification methods are provided in great detail through documents that can be downloaded from the MSC website ([www.msc.org](http://www.msc.org)). At present, the Fisheries Certification Methodology is in its 6th version, issued September 2006.

### **8.3 Submission of Data on the Fishery**

The MSC certification process is similar to other certification schemes applied in other industries in that proving compliance to the standard requires that the client provide objective evidence of their compliance with the standard. What is unique about the MSC certification process over a vast number of other certification schemes is the requirement of the assessors to analyze and evaluate the objective evidence and confirm that the evidence proves that the fishery performance merits a specific score.

As such, clients of the certification process are required to submit evidence to prove that they meet the standard in all areas of the fishery from the status of stocks, to ecosystem impacts, through management processes and procedures. This evidence may take many different forms including internationally peer-reviewed literature, grey literature, working documents of the scientific and management authorities, policy documents, observations on the part of the assessment team, observations and fact presented in written or oral form from direct and indirect stakeholders, etc.

Under the MSC program, it is the responsibility of certification applicants to provide the objective evidence required by the assessment team. It is also the responsibility of the applicants to ensure that the assessment team has access to any and all scientists, managers, and fishers that the assessment team identifies as necessary to interview in its effort to properly understand the functions associated with the management of the fishery. Last, it is the responsibility of the assessment team to make contact with stakeholders that are known to be interested, or actively engaged in issues associated with fisheries in the same geographic location.

The Oregon Trawl Commission provided a very detailed, 68 page submission to support their application for certification. The document included a foot-noted response and annotated bibliography to each performance indicator. The client also assisted the assessment team in organizing the fishery assessment visit and arranging meetings with all necessary harvesters, processors, scientists, managers and enforcement officials.

During this fishery assessment, numerous attempts were made to gather direct information and/or opinions from stakeholder groups known to participate in various aspects of the management of the Oregon ocean shrimp fishery. No official or directed stakeholder comments were received during this assessment.

#### **8.4 Performance Evaluations**

After completing information reviews and interviews, the assessment team is responsible to use all the information gathered to assess the performance of the fishery. This is done by assigning numerical scores between 0 and 100, using increments of 5 for each performance indicator. The team uses the scoring guideposts to benchmark the performance of the fishery. To practically accomplish the scoring process in a standardize manner between certification bodies, the MSC requires that a decision support software tool, called Expert Choice be used to calculate the scores. A full description of the AHP process can be found on the MSC web site ([www.msc.org](http://www.msc.org)). In essence, the process requires that all team members work together to discuss and evaluate the information they have received for a given performance indicator and come to a consensus decision on weights and scores. Using the software, scores and weights are then combined to get overall scores for each of the three MSC Principles.

As previously mentioned, each certified fishery must have an aggregated weighted score of 80 or above on each of the three MSC Principles. Individual performance indicators receiving a score of less than 80 must have a 'Condition' established that when met, would bring the fishery's performance for that indicator up to the 80 level score representing a well-managed fishery.

### **9.0 TRACKING, TRACING FISH AND FISH PRODUCTS**

The specific scope of this full certification assessment is the commercial ocean shrimp fishery conducted by Oregon's permitted harvesters within the coastal and federal waters off the states of Washington, Oregon and California with the product landed in Oregon ports. Federal waters include waters beyond the three nautical mile state water limits out over the shelf and slope to the 200 nautical mile line.

MSC Chain of Custody requirements were only checked as far as shrimp being landed in Oregon ports by legally permitted, Oregon shrimp fishing vessels where the landings can be monitored in accordance with requirements.

In order for subsequent links in the distribution chain to be able to use the MSC logo, the shrimp must enter into a separate chain of custody certification. The subsequent links must be able to prove that they can track the shrimp product to Oregon permitted vessels which landed in Oregon ports.

## 10.0 CERTIFICATION RECOMMENDATION

The overall performance of the Oregon Ocean Shrimp fishery is identified in Table 4 below. The fishery is recommended for Certification under the MSC program as the following performance criteria have been met:

1. Each MSC Principle has an aggregated, weighted score higher than the required score of 80.
2. No individual performance indicator had a score below 60.
3. The client has agreed to improve the fishery performance for four performance indicators which had scores below 80 and above 60.

**Table 4: Final scores allotted to Oregon shrimp fishery and number of conditions issued.**

<b>MSC Principle</b>	<b>Oregon Shrimp Fishery Performance</b>	<b>Number of Conditions Issued</b>
Principle 1	85.65	1
Principle 2	86.44	1
Principle 3	87.36	2

### 10.1 Conditions

The fishery attained scores below 80 for the following performance indicators. The client has agreed to improve the performance of the indicators by undertaking the actions identified below each condition.

#### **Performance Indicator 1.1.2.1**

All fishing related mortality is recorded/ estimated. This includes landings, discards, and incidental mortality (adult and juvenile).

#### **Condition**

The client must meet the requirements of the 80 scoring guidepost prior to the first annual surveillance audit. Discards are to be accurately recording in log books. Discards are to be well estimated for adult and juvenile shrimp.

[A possible solution, provided as a suggestion only is that the client can address this condition by including estimates of discards in their logbooks and continuing to gather statistically valid information from the An electronic logbook system is currently under

development, providing an excellent opportunity to capture the required information, first for the Oregon fleet but with the potential for expansion to fishers from Washington and California. With continuation of observer coverage, results from both sources can be evaluated and compared for consistency. Specific regulations (or conditions of license) regarding remedial procedures for encounters with 'pinheads' (see 1.1.1.4 above) and the use of sorting machines can also be effective in reducing discards. Addressing this condition will also help resolve deficiencies noted in 3.1.3, below.]

### **Proposed Client Action Plan**

ODF&W agrees that having this information would be very valuable to their shrimp management program. Timing is also excellent in this corrective action (CA), as the department was planning on re-ordering shrimp logbooks this coming year and they will now modify the existing logbooks with a column that will catch the discard information. The OTC is also working with Pacific States Marine Fisheries Commission (PSMFC) on an electronic logbook for all west coast trawl fisheries and that feature will be incorporated as well.

### **Performance Indicator 2.1.1.4**

Information exists on the ability of the ecosystem to recover from fishery related impacts.

### **Condition**

Within one year, the client must document the main elements of the ecosystem affected by the fishery. Within two years the client must have started a study which will demonstrate their understanding of the affected ecosystem elements by providing a convincing scenario of how the ecosystem would recover from the fishery related impacts.

[As a possible suggestion, the team thinks that two actions are required: firstly conduct a literature search that focuses on characterizing the effects of sediment plumes on representative marine communities, and then prepare a report that infers likely effects (and significance) to key infauna species on shrimp grounds; and secondly; design and implement a controlled experiment to test understanding of ecosystem recovery. The approach would be to establish at least two control (non-trawled) and two shrimp trawled sites; then through underwater video or other acceptable means, perform at least a semi-quantitative analysis of differences in the abundance of seapens, shrimp, tube worms, corals and other key infaunal communities between the two treatments.]

### **Proposed Client Action Plan**

This corrective action is in two parts, 1) a literature search and 2) the design and application of a controlled experiment. The OTC will fund the literature search and ODF&W has already started an ROV study on benthic impacts this last month. I think that it is important to point out that this study was already on the drawing board before

the Assessment Team began discussing it as a possible CA. I believe that the proactive approach of the shrimp program, continually trying to better understand the fishery and its impacts, is why the Oregon pink shrimp fishery has scored as well as it has.

#### Literature Search

Later this summer, the OTC will hire\* a qualified contractor to conduct a literature search that will focus on characterizing the effects of sediment plumes on representative marine communities and to prepare a report that infers likely effects (and significance) to key fauna species on the shrimp grounds that will satisfy the CA requirements. This work will be completed within the 12 month time frame.

#### Controlled Experiment

ODF&W has recently completed 20 hours of ROV generated video tape of the sea floor in four areas around the Nehalem Bank. Two sites were selected inside and outside of an area newly closed to bottom trawling off of the northern Oregon Coast (see attached chart). The 20 hours of film footage taken with the ROV will require a tremendous amount of time to review, analyze and evaluate and those efforts will begin this winter and could take up to two years. While this is a long term project (5-10 years), the department is directed by the Governor (through designees) and the legislature (through budgets) and the staff has a limited ability to truly commit to do future projects. However, I believe that the shrimp program has an outstanding track record of following through on their plans. As Director of the OTC, I am also on the external budget committee for ODF&W and am able to help explain the value of this project to the fishery and the coastal communities if funding turns into an issue.

### **Performance Indicator 3.1.3**

The management system incorporates and applies an adaptive and responsible exploitation strategy.

80 Scoring Guidepost A responsible management strategy is followed, including:

- explicit long-term management objectives seek to maintain stocks at high levels of productivity.
- an explicit harvest strategy which accounts for uncertainty.
- the management system estimates all commercial catches, landings and by-catch and annually assesses the status of target stocks.

The deficiencies that reduce the score below 80 relate to shortcomings of total catch and estimates of discards (see 1.1.2.1 for elaboration). Periodic observer coverage exists that records discards of undersized shrimp, but there are no estimates of total catches compared with total landings data.

**Condition**

Prior to the first annual surveillance audit, the client must prove that the management system estimates all commercial catches, landings and by-catch and annually assesses the status of the stock.

**Proposed Client Action Plan**

As stated earlier, the timing is excellent in this CA, as the department was planning on re-ordering shrimp logbooks this coming year and they will now modify the existing logbooks with a column that will catch the discard information. The OTC is also working with the PSMFC on an electronic logbook for all west coast trawl fisheries and that feature will be incorporated as well.

**Performance Indicator 3.6.1**

The management system measures and records and evaluates all aspects of the fishery to provide a basis for assessments of stocks and management performance.

**Condition**

Within one year, the client shall subject the fishery monitoring program to an independent outside review to identify gaps. The review shall verify that the monitoring program covers all indicators of stock health and management performance.

The review must be undertaken by a credible management expert.

**Proposed Client Action Plan**

The OTC will to hire a credible management expert to review the performance of the management system. Within 6 months of the certificate award the OTC will provide:

- The proposed reviewers(s) curriculum vita
- The terms of reference and scope for the management Review.

Prior to the First Annual Surveillance Audit, the OTC will provide:

- The report of results of the Management Review
- Identify Gaps from review process
- Proposed corrective action for identified gaps]
- Propose timeline for corrective action plan
- Propose period and rationale for subsequent management review

**11 ASSESSMENT RESULTS**

Table 5, starting on page 33, is a tabular explanation of the assessment team's evaluation of the information it received and the team's interpretation of the information as it pertains to the fishery's compliance with the MSC Principles and Criteria.

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

**Table 5: Scoring table for Oregon Pink Shrimp Fishery**

<b>MSC Principle 1</b>	<b>A fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery.</b>		85.65
------------------------	--	--	-------

<i>Intent</i>	<i>The intent of this principle is to ensure that the productive capacities of resources are maintained at high levels and are not sacrificed in favor of short term interests. Thus, exploited populations would be maintained at high levels of abundance designed to retain their productivity, provide margins of safety for error and uncertainty, and restore and retain their capacities for yields over the long term.</i>
---------------	--

Weighting Comment	Three MSC Principles are weighted equally as required by MSC. Principle 1, criteria 1 (PIC1) weighted heaviest because the higher level of management control required under PIC1 over PIC3. Pink shrimp are short lived, protandric hermaphrodite, and subject to environmental forcing, which make measure of PIC3 parameters difficult and highly variable. PIC2 was not scored and has no weight.
-------------------	---

<b>1.1 - MSC Criterion 1</b>	<b>The fishery shall be conducted at catch levels that continually maintain the high productivity of the target population(s) and associated ecological community relative to its potential productivity.</b>	75	85.81
------------------------------	---	----	-------

Weighting Comment	Sub-criterion 1.1.1, 1.1.5 and 1.1.6 were weighted slightly more important than other criterion because of critical importance for stock identification in 1.1.1, importance of the stock assessment (1.1.5) and remaining within health stock limits (1.1.6).
-------------------	--

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

<b>1.1.1 TAVEL Sub-Criterion</b>	There should be sufficient information on the target species and stock identity to allow the effects of the fishery on the stock to be evaluated.			18.7	
----------------------------------	---	--	--	------	--

Weighting Comment	Within this sub-criterion, all performance indicators (PIs) are equally weighted.
-------------------	---

1.1.1.1	The target species is readily identifiable and distinguishable from congeners.	<ul style="list-style-type: none"> <li>• Misidentification is possible given the similarities among Pandalids. This increases recording errors of catches, but does not significantly compromise the integrity of monitoring.</li> </ul>	<ul style="list-style-type: none"> <li>• Misidentification of the target species is unlikely. Misidentification has little or no effect on the recording errors of catches.</li> </ul>	<ul style="list-style-type: none"> <li>• The target species is readily identified by fishers and by regulators. Catches are recorded appropriately.</li> </ul>	14.3	100
Scoring Rationale/ Objective Evidence	<p>Ocean shrimp (<i>Pandalus jordani</i>) is the dominant species in the fishery for pink shrimp off Washington, Oregon and California, comprising more than 99% of the shrimp catch in the area of operation (Hannah and Jones, personal communication). Fishers, questioned during the site visit, concurred with this observation. <i>P. jordani</i> are easily separated from its closest congener, the pink shrimp <i>P. borealis</i>, by the absence of a sharp abdominal spine which, on <i>P. borealis</i>, is present and faces rearward (DFO, 2004). Except for some of the larger species of pandalid shrimp, it would be difficult to isolate and identify the few individual of other pandalid species from thousands of ocean shrimp in a typical trawl catch off the Oregon coast (Hannah and Jones, personal communication). Although Washington and California have minimal sampling programs, ODFW collects biological data, catch and CPUE data from the fleet catching off Washington, Oregon, and California and delivering into Oregon ports. Total landed catch from all three states is reported to state agencies and to the Pacific Fishery Information Network (PacFIN). Since 1981, Oregon catch has averaged in excess of 60% of the WOC area. More recently, the five-year running average has approached or exceeded 70% (Golden, 2006a).</p> <p>A score of 100 is justified based on the low numbers of other shrimp species in the commercial catches, the ability to readily identify the dominant ocean shrimp, and the sampling program which monitors catch composition and is considered to be representative of the overall fishery.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

1.1.1.2	Geographical range and migration patterns of the target stock are known.	<ul style="list-style-type: none"> <li>A fishery dependent estimate of the geographical range of the target species is available. The management unit (s) approximate the stock distribution.</li> </ul>	<ul style="list-style-type: none"> <li>A reliable fishery-independent estimate of the geographical range of the target species is available including information on temporal and spatial migration patterns.</li> </ul>	<ul style="list-style-type: none"> <li>The complete geographic range of the target species, including migration patterns, is understood, verified and updated periodically.</li> </ul>	14.3	85
Scoring Rationale/ Objective Evidence	<p>Ocean shrimp live in mud-sand habitat from 37 – 460 m and occupy well-defined areas or beds. Their geographic range and distributional patterns are well described in the literature. Genetic studies provided evidence that ocean shrimp consist of one coast-wide stock extending off the coasts of British Columbia to California (Collier and Hannah, 2001). They occur from Unalaska in the Aleutian Islands as far south as San Diego, California. Commercially fishable quantities occur from Vancouver, British Columbia to Point Arguello, California. There can be considerable interannual variation in shrimp density within individual grounds which can lead to reductions in fishing effort in some areas and concentration in others. The overall stock area appears to exhibit considerable interannual variation (Hannah, 1993).</p> <p>Distribution of ocean shrimp is influenced by environmental variables, notably coastal ocean currents associated with the Davidson current and currents associated with spring and summer onshore winds and upwelling (Hannah, 1993). Shrimp larvae may drift for several weeks in alongshore currents. Depending on current direction and strength with respect to larval dispersal, recruiting shrimp can be distributed in either a northerly or southerly direction from their point of larval release.</p> <p>Strong El Niño events, such as the one occurring during 1982-83, may shift shrimp populations to the north. Some highly productive shrimp beds are often associated with oceanic gyres with circular current patterns which tend to concentrate shrimp (Hannah and Jones, personal communication).</p> <p>Migratory behavior is mostly passive, although nightly vertical migrations take place as shrimp move to midwater depths to feed. Their diel vertical movements may also assist with movement and dispersal of shrimp by alongshore currents (Percy, 1970).</p> <p>Fishery-independent studies have contributed extensively to the knowledge of the geographic range and migrations of the target stock. A score of 85 is warranted, given that some elements of temporal and spatial migration patterns are not fully understood and the information is not updated periodically.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
1.1.1.3	The life history of the species is understood. Age, sex, maturity, natural mortality, growth and fecundity are defined.	<ul style="list-style-type: none"> <li>Aspects of the life history are sufficiently understood to support a basic evaluation of the effects of fishing.</li> </ul>	<ul style="list-style-type: none"> <li>Critical elements of the life history of the species are clearly documented and understood to support a comprehensive qualitative evaluation of the effects of fishing.</li> </ul>	<ul style="list-style-type: none"> <li>All aspects of the life history of the species are clearly documented and understood, facilitating a comprehensive quantitative evaluation of the effects of fishing.</li> </ul>	14.3	95
Scoring Rationale/ Objective Evidence	<p>The life history of ocean shrimp has been studied extensively and is well understood (Abramson et al., 1981). Age, sex, growth, and maturity have been well documented, and are monitored by ODFW throughout the fishing season (e.g. Hannah and Jones, 2006b). Shrimp are protandric hermaphrodites maturing in their second year of life as males, then changing sex to function as females. Sex change by age class may vary in response to demographic characteristics of the shrimp population. When there is a lack of older females there is an increase in “primary” females at age 1 (Charnov and Hannah, 2002).</p> <p>Growth rates vary by sex, year-class, and by region. High natural mortality apparently varies by age class (Collier and Hannah, 2001) and has been related to predator abundance (Hannah, 2001). Comparative studies have characterized temporal and geographic variation of shrimp fecundity (Hannah et al., 1995).</p> <p>Fishery impacts on growth, sex and age composition have been studied and quantified (Hannah and Jones, 1991; Charnov and Hannah, 2002). Bioeconomic modeling provided little evidence of growth overfishing but demonstrated a slight economic advantage to delaying the season until the third week in April (Gallagher et al., 2006). There is little evidence that the fishery impacts recruitment and future abundance of ocean shrimp. Management measures take into account the life history of ocean shrimp and were evaluated during development of the shrimp FMP (Abramson et al., 1981).</p> <p>The life history of the species is well documented and understood. However, typical for pandalids, quantifying mortality and distinguishing natural causes from fishing effects are difficult. Therefore, a score of 95 was considered appropriate.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

1.1.1.4	Spawning and nursery areas and the timing critical to both are identified.	<ul style="list-style-type: none"> <li>• There is some information on primary location of spawning and nursery areas/times.</li> </ul>	<ul style="list-style-type: none"> <li>• Spawning and nursery areas/ times are known.</li> </ul>	<ul style="list-style-type: none"> <li>• Spawning and nursery areas/times are sufficiently well documented to support closed areas/seasons where and when necessary.</li> </ul>	14.3	85
Scoring Rationale/ Objective Evidence	<p>Mating of shrimp takes place during September and October. Females carry extruded eggs until larval hatching in March to early May (Abramson et al., 1981; Collier and Hannah, 2001). In most years, the majority of the larvae have been released prior to April 1st. Larvae are pelagic and, therefore, subject to coastal currents for about 2.5 to 3 months. Ocean shrimp mating, spawning, and larval development occur over a broad geographic area. Shrimp larvae occupy deeper portions of the water column as they develop. Once settled, migrations may be vertical (diel) but it is thought they remain within the same geographic area or bed (Rothlisberg, 1975; Collier and Hannah, 2001). The use of seasonal closures to protect spawning shrimp was evaluated in a paper by Hannah (1999). The shrimp fishery has a coastwide (Washington, Oregon, and California) uniform season from April 1st through October 31st each year, thereby avoiding most of the egg-bearing period. Fishery impacts to nursery areas are thought to be minimal due to the pelagic nature of larvae.</p> <p>Although spawning areas and times are documented, the information on nursery areas is less complete. However, it is believed that nursery areas vary temporally and geographically from year to year, likely in response to the dynamic nature of the coastal currents. Fishermen generally avoid areas where very small shrimp (pinheads) occur but there is no effective communication mechanism within entire fleet to broadcast encounters with pinheads. Knowledge of spawning and nursery areas/times and the seasonal closure during the ovigerous period justifies a score of 85.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

1.1.1.5	Information is collected on the abundance, distribution and composition of the stock.	<ul style="list-style-type: none"> <li>• Fishery dependent and/or fishery independent indices are available on the abundance, distribution and composition of the stock.</li> <li>• Qualitative information exists on the appropriateness of the indices as proportional indicators of stock size.</li> </ul>	<ul style="list-style-type: none"> <li>• Uncertainties have been identified and reduced to allow trends to be determined from indices.</li> </ul>	<ul style="list-style-type: none"> <li>• Fishery dependent and fishery independent indices are available on the abundance, distribution and composition of the stock.</li> <li>• Uncertainties in indices have been fully analyzed.</li> <li>• Indices are consistent and there is clear evidence that they are representative of the stock size.</li> </ul>	14.3	90
Scoring Rationale/ Objective Evidence	<p>All state sampling programs collect landing data on the ocean shrimp fishery. Presently, only Oregon monitors the fishery by collecting and analyzing logbook data and biological samples from landed catch. Washington has suspended collection of logbook data while California continues to collect logbooks. In addition, ODFW conducts special studies periodically to characterize abundance, distribution, and composition of the stock (Hannah and Jones, 2005). Annual fishery-independent shrimp trawl surveys were conducted off the Oregon coast during the mid to late 1970's, however the results were not thought to represent a reliable indicator of stock abundance (Abramson et al., 1981).</p> <p>Although Washington and California have minimal sampling programs, ODFW collects biological data, catch and CPUE data from the fleet catching off Washington, Oregon, and California and delivering into Oregon ports. The resource sampled is representative of the most of the stock area fished (see section 1.1.1.1 above). Presently, there is little effort by fleets in other states: about 5 boats fished in California, and 10 to 12 in Washington (Pettinger, personal communication).</p> <p>ODFW assessments of stock condition consist of in-season monitoring of CPUE, geographic distribution of catch, and year-class strength. About 90 to 95% of the ODFW logbook data collected are considered accurate and are used in annual assessments and in special studies (see section 3.5.2). Biological sampling is similarly robust and conducted in all major ports where shrimp are landed (Hannah and Jones, 2006b). The major uncertainties of assessments deal with predicting environmental effects on future stock conditions. Fishery effects, if any, appear to be masked by environmental influences on survival of recruits. Retrospective studies are conducted with environmentally based models periodically to study trends in population abundance. Results of these studies are published in peer reviewed journals. Shrimp abundance was found to be highly correlated to environmental conditions as measured by sea level height during spring transition (Hannah and Jones, 1991).</p> <p>Only fishery dependent indices are currently available. However, historical fishery independent indices were evaluated and rejected as reliable indicators of abundance. Focus shifted towards environmental models which, at present, are retrospective but provide insight regarding the major factors influencing ocean shrimp production. Uncertainties in both historic and currently used indices have been fully analyzed. Evidence that fishery dependent indices are fully representative of the stock has not been fully clarified. Therefore, a score of 90 was given.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
1.1.1.6	There are studies characterizing the environmental effects (both physical and biological) on population dynamics.	<ul style="list-style-type: none"> <li>• There is evidence of studies on the effects of biological and physical influences on the population.</li> <li>• Research is encouraged and ongoing.</li> </ul>	<ul style="list-style-type: none"> <li>• There is sufficient knowledge of biological and physical factors affecting abundance, distribution, survival and year class strength to infer the effects on population dynamics.</li> </ul>	<ul style="list-style-type: none"> <li>• There is extensive and well-documented knowledge of biological and physical factors affecting abundance, distribution, survival and year class strength to allow estimation of the effects on population dynamics.</li> </ul>	14.3	95
Scoring Rationale/ Objective Evidence	<p>Numerous studies conducted over the past 20 years characterize environmental effects of the oceanographic changes (Rothlisberg and Miller, 1983; Rothschild and Fogarty, 1989; Hannah, 1993; Hannah, 1999) and predator impacts (Gotshall, 1969 a,b; Alton and Nelson, 1970; Francis, 1983; Rexstad and Pitkitch, 1986; Hannah, 1995) on ocean shrimp populations. Oceanographic factors appear to explain most of the variation seen in recruitment and abundance of adults. Recruitment is highly negatively correlated to April sea height level (SLH) during the period of transition from winter strong northerly flowing longshore currents to the summer period characterized by weak longshore currents, upwelling, and offshore surface currents. When winter-like current conditions extend into the spring beyond the average timing of transition, newly released shrimp larvae are thought to be advected to the north away from favorable habitat where shrimp settle and grow. On the other hand, very strong periods of upwelling may result in shrimp larvae being advected offshore and are likewise lost from favorable habitat (Hannah and Jones, personal communication).</p> <p>Ocean shrimp are a significant prey item for several groundfish species, and incoming year-classes of one species are thought to have a significant impact on natural mortality rates of shrimp (Gotshall, 1969a,b). In particular, shrimp mortality is related to age 2 abundance of Pacific whiting <i>Merluccius productus</i> (Hannah, 1995).</p> <p>The results of extensive studies are well documented and provide insight on the biological and physical factors affecting abundance, distribution, survival and year class strength, warranting a score 95 for this indicator. More quantification of the effects on population dynamics is anticipated with continued development and update of models.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

1.1.1.7	There are sufficient fishery and/ or fishery-independent indices available to evaluate the effects of fishing and ecosystem changes on recruitment variability	<ul style="list-style-type: none"> <li>• There are indices used to qualitatively evaluate the effects of fishing and ecosystem changes on recruitment variability.</li> </ul>	<ul style="list-style-type: none"> <li>• There are fishery dependent and/or fishery-independent (e.g. oceanographic and fishery research surveys) indices which are used to analyze the effects of fishing and ecosystem changes on recruitment variability.</li> </ul>	<ul style="list-style-type: none"> <li>• There are fishery and fishery-independent, standardized, time-series indices that are used to quantify the effects of fishing and ecosystem changes on recruitment variability and to provide short and medium-term recruitment forecasts.</li> </ul>	14.3	90
Scoring Rationale/ Objective Evidence	<p>Considerable progress has been made in the development of shrimp population dynamics models which incorporate environmental and fisheries information (Hannah, 1993, 1995, 1999; Hannah and Jones, 1991). Model results have successfully explained much of the variability in shrimp abundance, and the evidence points towards the ocean environment as being the primary driver of abundance, with only a few exceptions. However, the dynamic nature of ocean conditions and population responses to them do not yet permit reliable forecasting with the models developed so far. Furthermore, there is no clear evidence of a stock-recruitment relationship in ocean shrimp populations but there appears to be a high correlation between stock size when strong recruitment events occur (recruitment-stock relationship). There is evidence that the shrimp fishery can change the age structure of the population under high levels of effort - where one-year old shrimp dominate the catch. Shrimp respond to higher population densities of age one shrimp by transitioning to females earlier in life. With a few possible exceptions, the shrimp fishery appears to not influence the future recruitment or abundance. In the few instances where shrimp populations have declined dramatically, either due to adverse environmental conditions, effects of predation by Pacific whiting, fishing effort, or a combination of these factors, populations have recovered to former levels within a short time span - typically less than 5 years.</p> <p>Modeling efforts to date are exemplary and provide valuable insight with respect to the major factors controlling population dynamics of ocean shrimp. A score of 90 is warranted. However, reliable forecasting for population trends and quantification of the effects of fishing are lacking.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

<b>1.1.2 TAVEL Sub-Criterion</b>	There should be sufficient information on the fishery to allow its effects on the target stock to be evaluated.	16.3	
----------------------------------	---	------	--

Weighting Comment	Slightly more importance is placed on knowledge of fishing mortality and fishing effort, critical management data.
-------------------	--

