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Annual Pink Shrimp Review

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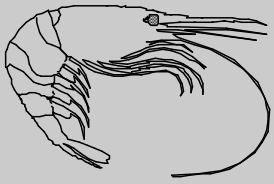
In color on the Web: "http://www.dfw.state.or.us/MRP/publications"



TO: OREGON SHRIMP INDUSTRY
FROM: Bob Hannah and Steve Jones
Subject: Opening of 2011 Commercial Fishery
Date: 15 February 2011

Notices/Reminders

- ***ATTENTION!*** New BRD regulations in effect (pg. 7)
- Eulachon listed as threatened; Reducing catch a high priority (ESA issues, pg. 4)
- What shrimpers can do now to further reduce eulachon catch (pg. 6)
- Upcoming gear survey (pg. 7)

The 2011 pink shrimp (*Pandalus jordani*) season will begin 1 April and extend through 31 October. A summary of the 2010 season is provided for your review including catch, effort and market sample information. New bycatch reduction device (BRD) requirements, indicators for the 2011 season, and research findings are also presented. Important eulachon smelt (eulachon) issues are discussed and possible methods to further reduce eulachon catch are described.

2010 Season Summary

Shrimp catch rates were nothing short of fantastic during 2010, even higher than the phenomenal rates experienced during 2009. The harvest was apparently fueled by exceptional recruitment of age-1 shrimp in both years. Dense concentrations of shrimp allowed shrimpers to make short-duration trips, especially on the south coast where shrimp abundance was greatest. Shorter trips helped keep fuel costs in check for many shrimpers as the fleet grappled with mediocre shrimp prices.

Shrimpers landed about 31.4 million pounds of pink shrimp into Oregon ports during the 2010 season, the highest landing total since 2002 and about 9.3 million pounds more than in 2009 (Figure 1). Shrimping began in earnest about two weeks into April as shrimpers and processors negotiated prices. Despite the delay, the fleet landed almost 3.2 million pounds during April (Figure 2). Monthly catch remained well above average for the rest of the season.

As in 2009, shrimp harvest was heavily skewed to the south coast. About 75% of the season landing total was taken between Heceta Head and Cape Mendocino. The catch total was highest in the Bandon Bed, producing a whopping 13.5 million pounds alone! The Port Orford bed came in a distant second with about 4.5 million pounds harvested. North coast harvest was focused in the Cape Lookout and Tillamook Head beds, with each producing about 3.7 million pounds. Catch by month and area peaked in the Bandon Bed during June with about 3.0 million pounds taken, with the bed producing at a high rate throughout the season (Figure 3).

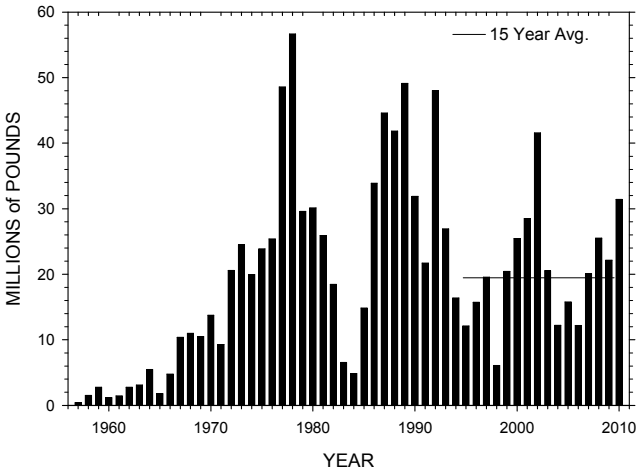


Figure 1. Oregon pink shrimp commercial landings (millions of pounds) 1957-2010. Includes all pink shrimp landed into Oregon ports.

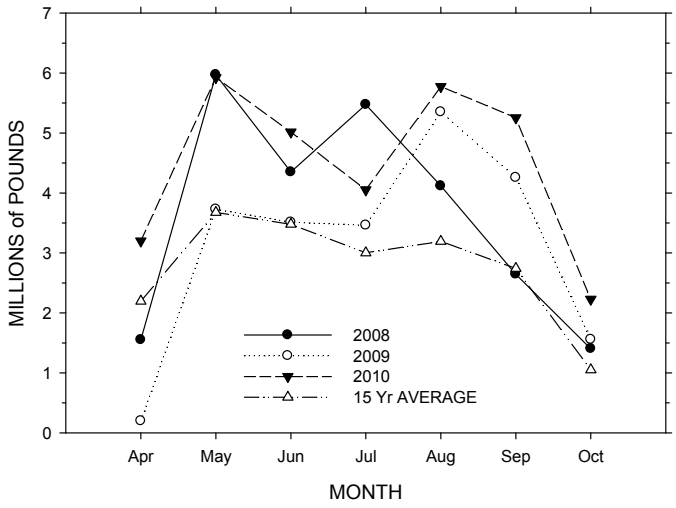


Figure 2. Oregon pink shrimp landings by month during 2008, 2009, 2010 and the 15 year average (1995-2009).

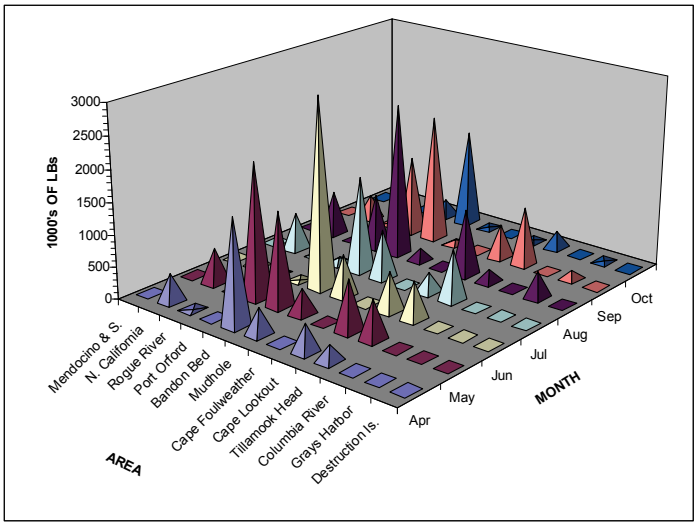


Figure 3. Total 2010 Oregon pink shrimp landings (1000's of pounds) by month and area.