1.1.2.1	All fishing related mortality is recorded/ estimated. This includes landings, discards, and incidental mortality (adult and juvenile).	<ul style="list-style-type: none"> <li>• Sufficient information is available to allow accurate estimate to be made of landings.</li> <li>• Qualitative estimates of discards are available.</li> </ul>	<ul style="list-style-type: none"> <li>• Landings and discards are accurately recorded in log books as required by regulation.</li> <li>• Discards are well estimated for adult and juvenile shrimp.</li> </ul>	<ul style="list-style-type: none"> <li>• Landings and discards are accurately monitored and fishing mortality is known.</li> </ul>	30	70
Scoring Rationale/ Objective Evidence	<p>Shrimp landings and incidentally caught groundfish are recorded coastwide through the use of landing receipts or fishtickets. Discarded shrimp are not routinely recorded. Fishermen generally avoid areas of small shrimp (termed ‘pinheads’) as they are unmarketable and not legal to land in large quantities (Hannah and Jones, personal communication). One study, documenting shrimp and fish catch and discard using an expanded logbook program (Krutzikowsky et al., 2006), found that almost 80% of the shrimp discarded was due to bycatch of finfish species mixed in with shrimp catch. Only 6,000 lb of shrimp were discarded for nearly 2.3 million pounds landed. The study was based on 1998 logbook information. During that year, one-year old shrimp comprised 45% of the population compared to the long term average of 64% between 1975-2005. The percentage of one-year-old shrimp has averaged 63% recently (2001-2005). Therefore, sampling and discard in 1998 might not be representative of recent conditions. Recent mandatory BRD requirements have reduced or eliminated the need to discard mixed catches of fish and shrimp due to heavy contamination of catches with unmarketable fish.</p> <p>Shrimp trips were observed in Washington, Oregon, and California by the West Coast Groundfish Observer Program (WCGOP) from 2002-2005. This is a statistically based sampling program and estimates of shrimp and groundfish catch and discard were quantified from the observed trips. Recently, John Cusick (NMFS Observer Coordinator), indicated that the WCGOP will continue to place observers on shrimp vessels as they become available, possibly next year. There is no plan to phase out the shrimp fleet from the observer program rotation (Pettinger, personal communication).</p> <p>ODFW has published a report which summarizes and analyzes data from several sources, and evaluate the effects of mandatory fish excluders or BRDs recently implemented (Hannah and Jones, 2007). BRDs have reduced bycatch of finfish species to 10% or less of the total catch.</p> <p>The SG 80 requirements are not met because discards are not recorded in logbooks. In fact, there is no provision in the Oregon logbook for recording discards either qualitatively or quantitatively. Observer coverage exists but data are not sufficient to reliably estimate shrimp discards in the fishery. BRD's reduce shrimp discards but the amounts have not been quantified. Although 'pinheads' are avoided by fishermen, bags are occasionally dumped when they are encountered in test fishing. Furthermore, site visit information raised concerns about the use sorting machines by some fishermen. This performance indicator was scored 70 and requires a condition to meet the 80 guidepost.</p> <p><b>Condition</b> - The client must meet the requirements of the 80 scoring guidepost prior to the first annual surveillance audit. Discards are to be accurately recording in log books. Discards are to be well estimated for adult and juvenile shrimp.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

1.1.2.2	Fishing effort is known and standardized.	<ul style="list-style-type: none"> <li>Nominal effort data are available which can be used to estimate effective fishing effort well enough to support a rudimentary analysis for tracking trend in the stock.</li> </ul>	<ul style="list-style-type: none"> <li>Accurate estimates of effective fishing effort are available and support a high degree of confidence in the evaluation of change in stock size over time by statistical area.</li> </ul>	<ul style="list-style-type: none"> <li>Comprehensive records of fishing effort are kept and recorded at levels of temporal and spatial resolution to compute standardized, effective fishing effort, supporting a very high degree of confidence in the evaluation of change in stock size over time.</li> </ul>	30	80
Scoring Rationale/ Objective Evidence	<p>Only Oregon and British Columbia collect logbook data and compile and report catch by Pacific States Marine Fisheries Commission statistical area, fishing effort and catch-per-unit-effort (CPUE). Washington suspended its logbook collection program in 1993. California collects logbook data but has not compiled and reported summary statistics since 1992. Thus, complete accounting of total catch and effort, by area cannot be presented for years after 1992. CPUE is standardized and expressed in terms of single-rig equivalents (SRE) even though most of the fleet fishes double-rigged trawl gear. Catch, effort, and age and sex composition of the catch by statistical area have been compiled for available data from 1985-1995. Off the Oregon coast, CPUE can be useful as an index of stock size over time, with some limitations. If market conditions are poor (low price), or abundance falls below an economic threshold where it is no longer profitable to fish within an area, insufficient effort may be expended within the area to determine abundance of shrimp (Hannah and Jones, personal communication).</p> <p>It is noted that total fishing effort in terms of the number of vessels was constrained by a limited entry program implemented by Washington, Oregon, and California. In Oregon, the number of participants was capped at 150 by statute. The federally sponsored groundfish trawl buyback program has further reduced the number of potential vessels to 142. Market has played an even larger role in reducing effort and the current active fleet size in Oregon is about 40 vessels (Hannah and Jones, personal communication).</p> <p>Although Washington and California have minimal sampling programs, ODFW collects biological data, catch and CPUE data from the fleet catching shrimp off Washington, Oregon, and California and delivering into Oregon ports. The resource sampled is representative of the most of the stock area fished and the Oregon fleet historically has taken more than 60% of the three state harvest. Recent Oregon landings have approached 70% of the WOC area (Golden, 2006a) and there is little reason to believe that this trend will reverse (Pettinger, personal communication). Presently, there is little effort by fleets in other states: about 5 boats fished in California, and 10 to 12 in Washington.</p> <p>Only Oregon vessels approach the 100 SG, in that a rigorous standardization of fishing effort is conducted. Although effort data are lacking for Washington and California vessels, the information from the fleet fishing off all three states and delivering to Oregon ports is considered to be representative of the stock area. Therefore, a score of 80 is considered appropriate.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
1.1.2.3	Commercial fishing vessels, gear and methods are characterized for the fishery.	<ul style="list-style-type: none"> <li>• General fishing methods and gear type are known for the fishery.</li> <li>• Information is available on the size and composition of the fleet, but is not regularly updated.</li> <li>• Seasonal and geographical variations in fishing pattern are estimated.</li> </ul>	<ul style="list-style-type: none"> <li>• Main fishing methods and gear type are known for the fishery and information is available on location of fishing from fishing logs.</li> <li>• Information on the size and composition of the fleet is recorded and updated at regular intervals.</li> <li>• Seasonal and geographical variations in fishing pattern are known.</li> </ul>	<ul style="list-style-type: none"> <li>• All fishing methods and gear types employed in the fishery are specifically characterized by fishing ground and season.</li> <li>• Representative at-sea observer coverage records information on fishing practices.</li> <li>• Seasonal and geographical variability in fishing pattern, is recorded and regularly reviewed.</li> </ul>	20	90
Scoring Rationale/ Objective Evidence	<p>There have been periodic studies of commercial fishing vessels, gear, and methods for the ocean shrimp fishery (Jones et al., 1996). Vessel horse power and tonnage is documented for each vessel. Information on net size is collected periodically. Data on bycatch reduction devices or BRDs are collected for every trip as a part of the logbook data collection program in Oregon.</p> <p>Shrimp trips were observed in Washington, Oregon, and California by the West Coast Groundfish Observer Program (WCGOP) from 2002-2005. Presently, ODFW has been given WCGOP datasets for quantitative analysis and has a report in preparation which summarizes and analyzes data from several sources, and evaluate the effects of mandatory fish excluders or BRDs recently implemented (Hannah and Jones, 2006d). The WCGOP will continue to monitor the shrimp fishery on an as needed basis.</p> <p>ODFW has analyzed seasonal and geographic distribution of sampled fleet (Hannah, 1997), and continues to monitor fishing patterns through interviews and logbook collections during each fishing season. Fluctuations in geographic distribution of the stock area and how these changes relate to CPUE is well understood for the Oregon shrimp fishery (Hannah, 1995).</p> <p>It is doubtful that the limited observer coverage (86 of 2346 trips observed) is representative of the entire fishery. Otherwise, the other two elements of the SG 100 are adequately met and a score of 90 is appropriate.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

1.1.2.4	Gear and fishing method selectivity for the target species is known.	<ul style="list-style-type: none"> <li>Information is available on selectivity and qualitative changes in selectivity.</li> </ul>	<ul style="list-style-type: none"> <li>Selectivity is well estimated for key locations and times.</li> </ul>	<ul style="list-style-type: none"> <li>Full selectivity has been estimated, including locations and times of fishing over a suitable time series.</li> </ul>	20	100
Scoring Rationale/ Objective Evidence	<p>Over the past three decades, there have been several studies investigating the fishing gear, fishing method, mesh size, and selectivity of gear for ocean shrimp (Golden, 1981, Lo, 1978; Jones et al., 1996; Hannah and Jones, 2003; Abramson et al., 1981). Shrimp size at a given age varies geographically - larger shrimp are found in the southern part of their range and smaller shrimp to the north. Mesh size is not uniform along the coast, but scaled as appropriate for the different sizes of shrimp. In California a 1 3/8 inch mesh size in the codend is required by law. Oregon and Washington no longer restrict codend mesh size but control the size or grade of shrimp through a shrimp count-per-pound regulation. Mesh size is not generally thought to be completely effective at selecting for larger shrimp. ODFW has conducted video studies of shrimp behavior when they encounter trawl gear. Shrimp appeared to respond randomly or passively when contacting shrimp trawl webbing instead of actively seeking an exit to escape through meshes (Hannah et al., 2003). The volume of shrimp in the catch can also plug the net and fisherman can defeat the purpose of mesh restrictions by adjusting the nets to close the meshes (Hannah and Jones, personal communication).</p> <p>The Assessment Team commended the extensive work on selectivity that meet the requirements for a score of 100.</p>					

<b>1.1.3 TAVEL Sub-Criterion</b>	Reference levels which maintain high productivity have been developed for spawning stock abundance and/or fishing mortality.	14.8	
----------------------------------	--	------	--

Weighting Comment	Established reference levels are given much more weight than consistence with international standards as there are no established international reference level standards for pandalid species..
-------------------	--

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
1.1.3.1	<p>There are reference levels that are appropriate for the stock, respect limit and target objectives and take ecosystem effects into account. These reference levels include fishing mortality rates and/or spawning stock abundance.</p>	<ul style="list-style-type: none"> <li>• Reference levels have been chosen and are justified by general agreement among regional fishery scientists and fishers following qualitative analysis of the fishery and consideration of traditional knowledge.</li> <li>• Conditions that reflect unfavorable environmental conditions have been incorporated but not verified.</li> </ul>	<ul style="list-style-type: none"> <li>• Reference levels are justified based on stock biology and dynamics, demonstrated environmental influences and traditional knowledge.</li> <li>• Sources of uncertainty, variability and data limitations are known and some are accounted for, providing a margin of safety with respect to fishing mortality and/or stock abundance.</li> </ul>	75	85
Scoring Rationale/ Objective Evidence	<p>Reference levels are not set in terms of a numerical Optimum Yield or OY, but in terms of stock trends in CPUE and year-class strength as outlined in the Biological Points of Concern in the Fishery Management Plan (Abramson et al., 1981). Earlier in the fisheries history, California Department of Fish and Game (CDFG) attempted to use a Schaefer-type production model to establish annual quotas. Subsequent analysis indicated that variations in abundance and catch were highly variable and related to variable recruitment driven by environmental changes. Model assumptions were violated or poorly met (Geibel and Heimann, 1976). Attempts have been made to develop a reference level for minimum spawning stock abundance for shrimp stocks off the Oregon coast using models that incorporated environmental variability. A study by Hannah (1999) suggested a minimum spawning stock threshold of 1.3 billion in order to maintain a higher average recruitment. A recruitment model was used and incorporated CPUE, stock area, and index of age-1 shrimp. A regression model incorporated the recruitment index, April SLH, geographic stock area, spawning abundance, and egg production. The author has more recently cautioned that, while a spawner recruitment threshold may be possible, it may be advisable to base it on a retrospective study of stock size and stock recovery rather than a possible stock-recruitment relationship described in the 1999 paper (Hannah and Jones, personal communication). Such a retrospective study has been initiated but not completed at this time.</p> <p>Environmentally based models also demonstrated earlier production modeling assumptions of constant catchability and constant natural mortality to be in violation as both appear to demonstrate variability (Hannah, 1995; Hannah and Jones, personal communication).</p> <p>Models developed to date which use CPUE and/or age composition data have failed to provide meaningful reference points for fishery management. Environmentally based models have been able to show environmental effects on recruitment, but there appears to be no underlying stock-recruitment relationship that is affected by the fishery. These models appear to provide evidence of a recruitment-stock relationship that is heavily influenced by environmental conditions during the larval stage. Any impacts of the fishery that might have occurred are obscured by environmental noise. Impacts, be they fishery or environmental, which may have led to a decline in abundance appear to be mitigated by recovery times of one generation or less.</p> <p>Major sources of uncertainty and variability are linked with the inability to predict future environmental driving forces which appear to strongly influence recruitment. The forces of nature are highly variable and so strongly influence fate of larval shrimp that it is difficult to unmask potential fishery impacts if they exist. Predation may be an important ecosystem factor and may be another source of variability in natural mortality rates, which have been assumed to be constant for many modeling exercises. High quality data are collected over the majority of the stock range. The major limitation with the data is its use in conjunction with derived or assumed values such as catchability. Shrimp distribution may be another source of variability and there is some evidence that catchability is variable.</p>				

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

	<p>Presently, ODFW assesses shrimp stocks by evaluating logbook data and biological sample data collected at the docks. The geographic distribution of catch by area and CPUE are evaluated in-season and annually. Year-class strength is also evaluated. These indicators are compared against historical trends. Findings are reported to stakeholders through the publication of an annual newsletter. ODFW continues to conduct research on the population dynamics of ocean shrimp, influence of environmental effects, the potential impacts of fishing on shrimp populations, and appropriate reference levels.</p> <p>Both elements of SG 80 have been met in that reference levels address biological/environmental influences and traditional knowledge. Also, sources of uncertainty, variability and data limitations have been considered and are addressed in the management program. A score of 85 credits the work that has been completed to help understand stock dynamics and establish reference levels. However, they need further development.</p>				
--	---	--	--	--	--

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

1.1.3.2	Reference levels are consistent with international standards.	• Reference levels are being developed to meet international standards.	• Reference levels are established and are consistent with international standards.	• Reference levels meet or exceed international standards.	25	80
Scoring Rationale/ Objective Evidence	<p>Cadrin et al. (2004) recommended the precautionary approach (PA) adopted as part of the Food and Agricultural Organization (FAO) Code of Conduct along with a hierarchical approach to determining reference levels for pandalid shrimp. The PA approach advocated by the FAO recommends early application of conservation and management measures designed to prevent overfishing in the absence of scientific information. The authors point out that in the early stages of the fishery, less information is available, but conservation methods based on surveys, catch rates and life history might be useful for establishing preliminary reference levels useful for protecting the resource within a short time horizon. The authors point out that this does not necessarily permit development of longer term strategies for harvest management and resource protection. As the fishery matures, more sophisticated models should be employed and corrections to these models should be made based on a research agenda which seeks to improve model parameters.</p> <p>Survey techniques were attempted in order to develop reference levels for ocean shrimp on the West coast. A pre-season estimate of spawning biomass is needed to provide the basis for an appropriate harvest for the fishing season. Pre-season surveys off California and Washington were found to be poor predictors of shrimp abundance during the 1970's (Hannah and Jones, personal communication). Weather and ocean conditions prior to the spring transition period were not conducive to survey methods and catchability was an issue with the older, low rise nets. Ocean shrimp migrate vertically and were unavailable to the gear at times. More information is needed on the potential application of newer high-rise nets on survey methods for ocean shrimp (Hannah and Jones, personal communication).</p> <p>Longer term data sets on catch, effort, and age structure are available. Several attempts have been made to characterize shrimp population dynamics using fishery information and field samples as described above under sections 1.1.1 and 1.1.2 above. Shrimp abundance appears to be heavily influenced by environmental factors and predation, masking potential impacts of fishing. While attempts to establish references levels for Oregon ocean shrimp have been made, their adequacy remains in doubt (Hannah, 1999; Hannah and Jones, personal communication).</p> <p>Present reference levels are available which address overall fishing effort, shrimp size to allow for an appropriate level of escapement to first spawning, and appropriate fishing season to protect shrimp during the spawning period. Season length and count-per-pound are the primary tools used to protect shrimp, although the biological benefits of the latter are inferred, not demonstrated. The timing of ovigery in females was determined early in the history of the fishery, thus season length was established to minimize harvest of ovigerous females. Earlier in the fisheries history, season length was longer. The season was shortened as a pre-cautionary measure. All three states currently have a season lasting from April 1 to through October 31 to protect spawning females and to ensure consistency of regulations controlling season coastwide. The 160 maximum average count-per-pound rule was set as a standard to protect age-1 shrimp. Mesh selectivity and population response to fishing pressure still result in significant harvest of age-1 shrimp. The rule was created to protect shrimp until they reach a marketable size and to reduce fishing mortality of age-1 shrimp to increase the spawning stock at the end of each season (Abramson, et al., 1981).</p> <p>Presently, ODFW assesses shrimp stocks by evaluating logbook data and biological sample data collected at the docks. The geographic distribution of catch by area and CPUE are evaluated in-season and annually. Year-class strength is also evaluated. These indicators are compared against historical trends. Findings are reported to stakeholders through the publication of an annual newsletter (Hannah and Jones, 2006b).</p> <p>ODFW continues to conduct research on the population dynamics of ocean shrimp, influence of environmental effects, the potential impacts of fishing on shrimp</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

	<p>populations, and appropriate reference levels.</p> <p>Accepting the hierarcial approach of Cadrin et al. (2004) as a standard, and evidence that development of the reference levels for ocean shrimp followed that approach, a score of 80 is appropriate. Refinement of the reference levels requires fishery independent time series indices and further modeling of environmental inputs with forecasting capability.</p>				
--	--	--	--	--	--

<b>1.1.4 TAVEL Sub-Criterion</b>	There is a well defined and effective harvest strategy to manage the target stock.	18.9	
----------------------------------	--	------	--

Weighting Comment	Within this sub-criterion, all performance indicators (PIs) are equally weighted.
-------------------	---

1.1.4.1	There are mechanisms in place to control harvest as required for management of the stocks.	<ul style="list-style-type: none"> <li>• Mechanisms exist to monitor and, when necessary, control harvest but have not been tested.</li> </ul>	<ul style="list-style-type: none"> <li>• Mechanisms are in place to adjust harvest as and when required to maintain, or allow the target stock to return to, productive levels.</li> </ul>	<ul style="list-style-type: none"> <li>• Mechanisms are responsive, relevant and timely; mechanism performance has been evaluated and demonstrates a high degree of effectiveness.</li> </ul>	50	90
---------	--	--	--	---	----	----

Scoring Rationale/Objective Evidence	<p>Ocean shrimp are managed by season and count-per-pound rules. There is no annual quota in the management program. These harvest control methods have helped sustain a healthy fishery for more than two decades. Fishery impacts have not been demonstrated and recruitment is heavily influenced by environment during the larval phase of shrimp. Quotas were attempted early in the fishery but discarded due to inadequacies of models used to establish them. Giebel and Heimann (1976) concluded that quota management in California would be difficult to rationalize due to the high variability in biomass associated with environmental effects. They recommended a mesh size of 1.5 inches and other regulations to assure carry-over of an adequate spawning stock. Shrimp off California are larger for a given age class than off Washington and Oregon. Count-per-pound rules off Washington and Oregon were thought to accomplish the same goal. Over the stock range, mesh size and/or count-per-pound regulations coupled with a season to protect spawning females are thought to be adequate controls for a fishery that reduces spawning biomass in most years but does not appear to impact future stocks (Hannah and Jones, personal communication). Rationale for these measures was discussed in the Fishery Management Plan for Pink Shrimp (Abramson et al., 1981).</p> <p>The three states apply statute and administrative rules to manage the fishery and have emergency authority to impose additional restrictions through emergency and/or permanent rule changes. This could include a changes to limit effort or season length (opening, closing).</p> <p>Count and season rules appear to work well and are responsive. There is excellent communication with harvesters during fishing operations and through an informative, interactive annual newsletter. Therefore, a score of 90 is warranted. The harvest control mechanisms have not been extensively tested. Nevertheless, over the history of the fishery, two successive year class failures have not been observed. ODFW would look at time closures but there was some concern on how well Washington and California would adhere to the rules. To achieve a score of 100, the fishery managers would have to actively demonstrate stricter management of opening or closing dates to larval release in late release years and egg bearing females at the end of the season as well as demonstration that the management of season leads to an increase in productivity.</p>				
--------------------------------------	--	--	--	--	--

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
1.1.4.2	Clear, effective harvest control decision rules are described, communicated and enforced.	<ul style="list-style-type: none"> <li>• Informal harvest control decision rules exist consistent with stock health indices.</li> <li>• Harvesters are aware of harvest control decision rules.</li> <li>• Implementation is underway.</li> </ul>	<ul style="list-style-type: none"> <li>• Explicit decision rules, linked to stock health indices have been developed and implemented.</li> <li>• Industry participates in the crafting and implementation of decision making framework.</li> <li>• Rules are being evaluated for effectiveness.</li> </ul>	<ul style="list-style-type: none"> <li>• Explicit, tested decision rules are consistent with reference levels.</li> <li>• They are periodically evaluated and are being enforced.</li> </ul>	50	90
Scoring Rationale/ Objective Evidence	<p>Clear and effective harvest control rules have been in place since the implementation of the state management alternative outlined in the draft shrimp FMP. The ocean shrimp fishery in Oregon is managed by season to protect spawning females, and count-per-pound to protect recruiting shrimp by reducing fishing mortality of age-1 shrimp to increase the size of spawning stock at the end of each season and to ensure shrimp are taken at a marketable size (Abramson, et al., 1981). These harvest control rules are described, communicated and enforced. A recent example of industry involvement and participation was the development of bycatch reduction devices, now mandatory in Washington, Oregon, and California. With ODFW taking the lead, fishermen worked with staff in all three states to develop the latest generation of BRDs (Hannah and Jones, 2006d). ODFW uses interviews and surveys to communicate new information regarding regulations or potential regulations (Hannah and Jones, 2006b). Industry participates by testing new gear or methods, either voluntarily or by offering charter services.</p> <p>New regulations are evaluated for their effectiveness. For example, the WCGOP observed the shrimp fishery during implementation of BRDs from 2002-2005. Data from the study have been turned over to ODFW for analysis. Results from a report prepared for publication indicate that BRDs have reduced the bycatch of finfish species in the shrimp fishery to less than 10% of the total catch</p> <p>The count per pound and season rules are consistent with reference levels and have been evaluated and enforced, supporting a score of 90. However, they have not been tested and it has yet to be demonstrated that the count rule is effective with respect to biological benefit.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

<b>1.1.5 TAVEL Sub-Criterion</b>	There is a comprehensive stock assessment.			17.5	
----------------------------------	--	--	--	------	--

Weighting Comment	PI 1.1.5.1 is weighted slightly more than other PIs within sub-criterion because comprehensive assessment of the stock is more important than remaining PIs which are considered building blocks..
-------------------	--

1.1.5.1	The assessment methods/models provide a comprehensive assessment of the stock. These include, but are not limited to, provision for catch and effort data, age and/or sex structure of the catch and population, stock size indices, relationship of recruitment to spawning stock and evaluation of the effects of environmental variables.	<ul style="list-style-type: none"> <li>• Assessments evaluate indices of stock status that are generally believed to reflect abundance, production and mortality.</li> <li>• The indices are primarily qualitative and address aspects of the species biology, including the effects of the physical and biological environment.</li> </ul>	<ul style="list-style-type: none"> <li>• Assessments evaluate indices of stock status that have been shown to reflect abundance, production and mortality.</li> <li>• The indices model aspects of the species biology, including the effects of the physical and biological environment.</li> </ul>	<ul style="list-style-type: none"> <li>• Complex assessment models are used, capturing all major features appropriate to the biology and ecology of the species and the nature of the fishery.</li> <li>• The assessment models include statistical fitting of the data and address both process and measurement error.</li> </ul>	25	80
---------	--	---	--	--	----	----

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

Scoring Rationale/ Objective Evidence	<p>A comprehensive coastwide stock assessment for ocean shrimp was conducted and documented in the Fishery Management Plan for Pink Shrimp (Abramson et al., 1981). Coastwide assessments were made using a Schaefer-type production model for Washington, Oregon, and California and for catch years from 1959-1980 (Abramson and Tomlinson, 1972). Attempts have been made to use age, CPUE, and environmental data to explain and forecast abundance. To date, production and catch-at-age models have been largely unsuccessful in establishing meaningful reference limits for the ocean shrimp fishery. Environmentally based models have been useful in retrospective studies of environmental impacts on an apparent recruitment stock relationship; however none have shown any consistent impact of the fishery on future stock abundance (e.g. no consistent stock-recruitment relationship). The more recent application of environmentally based models has been accomplished over a more restricted range than coastwide using the most complete sets of information available. For the most part, the analyses were restricted to the portion of the stock off Oregon representing slightly more than 50% of the geographic area and historical biomass. Thus, inferences made from these studies regarding biomass and recruitment trends can be representative of shrimp stocks over a wider area.</p> <p>Assessments presently take the form of in-season and annual analysis of CPUE data and biological samples collected from the Oregon fleet. CPUE, year-class strength, and geographic distribution of catch is compared to historical data and indicators of Biological Concern listed in the draft shrimp Fishery Management Plan (FMP) (Abramson et al., 1981). Environmental models are updated yearly with the previous seasons data. Findings from retrospective studies using the environmental models are published in peer reviewed journals periodically (Hannah and Jones, personal communication). Sampling is representative of a large portion of the stock area as boats landing into Oregon fish off of Washington and California. In addition, the Oregon landed catch was historically more than 60% of the WOC area catch. More recently, the Oregon contribution to WOC landed catch has approached 70% (Golden 2006a).</p> <p>Elements of the 80 SG are considered to be met but elaboration of the rationale is necessary. While the shift from traditional fishery models to environmentally based models is seen as a major advancement, the latter have been retrospective with limited forecasting capability. That said, examples of models that successfully incorporate environmental variables and produce reliable forecasts are rare in fisheries science. The Assessment Team was impressed with the modeling efforts to date and acknowledges that lengthy time series of stock production and environmental data are required for their construction. Research on ocean shrimp, with respect to environmental forcing, rates highly when compared to similar efforts for other pandalid stocks throughout the northern hemisphere. The lead researcher at ODFW is proactive in understanding what drives production for ocean shrimp, providing relevant information supported by careful analysis.</p> <p>Periodically, ODFW shrimp biologists analyze historical data from the shrimp fishery, update long-term recruitment and spawning stock indices and re-examine existing environmental models to determine if there is any evidence that fishing has depressed recruitment. The type of assessment conducted is similar to the evaluation detailed in Hannah (1999) and Hannah (1993). While these analyses have only been published when the findings suggest something novel or potentially useful to other researchers, it is Bob Hannah's intention to revisit these models within the next two years as part of monitoring efforts of the sustainability of Oregon's shrimp fishery. To date, modeling efforts have shown strong evidence for environmental forcing of shrimp recruitment and very little evidence of any influence from the fishery, however it's possible that continued efforts will better define the environmental relationships, allowing the influence of the fishery on recruitment to be better understood. Continued efforts in this area are the cornerstone of ODFW's management approach for the shrimp fishery.</p>				
--	---	--	--	--	--

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
1.1.5.2	The assessment evaluates the overall coast wide pink shrimp stock.	<ul style="list-style-type: none"> <li>• A qualitative evaluation has been done, indicating that findings from the Oregon fishery apply to the total stock area.</li> </ul>	<ul style="list-style-type: none"> <li>• A quantitative assessment has been done that includes fishery data from some areas outside the Oregon fishing areas.</li> </ul>	<ul style="list-style-type: none"> <li>• A quantitative assessment has been done that includes fishery and fishery-independent data for the total stock area from British Columbia to California.</li> </ul>	12.5	80
Scoring Rationale/ Objective Evidence	<p>Ocean shrimp assessments occur on a portion of the stock range but are considered representative of conditions over a broader area. The last shrimp coastwide shrimp assessment was conducted in 1981 using a Schaefer-type production model (Abramson et al., 1981). Model results were given for 1959-1980 with a maximum sustainable yield (MSY) ranging from 60-81 million pounds. Problems with assumed catchability and the influence of environmental factors on shrimp population dynamics has led to the development of more refined models (Hannah, 1999; Hannah, 1995; Hannah, 1993; Hannah and Jones, 1991). Assessments conducted using these models have been applied to a subset of the coast wide ocean shrimp stock limited to the statistical areas off the Oregon coast and in some cases including an area extending down to Cape Mendocino off the California coast. These models have been useful in retrospective studies and in explaining environmental variability, but have not been adequate to forecast future conditions nor have they demonstrated any relationship between fishing effort and abundance. Even though annual fishery and resource assessments based on CPUE and year-class strength, and recent environmentally based models have been restricted to the portion of shrimp stocks off Oregon or Oregon and portions of California, they are considered representative of the Washington, Oregon, and California stock area.</p> <p>A quantitative coastwide assessment has been completed and reevaluated with respect to the underlying assumptions. More appropriate models, which incorporate environmental influences on stock production, are under development and include fishery data from outside the Oregon fishing area. These accomplishments support a score of 80.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
1.1.5.3	The assessment evaluates current stock size and/or fishing mortality relative to reference levels.	<ul style="list-style-type: none"> <li>Provisional estimates of the current stock size and/or fishing mortality relative to reference levels are available.</li> </ul>	<ul style="list-style-type: none"> <li>A qualitative assessment of the current stock size and fishing mortality relative to the reference levels has been completed and is reviewed periodically.</li> </ul>	<ul style="list-style-type: none"> <li>Regular assessment makes a reliable evaluation of the current stock size and/or fishing mortality relative to the reference levels.</li> </ul>	12.5	85
Scoring Rationale/ Objective Evidence	<p>Assessments are conducted within season and on an annual basis to estimate relative stock health. Stock size and fishing mortality off of the Oregon coast is reviewed by inference, by comparing in-season CPUE to historical CPUE and geographic extent of the fishery in the current year compared to historical spatial catch distributions. In addition, biological samples are taken to determine sex ratios, estimate year-class strength and compare these observations with historical data. Evaluation of stock condition is done by evaluating data with respect to characteristics outlined in the Biological Points of Concern listed in the shrimp FMP (Abramson, et al. 1981). Environmentally based models are updated annually and periodic retrospective studies are conducted to determine trends in stock abundance.</p> <p>ODFW collects biological data, catch and CPUE data from the fleet catching shrimp off Washington, Oregon, and California and delivering into Oregon ports. The resource sampled is considered representative of the stock area fished. ODFW has analyzed seasonal and geographic distribution of sampled fleet, and continues to monitor fishing patterns through interviews and logbook collections during each fishing season.</p> <p>The assessments are qualitative, relate indices of stock health to reference levels and are conducted both within season and annually. These points support a score of 85. A metric to help establish the level and importance of fishing mortality is not available, however.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

1.1.5.4	The assessment includes an evaluation of the consequences of harvest strategy options.	<ul style="list-style-type: none"> <li>The assessment makes an initial approximation of the consequences of harvest strategy options.</li> </ul>	<ul style="list-style-type: none"> <li>The assessment includes a robust approximation of the consequences of harvest strategy options.</li> </ul>	<ul style="list-style-type: none"> <li>The assessment evaluates the consequences of harvest strategy options and evaluates stock trajectories under decision rules.</li> </ul>	12.5	80
Scoring Rationale/ Objective Evidence	<p>Past assessments considered evaluation of harvest strategy, and current assessments monitor present policies in context with Biological Points of Concern outlined in the shrimp plan. The Fishery Management Plan for Pink Shrimp (Abramson et al., 1981) used a Schaefer-type production model to establish references levels for ocean shrimp in the Washington, Oregon, and California area. Prior work by Giebel and Heimann (1976) outlined the difficulties associated with the use of this model to develop annual quotas when shrimp abundance varies more in relation to recruitment which appears to be more sensitive to environmental conditions than the fishery. Management tools used in lieu of an annual quota were recommended by the authors. Mesh/size, count-per-pound, and a season were selected as the primary tools and these were evaluated during the Fishery Management Plan development process.</p> <p>More recent analyses over a more limited geographic range have evaluated fishery impacts and harvest strategy options (Hannah and Jones, 1991). There is some evidence that the fishery off the Oregon coast could adversely impact ovigerous females and subsequent recruitment in some years and that a season delay of two weeks offer some protection. There appears to be only one or two events in which such impacts may have occurred, and shrimp stocks appear to recover quickly from low stock conditions regardless of the reason for reduced abundance (environmental and/or fishery).</p> <p>The most recent evaluation of harvest strategy options has been the study of fish excluders used in the shrimp fishery to reduce bycatch of finfish species. From 2002-2005 the WCGOP observed trips aboard shrimp boats as bycatch reduction devices (BRDs) were implemented. The data are presently being prepared for publication by ODFW. ODFW found that BRDs have significantly reduced bycatch of finfish species and their mandatory use has reduce bycatch of finfish to less than 10% of the total catch by shrimp trawlers (Hannah and Jones, 2006d).</p> <p>Overall, harvest strategy options selected for the fishery appear to be robust in their efficacy at performing their designed use. The primary management tools evaluated in annual assessments relate to the fishing season and count-per-pound. The fishing season has minimized the harvest of ovigerous females. The 160 count-per-pound rule is similarly robust. Count-per-pound has averaged 114+ 4 over the history of ODFW's sampling program (1966-2005) (Hannah and Jones, personal communication). Mesh size is not used as a management tool in Washington and Oregon. Mesh size was evaluated in a study by Golden (1981). Size at age varies along the coast; older shrimp in the more northern latitudes are smaller than in the south. The count-per-pound regulation appears to have been sufficiently robust to reduce the catch of small shrimp and ensure survival of significant numbers of age-one shrimp to their first spawning as females.</p> <p>The intent of the PI is to confirm that the season and count-per-pound rules, as two current and important harvest strategy options, have been evaluated within the assessment process, with respect to their contribution to sustainability. The consequence of the closed season is reduced mortality on berried females. The potential benefits have been evaluated in the primary literature (e.g. Hannah and Jones, 1991; Hannah, 1999). The consequence of the count-per-pound is protection of shrimp until they reach a marketable size and to reduce fishing mortality of age-1 shrimp to increase the spawning stock at the end of each season. Although the biological benefits of the count-per-pound are inferential only, they have historically been well below (114 +/- 4) the 160 regulation and CPUE is almost back to "virgin" levels. Therefore, a score of 80 is appropriate, accepting that a robust approximation of the consequences equates to a thorough evaluation of their effectiveness as precautionary measures, despite uncertainty</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
1.1.5.5	The assessment takes sufficient account of major uncertainties in data (including evaluation of assumptions) to provide a robust assessment of the stock.	<ul style="list-style-type: none"> <li>Major uncertainties and underlying assumptions are identified. Some attempt has been made to evaluate these in the assessment.</li> </ul>	<ul style="list-style-type: none"> <li>The assessment takes into account major uncertainties in the data. The most important assumptions have been evaluated, the consequences are known.</li> </ul>	<ul style="list-style-type: none"> <li>The assessment addresses all significant uncertainties in the data and evaluates the assumptions in terms of importance, trend direction and potential bias to the assessment.</li> </ul>	12.5	80
Scoring Rationale/ Objective Evidence	<p>Past and present assessment methods incorporated an evaluation of major uncertainties in data and assessments. The earliest assessment used a Schaefer-type production model based on several assumptions including the following: 1) underlying mechanisms of population dynamics and the fishery do not change with time; 2) the population will eventually go into equilibrium if a constant level of fishing effort is applied; and 3) there are sufficient data points to adequately fit the model (Abramson et al., 1981). Catchability and natural mortality were held constant. These assumptions were found to be in violation. Analysis of the use of this model by Geibel and Heimann (1976) outlined the difficulties of setting meaningful quotas for a stock that appears to be more sensitive to environmental variation than effects of the fishery. Later models implicated variable natural mortality rates in response to possible changes in predator abundance, and changes in geographic distribution of shrimp populations with abundance. Catchability, therefore, is thought to be variable as well.</p> <p>The data used in annual monitoring and assessments are assumed to be representative of the stock area. Historically, Oregon has landed more than 60% of the three-state harvest and more recently this percentage has approached 70%. Logbook data quality is considered high – nearly 100% of the Oregon logbooks are collected and 90-95% of the logbooks are considered useable for analysis. Biological sampling occurs throughout the season in all major shrimp ports in Oregon. Use of subsets of coastwide data to represent the stock area was evaluated in Hannah (1999).</p> <p>The information verifies that some of the major uncertainties and assumptions have been given thorough consideration in past and present assessments and warrants a score of 80. Oregon sampling coverage is considered representative and the CPUE standardization procedure accounts for variation due to time, space and gear type.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
1.1.5.6	Uncertainties and assumptions are reflected in the assessment of management options.	<ul style="list-style-type: none"> <li>• Assumptions and major uncertainties and possible implications are recognized and are reported in the management process.</li> </ul>	<ul style="list-style-type: none"> <li>• The implications of major uncertainties and assumptions are addressed in the management process through the use appropriate decision rules.</li> </ul>	<ul style="list-style-type: none"> <li>• All significant uncertainties, assumptions and appropriate decision rules are addressed and reflected in the management process.</li> <li>• Methods for addressing uncertainty are periodically evaluated with appropriated changes to decision rules.</li> </ul>	12.5	85
Scoring Rationale/ Objective Evidence	<p>Uncertainties and assumptions were incorporated in the management options reviewed and analyzed within the framework of the Pink Shrimp FMP (Abramson et al., 1981), and within the alternative option adopted by the states to manage the fishery. Shrimp abundance is assumed to be largely driven by environmental conditions and it is assumed fisheries generally do not have much impact on future abundance (no stock-recruitment relationship). The major uncertainties relate to understanding future recruitments and abundance as well as the potential for fishery impacts on the resource. Precautionary measures in place include a season to protect ovigerous females and a count-per-pound regulation to ensure carry over of age-1 shrimp into the spawning population. A Point of Concern mechanism was developed as a part of the FMP to deal with uncertainties and assumptions. For example, a point of concern could be raised if there were two successive year-class failures or declining CPUE coupled with a shift towards harvest of younger shrimp. These signals could trigger action which would lead toward more conservative management measures. ODFW monitors all of the parameters outlined in the Point of Concern section of the FMP through port sampling and fleet logbook collections. Although Washington and California have minimal sampling programs, ODFW collects biological data, catch and CPUE data from the fleet catching off Washington, Oregon, and California and delivering into Oregon ports.</p> <p>Population dynamics of ocean shrimp, and the associated uncertainties and assumptions, are issues for continuing research. The Assessment Team agreed that the management program currently uses decision rules that are precautionary in this regard, supporting a score of 85. However, for a future audit, a retrospective (e.g. 20 years) on uncertainties and assumptions and how they have been, are or plan to be addressed would be useful.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

1.1.5.7	Methods/models used in the assessment are considered up to date and are fully reviewed by independent peer analysis.	<ul style="list-style-type: none"> <li>The assessment process is considered adequate to evaluate stock status relative to reference levels, and has successfully passed internal peer review.</li> </ul>	<ul style="list-style-type: none"> <li>Assessment has passed independent peer review.</li> </ul>	<ul style="list-style-type: none"> <li>The assessment process is considered state-of-the art by international standards.</li> </ul>	12.5	85
Scoring Rationale/ Objective Evidence	<p>Currently Oregon assesses age, sex, and count-per-pound during the fishing season and gathers information on fishing effort by area to determine distributional characteristics of shrimp populations. In-season information is monitored and compared with historical data annually. ODFW biologists review fishery information with the fleet, mindful of Points of Concern outlined in the shrimp FMP.</p> <p>Analytical models are updated periodically (not annually) through retrospective studies to determine trends in abundance, impacts of environmental drivers and the fishery. All of the analytical models used or evaluated to date have been published in peer reviewed journals. The resource sampled by ODFW is representative of the most of the stock area fished and the Oregon fleet takes nearly 60% of the three state harvest.</p> <p>The assessment and approach to developing reference levels for ocean shrimp is consistent with Cadrin et al. (2004). Peer review of Dr. Hannah's work has been achieved through primary, peer reviewed fishery science journals. All of the major assumptions used in the management approach have been published in this manner. Many of these findings have also been presented in pandalid shrimp for a at the international level.</p> <p>Internal review is conducted at the PSMFC level, through the publication of annual summary assessments and through the peer review provided by managers and scientists within the WOC fishery management authorities.</p> <p>A score of 85 has been provided for this effort as there is international peer reviewed literature and presentation at the international fora.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

<b>1.1.6 TAVEL Sub-Criterion</b>	The stock is at the appropriate, environmentally-linked reference level.			13.8	
----------------------------------	--	--	--	------	--

Weighting Comment	PI 1.1.6.1 is considered twice as important as 1.1.6.2.
-------------------	---

1.1.6.1	The spawning stock is at or above the reference level.	<ul style="list-style-type: none"> <li>Assessments suggest the spawning stock is likely above the reference level, or if below the reference level or declining, an appropriate recovery/rebuilding plan has been implemented (go to 1.2)</li> </ul>	<ul style="list-style-type: none"> <li>Assessments indicate the stock is above the reference level and not declining.</li> </ul>	<ul style="list-style-type: none"> <li>Assessments demonstrate the stock is above the reference level and is either stable or increasing.</li> </ul>	66.7	80
Scoring Rationale/ Objective Evidence	<p>Although fishing mortality reduces the spawning stock, subsequent recruitment has not shown to be consistently affected by the fishery. Current market conditions have constrained fishing effort to less than 30,000 hours in single rig equivalents (SRE), approximately 1/5 of the historical high which peaked at nearly 160,000 hrs (SRE), and market samples indicate a shift back towards a fishery on multiple age classes rather than on primarily 1-year-old shrimp (Hannah and Jones 2006a). CPUE, an indicator of relative abundance, is in excess of 500 pounds per hour compared to a historical low of 106 pounds per hour and an average of 392 pounds per hour (1968-2005). A permanent fleet reduction in all three states, low price paid for shrimp, and the high cost of fuel are thought to be the primary reasons for lowered effort. Thus, it is highly likely that current spawning stock levels are not significantly affected by the fishery.</p> <p>As the evidence indicates but does not demonstrate that spawning stock is at or above the reference level, a score of 80 is awarded.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

1.1.6.2	The fishing mortality is below the reference level.	<ul style="list-style-type: none"> <li>Assessments infer that fishing mortality does not exceed the reference level.</li> </ul>	<ul style="list-style-type: none"> <li>Assessments indicate that the fishing mortality does not exceed the reference level.</li> </ul>	<ul style="list-style-type: none"> <li>Assessments demonstrate that the fishing mortality does not exceed the reference level and is either stable or decreasing.</li> </ul>	33.3	90
Scoring Rationale/ Objective Evidence	<p>It is inferred that fishing mortality is low and will remain low with respect to the historical average. Nearly 300 vessels delivered shrimp into Oregon in 1980 when effort peaked at nearly 160,000 hours (SRE). A limited entry program adopted by the Oregon Legislature and implemented in 1980 subsequently reduced the number of boats through attrition (ORS, 2005a). An upper cap on permits was set at 150. Fishing effort in 2005 was less than 30,000 hours (SRE). Fewer than 50 boats are actively fishing in the Oregon ocean shrimp fishery during the 2006 season compared to about 150 boats a decade ago (Hannah and Jones, personal communication; Hannah and Jones, 2006b). Current effort levels remain at 30,000 hours (SRE) or less compared to the peak in 1980. The recent 5-year average effort (2001-2005) was about 42,000 hours (SRE) compared to the long term average (1968-2005) of about 71,000 hours (SRE). A permanent fleet reduction in all three states, low price paid for shrimp, and the high cost of fuel are thought to be the primary reasons for lowered effort.</p> <p>Although mortality from discards is unknown, there are no indications that the fishery has negatively impacted the resource. Standardized fishing effort, an indicator of fishing mortality, is well below the long-term average which indicates that fishing mortality is relatively low and is likely declining. A score of 90 is awarded, given that assessments indicate rather than demonstrate.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

<b>1.2 – MSC Criterion 2</b>	<b>Where the exploited populations are depleted, the fisheries will be executed such that recovery and rebuilding is allowed to occur to a specified level consistent with the precautionary approach and the ability of the populations to produce long-term potential yields within a specified time frame.</b>				Not Scored
------------------------------	---	--	--	--	------------

<b>Scoring Intent</b>	<b>The MSC Technical Advisory Board directs that this Criterion is only scored in the instance that the candidate fishery is determined to be in a depleted state hence a recovery plan is already in action. The decision whether the fishery is in a depleted state will be made at the beginning of the Fishery Assessment process.</b>				
-----------------------	--	--	--	--	--

1.2.1	When the stock is below the reference abundance level, and/or the fishing mortality is above the reference level, there are measures designed and implemented for recovery and rebuilding.	<ul style="list-style-type: none"> <li>• Appropriate recovery and rebuilding measures are being implemented through reduction in exploitation.</li> <li>• Measures are implemented even if they have not been tested. Fishing mortality is further reduced if the stock remains below the reference level.</li> </ul>	<ul style="list-style-type: none"> <li>• A recovery plan is in place, implementing appropriate protective measures that mitigate recruitment failure within the plan's time frame.</li> <li>• Measures have been tested and can be shown to aid in maintaining reproductive potential.</li> </ul>	<ul style="list-style-type: none"> <li>• Appropriate and proven protective measures are being implemented to improve recruitment potential by increasing the reproductive capacity as quickly as possible.</li> <li>• Total fishing mortality is nearly zero if the stock is below the reference level.</li> </ul>		Not Scored
Scoring Rationale/ Objective Evidence	Not scored: The Assessment Team confirmed with the available evidence, and ODFW and fishers that the west coast pink shrimp stock is not currently in a depleted state.					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

<b>1.3 – MSC Criterion 3</b>	<b>Fishing is conducted in a manner that does not alter the age or genetic structure or sex composition to a degree that impairs reproductive capacity.</b>			25	85
------------------------------	---	--	--	----	----

Weighting Comment	Within this criterion, all performance indicators (PIs) are equally weighted.
-------------------	---

1.3.1	The effects of the fishery on age or sex or genetic composition of the population does not impair reproductive capacity.	<ul style="list-style-type: none"> <li>• The knowledge of the effect of fishing on the biological characteristics such as age, size, sex, sex change and fecundity is adequate to identify potential threats to the reproductive capacity of the target stock.</li> </ul>	<ul style="list-style-type: none"> <li>• The knowledge of the effect of fishing on biological characteristics such as the age, size, sex, sex change and fecundity is adequate to detect threats from fishing on the reproductive capacity of the target stock.</li> </ul>	<ul style="list-style-type: none"> <li>• There is extensive knowledge of the effect of fishing on biological characteristics such as the age, size, sex, sex change, fecundity and genetic structure of the target stock.</li> <li>• Knowledge is adequate to quantify how fishery induced changes in these characteristics impact reproductive capacity.</li> </ul>	50	85
Scoring Rationale/ Objective Evidence	<p>Fishing has been shown to affect the age and sex composition of ocean shrimp. Hannah and Jones (1991) analyzed catch and effort statistics and catch sampling data to evaluate changes in shrimp population structure. The number of age 3 shrimp declined significantly while the number of age 1 shrimp increased both in percent of total catch and in size at age (density dependent growth). Density dependent growth and the ability of shrimp populations to accelerate the sex change process are believed to make shrimp resilient to over-harvest. Furthermore, recent effort levels have declined dramatically and ocean shrimp age composition has become less dominated by one-year old shrimp and primary females (Hannah and Jones, 2006b). Although past studies indicated low allele polymorphism in this population, there have been no recent updates of this information.</p> <p>The knowledge on the effects of fishing on shrimp biology is extensive but has not been used to quantify the impact on reproductive capacity. Therefore, a score of 85 was awarded.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

1.3.2	Adverse fishery impacts on reproductive capacity will be considered by management and remedial action incorporated in management planning and processes.	<ul style="list-style-type: none"> <li>Potential threats have been identified and are considered in the planning process.</li> </ul>	<ul style="list-style-type: none"> <li>Known threats are addressed through remedial action specified in management plans.</li> </ul>	<ul style="list-style-type: none"> <li>Management plans contain harvest control rules that address specific quantified fishery impacts on reproductive capacity.</li> </ul>	50	85
Scoring Rationale/ Objective Evidence	<p>The potential adverse impacts to reproductive capacity have been considered by management. Fishing on ovigerous females during a delayed spring transition was identified as a potential threat to reproduction and subsequent recruitment (Hannah, 1999). This issue was reviewed as early as 1992 by ODFW staff and discussed in Hannah (1999). In that paper, a season delay of two weeks was thought to be sufficient to ensure larval release during those occasional years when the spring transition was late and the percentage of ovigerous females was high. Remedial action was not deemed necessary to be forwarded to the Oregon Fish and Wildlife Commission as it was clear the population of shrimp had already recovered (1992 was one of the highest catch years on record), and the phenomenon was considered a rare event. ODFW staff indicated that the combination of late larval release coupled with high effort may have occurred in 2 or 3 years out of 40, and there has been no evidence of impacts to stocks longer than about 2-3 years.</p> <p>In the event a delayed opening is deemed necessary, the delay could be effectively controlled through action by the state of Oregon in the absence of cooperation by Washington and California. Most of the coastwide fleet hold Oregon permits. At a minimum, vessels fishing off of Washington, Oregon, and California holding an Oregon permits would be obligated to abide by the Oregon law if they deliver into Oregon. Oregon can also effectively enforce the laws to prevent fishing off Oregon during a season closure if fishing vessels hold an Oregon permit but are home ported elsewhere. The three states have also cooperated in the past by passing reciprocal rules when needed to take action over resource concerns.</p> <p>A score of 85 was awarded given that potential threats to reproductive capacity are addressed through the closed season (fishing on berried females) and count-per-pound (fishing on juveniles) rules, as originally specified under points of concern in the FMP (Abramson et al., 1981). A reciprocal rule for delayed opening is also possible but needs to be codified. The Assessment Team observed that an annual review of points of concern indicators, with current levels/status compared to historical averages/patterns (e.g. a traffic light summary table), would be useful.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

<b>MSC Principle 2</b>	<b>Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends.</b>			33.3	86.44
------------------------	--	--	--	------	-------

<i>Intent</i>	<i>The intent of this principle is to encourage the management of fisheries from an ecosystem perspective under a system designed to assess and restrain the impacts of the fishery on the ecosystem.</i>
---------------	---

Weighting Comment	MSC P2C2 is considered slightly more important than other criteria within this principle..
-------------------	--

<b>2.1 – MSC P2 Criterion 1</b>	<b>The fishery is conducted in a way that maintains natural functional relationships among species and should not lead to tropic cascades or ecosystem state changes.</b>	30.9	83.95
---------------------------------	---	------	-------

Weighting Comment	Sub-criterion 2.1.4, strategies to restrain negative impacts, is considered twice as important as other sub-criterion .
-------------------	---

<b>2.1.1 TAVEL Sub-Criterion</b>	There is adequate understanding of ecosystem factors relevant to the distribution and life history of the target and non-target species.	20	
----------------------------------	--	----	--

Weighting Comment	Within this sub-criterion, all performance indicators (PIs) are equally weighted.
-------------------	---

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
2.1.1.1	The nature, distribution and availability of habitats (i.e. sediment type, substrate type, community structure, etc.) are known in relation to fishing operations.	<ul style="list-style-type: none"> <li>Nature and distribution of all main habitats are known but information is not comprehensive or recent.</li> <li>Seasonal fishing areas are known and mapped.</li> </ul>	<ul style="list-style-type: none"> <li>Nature and distribution of all main habitats are known in moderate detail and information is recent.</li> <li>Distribution of fishing operations are monitored.</li> </ul>	<ul style="list-style-type: none"> <li>The nature, distribution and availability of all habitats types are monitored on an ongoing basis, including analysis of interannual variability.</li> <li>Fishing effort and distribution is monitored on an ongoing, constant basis.</li> </ul>	15.4	90
Scoring Rationale/ Objective Evidence	As noted in Hannah (1997), the geographic stock area of shrimp varies from one year to the next, is generally known, and is monitored annually. Likewise, sediment and substrate type in these areas are also known and have been documented (PFMC 1981, Dalstrom 1970, NMSF 2006b). Data from Oregon is comprehensive, but WA/ CA/ CAN data for the stock is not complete. The Oregon fishery, however, is the largest, centrally located, and adequately represents the nature distribution and availability of habitat. Fishing operations are monitored, but not as comprehensively outside of Oregon. A score of 90 was given because there is no interannual analysis of habitat variability, fishing effort and distribution.					

2.1.1.2	Information is available on non-target species directly and indirectly affected by the fishery.	<ul style="list-style-type: none"> <li>Qualitative information is available on main non-target species affected by the fishery including their distribution and relative abundance.</li> </ul>	<ul style="list-style-type: none"> <li>Quantitative information is available on the majority of non-target species affected by the fishery including their distribution, abundance and ecology.</li> <li>Qualitative information including distribution and abundance is available on other non-target species affected by the fishery.</li> </ul>	<ul style="list-style-type: none"> <li>Quantitative information is available on all non-target species affected by the fishery including their distribution, abundance and ecology.</li> </ul>	15.4	85
---------	---	--	--	--	------	----

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

<p>Scoring Rationale/ Objective Evidence</p>	<p>Presently, the ocean shrimp fishery is very clean in terms of direct impacts . There has been more than a 95% reduction in bycatch of finfish species through the use of mandatory fish excluder devices (Hannah and Jones 2006b). Indirect impacts, at present, are likely to be very low as well. Ocean shrimp occupy a lower trophic level than the diverse ichthyofauna which prey on shrimp. Pacific whiting, arrowtooth flounder, sablefish, and other finfish species are known to be significant predators of ocean shrimp, however the proportion of ocean shrimp is a small percentage of their overall diet.</p> <p>WCGOP studied the shrimp fishery from 2002-2005 as shrimp excluders were implemented. The study found that mandatory fish excluders reduced the catch of fish to less than 10% of the total catch, and that percentage was expected to drop even more as fishermen appear to be using more rigid grate BRDs and smaller grate spacing to ensure a purer catch of shrimp (Hannah and Jones 2006b).</p> <p>A survey using shrimp gear was conducted in 2004 by ODFW to evaluate shrimp abundance, sex composition, bycatch, and trawl gear (Hannah and Jones 2005). A survey evaluating shrimp abundance, sex composition, bycatch and trawl gear performance on the northern Oregon shrimp grounds - Fall 2004. Oregon Dept. of Fish and Wildlife, Newport, Oregon, January 2005, Information Reports No. 2005-01. The survey also demonstrated BRDs greatly reduced bycatch of finfish. Residual bycatch using BRDs did occur and was composed primarily of small fish including juvenile hake (<i>Merluccius productus</i>), smelt (<i>Osmeridae</i>), slender sole (<i>Eopseta exilis</i>), Dover sole (<i>Microstomus pacificus</i> and rex sole (<i>Errex zachirus</i>) and juvenile rockfish (<i>Sebastes</i>). The survey also indicated shrimp grounds overlapped with range of the juvenile darkblotched rockfish (<i>Sebastes crameri</i>), an overfished species.</p> <p>At present, the shrimp fishery is monitored at a very low level and observer coverage is applied as needed. The WCGOP found bycatch rates of groundfish were found to be significantly reduced by the use of bycatch reduction devices. Currently (2006), observer efforts are being directed at other non-shrimp trawl fishery sectors where groundfish bycatch is of greater concern. All of the mechanisms remain in place to place federal observers on shrimp trawlers if needed to measure bycatch should a new species of concern be identified. Future observer efforts in the ocean shrimp fishery by the WCGOP may be directed at observing bycatch rates of juvenile rockfish. Stock assessments of several important flatfish species caught in larger amounts prior to the implementation of BRDs indicate increasing trends in biomass. Dover sole, English sole, petrale sole are all above the overfished level and biomass appears to be increasing. Dover sole and English sole are at 62% and 91% respectively, of virgin spawning biomass (Lai, et al. 2006, Sampson 2006, OSU and PFMC 2006, Stewart 2006).</p> <p>Current indirect impacts of shrimp harvest are therefore likely to be small for three reasons. First, ocean shrimp's contribution to the predator species' overall diet is small and dispersed among many predators; second, contemporary fishing effort is very low in comparison to historical levels; and finally, fish excluders minimize bycatch of non-target species (Field, et al. 2006).</p> <p>Qualitative information exists in published reports on main non-target fish species. Information adequately meets and somewhat exceeds the 80 SG. Quantitative data on most benthic infaunal species are lacking. There are qualitative data on sea pens.</p>
--	---

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

2.1.1.3	Information is available on the structure and functioning of the food web, and the position and importance of the target species.	<ul style="list-style-type: none"> <li>• Key prey, predators and competitors are known.</li> <li>• General ecosystem roles of these species are known.</li> </ul>	<ul style="list-style-type: none"> <li>• General qualitative ecosystem knowledge exists regarding the position and general roles of pink shrimp in the food web structure and function.</li> </ul>	<ul style="list-style-type: none"> <li>• Quantitative information is available on the food web position and importance of the target species within the food web at all life stages.</li> </ul>	15.4	85
Scoring Rationale/ Objective Evidence	<p>Food web relationships and the trophic relationship of ocean shrimp within this web has been documented and studied (Dahlstrom, W. A. 1970, Field et al. 2006, Francis 1983, Percy 1970, Rexstad and Pikitch 1985, 1986). Pandalid shrimp have been described as a keystone component in boreal ecosystems, and prey on zooplankton and other benthic organisms, and in turn are preyed upon by several fish species (Cadrian et al. 2004). At lower latitudes, ocean shrimp are mid-range in the trophic level and have a fairly high production to biomass ratio compared to their predators (Field et al. 2006). The predator base is varied consisting primarily of groundfish species such as Pacific whiting, Pacific Ocean perch, canary rockfish, and arrowtooth flounder (Field et al. 2006). Shrimp prey mostly on benthic detritus and infauna, euphausiid shrimp, and copepods.</p> <p>Information presented exceeds the 80 SG. Characterizations of the food web position for some life stages are incomplete.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
2.1.1.4	Information exists on the ability of the ecosystem to recover from fishery related impacts.	<ul style="list-style-type: none"> <li>• Key elements of the ecosystem, affected by the fishery, are identified and provide some understanding of how the ecosystem may recover from fishery related impacts.</li> </ul>	<ul style="list-style-type: none"> <li>• The main elements of the ecosystem affected by the fishery have been documented and are understood, and this provides a convincing scenario of how the ecosystem would recover from fishery related impacts.</li> </ul>	<ul style="list-style-type: none"> <li>• Fishery impacts on the functioning ecosystem have been comprehensively evaluated and have been proven to be within safe limits.</li> </ul>	15.4	75
Scoring Rationale/ Objective Evidence	<p>Modeling work has been conducted on the contribution of ocean shrimp to trophic dynamics and the impact of fisheries on them (Field et al. 2006). Ecosystem modeling and retrospective stock assessments have been conducted. Fishery impacts appear to be a small factor in dynamics of shrimp abundance and potential trophic cascade effects (Field et al. 2006, Hannah and Jones. 1991, Hannah 1995, Hannah 1999).</p> <p>Evidence has been provided for fin fish impacts, but not for contact of shrimp trawls on benthic fauna. Additional information to adequately characterize the overall impacts to ecosystem is needed to meet the 80 SG.</p> <p><b>Condition</b> – Within one year, the client must document the main elements of the ecosystem affected by the fishery. Within two years the client must have started a study which will demonstrate their understanding of the affected ecosystem elements by providing a convincing scenario of how the ecosystem would recover from the fishery related impacts.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
2.1.1.5	Information is available on the effects of environmental variability including extreme events on target and non-target species productivity (e.g. nutrient effects).	<ul style="list-style-type: none"> <li>Some studies are available on the effects of environmental variability on both target and non-target components of productivity (e.g. recruitment of the target species, abundance of key non-target species).</li> </ul>	<ul style="list-style-type: none"> <li>Comprehensive studies are available on the effects of environmental variability on components of productivity such as recruitment of the target and non-target species.</li> </ul>	<ul style="list-style-type: none"> <li>There is ongoing monitoring and regularly updated projections on principal ecosystem components directly linked to recruitment of the target and non-target species.</li> </ul>	15.4	85
Scoring Rationale/ Objective Evidence	<p>Environmental variability including El Niño Southern Oscillation (ENSO) events and their impacts on ocean shrimp and other species, have been thoroughly studied for target and non-target species (Huyer and Smith. 1985, Hannah 1993, Field et al. 2006; Field and Francis 1983, Bailey and Francis 1985, Bailey and Incze 1985, Hollowed et al. 1987, Hollowed and Wooster 1987, Hollowed and Wooster 1991, Rothlisberg and Miller. 1983, Rothlisberg 1979). Retrospective and modeling studies indicate environmental variability strongly influences shrimp abundance, and other important predator species such as Pacific hake (Hannah and Jones 1991, Hannah 1993, 1995, 1999).</p> <p>The above information is supported by a) PFMC monitoring results of key non target species, and b) documents reporting results of Essential Fish Habitat (EFH) studies, those supporting the PFMC groundfish plan recommendations, and on-going studies of ODFW. These support a score beyond 80.</p> <p>To support a score of 100, the expectation would be that an integrated approach for planned monitoring and updating of environmental variability would be employed. Specifically incorporating environmental projections into the management of the key target and non-target species.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