Overall fishing effort during 2010 remained in the low range seen in the fishery since 2003. Fifty-three shrimp vessels made 733 trips during 2010, both slightly more than during 2009 (Figure 4 and 5). Hours fished (nets on the bottom) increased only slightly as well, with shrimpers putting in about 20,600 SRE hours in 2010 as opposed to about 18,000 in 2009 (Figure 6). However, the hours fished were about equally split between major areas on the south and north coasts, despite generally lower catch rates in northern areas (Figure 7).

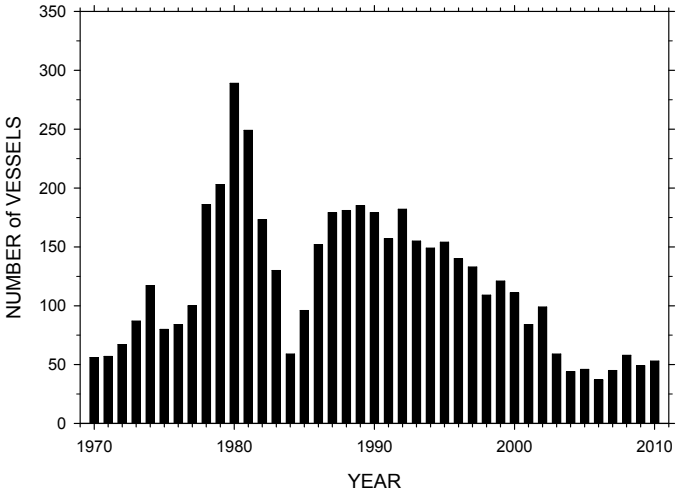


Figure 4. Annual number of vessels landing pink shrimp into Oregon ports: 1970-2010.

The low number of hours fished, in combination with extreme catch rates during 2010, led to the highest overall catch-per-unit-effort (CPUE) in the history of the fishery, even topping the record 2009 rate (Figure 8). Overall CPUE was highest off northern California, at a rate of just over 4,000 lb/ SRE-hour. The overall CPUE from the Orford and Bandon Beds was about 3,000 and 2,200 lb/ SRE/h respectively. Overall CPUE was more "normal" on the north coast, with both the Cape Foulweather and Tillamook Head beds coming in at about 750 lb/ SRE-hour, still very high historically. The highest area-month CPUE occurred off Northern California during April at nearly 5,500 lb/ SRE-hour (Figure 9).

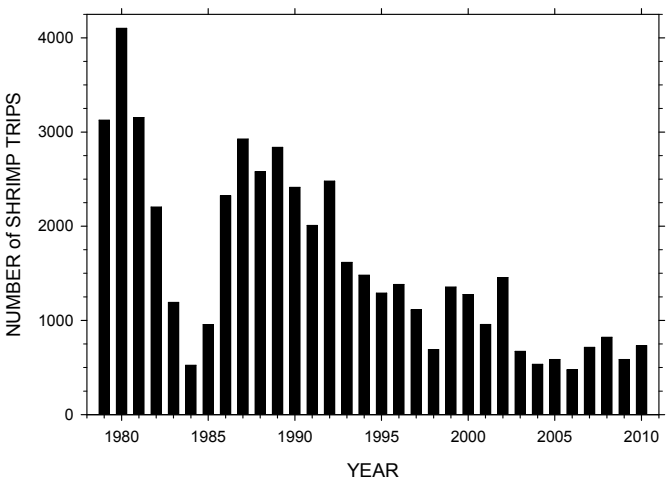


Figure 5. Annual number of trips landing pink shrimp into Oregon ports: 1979-2010.

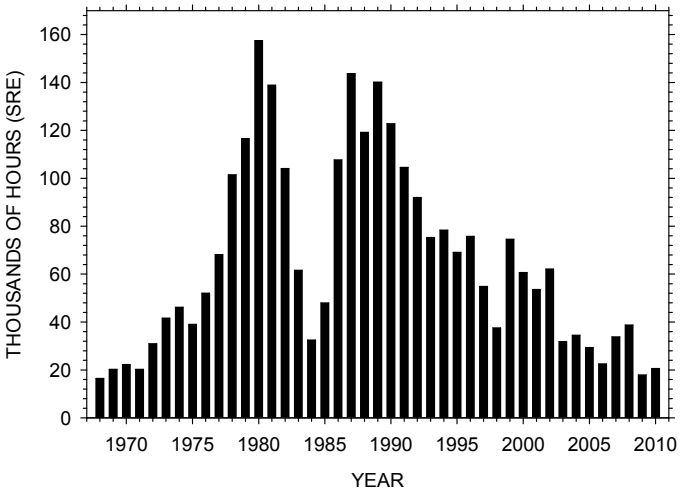


Figure 6. Fishing effort for pink shrimp landed in Oregon, 1968-2010. Note: 1000's of single-rig equivalent hours: 1 SRE = (1 single-rig hour)= (1 double-rig hour X 1.6).

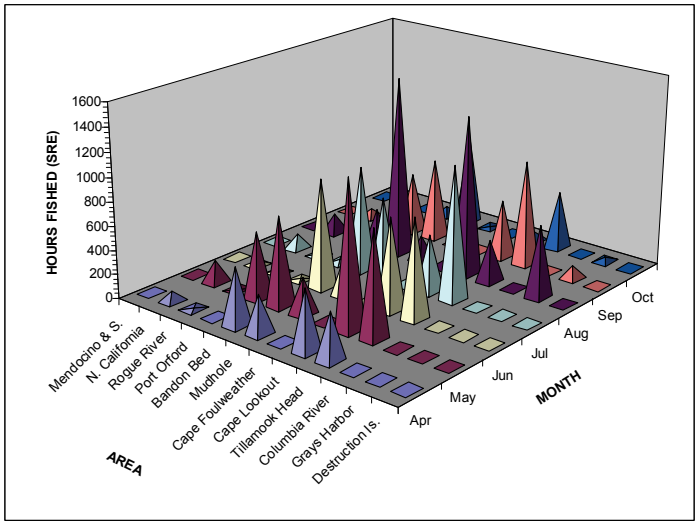


Figure 7. Fishing effort for pink shrimp landed in Oregon by month and area. Note: 1000's of single-rig equivalent hours: 1 SRE = (1 single-rig hour)= (1 double-rig hour X 1.6).