2.1.1.6	Sufficient information exists to support required changes in the fishery management system that will allow recovery of depleted non-target populations.	<ul style="list-style-type: none"> <li>There is some information on functional relationships, sufficient to recommend changes in fishing regulations that may reasonably be expected to recover and rebuild depleted non-target populations</li> </ul>	<ul style="list-style-type: none"> <li>There is adequate information on functional relationships to understand the implications of changes in fishery regulations designed to recover and rebuild depleted non-target populations.</li> </ul>	<ul style="list-style-type: none"> <li>There is a comprehensive understanding of functional relationships between the impacted non-target populations and the fishery.</li> <li>Intervention measures based on this understanding have been tested, and shown to be effective in promoting recovery and rebuilding of depleted non-target populations.</li> </ul>	23.1	90
Scoring Rationale/ Objective Evidence	<p>Most of the important non-target species caught in the ocean shrimp fishery are groundfish. Significant key species include Pacific hake and juvenile rockfish including dark-blotched rockfish. Stock assessments have been completed for Pacific hake and darkblotched rockfish. Pacific hake was, for a short period of time, considered overfished but now has been determined to be recovered (Hesler et al. 2006). Darkblotched rockfish are still considered overfished, but the latest stock assessment has shown the rebuilding timeline (2011) to be much shorter than first thought. Federal rules require necessary changes by all fisheries in order to implement rebuilding plans (Rogers 2005). Stock assessments have not been conducted on all species of groundfish, however the National Marine Fisheries Service conducts trawl surveys off Washington, Oregon, and California on an annual basis. Declines in abundance of non-target species caught in the shrimp fishery that might signal a problem would likely be detected by these surveys. Therefore, sufficient information exists and a system is in place for the recovery of non-target species of significance in the shrimp trawl fishery.</p> <p>As was pointed out elsewhere, the shrimp fishery now contributes minimal impact to non-target species abundance due to the implementation of mandatory fish excluder devices. For example, canary rockfish mortality by the shrimp fishery is now thought to be less than 0.1 mt, whereas prior to BRD's, the fishery landed around 10mt/year, (with a high of 30 mt the year prior to BRD's being mandatory) (Pettinger 2006b).</p> <p>Assessments on rockfishes, halibut, other flatfish support a score between 80 and 100. There is still more research warranted for other rockfish, especially darkblotched rockfish.</p>					

<b>2.1.2 TAVEL Sub-Criterion</b>	Non-target species fishery impacts are comprehensively understood.	20	
----------------------------------	--	----	--

Weighting Comment	Within this sub-criterion, all performance indicators (PIs) are equally weighted.
-------------------	---

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
2.1.2.1	<p>There is information available on the nature, extent and fate of the by-catch (landings and discards of non-target species).</p>	<ul style="list-style-type: none"> <li>• The management system requires some portion of the fishery to be monitored to attempt to quantify the catch of non-target species, but the effectiveness of the measures is uncertain.</li> <li>• Information available to managers from monitoring of catches of non-target species is adequate for main areas of the fishery.</li> </ul>	<ul style="list-style-type: none"> <li>• The management system requires monitoring of and accounting for catch of non-target species and use or discard of that catch throughout all significant components of the fishery.</li> <li>• Measures are taken to reduce the capture of non-target species, and substantial information is available.</li> </ul>	<ul style="list-style-type: none"> <li>• There is 100% real-time, reliable monitoring of and accounting for catch and use or discard of non-target species throughout the fishery.</li> <li>• The management measures are linked to the real-time information and have been evaluated as effective.</li> <li>• The management system has achieved continued improvement in the accuracy and precision of monitoring and accounting of catch and use or discard of non-target species.</li> </ul>	50	85
Scoring Rationale/ Objective Evidence	<p>Bycatch of non-target species is monitored through ongoing studies by ODFW and by NMFS. Landings and discard rates of bycatch are monitored by NMFS to estimate fishing mortalities. Several species of rockfish have been declared overfished and the PFMC has adopted rebuilding plans. The PFMC's rebuilding measures for 2007-2008, adopted at the same time as the PFMC's adoption of Amendment 16-4 of the Groundfish Management Plan, continue the strategy of constraining overfished rockfish total mortality by restricting fishing on co-occurring healthy stocks and preventing fishing in areas where rockfish may be taken incidentally. Caps for bycatch (OY) are established by the PFMC based on stock assessment and fishery evaluations (SAFEs). For example, darkblotched rockfish OY was set at 172 mt in 2003. Catch was estimated at 146 mt. Additionally, the Council has adopted rockfish bycatch limits for the Pacific whiting fishery, which has some rockfish incidental catch.</p> <p>Historically, retained bycatch of finfish species made up an important component of the overall catch by shrimp trawlers. The retained catch of finfish species has been documented in landing records (ODFW Pounds and Value Reports, PacFIN database). Selective studies are available on bycatch of finfish and bycatch reduction through gear modification and fish excluder devices (Hannah et al. 1996). More recently, the WCGOP (NMFS 2003a, Hannah and Jones 2006a) began monitoring the bycatch of non-target species. WCGOP studied the shrimp fishery from 2002-2005 as shrimp excluders were implemented. Data from the federal study was forwarded to ODFW and staff has prepared a report for publication on the impacts of fish-excluders on bycatch rates in the shrimp fishery (Cusick, J. 2006).</p> <p>At present, the shrimp fishery is monitored at a very low level and observer coverage is applied as needed. The ODFW study of WCGOP data determined that bycatch was reduced by 97% and that the total catch of non-target species in the shrimp fishery is less than 10% of the total catch. Currently (2006), WCGOP observer efforts are being directed at other non-shrimp trawl fishery sectors where groundfish bycatch is of concern. All of the mechanisms remain in place to place federal observers on shrimp trawlers if needed to measure bycatch should a new species of concern be identified. Future observer efforts in the ocean shrimp fishery by the WCGOP may be directed at observing bycatch rates of juvenile rockfish (Cusick, J. 2006). The application of 100% mandatory fish excluders is monitored by OSP and ODFW (Hannah and Jones 2006a). Recently, John Cusick (NMFS Observer Coordinator) stated that the WCGOP will continue to place observers on shrimp vessels as they become available, possibly next year. There is no plan to phase out the shrimp fleet from the observer program rotation (Pettinger 2006b). Based on these proactive initiatives, a score of 85 is warranted.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

2.1.2.2	There is information on unobserved fishing mortality (i.e. sources of mortality other than those above).	<ul style="list-style-type: none"> <li>• Areas of potential unobserved fishing mortality are identified, but no further information is available.</li> </ul>	<ul style="list-style-type: none"> <li>• Information from existing work has allowed qualitative estimates of unobserved fishing mortality to be made.</li> </ul>	<ul style="list-style-type: none"> <li>• Research has been carried out on unobserved fishing mortality allowing quantitative estimates to be made and it has been determined that unobserved mortality is not significant.</li> </ul>	50	80
Scoring Rationale/ Objective Evidence	<p>There is some video coverage of fish and shrimp behaviors in response to contact with shrimp trawl meshes and excluder devices (Hannah et al. 1996, Hannah and Jones 2006a). Some fish actively swim until they are swept into the codend or excluded if a bycatch reduction device is in place. Studies indicate that forced swimming can lead to stress and perhaps make fish more vulnerable to disease or predation once they escape the net (Davis et al. 2000). Mesh size is only used as a tool to select for large shrimp in California. High concentrations of very small shrimp may be caught (in spite of meshes large enough to pass small shrimp) as they are usually present in high quantities and tend to change the effective mesh size (Hannah and Jones 2006a). Fishermen actively avoid areas with a high concentration of small shrimp. Less than 0.3% of shrimp are dumped due to mixing with unwanted bycatch (Krutzikowsky et al. 2006). Therefore most of the shrimp targeted are retained. As was pointed out in section 1.1.1.7, there is little evidence fishing mortality is high enough to impact future recruitment, thus the small loss of some shrimp is likely within bounds of acceptable fishing mortality.</p> <p>To achieve score greater than 80, data and analyses are needed to quantify unobserved mortality.</p>					

<b>2.1.3 TAVEL Sub-Criterion</b>	There is adequate knowledge of the effects of gear-use on the ecosystem and extent and type of gear losses.	20	
----------------------------------	---	----	--

Weighting Comment	Effects of the fishery on the habitat that is fishing 200 days of the year is more important than the amount of ripped trawl gear and its ability to continue to fish, weighting significantly higher for 2.1.3.1..
-------------------	---

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

2.1.3.1	There is adequate knowledge of the physical impacts on the habitat resulting from use of gear.	<ul style="list-style-type: none"> <li>• Main impacts of gear use on the habitat are identified including extent and location of use.</li> <li>• Some effects of habitat perturbations have been estimated for similar gear in similar habitats.</li> </ul>	<ul style="list-style-type: none"> <li>• All types of impacts of gear use on the habitat are identified including extent and location of use.</li> <li>• Main habitat impacts have been inferred qualitatively.</li> </ul>	<ul style="list-style-type: none"> <li>• All types of impacts on the habitat resulting from the use of gear have been studied and quantified.</li> </ul>	71.4	80
Scoring Rationale/ Objective Evidence	<p>The extent and location of potential gear impacts is known and has been quantified. ODFW has studied the spatial distribution of fishing effort with respect to known fishing grounds and habitat (mud-sand bottom) (Hannah 1995). Furthermore, ODFW continues to update spatial distribution of fishing effort on an annual basis. NMFS has established several no-trawl areas to protect essential fish habitat for groundfish. The PFMC and NMFS did not feel it was necessary to exclude shrimp trawling to protect essential fish habitat and very little of the known shrimp grounds have set aside for that purpose (NMFS 2005b). Chapter 3 of the Pacific Coast Groundfish Essential Fish Habitat EIS indicates the lowest sensitivity classification for impacts to habitat by bottom trawl gears for large areas of the continental shelf inside of 200 meters where the majority of shrimp trawling occurs. Sensitivity for habitats encompassing shrimp grounds were rated between 0.01 to 0.75; where 0 indicates no detectable adverse effect and 1 indicates minor effects such as shallow furrows and differences between control and impacted areas of less than 25% in metrics measured (NMFS 2005b).</p> <p>There have been few studies of the impacts of trawl gear off the coast of Washington, Oregon, and California, and no formal studies of ocean shrimp trawl impacts. ODFW has observed many trips aboard shrimp trawlers including observations using underwater video (Hannah and Jones 2006c). Staff observed that trawl gear is semi-pelagic. That is, trawl doors make contact with the sea floor as does a footrope commonly used by the fleet. The net and fishing line do not make contact. Video coverage of the net and fishing line do show sea pens going under the net without being picked up by the trawl. No video coverage has been made of the bottom contact by doors or the footrope, however, the footrope does show some evidence that sea pens occasionally foul the footrope. Very few other invertebrates appear in the catch and the nets were not observed to get snagged on hard bottom substrates or pick up rocks and hard corals. The latter observation is likely due to the location where shrimp trawls are fished – namely, on mud-sand bottom.</p> <p>General trawl impacts on estuarine, shelf and slope habitats have been described and analyzed for the PFMC and NMFS as a part of the environmental impact statement (EIS) for designating essential fish habitat for groundfish (NMFS 2005b). The study estimated sensitivity and years to recovery for different gear type and habitat combinations. The study found that soft shelf substrates may be low to moderately sensitive to trawl impacts but recovery time in years is higher than in other habitat types. More formal video observations are planned for late 2006 by ODFW to observe shrimp beds actively trawled and compare video images in shrimp beds now off limits to trawling due to implementation of the NMFS Essential Fish Habitat Amendment to the Fishery Management Plan for Groundfish (Hannah and Jones 2006a). Results of that activity could justify moving the score above 80.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
2.1.3.2	Gear loss during fishing operations and its effects are known (I.e. ghost fishing).	<ul style="list-style-type: none"> <li>• Some recording of gear losses takes place.</li> <li>• The effects of ghost fishing have not been estimated.</li> </ul>	<ul style="list-style-type: none"> <li>• There is knowledge of the type, quantity and location of gear lost during fishing operations.</li> <li>• Estimates of the ghost fishing mortality are made.</li> </ul>	<ul style="list-style-type: none"> <li>• There is detailed knowledge of the type, quantity and location of gear types lost during fishing operations because recording requirements are verified by independent observer coverage.</li> <li>• The impacts of ghost fishing mortality on target and non-target species and habitats have been measured.</li> </ul>	28.6	80
Scoring Rationale/ Objective Evidence	<p>The ocean shrimp fishery is prosecuted in the continental shelf area over sand/mud habitats using semi-pelagic trawls. The shrimp beds are generally flat bottom without rocky outcroppings that might snag a net. In addition, Oregon State University's Marine Extension Program has made available a 'snag book' for trawlers to help them avoid sunken vessels or other objects that might result net entanglement. Hannah and Jones (2006a) had no knowledge of a shrimp trawl net lost in over 20 years. Port samplers interview fishers at dock, learn of such events which are so rare they are news. Based on the Assessment Team's interviews with fishers, last year two nets were lost, but both were recovered by grappling. There is great incentive to retrieve nets, as they are worth \$6-10,000. The shrimp fleet shares data on net snags, all mapped on GPS.</p> <p>No evidence was presented on the ghost fishing mortality from a lost net. Based on the evidence from all sources including ODFW, harvesters and the OTC, the team was convinced that the incidence of gear loss was negligible. This infers a qualitative estimate of near zero for ghost fishing mortality. Recording of lost nets have not been verified by independent observer coverage, because of the very rare occurrence.. Because permanent net loss is a rare event, a score of 80 is warranted.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

<b>2.1.4 TAVEL Sub-Criterion</b>	Strategies have been developed within the fisheries management system to address and restrain any significant negative impacts of the fishery on the ecosystem.			40	
----------------------------------	---	--	--	----	--

Weighting Comment	In general, PI 2.1.4.5 is the all encompassing, culmination of the other PIs and is the management action statement. Greater weight is given to this PI.
-------------------	--

2.1.4.1	Assessments of fishery impacts on ecosystem structure and/or function, habitats and on the populations of associated species are conducted.	<ul style="list-style-type: none"> <li>Some assessments of the main impacts of the fishery on ecosystem structure and function, habitats have been conducted.</li> </ul>	<ul style="list-style-type: none"> <li>Regular assessments of the impacts of the fishery on ecosystem structure and function, habitats and associated species populations (that may depend on shrimp as forage) are carried out and there is periodic feedback for improvement of assessment tools.</li> </ul>	<ul style="list-style-type: none"> <li>Regular assessments are carried out and there is a frequent feed back mechanism for improvement of assessment tools.</li> </ul>	14.4	80
Scoring Rationale/ Objective Evidence	<p>See 2.1.1.4 and 2.1.1.7 above. Food habit studies have shown shrimp are feed on detritus while on or near the sea floor and feed primarily on euphausiid shrimp and copepods when up in the water column (PFMC 1981, Percy 1970). Important predators of shrimp, such as Pacific hake, feed mostly on euphausiid shrimp as well (Livingston and Alton 1982, Livingston 1983, Livingston and Bailey 1985). Ecosystem modeling supports the contention that the shrimp fishery does not play as large a role in impacting ocean shrimp populations as these appear to be environmentally driven and possibly more affected by predator populations (Field et al. 2006). While an important ecosystem component, shrimp appear to be dispersed and make up a small percentage of individual predator species' diets.</p> <p>Impacts to essential fish habitats shared by ocean shrimp and groundfish have been evaluated for all trawl gears in the process of amending the Pacific Coast Groundfish FMP to reduce bycatch and protect habitat (NMFS 2004c). Appendix C of the Pacific Coast Groundfish FMP describes an assessment methodology for the effects of fishing on Pacific Coast groundfish EFH. This provides the basis for determining the need for management measures (PFMC 2006). See also the response to 2.1.3.1 above. More frequent assessment and feedback specifically for the shrimp fishery would be needed to score above 80.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
2.1.4.2	All significant effects of the fishery on the ecosystem have been identified and quantified.	<ul style="list-style-type: none"> <li>• Main impacts of the fishery on the ecosystem are inferred from existing information, but have not been investigated in detail.</li> </ul>	<ul style="list-style-type: none"> <li>• There is a comprehensive evaluation of the effects of the fishery on the ecosystem based on existing information.</li> </ul>	<ul style="list-style-type: none"> <li>• The effects of the fishery on the ecosystem have been characterized by appropriate comparative and/or experimental studies.</li> </ul>	14.4	80
Scoring Rationale/ Objective Evidence	<p>See 2.1.1.6 above. Fishery impacts are thought to be small in comparison to other environmental forces acting on the target population. ODFW has conducted a logbook analysis to measure finfish and shrimp discard and to evaluate the reasons for discard (Krutzikowsky et al. 2006). Impacts to non-target species have been minimized through the use of fish excluders. Studies have measured bycatch reduction of non-target species (Hannah and Jones 2006b, Hannah and Jones 2006d). (See sections 2.1.1.2, 2.1.2.2, and 2.1.3.1 above).</p> <p>Appendix C of the Pacific Coast Groundfish FMP describes an assessment methodology for the effects of fishing on Pacific Coast groundfish EFH (PFMC 2006). In context of the EFH plan, there has been a comprehensive evaluation for groundfish trawls. Experimental studies specifically for shrimp trawls are lacking, but planned in the future. When this data becomes available, a score above 80 would be possible.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

2.1.4.3	Management objectives are set in terms of impact identification and avoidance/reduction.	<ul style="list-style-type: none"> <li>• Management objectives exist that characterize most important impacts, and have identified possible impact avoidance/reduction techniques.</li> </ul>	<ul style="list-style-type: none"> <li>• Management objectives are set to detect and reduce adverse impacts on key ecosystem components, and are undergoing tests for effectiveness.</li> </ul>	<ul style="list-style-type: none"> <li>• Tested management objectives are set to detect and reduce all significant adverse impacts. These are designed to adequately protect ecosystems, habitats and populations of target and non-target species.</li> </ul>	14.4	90
Scoring Rationale/ Objective Evidence	<p>The Pink Shrimp FMP's first objective is to prevent long-term biological damage to the stock and the fifth objective is to avoid regulations which may cause intra-fishery conflicts (PFMC 1981). The first objective has been accomplished primarily through the application of a season and count-per-pound regulations. These regulations 1) prevent harvest during the spawning period and 2) reduce fishing mortality of the first age class to ensure survival of a significant proportion of the incoming year-class until their first spawning. Overfished non-target species are protected through the use of mandatory bycatch reduction devices, satisfying objective 5.</p> <p>See updated section 2.1.3.1 above. Essential fish habitat areas have been identified and set aside to protect non-target species habitats by PFMC and NMFS. The areas of potential impact to shrimp habitat are known and quantified (depths less than 200m). Additional video studies to evaluate shrimp trawl impacts to habitat and their recovery are planned by ODFW. It should be noted that most of the shrimp grounds are inside of 200 meters. Bottom trawl impacts inside of 200 meters are considered to be very low (see section 2.1.3.1 above).</p> <p>To attain the harvest goals for groundfish species and the conservation goals for rebuilding groundfish species which interact with the pink shrimp fishery, the Secretary of Commerce, through recommendation by the Pacific Fishery Management Council may impart restrictions on other fisheries (e.g. pink shrimp). These restrictions are typically incorporated within the Pacific Coast Groundfish Fishery Management Plan, Goal 1 of the Groundfish FMP is Conservation: Prevent overfishing and rebuild overfished stocks by managing for appropriate harvest levels and prevent, to the extent practicable, any net loss of the habitat of living marine resources. Objective 5 under this goal is "Describe and identify essential fish habitat (EFH), adverse impacts on EFH, and other actions to conserve and enhance EFH, and adopt management measures that minimize, to the extent practicable, adverse impacts from fishing on EFH. This applies all fishing, including shrimp trawls. Section 10 of the Pacific Coast Groundfish FMP describes the mechanism for PFMC review of state regulations to assure consistency with the FPM goals and objectives. The above justifies a score of 90.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
2.1.4.4	Levels of acceptable impact are determined and reviewed.	<ul style="list-style-type: none"> <li>• There is sufficient information to determine acceptable impacts to some key non-target species and habitats.</li> </ul>	<ul style="list-style-type: none"> <li>• Levels of acceptable impacts for most key non target species and habitats have been determined and are reviewed periodically.</li> </ul>	<ul style="list-style-type: none"> <li>• Levels of acceptable impact for all key populations and habitats have been determined and are subject to frequent review and adjustment.</li> </ul>	14.4	85
Scoring Rationale/ Objective Evidence	<p>The Pink Shrimp FMP lists several biological points of concern that could trigger action to protect ocean shrimp (PFMC 1981), although retrospective studies have shown no long-term effects of reaching at least one of these concerns (See 1.3.1 above). Fishing effort by area, and age, size and sex composition are monitored throughout the fishing season in Oregon to assess both the fishery and resource. Ocean shrimp fishery impacts to non-target species of groundfish are monitored by the Groundfish Management Team. State and federal authorities review and regulate bycatch through use of bycatch reduction devices and allocation of bycatch amounts. Presently, bycatch of non-target species is thought to be at a historical minimum. Studies indicate that less than 10% of the total shrimp trawl catch is made up of non-target species (Hannah and Jones 2006d). Impacts of all gear types on essential fish habitat have been accounted for through amendments to the groundfish fishery management plan. Areas of sensitive habitat have been restricted to certain gear types (See also the updated section 2.1.3.1 above) (NMFS 2005b).</p> <p>The evidence supports a score above the 80 SG, but additional information specifically on the habitat impacts of the shrimp fishery and more frequent assessments and adjustments are needed to score this PI higher.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
2.1.4.5	Management responds to assessment results and is effective in preventing any significant negative impacts of the fishery on the ecosystem.	<ul style="list-style-type: none"> <li>• Management considers assessment results and demonstrates a commitment to restraining significant negative ecosystem impacts.</li> <li>• Testing of effectiveness of measures that prevent significant impact are underway.</li> </ul>	<ul style="list-style-type: none"> <li>• Management responds to assessment results in accordance to the requirements of existing law and promulgates measures that have demonstrated to be effective in restraining the most significant negative ecosystem impacts.</li> </ul>	<ul style="list-style-type: none"> <li>• Management responds proactively to assessment results, and promulgates measures that clearly result in prevention of significant negative ecosystem impacts.</li> </ul>	26	85
Scoring Rationale/ Objective Evidence	<p>See response to 3.1.3 below. Ecosystem impacts are likely to be confined primarily to the target species and non-target groundfish species. As stated before, fishing effects likely play a smaller role in impacting shrimp populations than the environment (Field et al 2006). Non-target species impacts are minimized through the use of gear modifications (especially bycatch reduction devices), fishing seasons, gear and the areas fished. Impacts are considered moderate on soft-mud/sand habitat (See Appendix C of Amendment 19 to the Pacific Coast Groundfish FMP (NMFS 2006b)). Formal studies of impacts of shrimp gear on habitat are planned by ODFW for later this year (2006). Qualitative information based on multiple observation trips including video coverage is available. See section 2.1.3.1 above.</p> <p>Management has demonstrated proactiveness on this issue. This score could be higher pending results of, and management action on, planned studies.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

2.1.4.6	Monitoring, surveillance and enforcement of the management system are in place to ensure that the requirements of the management system to restrain negative impacts on the ecosystem are achieved.	<ul style="list-style-type: none"> <li>Monitoring, surveillance and enforcement policies exist.</li> <li>Required monitoring, surveillance and enforcement activities are focused on key fishing areas.</li> </ul>	<ul style="list-style-type: none"> <li>Monitoring, surveillance and enforcement activities cover most fishing areas.</li> <li>These activities are periodically evaluated, resulting in changes as warranted.</li> </ul>	<ul style="list-style-type: none"> <li>Monitoring, surveillance and enforcement of the management system is ongoing in all OR waters.</li> <li>Evaluation is quantitative and regular, resulting in timely changes to the management system, if necessary.</li> </ul>	16.5	95
Scoring Rationale/ Objective Evidence	<p>The implementation of mandatory fish excluders has minimized potential ecological impacts on non-target species. Fishing seasons and count-per-pound have reduced impacts on shrimp during spawning and larval release periods. The essential fish habitat EIS considers impacts to habitat to be minimal for bottom trawl gears operating inside of 200 meters, including shrimp trawls (NMFS 2006bb). The Oregon Department of Fish and Wildlife actively monitors the biological parameters of the target species during the fishing season. The Oregon State Police conduct surveillance, monitor, and enforce regulations for the fishery. According to OSP records, compliance rates averaged about 89% out of 403 contacts recorded during the years 2001-2006 (data from 2005 and 2006 are incomplete). ODFW staff felt that few of the violations within the 2001-2006 time period were related to small shrimp or fishing out of season. According to OSP, about 80-90 % of the violations were related to compliance with individual licensing requirements not related to the boat license or limited entry permit (See section 3.7.5 below).</p> <p>The West Coast Groundfish Observer Program conducts at-sea observations at a minimal level presently, since mandatory fish excluders have significantly reduced bycatch of groundfish (Hannah and Jones 2006a). In addition the EFH amendment to the Pacific Coast Groundfish FMP has closed portions of the ocean to fishing. Compliance with spatial management will be accomplished in part with vessel monitoring systems (VMS) which will be mandatory for all vessels seeking to retain groundfish and to protect newly designated areas of essential fish habitat. Shrimp trawlers will be required to have VMS by the 2007 fishing season (Pettinger 2006c.).</p> <p>A high score is warranted because there is planned allocated enforcement, and there is annual education of officers and evaluation between ODFW and OSP. There is some on-water for enforcement by the US Coast Guard. There is some observer data and ODFW is evaluating what is the issue.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

<b>2.2 – MSC P2 Criterion 2</b>	<b>The fishery is conducted in a manner that does not threaten biological diversity at the genetic, species or population levels, and avoids or minimizes mortality of, or injuries to endangered, threatened, or protected species.</b>			33.3	93
---------------------------------	--	--	--	------	----

<b>2.2.1 TAVEL Sub-Criterion</b>	Fishing is conducted in a manner that does not have unacceptable impacts on recognized protected, endangered or threatened species.			100	
----------------------------------	---	--	--	-----	--

Weighting Comment	Within this sub-criterion, all performance indicators (PIs) are equally weighted.
-------------------	---

2.2.1.1	There is adequate information on the presence and populations of protected, endangered or threatened (PET) species.	<ul style="list-style-type: none"> <li>• There is a program implemented to identify PET species directly related to the fishery.</li> <li>• There is periodic monitoring of the general population trends and status of PET species.</li> </ul>	<ul style="list-style-type: none"> <li>• Key PET species directly related to the fishery have been identified and characterized.</li> <li>• Populations are monitored and assessed on a regular basis.</li> </ul>	<ul style="list-style-type: none"> <li>• There is knowledge of all populations of PET species directly or indirectly related to the fishery including their dynamics.</li> <li>• Regular monitoring of PET species is undertaken, supported by research programs to assess threats and promote their conservation.</li> <li>• The type and distribution of critical habitats have been identified.</li> </ul>	20	100
---------	---	---	---	---	----	-----

Scoring Rationale/ Objective Evidence	<p>Rare, threatened, or endangered species are identified through the federal Endangered Species Act of 1973. In addition, the PMFC and NMFS identify depleted or overfished species in accordance with the Magnuson-Stevens Act and have specified rebuilding plan amendments to the Pacific Coast groundfish FMP for these species.</p> <p>The Assessment Team gave consideration specifically to those species covered under US ESA legislation. Overfished species are evaluated under Principal 2 Criterion 3. There has been classification of protected, endangered and threatened species within the areas that the pink shrimp fishery is conducted. No significant interactions with the trawl fisheries for ocean shrimp have been identified for listed marine species of birds, mammals, or fish. There is ongoing monitoring of PET species which are listed under the ESA as conducted by NMFS. During the assessment of the essential fish habitat environmental impact statement for NOAA fisheries, the pink shrimp fishery was characterized and there were no designations of the significant shrimp beds as essential fish habitat.</p>				
---------------------------------------	--	--	--	--	--

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

2.2.1.2	Interactions of the fishery with endangered, threatened, and protected species are adequately characterized.	<ul style="list-style-type: none"> <li>The main interactions directly related to the fishery are known through independent monitoring.</li> </ul>	<ul style="list-style-type: none"> <li>Quantitative estimates are made of the effects of interactions with key species directly related to the fishery.</li> <li>There is a requirement to record and report all incidental mortalities.</li> </ul>	<ul style="list-style-type: none"> <li>Reliable quantitative estimates are made of the interactions of all populations directly related to the fishery, and qualitative information is available on indirect impacts.</li> <li>Adequate enforcement assures Incidental mortalities are recorded and reported.</li> </ul>	20	90
Scoring Rationale/ Objective Evidence	<p>Of the 56 species listed as threatened or endangered in Oregon, only a few occupy habitats in the Pacific Ocean. Listed species of Pacific salmon, the Northern Stellar sea lion, and marbled murrelet have been evaluated with respect to potential interactions with fisheries in Oregon. No significant interactions with the trawl fisheries for ocean shrimp have been identified for listed marine species of birds, mammals, or fish.</p> <p>Commercial fisheries in the United States are classified by the level of threat to marine mammals into three categories. The Marine Mammal Protection Act (MMPA) requires registration of vessels if they participate in a category I or II fishery. Registered vessels must obtain a marine mammal authorization to legally incidentally take a marine mammal. The shrimp trawl fishery is classified as a category III fishery and no documented taking of marine mammals has been listed for shrimp trawl gear, however vessel operators must report mortalities or injuries of marine mammals to the NMFS Office of Protected Resources (See pages 48802-48823 of CFR Vol. 71, No. 162, August 22, 206). Reporting of mortality or injury of marine birds is voluntary for category III fisheries. Groundfish trawl fisheries (also category III) are thought to have minimal interactions with marine birds, even though they are seen feeding on offal (NMFS 2003b). Shrimp trawl gear is operated in a similar fashion on grounds which overlap the groundfish fishery.</p> <p>Several depleted species of groundfish are known to interact with the ocean shrimp fishery. Species of particular concern are bocaccio, canary rockfish, widow rockfish, and yelloweye rockfish. Since the implementation of mandatory excluders, however, bycatch of these species has been minimized (Hannah and Jones 2006b, Hannah et al. 1996). Allocation of bycatch mortality as a part of the federal annual specifications for fishing reflect this – a bycatch mortality in the shrimp fishery of 0.1 metric ton or less has been projected for each species (PFMC 2006). This level of mortality is at a trace amount (less than 0.1%) compared to the total catch mortality.</p> <p>The WCGOP evaluates each fishery for which there is groundfish bycatch. The shrimp fishery was studied from 2001-2005 using methods outlined in the WCGOP program documentation (NMFS 2003a).</p> <p>A high score is warranted because it is required by law to record and report mortalities; enforcement is achieved through the US Coast Guard and NMFS officers on the water, and the there is support by the industry, based on Assessment Team interviews.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
2.2.1.3	The level of interaction that results in an unacceptable risk to PET species is known.	<ul style="list-style-type: none"> <li>The level of interaction that results in an unacceptable risk is known for the PET species most likely to be affected by the fishery, within the key fishing areas.</li> </ul>	<ul style="list-style-type: none"> <li>The level of interaction that results in an unacceptable risk is known for most of the PET species affected by the fishery, through the most of its range.</li> </ul>	<ul style="list-style-type: none"> <li>The level of interaction that results in an unacceptable risk on all PET species is known for the full range of the fishery.</li> </ul>	20	100
Scoring Rationale/ Objective Evidence	<p>See 2.2.1.1 and 2.2.1.2 above. The taking of species listed under ESA guidelines has been determined and the shrimp fishery is not a risk factor in exceeding allowable mortality. Likewise, the shrimp fishery is not a significant risk factor in mortality of depleted groundfish species, and has been allocated only a trace amount for 2006 annual specifications for groundfish harvest.</p> <p>This meets the 100 SG.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
2.2.1.4	Strategies have been developed within the fisheries management system that address and restrain impacts of the fishery to adequately protect threatened or endangered species.	<ul style="list-style-type: none"> <li>• Management measures exist in terms of impact identification and avoidance/reduction in relation to threatened and endangered species.</li> </ul>	<ul style="list-style-type: none"> <li>• Management measures ensure that impacts on PET species are quantified and that impacts are reduced to be within acceptable risk limits.</li> <li>• These are designed to adequately protect aspects of the ecosystem within main fishing areas, considered to be of high conservation importance.</li> </ul>	<ul style="list-style-type: none"> <li>• Management measures to detect and reduce impacts on PET species have been tested and verified.</li> <li>• These are designed to protect ecosystems, habitats and populations of target and non-target species.</li> </ul>	20	90
Scoring Rationale/ Objective Evidence	<p>No significant interactions with the trawl fisheries for ocean shrimp have been identified for listed marine species of birds, mammals, or fish.</p> <p>There is a defined strategy for the identification of impacts on PET species including species listed under the ESA as well as species and stocks which have been designated as depleted. NMFS has the legal responsibility to identify, characterize and implement measures that restrain impacts within acceptable risk limits. Should impacts related to the shrimp fishery be identified, NMFS, PSMFC and ODFW (as well as California and Washington) would work together to identify the necessary protection measures and the implementation of those measures. This strategy has been proven through the protections provided to a number of salmon stocks, for instance.</p> <p>A high score is warranted, but the 100 SG is not achieved because there is no testing to quantitatively verify the reduction of impacts in the shrimp fishery. Quantified estimates are made under the groundfish plan.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

2.2.1.5	The effects of the fishery on biological diversity and productivity have been determined.	<ul style="list-style-type: none"> <li>• There are some reports linking the effects of the fishery on biological diversity.</li> <li>• Qualitative estimates of impacts on biological diversity have been inferred using general information from similar fisheries and the scientific literature.</li> </ul>	<ul style="list-style-type: none"> <li>• Effects on biological diversity and productivity within fishing areas are qualitatively understood.</li> <li>• Research has been conducted to characterize the impacts of fishing to biological diversity in OR pink shrimp fishing areas.</li> </ul>	<ul style="list-style-type: none"> <li>• Quantitative effects on biological diversity and productivity are well documented, and OR fishery related impacts are monitored and regularly assessed.</li> </ul>	20	85
Scoring Rationale/ Objective Evidence	<p>See responses 2.1.1.2, 2.1.1.3, 2.1.1.6, 2.1.4.1, 2.1.4.5 and discussion on habitat observations in section 2.2.1.4 (last paragraph) above. Simulation modeling has been used to measure impacts of fishing on trophic dynamics of several marine species within the Northern California Current ecosystem. Shrimp are thought to be low on the trophic scale and fishing is not thought to impact future production. The target population appears to be resilient and more affected by environmental drivers. Diversity could be affected by reducing food supplies to important prey species. Several species prey on ocean shrimp and likely account for a significant proportion of their overall mortality. Pacific whiting (<i>Merluccius productus</i>), an abundant and important predator of ocean shrimp, is also harvested by a shore based and at-sea midwater trawl fleet. Diets of predators are very diverse however, and as an individual component, shrimp constitute a relatively small fraction of the dietary mix taken by predators. Biological diversity and productivity of non-target species could be affected due to bycatch impacts. As was pointed out in 2.1.4.6, bycatch has been reduced significantly through the use of mandatory fish excluders or bycatch reduction devices. For the same reason, the diversity of shrimp trawl catch is also very low due to the high purity of shrimp catch (greater than 90% shrimp).</p> <p>There has been significant work to characterize the effects of the fishery and those effects are qualitatively understood. Impacts to characterize fishing impacts on biological diversity have been and continue to be studied. A score of 85 was assigned.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
<b>2.3 – MSC P2 Criterion 3</b>	<b>Where exploited populations are depleted, the fishery will be executed such that recovery and rebuilding is allowed to occur to a specified level within specified time frames, consistent with the precautionary approach and considering the ability of the population to produce long-term potential yields.</b>			35.8	82.5
<b>Scoring Intent</b>	<b>The MSC Technical Advisory Board directs that this Criterion is only scored in the instance that non target species are determined to be in a depleted state hence a recovery plan is already in action. The decision whether the non target species are in a depleted state will be made at the beginning of the Fishery Assessment process.</b>				
<b>2.3.1 TAVEL Sub-Criterion</b>	There are management measures in place that allow for the rebuilding of affected populations.			100	
<b>Weighting Comment</b>	Within this sub-criterion, all performance indicators (PIs) are equally weighted.				

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

2.3.1.1	Management measures are in place to modify fishery practices to minimize further degradation of depleted non-target populations.	<ul style="list-style-type: none"> <li>• Informal management measures exist allowing modification of fishing practices to reduce unacceptable mortality of non-target depleted populations.</li> </ul>	<ul style="list-style-type: none"> <li>• Effective management measures (e.g. reducing fishing effort, requiring gear modifications, setting bycatch quotas) are in place to modify fishery practices in light of the identified unacceptable impacts.</li> <li>• Affected non-target species fishing mortality is nearly zero if the affected population is below the limit reference point.</li> </ul>	<ul style="list-style-type: none"> <li>• Monitoring programs periodically verify the effectiveness of management measures to modify fishery practices when necessary.</li> <li>• Total fishing mortality is zero if the non-target population is below the limit reference point.</li> </ul>	50	80
Scoring Rationale/ Objective Evidence	<p>The shrimp fishery is a category III fishery (see section 2.2.1.2 above) and is not thought to have any significant impact on threatened or endangered marine mammals. Most of the important non-target species caught in the ocean shrimp fishery are groundfish. Significant key species include Pacific hake and juvenile rockfish, including dark-blotched rockfish. Stock assessments have been completed for Pacific hake and darkblotched rockfish. Pacific hake was, for a short period of time, considered overfished but now has been determined to be recovered (Hesler et al. 2006). Darkblotched rockfish are still considered overfished, i.e. the spawning stock has been below 25% of the unfished level and is not yet above 40% (Rogers 2005). Federal rules require necessary changes by all fisheries in order to implement rebuilding plans. ABC has been set at OY in recent years (e.g. 294 mt in 2006). Stock assessments have not been conducted on all species of groundfish, however the National Marine Fisheries Service conducts trawl surveys off Washington, Oregon, and California on an annual basis. Declines in abundance of non-target species caught in the shrimp fishery that might signal a problem would likely be detected by these surveys. Therefore, sufficient information exists and a system is in place for the recovery of non-target species of significance in the shrimp trawl fishery. As was pointed out elsewhere, the shrimp fishery now contributes minimal impact to non-target species due to the implementation of mandatory fish excluder devices.</p> <p>The Assessment Team is scoring this because to the presence of the overfished darkblotched rock fish in the shrimp catch. A score of 80 is assigned because incidental mortality is nearly zero (but not at zero), and effective management measures are in place that have modified fishing practices.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
2.3.1.2	Rebuilding mechanisms allow for recovery of affected populations.	<ul style="list-style-type: none"> <li>• Rebuilding mechanisms for depleted populations have been identified and implementation is underway.</li> <li>• Testing of effectiveness of these mechanisms is underway.</li> </ul>	<ul style="list-style-type: none"> <li>• Rebuilding mechanisms to promote recovery of the affected population within specific time frames are implemented.</li> <li>• Mechanisms have been tested and can be shown to allow rebuilding of the affected populations.</li> <li>• Affected non-target species fishing mortality is nearly zero if the affected population is below the limit reference point.</li> </ul>	<ul style="list-style-type: none"> <li>• Specific rebuilding mechanisms are implemented to promote recovery as quickly as is possible.</li> <li>• Additional measures are being implemented to prevent problems in the future.</li> <li>• Total fishing mortality is zero if the population is below the limit reference point.</li> </ul>	50	85
Scoring Rationale/ Objective Evidence	<p>The management system provides for effective measures for the shrimp fishery to aid in the recovery of affected non-target populations. See section 2.3.1.1 above. Overfished groundfish species are the most important non-target species of concern that may be caught by the shrimp fishery. Mandatory fish excluders have reduced bycatch of overfished groundfish in the shrimp fishery to miniscule levels compared to other groundfish fishery impacts. NMFS requires rebuilding plans for overfished species. Management measures appear to be effective for some non-target species. For example, Pacific hake and lingcod (in the northern groundfish management area) are considered to be no longer overfished. Other, longer lived rockfish species are on a longer rebuilding time frame. The most recent rebuilding plans for darkblotched rockfish, Bocaccio and widow rockfish indicate populations of these species are continuing to be rebuilt towards their target levels (Rogers 2005, MacCall 2005, He et al. 2005).</p> <p>A score of 85 is assigned because the elements for SG 80 are met and specific rebuilding mechanisms are implemented to promote recovery as quickly as is possible. Fishing mortality, while low however, is not at zero.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

<b>MSC Principle 3</b>	<b>The fishery is subject to an effective management system that respects local, national and interjurisdictional laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable.</b>			33.3	87.36
------------------------	--	--	--	------	-------

<i>Intent</i>	<i>The intent of this principle is to ensure that there is an institutional and operational framework for implementing Principles 1 and 2, appropriate to the size and scale of the fishery.</i>
---------------	--

Weighting Comment	Criterion 3.1, 3.4, 3.7 are the essential foundations for the management for achieving P3 and are weighted equally and slightly higher than the remaining criterion, which are also weighted equally. The rationale for this weighting is 3.1 provides basic guidance for the management program. 3.4 it the management driver to implement the program and 3.7 essential to achieve compliance with the program.
-------------------	---

<b>3.1 TAVEL Criterion 1</b>	The management system has a clearly defined scope capable of achieving MSC Principles 1 and 2 and their associated criteria. This includes short and long-term objectives and associated strategies including those for managing the ecological impacts of fishing, consistent with a well-managed fishery.	14.3	
------------------------------	---	------	--

Weighting Comment	PIs 3.3.3, 3.3.4 and 3.3.6 are most critical to sustainability under P3 hence higher weighting.
-------------------	---

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

<p>3.1.1 (Relates to MSC Criterion 3.2)</p>	<p>All agencies (state, federal, interjurisdictional) in the fisheries management system have clear-cut lines of responsibility. Their functions, particularly those involving interactions between these authorities are clearly defined.</p>	<ul style="list-style-type: none"> <li>• State, federal and interjurisdictional organizations responsible for interacting in the management process have been identified.</li> <li>• Functions and responsibilities among entities are generally understood.</li> </ul>	<ul style="list-style-type: none"> <li>• Functions and responsibilities requiring interactions among the entities are explicitly defined and codified.</li> <li>• Interactions between agencies are effective and operate without conflict.</li> </ul>	<ul style="list-style-type: none"> <li>• Interactions between entities are periodically evaluated and modified where necessary.</li> </ul>	<p>11.7</p>	<p>90</p>
<p>Scoring Rationale/ Objective Evidence</p>	<p>The state and federal agencies have clear lines of responsibility, including functions that require coordination between the states. Washington, Oregon, and California manage the ocean shrimp fishery through state statute or administrative code to regulate limited entry programs, fishing seasons, fishing gear regulations, counts-per-pound, and landings. The federal government through NMFS regulates retention of groundfish by setting limits and establishing area closures (Hannah and Jones, personal communication; ODFW, 2006; Oregon Legislature, 2005a, 2006a). Fisheries regulations for ocean shrimp are straight forward and have been very stable, requiring few adjustments. When an interjurisdictional issue does come up, a tri-state process is used to resolve the issue and take consistent regulatory action on the part of the three states. Sometimes this is facilitated by the Pacific States Marine Fisheries Commission (PSMFC). A recent example of interjurisdictional cooperation involved the NMFS asking the states to develop and implement fish excluders in the state managed ocean shrimp fishery. Excluders were needed to allow fishing in federally mandated rockfish conservation areas to protect overfished rockfish species. With Oregon taking the lead, the three states developed and implemented mandatory fish excluders for the ocean shrimp fishery (Hannah and Jones, personal communication).</p> <p>Current procedures and lines of responsibilities and long-standing history of cooperation justify a score of 90. A score of 100 would be achievable if there were an explicit process for periodic evaluation of the interjurisdictional coordination.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

3.1.2 (Relates to MSC Criteria 3.2, 3.5, 3.7)	The management system contains clear short- and long-term objectives	<ul style="list-style-type: none"> <li>Short- and long-term resource and environment objectives are implicit within the management system</li> </ul>	<ul style="list-style-type: none"> <li>The management system contains explicit short- and long-term resource and environment objectives that are periodically evaluated</li> </ul>	<ul style="list-style-type: none"> <li>The management system contains clear and explicit short- and long-term resource, environmental, and socio-economic objectives that are regularly measured by performance indicators.</li> </ul>	11.7	90
Scoring Rationale/ Objective Evidence	<p>The management system has operated under and continues to adhere to short and long-term objectives enumerated in the draft FMP for the Pink Shrimp Fishery (Abramson et al., 1981). The states appropriated these objectives by implementing the Council recommended alternative – state adoption of management and exploitation strategies described in the plan (see 3.1.3 below).</p> <p>The management system is guided by short and long term resource and environmental objectives that are both periodically measured and evaluated. A score of 90 is justified as a result. A higher score would be warranted if there were more explicit attention to regular measurement and monitoring of socioeconomic objectives in addition to resource and environmental objectives.</p>					

3.1.3 (Relates to MSC Criteria 3.2, 3.7, 3.9, 3.10)	The management system incorporates and applies an adaptive and responsible exploitation strategy.	<ul style="list-style-type: none"> <li>Management objectives seek to maintain stocks at high levels of productivity.</li> <li>The harvest control strategy is informal but consistent with objectives.</li> <li>The harvest control strategy takes into consideration uncertainties in the status of the stocks.</li> <li>The management system provides for making estimates of all catches, landings and by-catch and conducting an annual assessment of the status of target stocks.</li> </ul>	<p>A responsible management strategy is followed, including:</p> <ul style="list-style-type: none"> <li>explicit long-term management objectives seek to maintain stocks at high levels of productivity.</li> <li>an explicit harvest strategy which accounts for uncertainty.</li> <li>the management system estimates all commercial catches, landings and by-catch and annually assesses the status of target stocks.</li> </ul>	<p>A responsible management strategy is followed, including:</p> <ul style="list-style-type: none"> <li>a management plan that is explicit.</li> <li>an explicit harvest strategy, that is precautionary, accounting for variances in survey estimates, uncertainties in stock assessment advice, and other risk factors.</li> </ul>	17.6	75
--	---	--	---	--	------	----

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

Scoring Rationale/ Objective Evidence	<p>The management system reflects elements of the draft FMP for the Pink Shrimp Fishery that was originally prepared for the Pacific Fishery Management Council in 1981. Five alternative management and exploitation strategies were evaluated in the context of potential Council jurisdiction, and a sixth alternative was considered which presumed state implementation of the plan. The Council recommended adoption of the 6th alternative and the states appropriated a management regime most similar to alternative IV in the FMP. Alternative IV had a coastwide winter closure, a 1 3/8 inch minimum mesh size with no codend liners, a maximum average count/pound, and no in-season closures. Of the measures outlined in Alternative IV, mesh minimum mesh size restrictions were not uniformly implemented coastwide. In other regulatory aspects, Alternative IV was nearly as restrictive as the most restrictive alternative (I) which also included in-season closures. Other alternatives considered different combinations with and without a year-round season, mesh regulations, maximum count/pound and in-season closures (Abramson et al., 1981). In addition, all three states have adopted limited entry programs and require mandatory excluders.</p> <p>Management is accomplished primarily by regulating season length with a coastwide winter closure from November 1 to March 31 and by a maximum average count-per-pound of 160 (see discussion in 1.14). During the season, Oregon monitors fishery performance, collecting information on the distribution of fishing effort, size, and sex. Assessment of stocks consists of an evaluation of fishery performance and relative strength of shrimp age classes compared against Biological Points of Concern listed in the draft FMP for the Pink Shrimp Fishery (Abramson et al., 1981). Historically, the fishery may have periodically approached Biological Points of Concern. Analysis of environmental and fishery information suggest the ocean shrimp fishery is hyper-stable, however (Hannah and Jones, personal communication; Hannah, 1995). Fishing effort can vary dramatically, increasing and decreasing with shrimp abundance in response to the profitability of shrimp fishing, but effort per unit stock area is largely without trend. In recent years, fishing effort has declined due to low ex-vessel prices and unfavorable economic conditions. Age structure appears to be responding in that more 2 and 3 year-old shrimp are contributing to the catch. Separating out fishery effects has proven difficult as natural mortality appears to vary in response to predatory abundance and environmental factors appear to control recruitment. There is some evidence shrimp populations have responded to high levels of fishing effort in the past through a reduction in contribution of the catch by 2 and 3-year old shrimp and an increase in primary females (Hannah and Jones, 1991). While this might constitute a Biological Point of Concern if abundance were low and effort were increasing, retrospective studies have failed to provide evidence of long-term changes detrimental to the stocks (Hannah, 1999). No real evidence has been found to suggest a need to respond to changes seen in the abundance, age, and sex structure of ocean shrimp populations. The management system has shown to be responsive to other issues of biological concern, such as the incidental catch of overfished groundfish stocks via the implementation of bycatch excluder grates.</p> <p>On the whole, the management system appears to be managing shrimp target catches responsibly and adaptively. It is believed that environmental fluctuations dominate the effects of fishing as determinants of mortality. Nevertheless, there are long standing harvest strategies in place that rely on average count per pound and seasonal closures to provide additional protection to the biomass. The deficiencies that reduce the score below 80 relate to shortcomings of total catch and estimates of discards (see 1.1.2.1 for elaboration). Periodic observer coverage exists that records discards of undersized shrimp, but there are no estimates of total catches compared with total landings data.</p> <p><b>Condition</b> - The deficiencies that reduce the score below 80 relate to shortcomings of total catch and estimates of discards (see 1.1.2.1 for elaboration). Periodic observer coverage exists that records discards of undersized shrimp, but there are no estimates of total catches compared with total landings data.</p>
--	---

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
<p>3.1.4 (Relates to MSC Criteria 3.2, 3.7, 3.9, 3.10, 3.13)</p>	<p>The management system incorporates and applies tactics (e.g. no take zones or closed areas) to manage ecological impacts (including impacts on spawning and nursery areas) of fishing using an approach consistent with MSC Principle 2.</p>	<ul style="list-style-type: none"> <li>• Where impacts have been identified, steps have been taken to develop appropriate control measures.</li> </ul>	<ul style="list-style-type: none"> <li>• Where assessments demonstrate possible ecological impacts, the management plan explicitly takes such impacts into account.</li> <li>• The regulation of the fishery to manage ecological impacts of fishing is consistent with the precautionary approach.</li> </ul>	<ul style="list-style-type: none"> <li>• The management system includes a plan with clear long-term objectives for managing ecological impacts of fishing that are explicit.</li> <li>• The plan requires regular quantitative assessments of the status of ecosystem components, taking into account all significant (identified or estimated) ecological impacts of the fishery, including but not limited to food competition, disruption of prey fields, disruption of foraging behavior, disruption to animals, impacts on spawning/nursery areas and alterations in food webs and habitats.</li> <li>• The plan includes all ecosystem components and is explicitly precautionary, accounting for uncertainty.</li> </ul>	<p>17.6</p>	<p>85</p>

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

<p>Scoring Rationale/ Objective Evidence</p>	<p>Appropriate tactics for minimizing ecological impacts have been adopted by the management system for ocean shrimp. A fishing season is used to protect ocean shrimp during their spawning period. Count-per-pound regulations protect the first year-class of shrimp from excess fishing effort, until a portion of them survives until first spawning. Shrimp larvae are pelagic and are unavailable to the gear. As they grow, shrimp settle and move in from deeper water to occupy shrimp beds as they mature.</p> <p>The bycatch of depleted groundfish species has been identified as a concern. These non-target species are protected through the use of mandatory fish excluder devices in the shrimp fishery.</p> <p>There have been few studies of the impacts of trawl gear on habitat off the coast of Washington, Oregon, and California, and no formal studies of ocean shrimp trawl impacts. ODFW has observed many trips aboard shrimp trawlers including observations using underwater video (Hannah and Jones, personal communication). Fishing gear is semi-pelagic, that is, trawl doors make contact with the sea floor as does a footrope commonly used by the fleet. The net and fishing line do not make contact. Video coverage of the net and fishing line do show sea pens going under the net without being picked up by the trawl. No video coverage has been made of the bottom contact by doors or the footrope, however, the footrope does show some evidence that sea pens occasionally foul the footrope. Very few other invertebrates appear in the catch and the nets were not observed to get snagged on hard bottom substrates or pick up rocks and hard corals. The latter observation is likely due to the location where shrimp trawls are fished – namely, on mud-sand bottom.</p> <p>Measures to protect essential fish habitat from the impacts of bottom trawl gears have been adopted by the PFMC. Shrimp trawls are considered bottom trawls and fishery impacts from all bottom trawl sources were considered the lowest inside of 200 meters on the continental shelf where the majority of shrimp trawling occurs (see updated section 2.1.3.1).</p> <p>The Oregon shrimp fishery has undertaken steps, such as requiring bycatch excluder devices, to minimize ecological impacts on other species. Assessments of gear use have been done to observe impacts on habitat, which appear to be minimal. The fishery is allowed to conduct trawling operations within trawl closure areas. In addition, the fishery has long term and explicit objectives for managing ecological impacts and hence it meets the first bullet of SG100.</p>
--	---

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
<p>3.1.5 (Relates to MSC Criteria 3.2, 3.4, 3.6, 3.7)</p>	<p>The management system takes into account socio-economic impacts in the development of management plans.</p>	<ul style="list-style-type: none"> <li>• The fishery management system gives consideration to the long-term socio-economic interests of people and communities dependent on fishing.</li> <li>• The fishery is free from subsidies that directly and substantially promote overcapacity and excess input use.</li> <li>• The management system considers possible behavioral responses to effort control, e.g., shorter seasons cause investments in vessel mobility.</li> <li>• Management measures exist to limit entry and prevent excessive capitalization.</li> </ul>	<ul style="list-style-type: none"> <li>• The management system incorporates objectives and strategies aimed at improving the long-term socio-economic well-being of people and communities dependent on fishing for livelihoods.</li> <li>• The fishery management system promotes measures that achieve conservation objectives in a cost-effective manner.</li> <li>• Measures for controlling effort take into account the need to reduce perverse race-to-fish incentives.</li> <li>• Management has adopted measures to prevent excess capacity growth.</li> </ul>	<ul style="list-style-type: none"> <li>• The management system has adopted explicit objectives, strategies and tactics to improve the long-term socio-economic well-being of people and communities dependent on fishing for livelihoods, while achieving conservation objectives.</li> <li>• Managers have adopted measures that give individual fishermen incentives to increase the economic value rather than the volume of catch.</li> <li>• Measures for managing effort have been adopted that reduce race-to-fish incentives.</li> <li>• The fishery management system provides incentives that foster a stewardship ethic among participants.</li> <li>• The fishery management system generates incentives that direct innovation toward maximizing value from a biologically sustainable fishery rather than toward race-to-fish volume maximization.</li> </ul>	<p>11.1</p>	<p>90</p>
<p>Scoring Rationale/ Objective Evidence</p>	<p>The management system has a requirement to consider socio-economic impacts in the development and implementation of management plans. Initially, socio-economic impacts were considered during the drafting of the FMP for the Pink Shrimp Fishery . The management system currently administered under state regulations (and federal regulations pertaining to federally managed species taken as bycatch in the shrimp fishery) must consider relevant socio-economic factors in development of plans and their implementation through state and federal regulatory processes. In addition to socio-economic impact analysis required by rulemaking, affected public have the opportunity to testify in front of the Oregon Fish and Wildlife Commission (state regulatory process) and the PFMC (federal regulatory process) (Oregon Revised Statutes 506.109 and 506.119; NMFS. 2005a).</p> <p>The original FMP and the management system that emerged explicitly incorporate objectives, strategies and targets that focus on socio-economic impacts. Managers have adopted measures such as limited entry and buy back programs that are responsive to overcapacity and excess capitalization in the fishery. Actions taken exceed the requirements for SG80. Higher scores could be achieved with more attention to basic race to fish incentives.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