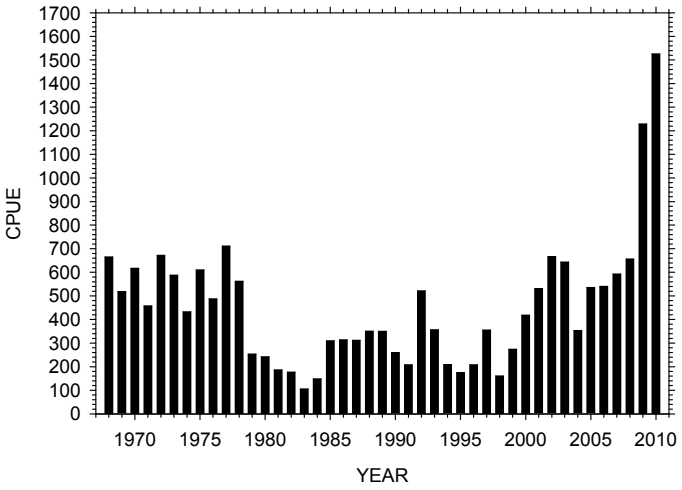


Figure 8. Catch-per-unit-of-effort (CPUE = lbs/SRE hour) for vessels landing pink shrimp into Oregon; 1968-2010.

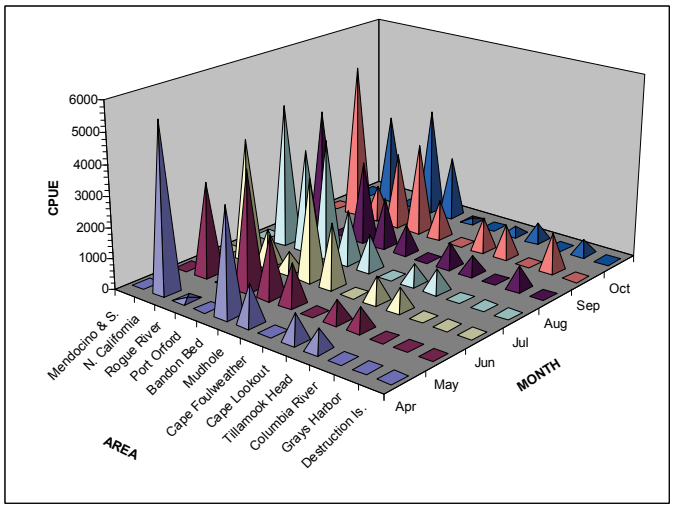


Figure 9. CPUE (=lbs/SRE hour) of Vessels harvesting pink shrimp by month and area during 2010.

The weighted average count-per-pound (count) of shrimp landed in Oregon during 2010 was 120 shrimp/lb, just slightly lower than in 2009 (Figure 10). Although small age-1 shrimp were abundant early in the 2010 season, shrimpers were generally able to find large volumes of larger age-2 shrimp due to excellent hold-over from 2009.

Age-1 shrimp (hatched in 2009) and age-2 shrimp made up the lion's share of the catch during 2010, coming in at about 59% and 38%, respectively (Figure 11). Both of these age groups resulted from exceptionally large year classes. Again, the relatively high age-2 component resulted from good hold-over of one year olds from 2009. Age-3 shrimp were a small component of the catch during 2010. They originated from a more normal year-class and had already been harvested for two seasons.

The average ex-vessel price for pink shrimp in 2010 was $.35/lb, up about $.04 from 2009 (Figure 12). The average monthly price was nearly flat throughout the season, varying no more than $0.01 or $0.02/lb (Figure 13). Like last year, apparently markets couldn't support a higher price like those seen earlier in the decade due to the slow general economy. A couple of factors worked for many shrimpers to offset the relatively low price though. Plant-imposed trip limits were generally high

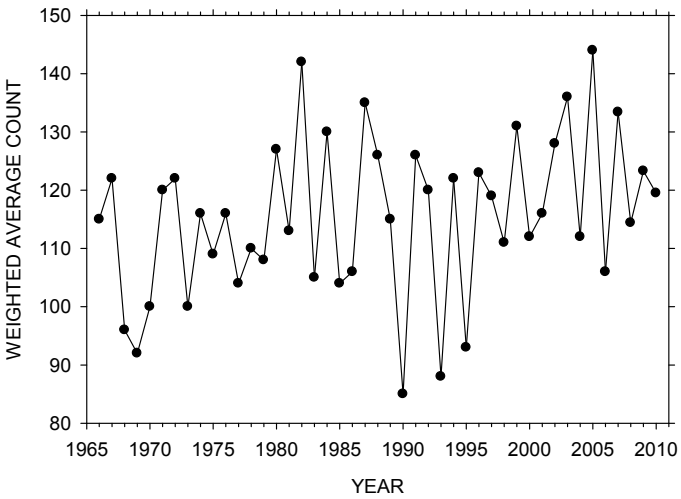


Figure 10. Average (catch weighted) count-per-pound of pink shrimp landed into Oregon; 1966-2010.

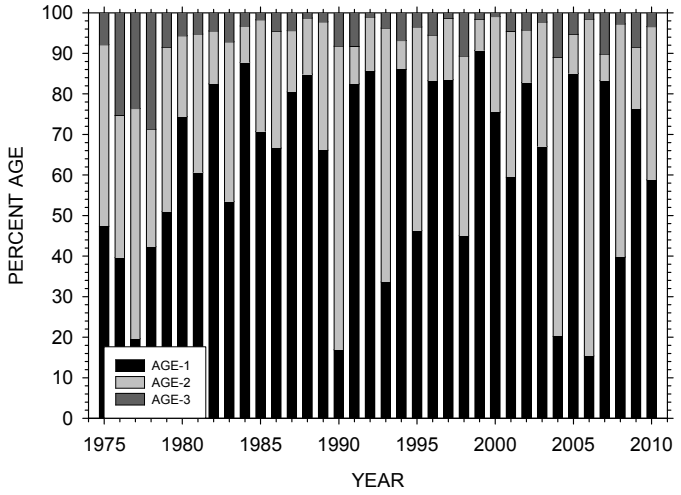


Figure 11. Annual percent age composition of pink shrimp (#'s of shrimp) landed in Oregon, 1975-2010.

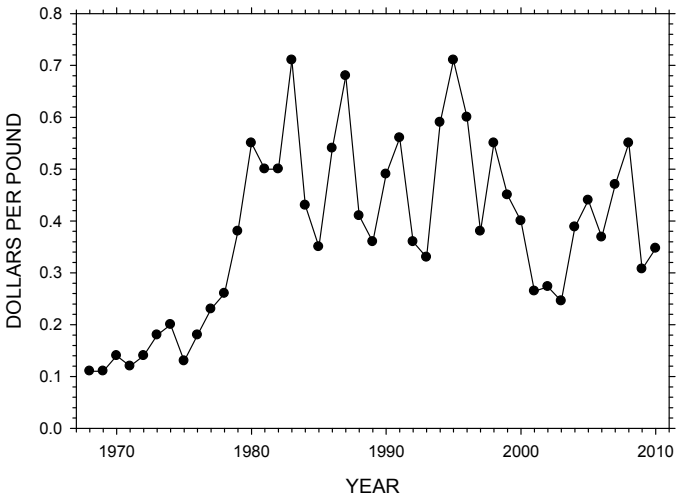


Figure 12. Annual average ex-vessel price per pound paid for pink shrimp landed in Oregon; 1968-2010. Prices not adjusted for inflation.

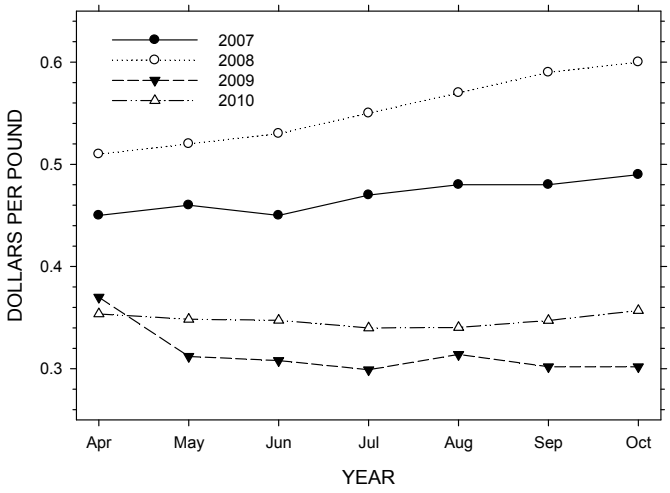


Figure 13. Monthly average ex-vessel price-per-pound paid for pink shrimp landed in Oregon: 2007 through 2010.

during 2010, so vessels could use more (if not all) of their hold capacity on a trip. Plus, shrimp catch rates were so high in several areas that shrimpers could fill their hold or meet their plant limit in two days or less, thus saving fuel.

Indicators for 2011

We're all wondering what's in-store for shrimp harvest in 2011. Our best indicators suggest that good shrimping should be available, but that age-1 shrimp may not be as abundant as during the last two seasons.

As in 2010, hold-over of age-2 shrimp (age-1 in 2009) could be high in 2011. Season-end CPUE was close to 1,500 lb/ SRE hour in October 2010, suggesting that shrimp abundance was still high. Monthly CPUE was extremely high throughout the season, ending up well above the late-season levels seen in 2009 (Figure 14). The high level suggests that age-1 shrimp were extremely abundant. If over-winter age-2 survival is as good during 2011 as it was last year, volume of age-2 shrimp available could be higher than normal, especially on the south coast.

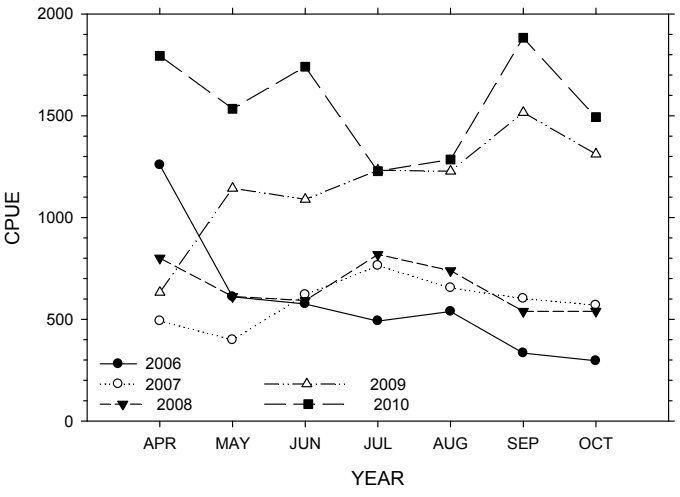


Figure 14. Monthly CPUE (=lbs/SRE hour) for vessels landing pink shrimp into Oregon in 2006, 2007, 2008, 2009 and 2010.

Unlike the 2009 and 2010 seasons, our recruitment model (based on Crescent City sea level) suggests that age-1 recruitment may be slightly below average in 2011 (Figure 15). The Crescent City April 2010 sea level index was 7.3, indicating that oceanographic conditions may have been less favorable to shrimp recruitment than they have been over the last two years. We've just experienced two seasons with extremely high recruitment events, but the scenario may change in 2011.