3.1.6 (Relates to MSC Criteria 3.2, 3.7, 3.10)	The management framework includes a plan to assess causes of stock declines and promote recovery.	<ul style="list-style-type: none"> <li>• The causes of decline cannot be differentiated, but some catch or effort reductions are implemented by regulation.</li> </ul>	<ul style="list-style-type: none"> <li>• The causes of decline can be differentiated into fisheries and other causes.</li> <li>• Harvest control measures to promote recovery are coordinated with other responsible authorities.</li> </ul>	<ul style="list-style-type: none"> <li>• Specific measures to remove fishery-dependent causes and adapt to other causes to promote recovery are developed in a comprehensive plan with other authorities.</li> </ul>	17.6	85
Scoring Rationale/ Objective Evidence	<p>The management system provides for robust in-season monitoring of the fishery and ocean shrimp resource with an annual assessment consisting of an evaluation of CPUE , year-class strength, count-per-pound, and geographic distribution of the resources. In addition, environmentally based models are updated annually to add past season's data to databases used in these models. Periodic retrospective studies are conducted with environmentally based models to evaluate trends in stock abundance. Retrospective studies have failed to reliably separate out fishery effects from environmental effects, and the latter factors appear to dominate the population dynamics (Hannah, 1995; Hannah, 1999; Field et al., 2006). The fishery is regulated primarily by season and size (count-per-pound). These have the effect of reducing fishing effort during periods of vulnerability and while incoming year-classes reach the age of first spawning (Abramson et al., 1981). It should be noted that the likelihood of the fishery impacting the resource during conditions of poor recruitment and low biomass but low count-per-pound shrimp is much reduced due to a permanent reduction in fishing capacity. In addition, there are additional constraints on vessel capacity which limit the vessel size increase when a permit is transferred to a new owner. Assessment consists of monitoring fishery activity, growth, and year-class strength through dockside sampling programs, and comparing them to Biological Points of Concern articulated in the original shrimp FMP (Abramson et al., 1981). State agencies have the authority to implement emergency and/or temporary rules to place needed restrictions on the fishery.</p> <p>The management system demonstrates precautionary measures designed to ensure sustainability in the event of adverse environmental fluctuations. Specific measures such as closed seasons, count per pound regulations, and programs for the reduction of fishing effort are in place to provide a safety margin. ODFW is also keenly aware of possible opportunities of price- induced effort increases, ODFW shrimp biologist has commented that the reintroduction of significant latent effort into the fishery would be a cause for alarm and would result in an evaluation of the possible risk to the stock (B.Hannah, Pers. Comm). ODFW has authority to introduce emergency rules to control effort, either by reduction of the season length or by using spatial closures to protect specific shrimp beds.</p> <p>Research has been conducted attempting to determine fishery dependent indications of biomass change; conclusions to date are that the effects of the fishery can not be detected with the available data.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

<p>3.1.7 (Relates to MSC Criteria 3.2, 3.5, 3.7)</p>	<p>Procedures exist for measuring performance relative to the objectives.</p>	<ul style="list-style-type: none"> <li>Measures are used to gauge performance relative to objectives.</li> </ul>	<ul style="list-style-type: none"> <li>Periodic, comprehensive measurement of performance indicators is undertaken.</li> <li>Management measures are adapted to meet objectives when necessary.</li> </ul>	<ul style="list-style-type: none"> <li>Procedures are used for regular empirical measurement of performance relative to the objectives.</li> <li>There is a regular process for adapting management measures when objectives are not being met.</li> </ul>	<p>12.5</p>	<p>85</p>
<p>Scoring Rationale/ Objective Evidence</p>	<p>The management system monitors the fishery, resource status, and management performance within season and through an annual assessment and review. Environmentally based models are updated annually. Periodic retrospective reviews are made of the fishery to look for potential fishery effects. So far, most of the evidence supports a recruitment-stock effect forced by environmental drivers (Hannah, 1999; Field et al., 2006). Biological Points of Concern were outlined in the original shrimp FMP. Presently, assessments by ODFW consist of monitoring fishery performance within season to determine distributional patterns, age, sex, and count-per-pound of ocean shrimp. These are evaluated for evidence of relative changes in abundance and of potential year-class failures (Abramson et al., 1981; Hannah and Jones, personal communication).</p> <p>Management of bycatch in the shrimp fishery was the most recent example of a change which included evaluation of performance relative to the objective of minimizing bycatch of overfished non-target species. The shrimp fishery was observed by the WCGOP from 2002-2005 while fish excluder devices or bycatch reduction devices (BRDs) were implemented. NMFS provided observer data to ODFW for analysis. ODFW found that BRDs reduced bycatch by 97% and that bycatch was less than 10% of the overall shrimp trawl catch (Hannah and Jones, 2006d). State agencies have the authority to implement emergency and/or temporary rules when a change is needed in fishery management to achieve fishery goals and objectives. All three states implemented rules requiring mandatory fish excluders to achieve the objective of minimizing bycatch.</p> <p>Monitoring of total landings, effort, catch per effort, size and sex ratios are regularly and comprehensively conducted. ODFW conducts annual reviews of the fishery management against stated objectives. Management measures have been adapted to meet objectives as the recent bycatch excluder adoption demonstrates. A score of 85 has been assigned because there is a demonstrated process for adapting management measures among states when objectives are not being met.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

<b>3.2 TAVEL Criterion 2</b>	The management system recognizes applicable legislative and institutional responsibilities and coordinates implementation on a regular, integral and explicit basis.			11.4	
------------------------------	--	--	--	------	--

Weighting Comment	PI 3.2.2, regulatory streamlining, was weighted slightly more important than PI 3.2.1.
-------------------	--

3.2.1 (Relates to MSC Criterion 3.16)	The fishery is managed and conducted in a manner that respects domestic law.	<ul style="list-style-type: none"> <li>The management system makes consistent efforts to operate in accordance with all substantive and procedural aspects of applicable domestic law.</li> <li>No violations have been identified that would jeopardize the management of fisheries resources.</li> </ul>	<ul style="list-style-type: none"> <li>The management system is in compliance with all substantive and procedural aspects of applicable domestic law.</li> </ul>	<ul style="list-style-type: none"> <li>The management system is clearly in compliance with all substantive and procedural aspects of applicable domestic law.</li> <li>No agent of the management system, including its component institutional entities, has been found at any time to be in violation of any order of any domestic court of jurisdiction on any matter related to performance of any statutory duty concerning the fishery.</li> </ul>	40	90
Scoring Rationale/ Objective Evidence	<p>The ocean shrimp fishery is managed primarily under state statutes and administrative rules and in a fashion that respects domestic law. Federal rules apply to federally managed species taken in the shrimp fishery. State and federal agents connected with the management of shrimp and incidentally caught groundfish monitor the fisheries and enforce compliance with the law. The PFMC hosts an Enforcement Committee with representatives from state enforcement agencies in Washington, Oregon, and California, and the federal government. Coordination of state and federal laws is accomplished through this body. Within the state of Oregon, ODFW and OSP utilize a Coordinated Enforcement Process (CEP) to coordinate between agencies and to set priorities.</p> <p>Enforcement priorities are reviewed annually under the CEP for all commercial fisheries including the ocean shrimp fishery.</p> <p>The management system is in compliance with SG80 and first bullet point of SG100. Achievement of SG100 possible with evidence that no injunctions have been filed against any agent of the management system.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
3.2.2 (Relates to MSC Criterion 3.1)	The fishery is managed and conducted such that state and interstate requirements fit with the federal regulatory standard for the fishery as per PFMC decisions and the Magnuson-Stevens Act.	<ul style="list-style-type: none"> <li>• The management plan is consistent with the federal National Standards.</li> </ul>	<ul style="list-style-type: none"> <li>• The management plan implicitly incorporates the federal National Standards.</li> </ul>	<ul style="list-style-type: none"> <li>• The management plan explicitly incorporates and is in compliance with all aspects of the federal National Standards.</li> </ul>	60	90
Scoring Rationale/ Objective Evidence	<p>The management system, along with state and interstate requirements, closely parallels federal regulatory standards for the fishery. There are 10 National Standards applicable to the Magnuson-Stevens Act (NMFS 1998, 2004a; Abramson et al., 1981). Most of the standards were applicable when the original draft shrimp FMP for was presented to the PFMC. The fishery as managed is consistent with these standards in the following ways:</p> <p>National Standard 1 requires that conservation and management prevent overfishing while achieving the optimum yield (OY) on a continuing basis, for the United States fishing industry.</p> <p>Size and season limits are used to prevent overfishing of spawning biomass. Although a numerical OY has not been determined for ocean shrimp, the management system does monitor trends in year-class strength, sex ratio, CPUE, and estimates catch area to evaluate trends in abundance and stock condition.</p> <p>National Standard 2 requires conservation and management measures to be based on the best scientific information available.</p> <p>The management system for ocean shrimp was based on the best scientific information available when the shrimp FMP was compiled. Since then, ODFW staff and others have continued to contribute to the body of scientific literature in the form of peer reviewed journals. This information has been used as a basis to evaluate stock health through several retrospective studies cited throughout this document.</p> <p>National Standard 3 states that individual stocks of fish shall be managed as a unit throughout its range, to the extent practicable. Interrelated stocks are to be managed as a unit or in close coordination.</p> <p>All three states use similar regulations. ODFW has the most intensive monitoring and assessment program. Oregon vessels catch more than 60% of the shrimp coastwide and sampling and assessments are thought to be representative of the stock area (see 1.1.5.1 above).</p> <p>National Standard 4 requires conservation and management measures to be fair and not discriminate between residents of different states.</p> <p>All three states use similar regulations and each state makes use of reciprocal rules to recognize legal requirements of an adjacent state.</p> <p>National Standard 5 requires management and conservation measures, where practicable, to consider efficiency in the utilization of the fishery resources, and that no measure shall have economic allocation as its sole purpose.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

	<p>Efficiency was considered as the states prepared and implemented limited entry programs to reduce fleet capacity, but the reduction in permits was far more than originally intended. Despite this, there is likely excess fleet capacity that is presently not utilized due to other economic constraints on the fishery. ODFW can protect against significant latent effort reintroduction by reducing season length or requiring spatial rotation of the fleet through spatial closures of specific shrimp beds.</p> <p>National Standard 6 requires that conservation and management measures account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.</p> <p>Coastwide, the management of the shrimp fishery accounts for increased need to protect overfished species by changing regulations and minimizing bycatch through the mandatory use of finfish excluders.</p> <p>National Standard 7 requires conservation and management measures to, where practicable, minimize costs and avoid unnecessary duplication.</p> <p>Federal costs and duplication of efforts were minimized and continue to be minimized in the shrimp fishery by state implementation of management measures.</p> <p>National Standard 8 requires conservation and management measures, consistent with Standard 1, recognition of the importance of fishery resources to fishing communities to (A) provide for sustained participation of communities, and (B) to the extent practicable, minimize adverse economic impacts to same.</p> <p>Goal number 6 in the shrimp FMP speaks to this standard. Regulations are similar coastwide and measures used by states to implement the plan were generally thought to have positive impacts on social structure and distribution of wealth (Abramson et al., 1981).</p> <p>National Standard 9 requires that conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.</p> <p>Rules affecting the state fishery were put into place to protect federally managed species and those too were consistent with National Standard 9 dealing with bycatch. The shrimp fishery has implemented mandatory fish excluders coastwide in support of the national standard.</p> <p>National Standard 10 requires conservation and management measures, to the extent practicable, promote the safety of human life at sea.</p> <p>Present management is consistent with this National Standard. The shrimp fishery is closed during the worst weather period of the year. Effort limitation has eliminated any potential for a derby fishery. The U.S. Coast Guard enforces marine safety regulations and monitors the fleet for compliance.</p> <p>While not managed under a federal FMP, the shrimp fishery is managed by state regulations. Some regulations are consistent with the draft FMP and others, such as mesh size, vary from the original plan. Regulations have been modified from those suggested in the original FMP, but a consistent process was used, including a biological analysis of the resource impacts and rule making by state authorities (legislature or Fish and Wildlife Commissions) to implement them.</p> <p>Some National Standards have changed since the Draft 1981 FMP was developed. The 81 Draft FMP was mainly consistent at the time with the National Standards. Changes in federal National Standards have been incorporated into state regulations. The 100 SG are achievable if explicit codification could be provided that links OR management statutes with the National Standards.</p>				
--	--	--	--	--	--

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

<b>3.3 TAVEL Criterion 3</b>	The management system includes a rational and effective process for acquisition, analysis and incorporation of new scientific, social, cultural, economic and institutional information.			11.4	
------------------------------	--	--	--	------	--

Weighting Comment	Within this sub-criterion, all performance indicators (PIs) are equally weighted.
-------------------	---

3.3.1 (Relates to MSC Criterion 3.2)	The management system solicits and takes into account relevant information from all categories of stakeholders.	<ul style="list-style-type: none"> <li>The management system has mechanisms to receive information and policy recommendations from stakeholders and technical sources within and external to the fishing community.</li> <li>Information and advice is evaluated but there are no formal procedures for responding to such information and advice.</li> </ul>	<ul style="list-style-type: none"> <li>The management system has a formal and open process to solicit and receive relevant information and policy recommendations from all significant public and private stakeholders.</li> <li>The management system evaluates all information and does not discriminate against information on the basis of the stakeholder category from which it was supplied.</li> </ul>	<ul style="list-style-type: none"> <li>The management system has a stable, well-led, predictable, open and tolerant process to solicit relevant information from all public and private stakeholder interests.</li> <li>The management system evaluates information in an unbiased, objective manner and does not discriminate against information solely upon the basis of the identity of stakeholder category from which it was supplied.</li> <li>There is an active program of familiarizing stakeholder groups with the management system's principles and criteria for decision making.</li> </ul>	25	95
--	---	---	--	---	----	----

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

Scoring Rationale/ Objective Evidence	<p>The management system has a long history of public involvement with a broad spectrum of stakeholders. The draft Fishery Management Plan for the Pink Shrimp Fishery off Washington, Oregon, and California was developed by the pink shrimp (ocean shrimp) Plan Development Team through the PMFC. All stakeholders were represented in this process including commercial fishing and processing interests, tribal nations, government, recreational users, and the general public (Abramson et al., 1981). The state agencies continue to be sensitive to the needs of all stakeholders when there is a need for changes in regulations. Since the states implemented the FMP, stakeholders continue to be represented through a tri-state management process, Pacific States Marine Fishery Commission, and individual states' fish and wildlife commissions (Hannah and Jones, personal communication). Explicit procedures have been developed and continue to be used by state fish and wildlife agencies for gathering input from internal and external sources and incorporating such input into the regulatory process. In addition, ODFW staff actively solicits input from stakeholders through "town hall" type meetings, newsletters, mailings, and surveys prior consideration of regulatory changes or Commission hearings on same. Both background (need for change) and procedures for considering input are explained to interested public. Written and oral testimony from all sources is summarized and included in staff reports to the Oregon Fish and Wildlife Commission. Further, additional opportunity is provided for public comment during the Commission meetings, be they informational or at the time when regulatory action is taken. Newsletters and mailings are used to communicate proposed and implemented regulatory changes (Hannah and Jones, 1994, 2001).</p> <p>The management system is responsive to information and recommendations from all relevant stakeholders. The Oregon Fish and Wildlife Commission is open to comments without prejudice as to source; these are recorded and published and additional opportunities are provided for public input. Various forms of communication are used to disseminate information and encourage stakeholder participation. SG80 easily surpassed; SG100 achievable with documentation of the scope of coverage for bullet point #3.</p>				
--	---	--	--	--	--

3.3.2 (Relates to MSC Criterion 3.2)	The management system assesses relevant information pursuant to objective processes that incorporate all relevant stakeholder concerns.	<ul style="list-style-type: none"> <li>The management system has informal procedures for assessing and incorporating information from outside sources.</li> </ul>	<ul style="list-style-type: none"> <li>The management system has explicit procedures for assessing and incorporating information from outside sources.</li> </ul>	<ul style="list-style-type: none"> <li>The management system is periodically reviewed to ensure that all outside stakeholder interests are considered and incorporated into the decision process.</li> <li>The management authority has identified an independent party to adjudicate disputes with stakeholders.</li> </ul>	25	80
Scoring Rationale/ Objective Evidence	<p>See 3.3.1 above. The Council and state fish and wildlife commissions are required to consider stakeholder concerns through NEPA environmental impact statement processes (Council and federal governance) and through public meeting law processes (state governance).</p> <p>Evidence warrants a score of 80. A higher level could be achieved with evidence that the system is periodically reviewed, and that an independent party is identified to adjudicate disputes with stakeholders.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

3.3.3 (Relates to MSC Criterion 3.2)	The management system presents managers with clear, useful, and relevant information about policy options and their likely consequences.	<ul style="list-style-type: none"> <li>• The management system presents decision makers with clearly differentiated policy alternatives for action.</li> <li>• Decision makers incorporate formal and informal information to predict the consequences of various options and discriminate among them to determine best actions.</li> </ul>	<ul style="list-style-type: none"> <li>• Policy options are responsive to relevant stakeholders via a process proscribed by fisheries management law and procedures.</li> <li>• The management system's decision makers show evidence of understanding and consistently incorporating the information provided to them.</li> <li>• Technical information reflects the most recent and rigorous scientific understanding.</li> </ul>	<ul style="list-style-type: none"> <li>• The management system provides decision makers with timely and comprehensive information suitable for the nature of the decisions under consideration.</li> <li>• Managers also demonstrate consistent and precautionary procedures for accounting for information gaps and uncertainties.</li> <li>• Procedures for addressing information gaps are in place and are regularly utilized.</li> </ul>	25	95
Scoring Rationale/ Objective Evidence	<p>The management system provided a formal and clearly articulated evaluation of policy options when it considered the original shrimp plan with its multiple options. The system continues to address the need for periodic changes using state and federal forums. In 1981, the draft Fishery Management Plan for the Pink Shrimp Fishery off Washington, Oregon, and California was presented to state and federal managers and the public through the PFMC. Policy options were discussed and state managers were asked to implement the plan through coordinated state action (an alternative option stated in the plan and adopted by the states). State fish and wildlife commissions continue to work together with fishing industry, interested public and agency staff to review information and select and set policy through state regulations. Information from internal and external sources is dealt with consistently and in an open way. Agencies solicit comment through media and public meeting process. Comments and reviews are published with regulatory analysis for policies adopted or rejected by fish and wildlife commissions. Newsletters and mailings are used to communicate proposed and implemented regulatory changes (Hannah and Jones, 1994; 2001). The Oregon Fish and Wildlife Commission (in conjunction with other state fish and wildlife agencies in Washington and California) direct staff to prepare formal reports for public distribution and presentation. The staff reports reflect public input gathered, biological analysis, socio-economic impact analysis, and alternatives for the regulations being considered (ODFW, 2003).</p> <p>The original fishery management plan provided the broad framework, objectives and policy options, and lines of responsibility within which management actions are undertaken. Current management practices have not deviated significantly from the framework, and the Oregon Fish and Wildlife Commission continues to refine management to reflect changes in information about the resource. The process is to be commended for being open and transparent, and responsive to stakeholder input. The current approach used in the pink shrimp fishery warrants a score of 95. Specific procedures for addressing information gaps are not formalized although management is integrally involved with the fishery and communication with industry allow prioritization of the information needs.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
3.3.4 (Relates to MSC Criteria 3.2, 3.5)	The management system provides for timely and fair resolution of disagreements arising within the fishery management system, including any disputes with third parties with an interest in the fishery.	<ul style="list-style-type: none"> <li>Informal dispute resolution mechanisms are in place to resolve interjurisdictional or third party conflicts.</li> </ul>	<ul style="list-style-type: none"> <li>The management system has formal and codified mechanisms for timely resolution, of significant disputes arising within or external of the system.</li> <li>The management system's dispute resolution procedures are clearly open and transparent.</li> </ul>	<ul style="list-style-type: none"> <li>The management system provides for appropriate documentation of the nature and resolution of disputes.</li> <li>The management system's dispute resolution procedures show no evidence of a pattern of discrimination against any participants in other jurisdictions or significant stakeholder interest.</li> </ul>	25	90
Scoring Rationale/ Objective Evidence	<p>Few conflicts exist between jurisdictions, and the management system has an efficient means of dealing with them when they occur. Washington, Oregon and California, and the federal government work together in what is referred to as the tri-state process to resolve jurisdictional issues. State and federal legal counsels are used to resolve jurisdictional issues over authority. Other disagreements are resolved through conferences between agencies. When the issues extend beyond state waters and are inter-jurisdictional in nature, the PSMFC has been used to provide a public and technical forum for resolving them. Conflicts almost always involve both stakeholders from different regional areas and agencies. The PSMFC uses a committee process to resolve issues. Committees are structured so that there is a balance of interests and representation (fishermen, processors, and agencies) from different areas. Internally, ODFW uses review boards to resolve conflicts between the agency and individual stakeholders. For example, ODFW uses a permit review board and hearings officer to try and resolve grievances over denied shrimp permits.</p> <p>The management system has codified and formal procedures for resolution of disagreements arising from interjurisdictional concerns and/or third party interests. The procedures meet bullet point #1 of the 100SG, and would warrant the higher score with documented evidence that bullet point #2 is met.</p>					

<b>3.4 TAVEL Criterion 4</b>	The management system and fishery implements measures and strategies (by rule or by voluntary action of the fishery) that demonstrably reduce by-catch, destructive fishing practices and operational waste.	14.3	
------------------------------	--	------	--

Weighting Comment	Within this sub-criterion, all performance indicators (PIs) are equally weighted.
-------------------	---

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
3.4.1 (Relates to MSC Criterion 3.12)	The management system applies gear restrictions and mandatory practices to avoid catch of non-target species, minimize mortality of this catch.	<ul style="list-style-type: none"> <li>• The fisheries management system has implemented measures for minimizing catches of non-target species.</li> <li>• Qualitative evidence from at-sea and dockside observations indicates some success in reducing non-target by-catch.</li> </ul>	<ul style="list-style-type: none"> <li>• The management system uses a formal and comprehensive program to minimize catch of non-target species, including explicit by-catch objectives and strategies that reduce the take of these species to acceptable levels.</li> <li>• There is independent evidence of fishery-wide adoption of measures undertaken to reduce by-catch of non-target species.</li> </ul>	<ul style="list-style-type: none"> <li>• The management system has achieved fishery-wide acceptable by-catch objectives, resulting in a reduced catch of non-target species.</li> <li>• Management has clearly demonstrated the effectiveness of by-catch reduction measures through independent at-sea measurement.</li> </ul>	33.3	100
Scoring Rationale/ Objective Evidence	The management system provides for one of the best mandatory systems for minimizing bycatch and mortality of non-target species. The ocean shrimp fishery of the Pacific coast is one of the cleanest shrimp fisheries in the world due to the implementation of mandatory fish excluder devices or bycatch reduction devices (BRDs) in Washington, Oregon, and California. Mixed tows of shrimp and unwanted finfish could be dumped if the ratio of shrimp to total catch was low. BRDs have effectively eliminated the need for this practice. Sandpaper belt sorters were also used in the past to eliminate bait fish from the catch. These are also declining in use due to the implementation of mandatory fish excluder devices (Hannah and Jones, personal communication). Independent quantitative information has been collected on the effectiveness of the mandatory excluder program by ODFW and NMFS. A publication is being prepared by ODFW which analyzes data collected by the WCGOP from 2002-2005 as BRDs were being implemented (Cusick, 2006). The program's attention to bycatch reduction is to be commended; warrants a 100.					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

3.4.2 (Relates to MSC Criterion 3.14)	The fishery does not use destructive (e.g. poison, explosives) fishing practices.	<ul style="list-style-type: none"> <li>There is no evidence that destructive fishing practices take place within the fishery.</li> </ul>	<ul style="list-style-type: none"> <li>Fishery management system prohibits use of destructive fisheries practices.</li> <li>Monitoring and enforcement efforts are sufficient to identify a problem if it exists.</li> </ul>	<ul style="list-style-type: none"> <li>Active monitoring and enforcement in the fishery has verified that no destructive fishing practices exist.</li> </ul>	33.3	100
Scoring Rationale/ Objective Evidence	Trawl fishing is the means used to catch ocean shrimp. No poisons or explosives are used. Meets SG100 criteria.					

3.4.3 (Relates to MSC Criterion 3.15)	The fishery minimizes operational waste such as lost fishing gear, oil spills, on-board spoilage of catch, etc.	<ul style="list-style-type: none"> <li>The fishery encourages the reduction of operational waste.</li> </ul>	<ul style="list-style-type: none"> <li>The fishery has established targets and implemented rules to minimize operational waste.</li> <li>There is evidence that operational wastes have been reduced.</li> </ul>	<ul style="list-style-type: none"> <li>The management system provides fishermen with incentives to minimize operational waste.</li> <li>Evaluation of the monitoring and enforcement programs demonstrate targets for reducing operational waste have been achieved.</li> </ul>	33.33	90
Scoring Rationale/ Objective Evidence	<p>State and federal laws prohibit dumping of oils and gear into the territorial seas and federal Fisheries Conservation Zone (FCZ). The U.S. coastguard enforces federal regulations and Oregon State Police regulate waste and pollution regulations in state waters. Industrial waste that may be damaging to habitats, like old nets, may be disposed of free of charge in Oregon ports.</p> <p>Spoilage happens from time to time. However, there are strong economic incentives to prevent this from happening by proper icing of the product. Price is negotiated at the beginning of the fishing season and delivery schedules are worked out in advance, and hence there are no deliveries of shrimp on speculation, which might lead to wastage. In addition, trip duration has been declining in recent years so there is less opportunity for spoilage. Finally, Oregon has a law against wanton waste of fish (Oregon Legislature, 2005b).</p> <p>Overall, there are both built in economic incentives that discourage waste of shrimp, as well as laws such as the wanton waste law that discourage spoilage. There are also efforts to retrieve lost nets, remove garbage, and recycle oil. These justify a score of as high as 90. There are no targets for reducing operational waste.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

<b>3.5 TAVEL Criterion 5</b>	A research program is conducted to support management needs.			11.4	
------------------------------	--	--	--	------	--

Weighting Comment	PI 3.5.1 is considered more important than the remaining PIs within sub-criterion as a research program to support management of the target species is of critical importance.
-------------------	--

3.5.1 (Relates to MSC Criterion 3.8)	There is a research program that supports management of target species and protection of the ecosystem.	<ul style="list-style-type: none"> <li>• Research supports short term information needs for stock assessment and evaluation of effectiveness of harvest control measures.</li> <li>• Major areas requiring further research have been identified.</li> </ul>	<ul style="list-style-type: none"> <li>• The research program provides the management system with reliable, timely information on the status of the stocks and of other ecosystem health performance indicators required for management.</li> <li>• There is internal review of the content and scope of the research program.</li> <li>• Longer term research periodically provides improvements in basic scientific understandings of the stock, ecosystem and fishery economics.</li> <li>• Research is planned to address major gaps in knowledge.</li> </ul>	<ul style="list-style-type: none"> <li>• There are regular reviews of the content and scope of the research program by peer groups and stakeholders.</li> <li>• Research provides continuing, significant progress in scientific understanding of:               <ol style="list-style-type: none"> <li>1) Fluctuations in target and impacted non-target species</li> <li>2) Effectiveness of harvest strategies</li> <li>3) Effects of fishing on the ecosystem</li> <li>4) Ecosystem management strategies</li> <li>5) Economic considerations related to the fishery.</li> </ol> </li> <li>• Funding is adequate to address significant knowledge gaps, is adjusted in a timely and appropriate manner to serve changing research priorities and is predictable over a long-term time scale.</li> </ul>	40	90
---	---	--	---	---	----	----

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

Scoring Rationale/ Objective Evidence	<p>There is a long-standing and active research program which supports management of ocean shrimp within the Marine Resources Program of the Oregon Department of Fish and Wildlife (Hannah and Jones, personal communication). Annual assessments based on the previous season's fishery and sampling data are conducted and communicated in an annual newsletter. Environmentally-based models are updated annually. Periodic retrospective studies are conducted to look for environmental and fishery effects on ocean shrimp population dynamics. Gear studies are conducted to gather data useful in reducing bycatch and to understand elemental gear efficiency. In-season fishery management performance is monitored through active logbook collections and biological sampling. ODFW's most recent plans include a study of the impacts of shrimp gear on habitat, slated to take place late in 2006.</p> <p>Surpasses requirements for SG80 but does not yet meet second 100 bullet point concerning ecosystem management strategies. Additional habitat work is ongoing, including OTC work done to date with Fiber Optic Line Trawl Committee.</p>				
--	--	--	--	--	--

3.5.2 (Relates to MSC Criterion 3.17)	Fishermen assist in the collection of catch, discard and other relevant data.	<ul style="list-style-type: none"> <li>• Fishermen are involved in the collection of some catch, discard and other information.</li> </ul>	<ul style="list-style-type: none"> <li>• Fishermen are regularly involved in the collection and recording of relevant catch, discard and other information.</li> </ul>	<ul style="list-style-type: none"> <li>• Fishermen assist significantly in the collection and recording of all appropriate catch, discard and other information.</li> </ul>	20	85
---	---	--	--	---	----	----

Scoring Rationale/ Objective Evidence	<p>Fishermen make a substantial contribution to data collection of catch and other fishery and resource information. Fishermen in Oregon's shrimp fishery maintain mandatory logbooks, allow biological staff to conduct ride-along trips to gather information, participate actively in chartered trips, and respond to surveys conducted by Oregon Department of Fish and Wildlife staff (Hannah and Jones, personal communication). According to staff, data quality is very good - nearly 100% of the logs are collected and about 90-95% of the logbooks have been filled out according to instructions on the logbook, and are used. Studies by ODFW have demonstrated that only about 30% of the groundfish bottom trawl logbook data are needed to adequately represent catch by statistical area (Golden, 2006b). Bycatch information was collected through a special logbook provided to the fishermen and through research cruises (Hannah and Jones, 2005, 2006d; Krutzikowsky et al., 2006).</p> <p>The main deficiency preventing higher scoring is that the sampling of discards is not regularly conducted or recorded. Fishermen participate in ride along programs, and any additional requests made from ODFW (e.g. provision of vessels for special projects, testing of excluders). The fleet is highly cooperative with requests made for additional info and activity. Obligations to collect additional information on discards and bycatch of darkblotched are not in place by ODFW.</p>				
--	---	--	--	--	--

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

3.5.3 (Relates to MSC Criterion 3.8)	Relevant research is carried out by the fishing industry and other organizations and taken into consideration by the management system.	<ul style="list-style-type: none"> <li>The management system is aware of research carried out by the industry and other organizations and elements of this are taken into consideration.</li> </ul>	<ul style="list-style-type: none"> <li>Applicable research carried out the fishing industry and by other organizations is used by management.</li> </ul>	<ul style="list-style-type: none"> <li>Research is co-coordinated with existing research plans of the management system.</li> </ul>	20	100
Scoring Rationale/ Objective Evidence	Fishermen are active participants in research projects and work in close partnership with ODFW. As an example, the latest fish excluder technologies were primarily developed by the fishing industry after ODFW initiated a demonstration project which tested several designs. In addition, fishermen host observers from the West Coast Groundfish Observer Program. ODFW actively seeks advice from the fishing industry and incorporates their advice into the management system (Hannah and Jones, personal communication). The close partnership between fishermen and ODFW is commendable, warranting a 100 score.					

3.5.4 (Relates to MSC Criterion 3.8)	Research results are available to interested parties in a timely fashion.	<ul style="list-style-type: none"> <li>The majority of research results are available to interested parties.</li> </ul>	<ul style="list-style-type: none"> <li>Research results are available to interested parties on a regular and timely basis.</li> </ul>	<ul style="list-style-type: none"> <li>Research results are proactively made available to all interested stakeholders on a regular basis and in a timely manner.</li> </ul>	20	100
Scoring Rationale/ Objective Evidence	Research results are proactively made available on a regular basis and in a timely manner, through personal dockside communication, a newsletter, information reports, peer reviewed journals, presentations, and through ODFW's website (Hannah and Jones, personal communication; Hannah and Jones, 2006b; <a href="http://www.dfw.state.or.us/MRP/">http://www.dfw.state.or.us/MRP/</a> ). Research results are communicated at least annually (through the newsletter) and in some cases more frequently through web postings and meetings. The scope of efforts to communicate research results is thorough and unusual, meriting a 100 score.					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

<b>3.6 TAVEL Criterion 6</b>	The management system effectively monitors all relevant performance aspects of the fishery.			11.4	
------------------------------	---	--	--	------	--

<p>3.6.1 (Relates to MSC Criteria 3.7, 3.9, 3.10)</p>	<p>The management system measures and records and evaluates all aspects of the fishery to provide a basis for assessments of stocks and management performance.</p>	<ul style="list-style-type: none"> <li>• The management system has a program that monitors the basic indicators of the stock health status.</li> <li>• The program is subject to internal evaluation on a periodic basis.</li> <li>• Monitoring results are compiled, analyzed, and disseminated to fishery managers.</li> </ul>	<ul style="list-style-type: none"> <li>• There is a monitoring program that covers all indicators of stock health and management performance.</li> <li>• The monitoring program has been subjected to independent outside review to identify gaps.</li> </ul>	<ul style="list-style-type: none"> <li>• The management system has a comprehensive monitoring program.</li> <li>• Full records are kept of monitoring results and these are made available to relevant research and management bodies.</li> <li>• The results of monitoring efforts are compiled, analyzed, and disseminated to fishery managers such that management and research efforts can be informed as to needed improvements in a timely manner.</li> </ul>	<p>100</p>	<p>70</p>
<p>Scoring Rationale/ Objective Evidence</p>	<p>The management system conducts a systematic review of the fishery, resource status, and management performance. The annual review is published in the form of a newsletter to inform stakeholders and decision makers (Hannah and Jones, 2006b). In addition, the management system provides a framework for evaluating the fishery, resource status, and management performance within season. ODFW maintains an active in-season fishery monitoring program. Logbooks are collected from the fleet to determine catch location, CPUE, and distributional characteristics of the shrimp resources. Biological samples are taken throughout the fishing season to determine age and sex composition and count-per-pound. All relevant information is used to monitor fishery performance within the season and is incorporated into annual review and update of environmentally-based models. Periodic retrospective studies of ocean shrimp population dynamics are also conducted and published in peer reviewed journals (Hannah and Jones, 2006b; Hannah and Jones, personal communication).</p> <p>While there is an impressive and successful research effort to support the shrimp fishery, there does not appear to be any periodic and independent outside review to identify research/information gaps.</p> <p><b>Condition</b> - Within one year, the client shall subject the fishery monitoring program to an independent outside review to identify gaps. The review shall verify that the monitoring program covers all indicators of stock health and management performance.</p> <p>The review must be undertaken by a credible management expert.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

<b>3.7 TAVEL Criterion 7</b>	The management system ensures that there is a high degree of compliance in the fisheries with management measures and directives regarding fishing practices required by the system			14.3	
------------------------------	---	--	--	------	--

Weighting Comment	PIs 3.7.1 to 3.7.4 area weighted equally and provide the basis for 3.7.5, which is weighted twice as important as the other PIs as it the compliance measure of the fishery.
-------------------	--

3.7.1 (Relates to MSC Criterion 3.16)	Fishermen are aware of the management system and legal and administrative requirements.	<ul style="list-style-type: none"> <li>Fishermen are aware of key management and legal requirements.</li> </ul>	<ul style="list-style-type: none"> <li>Fishermen are aware of management and legal requirements upon them and are kept up to date with new developments.</li> </ul>	<ul style="list-style-type: none"> <li>All fishermen are aware of management legal requirements through a clearly documented and communicated mechanism such as a code of conduct.</li> </ul>	16.7	90
Scoring Rationale/ Objective Evidence	Fishermen are made aware of management and legal requirements through clearly documented and communicated material including the newsletter, Oregon Revised Statutes and Oregon Administrative Rules, the instructions given during annual licensing and permit renewal processes, and through dock-side communication with ODFW staff (Oregon Legislature, 2005a; ODFW, 2006; Hannah and Jones, personal communication; Hannah and Jones, 2006b). Washington, Oregon, and California have reciprocal rules in place and provisions to allow fishermen with properly licensed vessels to trawl for shrimp off of an adjacent state's waters and deliver back into their home port. For example, Oregon vessels fishing off California must use 1 3/8 inch mesh codends in compliance with California rules. Likewise, fishing vessels licensed in Washington State may use a single delivery license to make a delivery into Oregon. Lack of hard evidence of effectiveness of communication efforts is only deficiency preventing SG 100 score.					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

3.7.2 (Relates to MSC Criterion 11)	Surveillance and enforcement are in place to ensure that requirements of the management system are complied with.	<ul style="list-style-type: none"> <li>• Surveillance activities and enforcement measures are reactive and focused on key management measures.</li> </ul>	<ul style="list-style-type: none"> <li>• Enforcement systems have been implemented and there is control and adequate compliance with most management measures that affect fishing mortality over the key fishing areas.</li> </ul>	<ul style="list-style-type: none"> <li>• There is a high degree of control on and compliance to all regulations that affect fishing mortality and stock health, for target and non target populations, over all fishing areas.</li> </ul>	16.7	80
Scoring Rationale/ Objective Evidence	<p>The management system provides for a prioritized system of surveillance and enforcement to ensure compliance with rules and regulations. The Oregon State Police enforces state fish and wildlife rules and regulations. They review legal requirements for the shrimp fishery with ODFW on an annual basis and whenever there is a rule change. ODFW and OSP are participants in a Cooperative Enforcement Program (Cleary, D. - Oregon State Police, personal communication). Priorities for enforcement are reviewed annually. Ocean shrimp receives a medium to high priority during April and May at the beginning of the shrimp season and when count-per-pound monitoring is most needed. NMFS and the OSP work together on cases that involve federally managed groundfish species which occur as bycatch in the shrimp fishery. Both ODFW and OSP monitor landings dockside. If dock sampling indicates a potential problem with compliance, OSP is informed. ODFW assists OSP in gathering evidence, if required. At-sea monitoring occurs as both NMFS and OSP agents make use of United States Coast Guard vessels to observe and inspect at-sea. USCG personnel also inspect fishing vessels for compliance with federal regulations. Coordination and consultation between the three state's enforcement agencies is also done to ensure compliance with regulations (see reciprocity discussion in 3.7.1 above).</p> <p>OSP provided evidence in the form of compliance monitoring statistics which demonstrated that the shrimp fishery compliance index ranged between 86.1 and 88.4 % for the years of 2004 through 2006. This evidence and other communication from the OSP merited a score of 80.</p>					

S,

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

3.7.3 (Relates to MSC Criterion 11)	Corrective actions can be applied in the event of non-compliance and there is evidence of their effectiveness.	<ul style="list-style-type: none"> <li>Mechanisms exist or are being developed to address non-compliance.</li> </ul>	<ul style="list-style-type: none"> <li>There are explicit measures used to address non-compliance in a formal or codified system.</li> </ul>	<ul style="list-style-type: none"> <li>Corrective actions are applied in the event of non-compliance, and these have been demonstrated to be effective.</li> </ul>	16.7	90
Scoring Rationale/ Objective Evidence	<p>The management system includes a complete framework of state and federal laws, enforcement officials, and courts for providing corrective action when needed. Corrective actions are applied through warnings and citations and administered through civil code and within the Oregon District Courts. Non-compliance with federal regulations pertaining to bycatch of groundfish, threatened, or endangered species is accomplished by either state agencies or NMFS. Evidence of effectiveness of state enforcement of shrimp rules was provided by OSP (Cleary, D. - Oregon State Police, personal communication). These suggest that the laws are on the books, they are enforced, and they have been demonstrated to be effective (such as the high count per pound when pinheads show up). There is no evidence of repeat violations. Surpasses SG80 criteria but the 100 SG is not met because complete effectiveness has not been demonstrated, particularly on the issue of count per pound regulations. Each year, there is some very low level of non-compliance on this point.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
3.7.4 (Relates to MSC Criterion 3.16)	There is a clear record of enforcement actions (by-catch limits, count per pound, mesh regulations and closed areas and seasons).	<ul style="list-style-type: none"> <li>• Informal evidence of violations and corrective action exist.</li> </ul>	<ul style="list-style-type: none"> <li>• Formal evidence of violations and corrective actions is available and readily retrievable.</li> </ul>	<ul style="list-style-type: none"> <li>• Rigorous monitoring of the violations in enforcement activity is fully documented through dockside as well as investigative actions.</li> <li>• Results of convictions are considered in adjusting enforcement efforts.</li> </ul>	16.7	85
Scoring Rationale/ Objective Evidence	<p>OSP maintains a readily available record of contacts and violations by fishery. (See 3.7.5 below for summary of actions). Oregon district courts are required to forward case dispositions to OSP for their records (Cleary, D. - Oregon State Police, personal communication). Historical details of cases (nature of the case, specific violation, and disposition) are somewhat difficult to access however, and would, in most cases, require some OSP staff time to retrieve. Part of the difficulty is related to compliance by the court system which does not always consistently forward case disposition information to OSP. See also, Section 3.7.5 below.</p> <p>Details of the nature of recent violations and potential issues are discussed formally on an annual basis, even though historical documentation of case details is less accessible. As a part of the Cooperative Enforcement Program mentioned above, investigative and enforcement issues are reviewed annually and enforcement priorities are adjusted accordingly.</p> <p>Records of enforcement actions provided by Lt. Jeff Samuels of OSP verify that the 80 SG are met. Evidence needed regarding how conviction results affect future enforcement efforts to warrant the 100 SG.</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
3.7.5 (Relates to MSC Criteria 3.11, 3.16)	The fishery is fully compliant with fishing regulations and directives to fishing practices.	<ul style="list-style-type: none"> <li>Information on the extent of compliance is available.</li> <li>A basic analysis of compliance has been conducted.</li> <li>The majority of harvesting is compliant.</li> </ul>	<ul style="list-style-type: none"> <li>An analysis of surveillance and monitoring activities indicate overall compliance to fishery regulations that impact fishing mortality with few exceptions.</li> <li>There is a record of consistent prosecution of violations in the fishery.</li> </ul>	<ul style="list-style-type: none"> <li>The management system has comprehensive monitoring and enforcement systems to evaluate compliance to regulations.</li> <li>The judicial system has demonstrated a consistent willingness to enforce applicable rules.</li> <li>The fishery operates with no significant patterns of non-compliance.</li> </ul>	33.3	90
Scoring Rationale/ Objective Evidence	<p>The ocean shrimp fishery complies with state and federal mandates and laws. Compliance records are kept by the Oregon State Police. According to OSP records, compliance rates averaged about 89% out of 403 contacts recorded during the years 2001-2006 (data from 2005 and 2006 are incomplete). The judicial system has demonstrated a consistent willingness to enforce rules although assessment of fines for violations has varied by District Court and judge (Cleary, D. - Oregon State Police, personal communication; Hannah and Jones, personal communication). Although detailed information on the nature of violations was not immediately available, ODFW staff felt that few of the violations within the 2001-2006 time period were related to small shrimp or fishing out of season. According to OSP, about 80-90 % of the violations were related to compliance with individual licensing requirements not related to the boat license or limited entry permit. Turnover of crew or deckhands can be high. Typically, licensing violations involve vessel deckhands who have not yet purchased an individual crewmembers fishing license. Other citations within the period of record involve small groundfish overages. No court appearance or civil penalties are usually involved for small groundfish overages, and a citation results in a warning and forfeiture of the excess catch. Bycatch of groundfish has become insignificant since the implementation of mandatory fish excluders.</p> <p>A review of records regarding prosecution rates, fines, and disposition of court cases suggests a consistent record of enforcement of violations. The requirements of the 80 SG are met, there is a consistent record of violation prosecution in the fishery and although, overall fleet compliance has been demonstrated to be consistently high. The 100 SG was not met because there continues to be non-compliance in the fishery in relation to undersize shrimp and shrimp wastage..</p>					

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE
-----------------------	----------------------	----------------------	-----------------------	--------	-------

<b>3.8 TAVEL Criterion 8</b>	The performance of the management system is regularly and candidly evaluated in a systematic fashion and the system responds positively to appropriate recommendations for change			11.4	
------------------------------	---	--	--	------	--

Weighting Comment	Within this sub-criterion, all performance indicators (PIs) are equally weighted.
-------------------	---

3.8.1 (Relates to MSC Criterion 3.3)	The management system provides for program evaluation and review.	<ul style="list-style-type: none"> <li>The management system conducts informal, internal program reviews.</li> </ul>	<ul style="list-style-type: none"> <li>The management system has explicit provision for an objective, systematic, external evaluation of management performance.</li> <li>The criteria for and results of the evaluation of management performance are made public.</li> <li>Reviews are carried out at time intervals that foster continual improvements in management system</li> </ul>	<ul style="list-style-type: none"> <li>The criteria for and results of the on-going evaluation of management performance are made public and reflect input from all interested participants and stakeholders.</li> <li>The management system seeks and used the results of the on-going evaluation to improve management performance.</li> </ul>	50	90
---	---	--	---	--	----	----

Scoring Rationale/ Objective Evidence	<p>Fishery and management performance is systematically reviewed on an annual basis after the previous season’s assessment information has been analyzed. Results of the review are communicated to stakeholders and decision makers by ODFW staff through an annual shrimp review newsletter (Hannah and Jones, 2006b). A bottom-up and top-down approach to program evaluation characterizes the shrimp fishery. There is considerable latitude in responsibility of field biologists for program evaluation and review. The management system is characterized by a bottom-up approach when fishery biologists working closely with stakeholders identify management issues. When a need for change is required by the Fish and Wildlife Commission, ODFW staff are required to review the fishery and resource status as well as prepare options for implementing proposed changes (ODFW, 2003). Thus, staff presentations before the Commission provide another opportunity for regular program evaluation and review (Hannah and Jones, personal communication).</p> <p>Groundfish bycatch of overfished species became an issue within the PFMC and is an example of top-down initiation of program evaluation and review. Direction to change bycatch management came to the states from the PFMC (top-down). The states then used a bottom-up approach to develop a solution to the bycatch problem through development and implementation of mandatory fish excluders or BRDs. Extensive field work and testing was conducted by state agency and the fishery staff. Staff then brought recommendations for regulation changes to fish and wildlife commissions for action. SG 80 guidelines met. There are no established criteria for the on-going evaluation of management performance, so this performance indicator did not score 100. Results of the evaluation (OFWC) are available to the public, they reflect input from interested stakeholders.</p>				
--	--	--	--	--	--

PERFORMANCE INDICATOR	SCORING GUIDEPOST 60	SCORING GUIDEPOST 80	SCORING GUIDEPOST 100	WEIGHT	SCORE	
3.8.2 (Relates to MSC Criteria 3.3, 3.7)	The management system requires a response to outcomes of internal or external reviews.	<ul style="list-style-type: none"> <li>The management system is informally responsive to reviews of management performance.</li> </ul>	<ul style="list-style-type: none"> <li>The management system has established explicit objective guidelines for responding to internal and external reviews of management performance.</li> <li>The management system shows evidence of improved performance based on the results of internal and external reviews of management performance.</li> </ul>	<ul style="list-style-type: none"> <li>The management system has established comprehensive, objective standards or triggers for responding to internal and external reviews of management performance.</li> <li>The management system has demonstrated a consistent pattern of responding to the results of internal and external reviews of management performance.</li> </ul>	50	80
Scoring Rationale/ Objective Evidence	<p>See 3.8.1 above. Issues brought before the Fish and Wildlife Commission may come from ODFW staff, or from stakeholders who may petition the Commission to consider action. In addition, ODFW and the Fish and Wildlife Commission must respond to initiatives and statutory changes that come from the Oregon Legislature. The Fish and Wildlife Commission provides guidance to ODFW staff in terms of budget preparation, priorities, and agency response to issues which result in the need for regulatory change. Clear expectations are communicated to staff in preparing reports for Commission presentation. Proposed program changes in the management system via rule change need to be consistent with good resources stewardship practices, be enforceable, incorporate socio/economic analysis of impacts and consider public input as well as staff responses to public input. Proposed rule changes must be publicized in accordance with public meeting law requirements (Hannah and Jones, personal communication).</p> <p>Annually, ODFW staff prepares a review of the status of the resources, fishery and its management. The report is distributed in the form of a newsletter to affected stakeholders and agency decision makers (Hannah and Jones, 2006b).</p> <p>Current process of annual review of management by Commission meets conditions of bullet point #1 SG 80. Regulation changes reviewed by partner states WA and CA prior to any incorporation into their subsequent law.</p> <p>Annual management meeting reports including follow-up actions, list of required actions and verification of completed actions from management review meet conditions of bullet point #2 for SG 80.</p>					

## REFERENCES

The following references are either cited within this document or constituted the body of information consulted and referenced by the client in their submission.

- Abramson, N., J. Geibel, J. Golden, T. Northup, W. Silverthorne, J. Lukas, and R. Heimann 1981. Fishery Management Plan for the Pink Shrimp Fishery off Washington, Oregon and California. PFMC, Portland, OR, April 1981.
- Abramson, N. J., and P. K. Tomlinson. 1972. An application of yield models to a California ocean shrimp population. Fish. Bull. 70((3)):1021-1040.
- Alton, M. S., and M. O. Nelson. 1970. Food of Pacific hake, *Merluccius productus*, in Washington and Northern Oregon coastal waters.35-42.
- Bailey, K. M., and R. C. Francis. 1985. Recruitment of Pacific whiting, *Merluccius productus*, and the ocean environment. Mar. Fish. Rev. 47((2)):8-15.
- Bailey, K. M., and L. S. Incze. 1985. El Nino and the early life history and recruitment of fishes in temperate marine waters. Washington Sea Grant Program, University of Washington, Seattle, WA.
- Butler, T. H. 1964. Growth, reproduction and distribution of Pandalid shrimps in British Columbia. J. Fish. Res. Bd. Can. 21((6)):1403-1452.
- Cadrin, S. X., Boutillier, James A., Idoine, Josef S. 2004. A hierarchical approach to determining reference points for Pandalid shrimp. Can. J. Fish. Aquat. Sci 61:1373-1391.
- Charnov, E.L., D. Gotshall, and J. Robinson. 1978. Sex ratio: adaptive response to population fluctuations in pandalid shrimp. Science. 200: 204-206.
- Charnov, E. L. 1982. The theory of sex allocation. Princeton University Press, Princeton, N.J.
- Charnov, E. L., and P. J. Anderson. 1989. Sex change and population fluctuations in pandalid shrimp. Am. Nat. 134: 824-827.
- Charnov, E. L., and R. W. Hannah. 2002. Shrimp adjust their sex ratio to fluctuating age distributions. Evolutionary Ecology Research 4:239-246.
- Cleary, D. (Oregon State Police). 2006. Personal communication by email. J. T. Golden, Toledo, Oregon. June 21, 2006.

- Collier, P. C., and R. W. Hannah. 2001. Ocean Shrimp. Pages 118-120 *in* W. S. Leet, C. M. Dewees, R. Klingbeil, and E. J. Larson, editors. California's Living Marine Resources: A Status Report. Calif. Dept. Fish and Game, Sacramento, CA.
- Congress, U. S. 1973. Endangered Species Act.
- Congress, U. S. 1976. Magnuson-Stevens Fishery Conservation and Management Act Public Law 94-265 As amended through October 11, 1996.
- Cusick, J. 2006. Telephone interview. J. T. Golden, Seattle, Washington.: Description of present application of WCGOP to the ocean shrimp fishery and data availability. September 1, 2006.
- Dahlstrom, W. A. 1970. Synopsis of Biological Data on the Ocean Shrimp. CDFG, Menlo Park, CA, 57(4).
- Davis, M. W., B. L. Olla, and C. B. Shreck. 2000. Stress induced by hooking, net towing, elevated sea water temperature and air in sablefish: lack of concordance between mortality and physiological measures of stress. *Journal of Fish Biology* 56:1-15.
- DFO. 2004. Department of Fisheries and Oceans Canada [[http://www.dfo-mpo.gc.ca/zone/underwater\\_sous-marin/shrimp/shrimp-crevette\\_e.htm](http://www.dfo-mpo.gc.ca/zone/underwater_sous-marin/shrimp/shrimp-crevette_e.htm)]. Accessed: at.
- Field, J. C., R. C. Francis, and K. Aydin. 2006. Top-down modeling and bottom-up dynamics: linking a fisheries-based ecosystem model with climate hypotheses in the Northern California Current. *Progress in Oceanography* 68:238-270.
- Francis, R. C. 1983. Population and trophic dynamics of Pacific hake (*Merluccius productus*). *Can. J. Fish. Aquat. Sci.* 40:1925-1943.
- Gallagher, C. M., G. Sylvia, and R. W. Hannah. In press. The development of a bioeconomic model for the Oregon ocean shrimp fishery. 8 pages.
- Geibel, J. J., and R. F. G. Heimann. 1976. Assessment of ocean shrimp management in California resulting from widely fluctuating recruitment. *Cal. Fish and Game* 62((4)):255-273.
- Golden, J. 1981. Shrimp trawl mesh size studies-1981. ODFW, Newport, OR, September 1981.
- Golden, J. T. 2006a. Summary of PacFIN data., Toledo, Oregon: Five-year running average of percentage Oregon landed catch of Washington, Oregon, and California landed catch of ocean shrimp. October 17, 2006.
- Golden, J. T. 2006b. Self., Newport, Oregon: Sub-sampling trawl logbook data.

- Gotshall, D. W. 1969a. Stomach contents of Pacific hake and arrowtooth flounder from northern California. Calif. Fish and Game 55((1)):75-82.
- Gotshall, D. W. 1969b. The use of predator food habits in estimating relative abundance of the ocean shrimp, *Pandalus jordani* Rathbun. FAO Fisheries Report 57((3)):667-685.
- Hannah, R. W. 1993. Influence of environmental variation and spawning stock levels on recruitment of ocean shrimp *Pandalus jordani*. Can. J. Fish. Aquat. Sci 50:612-622.
- Hannah, R. W. 1995. Variation in geographic stock area, catchability, and natural mortality of ocean shrimp (*Pandalus jordani*): some new evidence for a trophic interaction with Pacific hake (*Merluccius productus*). Can. J. Fish. Aquat. Sci. 52:1018-1029.
- Hannah, R. W. 1997. Evaluation of methods used to estimate geographic stock area for ocean shrimp (*Pandalus jordani*) from logbook data. Oregon Dept. of Fish and Wildlife, Newport, Oregon, August 1997, Information Report No. 97-6.
- Hannah, R. W. 1999. A new method for indexing spawning stock and recruitment in ocean shrimp, *Pandalus jordani*, and preliminary evidence for a stock-recruitment relationship. Fish. Bull. 97:482-494.
- Hannah, R. W., and S. A. Jones. 1991. Fishery-induced changes in the population structure of Pink Shrimp *Pandalus jordani*. Fishery Bulletin 89:41-51.
- Hannah, R. W., and S. A. Jones 1994. Annual Pink Shrimp Review. Oregon Dept. of Fish and Wildlife, Newport, Oregon, March 11, 1994.
- Hannah, R. W., and S. A. Jones 1997. Total catch, fishing effort and age and sex composition of the catch, by area for the ocean shrimp (*Pandalus jordani*) trawl fishery, 1980-95. Oregon Dept. of Fish and Wildlife, Newport, Oregon.
- Hannah, R. W., and S. A. Jones. 2000. By-catch reduction in an ocean shrimp trawl from a simple modification to the trawl footrope. Journal of Northwest Atlantic Fishery Science 27:227-233.
- Hannah, R. W., and S. A. Jones 2001. 12th Annual Pink Shrimp Review. Oregon Dept. of Fish and Wildlife, Newport, Oregon, February 23, 2001.
- Hannah, R. W., and S. A. Jones. 2003. Measuring the height of the fishing line and its effect on shrimp catch and bycatch in an ocean shrimp (*Pandalus jordani*) trawl. Fisheries Research 60:427-438.

- Hannah, R. W., and S. A. Jones 2005. A survey evaluating shrimp abundance, sex composition, bycatch and trawl gear performance on the northern Oregon shrimp grounds - Fall 2004. Oregon Dept. of Fish and Wildlife, Newport, Oregon, January 2005, Information Reports No. 2005-01.
- Hannah, R. W., and S. A. Jones 2006a. Personal communication through interview. J. T. Golden, Newport, Oregon. September 1, 2006.
- Hannah, R. W., and S. A. Jones 2006b. 17th Annual Pink Shrimp Review. Oregon Dept. of Fish and Wildlife, Newport, Oregon, February 20, 2006.
- Hannah, R. W., and S. A. Jones 2006c. Personal communication through interview. J. T. Golden, Newport, Oregon: Discussion of observed shrimp trawl trips: on deck and underwater video assessment of impacts. October 5, 2006.
- Hannah, R. W., and S. A. Jones 2007. Effectiveness of bycatch reduction devices (BRDs) in the ocean shrimp (*Pandalus jordani*) trawl fishery. Fisheries Research, 85: 217-225.
- Hannah, R. W., S. A. Jones, and V. J. Hoover 1996. Evaluation of fish excluder technology to reduce finfish bycatch in the ocean shrimp trawl fishery. Oregon Dept. of Fish and Wildlife, Newport, Oregon, April 1996, Information Report No. 96-4.
- Hannah, R. W., S. A. Jones, and M. R. Long. 1995. Fecundity of the ocean shrimp (*Pandalus jordani*). Can. J. Fish. Aquat. Sci 52:2098-2107.
- Hannah, R. W., S. A. Jones, and K. M. Matteson 2003. Observations of fish and shrimp behavior in ocean shrimp (*Pandalus jordani*). Oregon Dept. of Fish and Wildlife, Newport, Oregon, November 2003.
- He, X., A. E. Punt, A. D. MacCall, and S. Ralston 2005. Rebuilding analysis for widow rockfish in 2005 *In* Status of the Pacific Coast Groundfish Fishery through 2005, Stock Assessment and Fishery Evaluation: Stock Assessments and Rebuilding Analyses (Volumes I – VII). National Marine Fisheries Service Southwest Fisheries Science Center, Santa Cruz, CA, October 2005.
- Hesler, T. E., I. J. Stewart, G. W. Fleischer, and S. Martell 2006. Stock assessment of Pacific hake (whiting) in U.S. and Canadian waters in 2006. National Marine Fisheries Service and University of British Columbia, Seattle, WA.
- Hollowed, A. B., K. M. Bailey, and W. S. Wooster. 1987. Patterns in recruitment of marine fishes in the northeast Pacific Ocean. Biol. Oceanogr. 5:99-131.