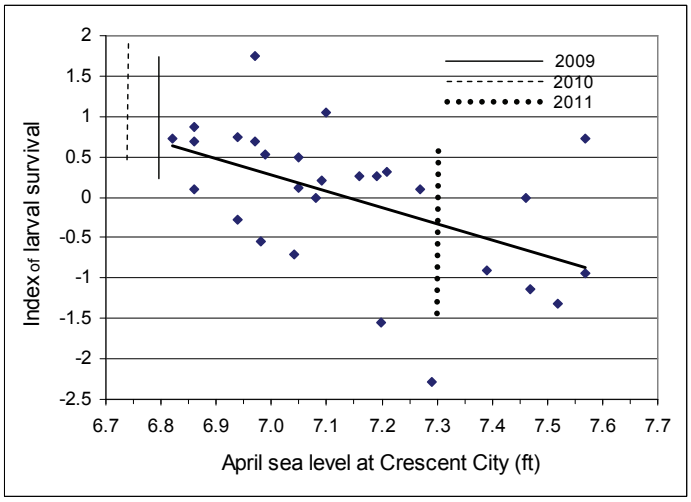


Figure 15. Index of larval survival vs. April sea level at Crescent City, CA. Points shown indicate year at age-1 catch. The dotted vertical line shows the survival range that might be expected in 2011.

Data from our September and October 2010 market samples suggest that age-0 shrimp were far less abundant this year than in 2009. The result backs up what many shrimpers told us they were seeing on the grounds that were fished during these months. However, we collected no samples of shrimp taken south of the Port Orford bed, yet we heard reports from shrimpers that zero's were unusually abundant off Northern California. Also, some shrimpers said that zero's were far more abundant in-shore of where most shrimping occurred in the Bandon and Port Orford Beds.

ESA/Eulachon Update

The Eulachon Challenge;

The southern distinct population segment (DPS) of eulachon smelt (*Thaleichthys pacificus*, Figure 16) was formally listed as "threatened" under the Endangered Species Act (ESA) on 18 March 2010, by the NOAA Fisheries Service. The southern DPS includes all eulachon south of the U.S./Canada border. The "threatened" listing indicates that this eulachon population has been deemed "likely to become in danger of extinction in the foreseeable future". It's a big issue for the Oregon pink shrimp industry, and it makes efforts to reduce eulachon take in the fishery a high priority. The Oregon Fish and Wildlife Commission made the first big move by requiring ¾" rigid-grate BRD's by 2012 (see page 7). The regulation was a direct response to the eulachon listing in March. It was the quickest and lowest-cost method to immediately reduce eulachon "take" using proven technology, while still allowing a normal shrimp fishery to occur. This should allow ODFW managers and the shrimp industry some time to explore other means of reducing

Figure 16. Examples of two size classes of eulachon smelt taken by shrimp trawl off Winchester Bay, Oregon during summer 2010.

eulachon "take", should that be deemed necessary by the National Marine Fisheries Service (NMFS) Northwest Region Protected Resources Division (PRD).

Eulachon Critical Habitat;

The NMFS has also developed and published a proposal to define eulachon critical habitat. As currently proposed in the definition, only selected bays and streams are included. However, this does not mean that marine habitats won't be included in the future, possibly to include some of the shrimp grounds. The proposed document states that "Although we cannot presently identify any specific marine areas where foraging takes place, we will continue to gather information and will consider revising the designation in future rulemaking if new information supports doing so". The prospect of any future designation of marine critical habitat for eulachon is real. Shrimpers need to realize that further reducing eulachon "take" in their fishery can only help to avoid such a designation. The full text of the proposed critical habitat designation and related information can be found at: "http://www.nwr.noaa.gov/Other-Marine-Species/Eulachon.cfm". The public comment period ends 7 March 2011.

Future Directions;

ODFW Marine Program staff have begun on-going consultations with the Protected Resources Division (PRD) staff to get a better understanding of their expectations regarding future management of eulachon "take" in the pink shrimp fishery. The PRD is currently focused on a rebuilding plan and gathering more information on a wide variety of aspects about eulachon ecology (both freshwater and marine). They recognize that the shrimp fishery probably isn't the primary cause of eulachon decline and are funding research designed to better define the cause(s) on all fronts. The PRD recognizes the proactive efforts made to date at reducing eulachon bycatch in the shrimp fishery, but encourages more research into ways to further reduce the catch.

Further reduction of eulachon catch in the Oregon pink shrimp fishery needs to be a common goal of shrimpers and ODFW shrimp project managers alike. Now is the time to develop workable solutions. Having proven solutions at-hand and making proactive rule changes may help avoid the need to have highly-restrictive ESA "4d" "take" rules in the rebuilding plan once it's developed.

From a shrimpers' standpoint, the least disruptive means to further reduce eulachon catch is probably by modifying trawl gear to keep eulachon out of the shrimp nets in the first place. If this can be done, it may help the shrimp industry avoid more

disruptive solutions in the future, such as area or depth closures. We encourage shrimpers to really get engaged in this concept and to come up with solutions. Our latest research leads us to believe that the best means of achieving this is with groundgear modification (see below, & 2010 Research pg. 8).

What Shrimpers Can Do;

We strongly recommend that shrimpers start experimenting with their groundgear (Figure 17). Our research indicates that many eulachon probably dive when they encounter a shrimp net, and that they will avoid capture if the central third of the groundline is removed. What we know about fish behavior suggests that the larger (more stout) the groundline, the more eulachon will be stimulated to rise off the bottom and enter into the net. Are continuous heavy groundlines laced with large-diameter "doughnuts" really necessary for shrimping; especially if they are increasing eulachon catch? Are "doughnuts" necessary at all, or would chain or cable suffice? Going with a lighter construction and/or a center section without a groundline may catch shrimp nearly as well, but with fewer eulachon. If you feel you must use a central section of groundline, simply raising the fishing line height should help reduce eulachon catch. Conversely, if you remove the central section to reduce eulachon catch, you may be able to cut shrimp loss by lowering your fishing line; without increasing eulachon catch. Ask around to find out what other shrimpers are using and seeing. For example, we talked to two Oregon shrimpers last year who fished groundgear lacking a center groundline section. One tested his nets with and without a center groundline section and said it didn't affect his shrimp catch most of the time.

Our research over the last few years shows conclusively that reducing rigid-grate bar spacing reduces eulachon catch. We have also continued to gain a better understanding of eulachon behavior in and around a shrimp trawl that may ultimately prove useful for attaining further eulachon catch reduction. We plan to continue our research efforts in upcoming years (see upcoming research plans, pg. 7) to test promising gear modifications and to document their effectiveness before proposing any new gear requirements in the shrimp fishery. In the interim, as we learn more, we strongly recommend that shrimpers begin incorporating and building upon the following steps to further reduce eulachon catch.