- Hollowed, A. B., and W. S. Wooster 1991. Variability of winter ocean conditions and strong year classes of northeast Pacific groundfish. ICES Variability Symp., Paper #33, Session 3.
- Huyer, A., and R. L. Smith. 1985. The signature of El Nino off Oregon, 1982-1983. J. Geophys. Res. 90((C4)):7133-7142.
- Jones, S. A., R. W. Hannah, and J. T. Golden 1996. A survey of trawl gear employed in the fishery for ocean shrimp *Pandalus jordani*. Oregon Dept. of Fish and Wildlife, Newport, Oregon, Information Reports No. 96-6.
- Krutzikowsky, V. H., R. W. Hannah, and G. Sylvia 2006. The influence of bycatch on fishing decisions in the ocean shrimp *Pandalus jordani* fishery: a logbook analysis. Oregon Department of Fish and Wildlife, Newport, Oregon.
- Lai, H., M. A. Haltuch, A. E. Punt, and J. M. Cope 2006. Stock assessment of petrale sole: 2004 *in* Status of the Pacific coast groundfish fishery through 2005, stock assesement and fishery evaluation: stock assessments and rebuilding analysis (Volume 2)  
National Marine Fisheries Service and University of Washington., Seattle, WA, September 2005.
- Livingston, P. A. 1983. Food habits of Pacific whiting, *Merluccius productus*, off the west coast of North America, 1967 and 1980. Fish. Bull. 81((3)):629-636.
- Livingston, P. A., and M. S. Alton 1982. Stomach Contents of Pacific Whiting, *Merluccius productus*, off Washington and Oregon, April-July 1967. US Dept. of Commerce, August 1982, #32.
- Livingston, P. A., and K. M. Bailey. 1985. Trophic role of the Pacific whiting, *Merluccius productus*. Mar. Fish. Rev. 47((2)):16-22.
- Lo, N. C. H. 1978. California ocean shrimp mesh experiment. Cal. Fish Game 64((4)):280-301.
- MacCall, A. D. 2005. Boccacio rebuilding analysis for 2005 *In Status of the Pacific Coast Groundfish Fishery through 2005, Stock Assessment and Fishery Evaluation: Stock Assessments and Rebuilding Analyses (Volumes I – VII)*. National Marine Fisheries Service Southwest Fisheries Science Center Ecology Division, Santa Cruz, CA, October 17, 2005.
- MSC (Marine Stewardship Council). 2006. MSC Evaluation of the Oregon Pink Shrimp Fishery: Units of Certification, Performance Indicators, and Scoring Guideposts.

- NMFS. 1998. 50 CFR Part 660, Magnuson-Stevens Act Provisions. National Marine Fisheries Service, editor CFR 50. National Marine Fisheries Service, Seattle, Washington.
- NMFS (National Marine Fisheries Service). 2003a. Northwest Fisheries Science Center West Coast groundfish observer program data report and summary analyses. NMFS, Northwest Fisheries Science Center, Seattle, WA, January, 2003.
- NMFS 2003b. Northwest Region Current Bycatch Priorities and Implementation Plan. National Marine Fisheries Service, Seattle, WA, November 2003.
- NMFS (National Marine Fisheries Service). 2004a. Amendment 16-3 to the Pacific Coast groundfish fishery management plan. Rebuilding plans for bocaccio, cowcod, widow rockfish, and yelloweye rockfish. Final environmental impact statement including regulatory impact review and initial regulatory flexibility analysis. Pacific Fishery Management Council, Portland, Oregon, July, 2004.
- NMFS (National Marine Fisheries Service). 2004b. Pacific coast groundfish fishery management plan. Pacific Fishery Management Council, Portland, Oregon, September, 2004.
- NMFS (National Marine Fisheries Service). 2004c. Pacific Coast groundfish fishery management plan bycatch mitigation program final environmental impact statement. Pacific Fishery Management Council, Portland, Oregon, September, 2004.
- NMFS. 2005a. 50 CFR Part 600, Magnuson-Stevens Act Provisions National Standard Guidelines Proposed Rule. National Marine Fisheries Service, editor CFR 50. National Marine Fisheries Service, Seattle, Washington.
- NMFS (National Marine Fisheries Service). 2005b. Pacific Coast groundfish essential fish habitat final environmental impact statement. Pacific Fishery Management Council, Portland, Oregon, December, 2006.
- NMFS (National Marine Fisheries Service). 2006a. 50 CFR Part 660, Subpart G Federal Pacific Coast Groundfish Regulations for Commercial and Recreational Fishing 3-200 Nautical Miles off Washington, Oregon, and California. National Marine Fisheries Service, Seattle, Washington, June 5, 2006.
- NMFS (National Marine Fisheries Service). 2006b. Amendment 19 to the Pacific coast groundfish fishery management plan (Essential fish habitat designation and minimization of adverse impacts environmental impact statement). Pacific Fishery Management Council, Portland, Oregon, March, 2006.
- ODFW 2003. Pink shrimp fishery - bycatch reduction devices. Oregon Department of Fish and Wildlife, March 3, 2003.

- ODFW 2006. Oregon Administrative Rules. Oregon Department of Fish and Wildlife, Portland, Oregon.
- Oregon Legislature. 2005a. Commercial Fishing and Fisheries. Chapter 508.
- Oregon Legislature. 2005b. Commercial Fishing and Fisheries. Chapter 509.
- Pearcy, W. G. 1970. Vertical migration of the ocean shrimp, *Pandalus jordani*: A feeding and dispersal mechanism. Calif. Fish and Game 56((2)):125-129.
- Pettinger, B. (Oregon Trawl Commission). 2006a. Phone J. T. Golden, Toledo, Oregon: Catch per unit effort threshold for the ocean shrimp fishery.
- Pettinger, B. (Oregon Trawl Commission). 2006b. Email. J. T. Golden, Toledo, Oregon: Comments on draft responses submitted by email.
- Pettinger, B. (Oregon Trawl Commission). 2006c. E-mail J. T. Golden, Toledo, Oregon: VMS required on shrimp trawlers in 2007.
- PFMC 2006. Agenda Item F.2a AH 1 Table 2-5 Projected mortality (mt) of depleted groundfish species by fishing sector in 2006. Pacific Fishery Management Council, June 2006.
- Rexstad, E. A., and E. K. Pikitch 1985. Notes on stomach contents of Pacific hake (*Merluccius productus*) collected during the 1983 NMFS groundfish survey. OSU, Newport, OR.
- Rexstad, E. A., and E. K. Pitkitch. 1986. Stomach contents and food consumption estimates of Pacific hake, *Merluccius productus*. Fish. Bull. 84((4)):947-956.
- Rogers, J. B. 2005. Update of darkblotched rockfish (*Sebastes crameri*) rebuilding analysis. National Marine Fisheries Service, Newport, OR, October 4, 2005.
- Rothlisberg, P. C. 1975. Larval Ecology of *Pandalus jordani* Rathbun. PhD. Oregon State University, Corvallis, Oregon.
- Rothlisberg, P. C. 1979. Combined effects of temperature and salinity on the survival and growth of the larvae of *Pandalus jordani* (Decapoda: Pandalidae). Mar. Biol. 54:125-134.
- Rothlisberg, P. C., and C. B. Miller. 1983. Factors affecting the distribution, abundance, and survival of *Pandalus jordani* (Decapoda, Pandalidae) larvae off the Oregon coast. Fish. Bull. 81((3)):455-472.

Rothschild, B. J., and M. J. Fogarty. 1989. Spawning-stock biomass: A source of error in recruitment/stock relationships and management advice. *J. Cons. int. Explor. Mer.* 45:131-135.

Sampson, D. B. 2006. The status of Dover sole off the U.S. West Coast in 2005 *in* Status of the Pacific coast groundfish fishery through 2005, stock assessment and fishery evaluation: stock assessments and rebuilding analysis (Volume 4) Oregon State University and Pacific Fishery Management Council., Newport, Oregon.

Stewart, I. J. 2006. Status of the U.S. English sole resource in 2005 *in* Status of the Pacific coast groundfish fishery through 2005, stock assessment and fishery evaluation: stock assessments and rebuilding analysis (Volume 2) National Marine Fisheries Service and Pacific Fishery Management Council, Seattle, WA, May 25, 2005.

## Appendix 1 – Peer Reviewer Comments.

### **Peer Reviewer 1 comments on Draft MSC Assessment Report The Oregon Pink (Ocean) Shrimp Trawl Fishery July 2007**

#### **General Comments**

##### **1. Overall clarity of the report:**

The report is well written and clear, with a consistent tone throughout. It conveys an accurate understanding of the fishery, shrimp biology, stock status, and the respective roles and responsibilities of various entities within the management process.

##### **2. Description of weights:**

The description of the weighting process could be elaborated. P.21 contains a brief statement that weighting of performance indicators took place prior to the fishery site visit, but a more detailed explanation of how weights were chosen and why weighting took place in advance of the fishery site visit would be helpful.

##### **3. Adequacy of background information on the fishery, MSC assessment process and evaluation team's conclusions and recommendations:**

The history and current status of the fishery, fishery management and methods of fishery assessment are thoroughly described at an appropriate level of detail. The federal-state, interstate, and shrimp-groundfish interactions in shrimp fishery management are accurately described. The process used to assess the fishery, including the field visit, stakeholder consultations and evaluation of information is clear.

The indicators and scoring guideposts are detailed and logical. Overall, the rationales for scores are clear. Explanation of scores directly relates to the criteria listed under each guidepost, explaining where the fishery meets the criteria for the score assigned and where it fails to meet the criteria for a higher score. Some exceptions are noted in the “specific comments on indicators” section below.

A commendable aspect of the evaluation is the attention paid to outcomes as well as process. Credit is given to precautionary actions that have led to desirable outcomes even in the absence of an explicit precautionary plan to act.

The evaluation team's conclusions and recommendations are logically tied to the information presented. The conditions requiring corrective action are clearly presented, relate to the deficiencies noted, and well-grounded in the fishery context.

#### **Specific Comments**

## 1. Specific comments on front matter:

### 2.4 Consultations (p.5)

It would be helpful to provide a little more information on what is meant by “very low” stakeholder participation. Reference is made to Table 2 containing details of stakeholder consultations but I could not find this list. Some interpretive comments on the nature of stakeholder participation in the assessment process would also be helpful. The lack of stakeholder participation can be either a positive or negative sign of stakeholder engagement, depending on the context of the particular fishery. From positive comments made elsewhere in the report about the ODFW–industry relationship and about extensive information provided by the client (Oregon Trawl Commission (OTC)), the lack of stakeholder participation could simply reflect confidence on the part of the industry that they would be well represented by the ODFW and OTC.

**TAVEL Response:** Additional information has been added to Section 2.4 to address peer reviewer’s comments. Reference to Table 2, in the text was erroneous, the proper reference was for Table 1.

### 3.5 Fleet, Gear and Harvest Controls (p.10)

The first sentence of paragraph 2 (“Total fishing effort...”) is missing a verb.

A year or time period should be provided for the statement on the number of boats fishing in each state.

**TAVEL Response:** Corrected.

### 3.6 Catch (p.11)

Ex-vessel prices should be noted as nominal or real. A source for the table is missing.

**TAVEL Response:** Corrected. Prices noted as real.

### 4.1 Management System Goals and Objectives (p.13-14)

The year of the Oregon limited entry system should be noted in the discussion on paragraph 3, bottom of page.

The fishery coverage (groundfish etc.) in addition to % fleet coverage of the observer program should be described in the last paragraph of the section.

**TAVEL Response:** Additional information has been added describing the west coast groundfish observer program.

### 5.2 Current Stock Status

The description of fishing effort hours (current and historical) should have respective years of reference specified.

It would be useful in this section, or elsewhere in the document, to note that stock protections are not dependent on the continuing existence of a low ex-vessel price for shrimp. Even if market conditions change in ways that significantly improve ex-vessel prices, controls, on fleet size, advance-season negotiation of price, and monitoring systems in place would allow precautionary actions to be taken in the event of price-driven effort increases.

**TAVEL Response:** Figures added which display fishing effort, percent age composition and CPUE. Comments about precautionary actions added to Section 4.2.

## **2. Specific comments on indicators:**

Except where noted for individual indicators, the rationales for the scores are clear and supportable, follow logically from the information presented, and are well explained. Overall, rationales do a good job explaining the information on which a score is based as well as further information needed to achieve a higher score.

### *Indicator 1.1.4.1*

It would be useful to add information as to what would be required to demonstrate a high degree of effectiveness of control mechanisms. Is the missing information the lack of explicit documentation of biological benefit of control rules? The text explaining the score seems to indicate that control mechanisms in place are quite effective. Further, text in 1.1.4.2 states that new regulations are evaluated for effectiveness. Text in 1.5.4 refers to “thorough evaluation of effectiveness as precautionary measures...” Some clarification is needed.

**TAVEL Response:** A high degree of effectiveness should include; a more proactive management of the season opening and closing to ensure maximum larval release and protect egg bearing females and demonstrated higher productivity as a result of these actions.

### *Indicator 2.1.1.5*

It would be useful in the rationale for this indicator to add some information as to what aspects of scoring guidepost 100 are missing; is it the lack of direct links to shrimp recruitment? The rationale describes the groundfish stock assessment and other related assessments of environmental variables conducted by NMFS.

**TAVEL Response:** Comprehensive studies on a effects of environmental variability do exist for key target and non-target species productivity. The missing aspect of the 100 SG for this fishery is that there is not planned monitoring and updating of the ecosystem components directly linked to the target and non-target species.

### *Indicator 2.1.3.2*

The conclusions on the low probability of ghost fishing by a lost trawl net are reasonable, but not consistent with the literal wording of scoring guideposts 80 and some of 100,

which state that estimates are being made of ghost fishing mortality and there is knowledge and measurement of gear loss and ghost fishing. Some more explicit text should be included to address this difference.

**TAVEL Response:** After consideration of the peer reviewer comments, the indicator was rescored to 80. Based on the evidence from all sources, the team was convinced that the incidence of gear loss was negligible. This infers a qualitative estimate of near zero for ghost fishing mortality.

*Indicator 2.1.4.3*

The relevance of the PFMC groundfish FMP to the shrimp fishery should be made more explicit in the rationale.

**TAVEL Response:** This has been corrected, the relevance is that the PFMC groundfish FMP is that the FMP imparts restrictions on the pink shrimp fishery in terms of allowed harvest of groundfish species and conservation limits on rebuilding species.

*Indicator 2.3.1.1*

The rationale for the score is clear but the tentative “proposed” should be changed to “assigned” or “given” or similar word.

**TAVEL Response:** Corrected.

*Indicator 3.1.6*

Protections in place against potential price-induced increases in effort could also be mentioned in the rationale. This potential could also be mentioned in the rationale for 3.2.2., under National Standard 5.

**TAVEL Response:** Suggested additions included in 3.1.6 and 3.2.2. ODFW can protect shrimp stocks against significant reintroduction of latent effort through season closures, spatial closures and instigation of latent effort reduction.

*Indicator 3.1.7*

The rationale for a slightly higher score than 80 should be included if the fishery only meets the requirements for SG80.

**TAVEL Response:** The rationale for a score of 85 has been clarified, reference to a meeting requirements of the SG80 were removed.

*Indicator 3.3.3*

It is not clear from the rationale what additional would be needed for the fishery to meet the criteria for SG100.

**TAVEL Response:** Additional rationale has been added, is short because procedures for addressing information gaps are not formalized, a score of 100 is not warranted.

*Indicator 3.6.1*

There is a note re external review still in the text (last sentence) that should be removed. Has the issue of what constitutes an external review been resolved with MSC?

**TAVEL Response:** Corrected. Note has been removed. External review has been defined for this fishery as a person or group external to the management of the fishery for a period of time but familiar with the operations and policies of the significant groups impacting fisheries management on the west coast fishery management organizations including the PFMFC, the PSMFC and state fishery departments.

*Indicator 3.7.3*

The wording of the rationale suggests that conditions for SG100 have been met, so if not, text should be added to explain why not.

**TAVEL Response:** The rationale for not meeting the 100 SG has been added to the scoring rationale. In short, the fishery management is unable to demonstrate complete effectiveness (i.e. no records of non-compliance) specifically on the count per pound rule.

*Indicator 3.7.5*

It is clear from the rationale why the score exceeds 80 but not clear why it doesn't meet the conditions for SG100. Some explanatory text should be added.

**TAVEL Response:** There continues to be non-compliance in the fishery in relation to undersize shrimp (160 count) and wastage of shrimp.

*Indicator 3.8.1*

The rationale states that the SG80 guidelines are met. Text should be added to explain how the fishery exceeds these conditions but doesn't meet conditions for SG100.

**TAVEL Response:** There are no established criteria for the on-going evaluation of management performance, so this performance indicator did not score 100. Results of the evaluation (OFWC) are available to the public, they reflect input from interested stakeholders.

**Peer Reviewer 2 comments on Draft MSC Assessment Report  
The Oregon Pink (Ocean) Shrimp Trawl Fishery  
July 2007**

**General Comments**

**Peer Reviewer**

- 1) Productivity and recruitment are assumed to be almost completely dependent on environmental conditions, and much is made of the inability to show any spawner recruit relationship. Nevertheless, it is clear that there is an upper limit to the size of the stock, given that pink shrimp are only found on a specific habitat type (sand-mud bottom) at a specific depth range. It is also clear that there must be some stock size below which the stock will be unable to recover. Quantitative reference points (or control points) are required if the fishery is to be managed properly.

Currently the reference points seem to be subjective: changes in the distribution and size of fishing grounds, a failure of two successive year classes, a shift to “younger” shrimp in the catch. More rigorous and objective reference points need to be defined. It sounds like a minimum stock size of 1.3 billion has been discussed in Hannah (1999). This is a step in the right direction, but a lot of work needs to be done to define this more clearly.

**TAVEL Response:** A number of efforts have been made over a 30 year period to define a spawner recruitment relationship and, although work is continuing, a reliable model has yet to be produced. In lieu of classic management tools, the department has chosen to manage the fishery based historical reactions of the stock to fishing pressure, known trophic relations and environmental changes.

It is the opinion that the current reference point proxies are adequate for providing timely advice for management purposes. The fishing log requires precise location, effort and catch information from the commercial fleet. This fishery dependent information provides a high volume of data on the distribution and abundance of the stock and changes to the fishing grounds. Protection of egg bearing females is provided by pre-season sampling. Year class survival is monitored at the beginning of the season by the number and frequency of “pinhead” or <1 year old shrimp in the catch. This is done at all landing locations and again provides a vast coverage of the stock areas.

ODFW have evaluated the prospect of developing quantitative reference points on a number of occasions. However, the decision not to proceed to develop and use abundance based reference points has been taken in light of the following; a lack of a clear spawner recruit relationship; impracticalities and cost of establishing a fishery survey for pink shrimp, the short life of pink shrimp (maximum four years) and the

correlation of recruitment success to environmental variability including current patterns, upwelling and sea level height.

The team assessed the current reference points used by the fishery managers (PI 1.1.3.1) and determined that, because reference levels do not incorporate margins of safety, the 100 scoring guidepost had not been met.

### **Peer Reviewer**

- 2) How will managers know when reference points have been reached? Currently, managers rely totally on reported CPUE, the size and distribution of the spawning grounds, and the size composition of the landed catch. It has been well-documented that the use of CPUE as an index of abundance is fraught with problems such as statistical adjustment for fishing power and targeting behavior. Time and experience have shown that relying on CPUE alone as an index of abundance is a recipe for disaster, particularly when the stock is contracting geographically and CPUE is hyperstable. I have a hard time understanding why useful, statistically sound trawl surveys can't be carried out for pink shrimp, particularly given the narrow range of habitat and depths occupied. This would give the managers an estimate of relative stock abundance, and perhaps even absolute biomass, that is independent of the fishery.

**TAVEL Response:** ODFW monitors CPUE at a fine spatial scale through out the season. Furthermore, the CPUE series is standardized and is considered representative of the stock area. ODFW recognizes the limitations of using the CPUE as an index of stock size when fishery performance is influenced by low market prices and low effort. CPUE is not viewed in isolation. Specifically, the biologists also monitor carapace size, age and sex composition. Therefore, interpretation of CPUE trends also consider market conditions and stock demographics.

Statistically valid, fishery independent surveys have been tried, specifically in California in the early 1980s. The survey was very expensive and ran into a number of operational problems. Extreme variability in catches, some of which was attributed to the vertical distribution of the species limit the usefulness of biomass/abundance estimates.

### **Peer Reviewer**

Relying on landings alone for size composition data is problematic. Reviewers have already pointed out the need to monitor discards of shrimp. The size composition of these discards must also be determined. Some data on the size composition of the stock on the grounds would also be desirable, perhaps using a trawl with a very small mesh size.

**TAVEL Response:** The assessment team has already defined a condition which requires that harvesters estimate and record discards. These data will be evaluated and possibly corrected across the fleet using independent at-sea observer data as the benchmark. There is no sorting machines permitted on board vessels and bycatch has been reduced to such levels that there is little reported sorting at sea. This was confirmed by information from ODFW biologists, harvesters and WCGOP observers. It was the opinion of the team that by in large, the vast majority of shrimp landings represented the actual catches.

Initially, the team has requested that the client and ODFW collect more detailed discard information and evaluate the need quantify potential stock impacts from the discarding.

### Peer Reviewer

- 3) It does not appear that effective action be taken once a reference point is reached. Managers seem to be relying on the fact that effort seems to be held at current levels due to profitability. This could change rapidly given rising global prices for seafood, or new markets. There are many cases where this has happened in the past. Herring were once sold for reduction rather than roe, urchins couldn't be given away. In this era of global markets, managers need to have a program that will be able to cope with a sudden rise in value. In the case of pink shrimp, the fact that there are only 40 out of a potential 142 licensed vessels operating makes this particularly critical. With this amount of latent effort catches could increase sharply in a single year.

**TAVEL Response:** This concern has been raised by industry, ODFW and the assessment team. However, economics are a primary controlling aspect of this fishery. Fuel costs have increased significantly, shrimp ex-vessel prices have continued to drop. The issue of latent effort has been discussed between industry and ODFW as well, ODFW retain the right to issue administrative rules to control effort and season length. ODFW and members of the Oregon Trawl Commission are quite concerned about potential latent effort and both continue to investigate strategies to reduce latent effort should it become necessary (B. Hannah, B. Pettinger, Pers. Comm).

One encouraging factor is that several of the vessels and owners holding latent effort permits have re-rigged their vessels for other fisheries. While re-rigging to fish shrimp is possible, there would need to be a significant change in the economic to encourage this to happen.

### Peer Reviewer

- 4) Monitoring of reported catches, reported bycatch, and discards of shrimp seems woefully inadequate. A statistically defensible observer program is required. Current coverage of trips is only 3.7%, and it is not clear that even this is based on representative or random sampling. I doubt that it is possible to generalize from this sample? It is admirable that bycatch has been reduced to only 10% of the catch, but even this could still be resulting in excessive

catches of sensitive species such as yelloweye, darkblotched, or canary rockfish. A sound observer program is required to determine whether or not this is the case.

**TAVEL Response:** The shrimp fishery's impact on other species has been assessed as part of the West Coast groundfish observer program (WCGOP) as part of the Pacific Council's groundfish management program. ODFW biologists analyzed data on fish bycatch for vessels using bycatch reduction devices (BRDs) for the years 2002–2005. The data was obtained from the WCGOP. Shrimp vessels were selected randomly for observer coverage, after being stratified by primary port of landing. Vessels were sampled continuously for a 2- month time period. The shipboard sampling and data analysis methods used by the WCGOP have been described by the NMFS Northwest Fisheries Science Center (2003). Shrimp catch for each trip was determined from landing receipts (Hannah and Jones, 2007).

In 2005, fish bycatch constituted 7.5 % of the overall catch. Of the rockfish species observed during the study period, neither canary nor yelloweye were observed in the nets by observers. Both of these species are prohibited to be landed. Darkblotched juveniles were observed in catches with a range of 0.8 to 0.28 percent of catch by weight dependent upon the spacing used in the BRDs.

The WCGOP has been continued for the pink shrimp fishery although it is not a high priority based on data collected during the 2002 – 2005 study period (J. Cuisak, Pers. Comm.). The Oregon shrimp fleet continues to experiment with reducing the spacing of bars on the rigid BRDs, it is expected that these experiments will lead to an overall reduction of fish bycatch to less than 5% of the catch. (Hannah and Jones, 2007).

### **Peer Reviewer**

5) Size at first harvest is currently controlled using a maximum count per pound (160/pound) in the landings. This has little meaning when discarded shrimp, and their size composition is unknown. Furthermore, there still seem to be a lot of immature shrimp in the landings themselves.

**TAVEL Response:** Fishers, scientists and managers of this fishery believe that discarding of shrimp is low and insignificant considering high natural mortality. Nevertheless, the issue of discarding and its importance has been flagged as an area of performance requiring improvement. It is expected that ODFW will evaluate this information and make a determination on the importance of discarding to stock health. Immature shrimp are observed in higher concentrations in the late summer and fall when the young of the year begin showing up in trawls. Oregon State Police, ODFW and the Oregon shrimp industry have demonstrated a very low level of tolerance to non-compliance with the count per pound rule, primarily because this is one of the cornerstone harvest control tools.

## **Specific Comments**

### **Peer Reviewer**

1.1.5.7 Peer review seems inadequate. A panel of independent experts, including university scientists and scientists from outside the Pacific coast, who are well-versed in population dynamics and fishery management seems advisable.

**TAVEL Response:** There has been significant effort to investigate and refine assessment techniques since the late 1980s. The fishery and stock management are reviewed at three levels including the peer review provided by other shrimp biologists in California and Washington. The fishery assessment process has been reviewed by managers within the PSMFC as well. Certain aspects of the fishery, specifically bycatch and reduction tactics and environmental relationships, have been reviewed by fishery scientists at the state, federal and academic levels. Finally, Dr. Hannah has produced a number of peer reviewed documents which have been published in international fisheries science journals.

The team argues that these levels of peer review have incorporated the independent experts from outside the Pacific coast.

### **Peer Reviewer**

1.3.1 There is no mention of the implications of Charnov's work with life history theory. This implies that we are changing the genetic composition of pink shrimp so that they transition to females earlier in life. If this comes at the cost of longevity, there could be adverse consequences in the future (see Beamish's paper on longevity overfishing).

**TAVEL Response:** Charnov and Anderson (1989) state that the age structure for *Pandalus jordani* fluctuates greatly from year to year. They argued that pandalid shrimp, off the west coast of North America have neither a fixed size nor a fixed age at sex change and that the age or size at sex change alters in response to year-to-year variation in the age and/ or size distribution of breeding adults (Charnov, 1982). In years when most of the breeders are larger, so is the size at sex change (Charnov et al, 1978).

In Charnov and Hannah (2002), the authors conducted a retrospective analysis of the 1980 to 2000 Oregon fishery data to confirm if that data supported the theory for adaptive sex ratio tracking (i.e. varied in response to year-to-year fluctuations in the population's age structure). The data clearly supported the theory. The authors also stated that they still had no knowledge about the physiological or social mechanisms the shrimp use in 'their decision' to become male or female at the age of first breeding, or to remain males as second breeders. Hannah and Jones (1991) suggest that accelerated sex change under increasing  $P$  (i.e. increased exploitation) may buffer recruitment and thus somewhat protect the population from overharvesting.

Beamish *et al* (2006) propose a definition for longevity overfishing as follows; the virtual elimination of older age classes in a population such that the removal impairs recruitment. They go on to state that older age classes have greater resilience to environmental perturbations that younger fish, such overfishing would prevent a population from rebuilding after periods of unsuitable ocean conditions. Furthermore, they considered a species to be long lived if its maximum age was equal to or exceeded 30 years.

Ocean shrimp clearly have not demonstrated longevity overfishing. There is no evidence of a trend that would suggest that primary females comprise a consistently higher percentage of the spawning population now than they did back in the 1970's. Furthermore, there is no evidence that the fishery of long standing as caused any significant decline in the population. Where year class recruitment failures have been identified, there has been correlation to environmental factors, and in one clear incidence, fishing pressure. Year class failures have been followed within 1 or 2 years by significant recruitment events.

### **Peer Reviewer**

3.1.3 A truly adaptive strategy would include experiments that probe the impact of fishing on the stock and evaluate uncertainty.

**TAVEL Response:** The team's opinion is that the 100 scoring guidepost incorporated the aspects suggested by the peer reviewer.

### **Peer Reviewer**

3.1.5 There must be a reduction in latent effort to make this credible.

**TAVEL Response:** As mentioned in 3 above, economics are a primary controlling aspect of this fishery at this time. The issue of latent effort has been discussed between industry and ODFW as well, ODFW retain the right to issue administrative rules to control effort and season length, although the latent effort is there, the managers would know if this effort was being brought back into effect.. ODFW and members of the Oregon Trawl Commission are quite concerned about potential latent effort and both continue to investigate strategies to reduce latent effort should it become necessary (B. Hannah, B. Pettinger, Pers. Comm).

One encouraging factor is that several of the vessels and owners holding latent effort permits have re-rigged their vessels for other fisheries. While re-rigging to fish shrimp is possible, there would need to be a significant change in the economic to encourage this to happen.

**Peer Reviewer****Conclusions**

The current scores on all three criteria seem high. Based on the comments above, I would have ranked performance below 80 for far more indicators.

**TAVEL Response:** The team has scored the fishery taking into account the objective evidence that the client has provided. The findings of the team are that the fishery does meet the MSC Standard.