1) Start using rigid-grates with ¾" bar spacing ASAP.
2) If you currently use an accelerator panel, consider removing it. Several shrimpers we know of fish without them successfully. We suspect that eulachon passage through the net will be faster and less stressful without the panel.
3) "Lighten-up" your groundgear as much as possible. Consider a groundline without "doughnuts", using just cable or chain instead. Minimizing bottom disturbance reduces invertebrate impacts and increases the opportunity for eulachon to escape.
4) Raise your fishing line height if you're using a continuous groundline. More height allows for more eulachon escapement.
5) Remove a section of your center groundline. Reducing bottom disturbance as much as possible and providing a mud cloud-free escape "window" without a groundline may be a relatively simple way to sharply reduce eulachon catch. We know of at least two shrimpers that currently fish successfully without a central section of groundline.
6) Of course there's the most obvious way to reduce eulachon catch. Move out of an area if you're catching <u>any</u> eulachon. If you do stay in that area, consider at least breaking your groundline at the center, thus creating a eulachon escape "window".

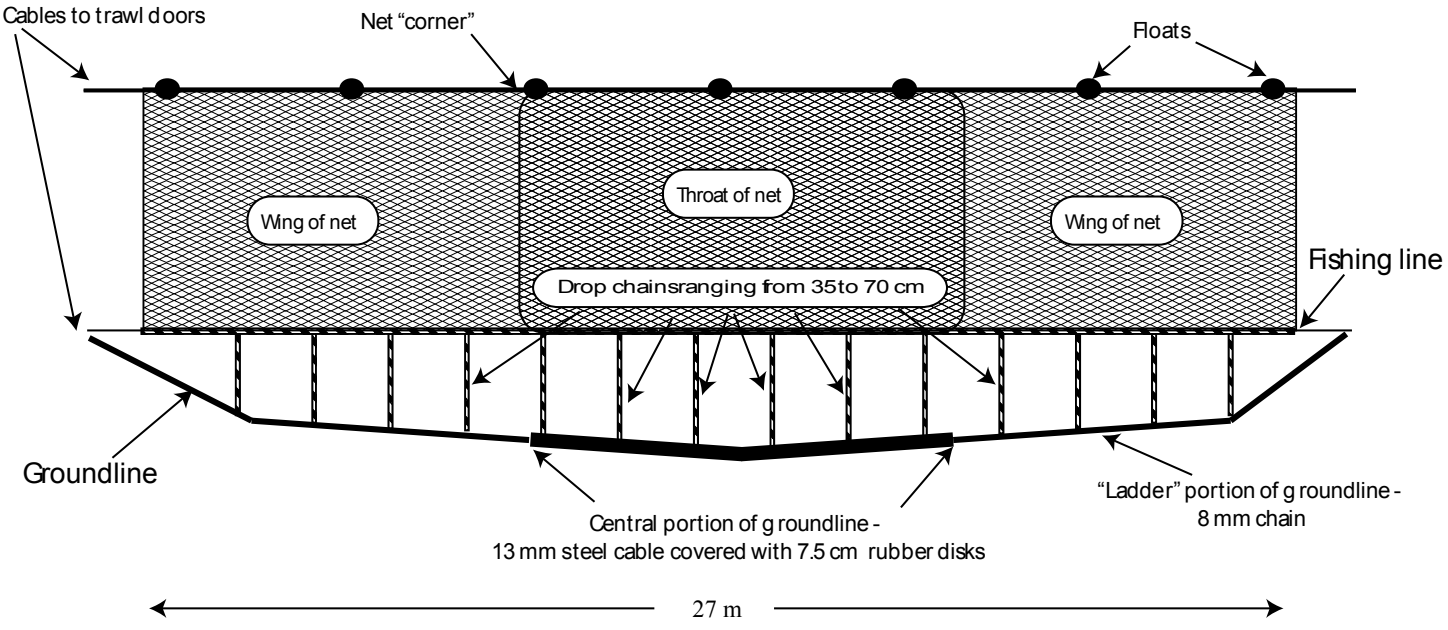


Figure 17. Schematic of a pink shrimp trawl net with "ladder style" groundgear (viewed from front, not to scale). Note: we define groundgear as all the gear (from wing-tip to wing-tip) at and below the bottom leading edge of the net.

Upcoming Research Plans

Our research plans for 2011 will focus on reducing eulachon bycatch through trawl groundgear modification, and gaining a better understanding of eulachon behavior as they interact with a rigid-grate BRD during the trawling process. Exploring alternative ideas to reduce eulachon bycatch is now essential for sustaining the Oregon shrimp fishery in the future due to the "threatened" status of eulachon and potential looming Rebuilding Plan "take" restrictions. Requiring ¾" rigid-grates is a good start, but efforts to further reduce bycatch may be needed. Additionally, there's the question of eulachon physical condition and survival after successful exclusion from a trawl with a rigid-grate BRD. It is a question that the Protected Resources Division (PRD) is pondering, and their perception may influence any future estimates of eulachon "take" in the shrimp fishery. We'd like to study this aspect of eulachon behavior so that all the resource managers involved in rebuilding eulachon populations can make more informed decisions concerning any future shrimp fishery regulations. Here's what we've currently got planned for addressing these issues.

Eulachon condition study;
The concern expressed by the PRD is that eulachon may be physically damaged or overly fatigued as they encounter a rigid-grate BRD and pass out of the shrimp trawl. Our plan is to mount a high-definition digital video camera on a rigid-grate BRD allowing a close-up lateral view of fish interacting with the bars. From this view, we hope to identify smelt by species, document any physical contact with the bars and possible associated damage (i.e. scale loss), and to assess their apparent residual swimming ability.

Groundline Study;
We plan to continue the groundgear work we did last summer, with the goal of reducing shrimp loss yet maintaining high eulachon escapement. Our hypothesis is that eulachon dive as a net approaches and will utilize a mud cloud-free space below the fishing line to escape the net. To test this, we'll be asking the skipper to adjust the net with no center groundline so that the fishing line is as close to the bottom as he's willing to go without causing net damage (say 8-10" ?). The fishing line of the other net, with an intact groundline, like the one in Figure 17, will be near the height that he'd normally fish. Fishing line height will be measured on both nets at all times with a recording inclinometer and all catch will be evaluated. To minimize our eulachon research "take", we'll use 3/4" BRD's for this experiment.

If this concept is proven to reduce eulachon catch and reasonable shrimp catch can be maintained, all Oregon shrimpers could be required to use nets with no central groundline at some time in the future. Please give the concept some thought. The benefits of this approach could include many fewer fish ever entering your trawl, which addresses the problem of how being excluded may negatively affect fish, and also should reduce impacts on benthic invertebrates like sea whips that create habitat for small fishes. Bycatch reductions should also benefit species such as darkblotched rockfish that are still considered "overfished". As mentioned before, we encourage shrimpers to experiment with their groundgear now and to consider using lighter versions including sections with no bottom contact. Even a relatively short section without a groundline may allow eulachon to escape. See if you can reduce eulachon catch with your nets and let us know what you find. Judging by our research findings last summer, we think that shrimping without center groundline sections may prove to be a reasonable way to proceed should the NMFS determine that eulachon catch remains too high in the shrimp fishery. Remember, even if you're not seeing much eulachon, the NMFS PRD measures eulachon "take" in numbers of individual smelt and not metric tons like we're inclined to measure. They view eulachon more like other ESA-protected species such as sea turtles and sea lions!! **Don't catch them!!**

Groundgear Survey;
During March 2011, we plan to begin a shrimp fleet survey to document the styles and prevalence of groundgear currently being used by Oregon shrimpers. ODFW staff will contact shrimpers in-person at the dock to get a look at the groundgear being used. We'll also be asking a few questions about how the gear is rigged and why that configuration is used. The survey results may be very useful later on, should groundgear alteration prove to be an effective way to reduce eulachon catch. Please give us all the help you can with this project.

Regulation Information

BRD Regulation Changes;
The Oregon Fish and Wildlife Commission adopted new BRD requirements for the pink shrimp fishery on 3 December 2011. Effective 1 January 2011, only rigid-grate BRD's are allowed with a maximum bar spacing of 1.0 inch. Soft-panel BRD's are **not allowed**. The maximum rigid-grate bar spacing allowed will decrease to ¾" as of 1 January 2012.

The two year phase-in to ¾" spacing will give current owners of 1.0" rigid-grates one more year of use, and may help avoid a "logjam" during the next few months at fabrication shops that make rigid-grates. We strongly recommend purchasing rigid-grates with ¾" spacing as soon as possible if you currently use something larger than 1.0" spaced rigid-grates.

When ordering new rigid-grates, please keep in mind that it's important to maintain water flow through a rigid-grate when going to a narrower bar spacing. If you're replacing a rigid-grate BRD that has larger bar spacing, please consider one with a larger overall diameter and/or smaller diameter bars. Many shrimpers have been using rigid-grates with diameters of 50" or more with good success. Also, the use of ¼" or 5/16" diameter round stock has become fairly common for new rigid-grates with ¾" spacing.

Albacore Fishing Not Allowed on Shrimp Trips;
Current federal trip declaration regulations state that vessels using trawl gear (including shrimp trawls) may only declare one gear type on any trip and may not declare non-trawl gear (i.e. troll gear) on the same trip in which trawl gear is declared. The exact language of the regulation can be found in the Federal Register, Vol 72, No. 235/Friday, December 7, 2007, pages 69168 and 69169. You can view these pages at: " http://www.gpoaccess.gov/fr/retrieve.html".

Essential Fish Habitat Trawl Closures;
The Pacific Fisheries Management Council (PFMC) has designated several Essential Fish Habitat (EFH) areas off the Oregon coast as no-trawl zones. The areas are set aside to protect hard-bottom habitats and associated species. Shrimpers are cautioned NOT to trawl within these areas. The NMFS will enforce the EFH no-trawl areas via the Vessel Monitoring

System. The area-closure that may affect Oregon shrimpers most is the Nehalem Bank/Shalepile EFH. Other EFH no-trawl areas near commonly shrimped grounds are Daisy Bank, Stonewall Bank, Heceta Bank and Coquille Bank. The coordinates delineating the Nehalem Bank and other EFH areas are listed on the PFMC web page at "http://www.pcouncil.org/groundfish/fishery-management-plan/fmp-appendices/", under Appendix C #3: Coordinates for EFH Conservation Areas.

CA/OR Shrimp Trawl Mesh Regulations;

As in 2009, many Oregon shrimpers traveled below the California/Oregon border to harvest shrimp in 2010. We heard no reports of shrimping violations during 2010, but we want to remind Oregon shrimpers of the need to be thoroughly aware of shrimp trawl regulations in both California and Oregon before they shrimp below the border.

California regulations require all California permitted pink shrimp trawlers fishing below the Oregon border to use trawls with a mesh size no smaller than 1-3/8" between the knots when shrimp trawling from 3-200 miles offshore. No trawling is allowed within California state waters (0-3 miles). Also, these vessels may not have any mesh smaller than 1-3/8" between the knots anywhere on-board (including extra codends). Oregon permitted pink shrimp trawlers fishing below the Oregon border that don't have a California permit must also use nets (including codends) with mesh no smaller than 1-3/8" between knots. If there is any other mesh in their nets or on-board (i.e. stored codends), such a vessel may not legally transit within California state waters (0-3 miles) at any time during the trip. Details on pertinent regulations can be found at:" **http://www.dfg.ca.gov/licensing/pdffiles/2009CommFishDigest.pdf**", pages 62-64.

Oregon regulations require that shrimp harvested below the California/Oregon border and landed into Oregon be caught with California-legal nets. The regulation reads; "It is unlawful to land shrimp taken south of the Oregon-California border with nets having a mesh size of less than 1-3/8 inches between the knots". Regulations pertaining to shrimp trawling can be found at: " **http://www.dforw.state..us/OARs/05.pdf**", pages 15-17.

VMS and Declarations required;

The National Marine Fisheries Service (NMFS) permanently requires shrimp vessels to have an approved and operating Vessel Monitoring System (VMS) on-board. For VMS-related information, please consult the NMFS "Compliance Guide for the Pacific Coast Groundfish Fishery Vessel Monitoring Program" at the following website: " http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/Vessel-Monitoring-System/Index.cfm", or call NMFS OLE at 206-526-6133.

Additionally, NMFS requires shrimpers to file a declaration report before the vessel is used to fish in any Rockfish Conservation Area (RCA). Shrimpers need to declare before leaving for their first shrimp trip of the season. Only one declaration is required for the season, providing that the vessel doesn't engage in another fishery during the season. For details about declaration procedures, please visit the NOAA Fisheries Office for Law Enforcement website (http://www.nmfs.noaa.gov/ole/nw_declarationreqs.html). Declarations may be made via phone by calling 1-888-585-5518.

Groundfish Limits;

The NMFS proposed 2011 groundfish limits for shrimpers are listed below: PLEASE NOTE! Groundfish limits may be changed in-season. Be sure to check on the current regulations frequently again this year!

- The groundfish TRIP LIMIT for shrimpers is 1500 lb/trip, not to exceed 500 lb/day.
- The weight of groundfish landed may not exceed the weight of shrimp landed.
- No Canary Rockfish, Thornyheads or Yelloweye Rockfish may be landed.
- Lingcod, 300 lb/month with a 24" minimum size limit.
- Sablefish; 2000 lb/month.
- All other groundfish; Landings of these species count toward the per-day and per-trip groundfish limits and do not have species-specific limits.
- Limited entry groundfish vessels possessing pink shrimp permits and harvesting pink shrimp must stay within the limits established for the shrimp fishery. They must also include any fish catch retained while shrimping toward their species limits for the limited entry groundfish fishery.

2010 Research

We conducted two major field projects during 2010. Only one of the experiments focused on eulachon bycatch reduction directly, but both projects yielded valuable insight into eulachon behavior. The insights form the basis for two more experiments and a gear survey during 2011(see upcoming plans pg 7). An overview of our 2010 research is provided below. Detailed results are present in a paper titled "Tests of trawl net modifications to reduce the bycatch of eulachon (*Thaleichthys pacificus*) in the ocean shrimp (*Pandalus jordani*) trawl fishery", which is currently in review for publication during 2011. Next year, we hope to evaluate eulachon physical condition after exclusion from a net with a rigid-grate BRD, and to determine if eulachon entrainment in shrimp trawls can be reduced through groundgear modification while maintaining reasonable shrimp catch. A gear survey we hope to complete will document current groundline configurations used by the fleet.

1.0" vs. ¾" grate spacing experiment;

During August 2010 we chartered the double-rig shrimper F.V. Miss Yvonne to conduct a catch comparison between a rigid-grate with 1.0" bar spacing and one with ¾" spacing. Our main focus was to determine if eulachon catch could be reduced significantly by using ¾" spacing and to measure any associated shrimp loss. The narrowest rigid-grate bar spacing used currently by Oregon shrimpers is ¾" and several top producing shrimpers used them very succesfully during the 2010 season.

During the study, all catch was evaluated from each side for each tow, utilizing a divided hopper to keep the catch separate. We used specially designed interchangeable rigid-grates which allowed us to switch the grates from side-to-side every two hauls to maximize our ability to detect catch differences statistically. The rigid-grates we tested were each 41" outside diameter. The 1.0" bar spacing version was constructed with 5/16" diameter aluminum bar stock and the ¾" version used ¼" bar stock. The difference in bar stock used was because we wanted water flow through the rigid-grates to be the same,

simplifying the analysis of shrimp and eulachon loss. No accelerator panels were used in either net. Fishing line height was monitored on both nets throughout the experiment using a recording inclinometer to verify that both nets were fishing at the same height. All smelt were retained and frozen from most tows, but a few larger smelt catches were subsampled and frozen. All frozen samples were processed later in a lab and all smelt were identified to species.

Our catch data analysis showed that eulachon catch was about 16% less using the ¾" rigid-grate than with the 1.0"version, both by number and weight. No shrimp loss occurred. Interestingly, there was no catch difference of whitebait smelt (the only other smelt species caught) or young-of-the-year (YOY) hake between grates. Another surprising finding was that there was no size-selection apparent from the eulachon bycatch. Instead, we found a general exclusion over all size-classes of eulachon. Larger eulachon were not excluded at a higher rate than smaller ones due to the 1/4 inch difference in bar spacing. We think this finding may be important because it suggests that exclusion occurs due to a behavioral (avoidance) response rather than physical sorting involving contact with the rigid-grate. It may indicate that eulachon are relatively strong swimmers (compared to whitebait smelt or YOY hake) and may still have the strength to avoid the rigid-grate and escape the net without damaging contact.

BREP groundline experiments;

First, we need to define some gear terms that we use so we're all thinking about the same parts of a shrimp trawl. For this discussion we define groundgear as all the gear (from wing-tip to wing-tip) at and below the bottom leading edge of the net (Figure 17, pg 6). Oregon shrimpers currently use a wide variety of groundgear styles and configurations in their trawl nets, ranging from a relatively "light" construction (diagramed in Fig. 17) to very "heavy" (may not weigh a great deal more in water, but definitely larger diameter, Figure 18). Each style can be expected to have a different impact on the bottom and associated critters. We refer to the bottom leading edge of the net as the fishing line. Chain droppers of varying length are generally suspended from the fishing line and attached to the groundline, which is in contact with the bottom.

During June 2010, ODFW staff teamed up with NMFS North-west Fisheries Science Center scientists to assess several shrimp trawl groundline styles in terms of how they interacted with fish and benthic invertebrates during shrimp trawling. The project, titled "Testing footrope modifications designed to reduce the bycatch of demersal groundfish and megafaunal invertebrates, and reduce physical impacts on invertebrates in the ocean shrimp (*Pandalus jordani*) trawl fishery", was funded by a grant from the national Bycatch Reduction Engineering Program (BREP) and administered through the Pacific States Marine Fisheries Commission (PSMFC). The word "footrope" in the title refers to the groundline in this discussion.

The study was conducted in two phases. First, we viewed each groundline style in action on the bottom, using underwater video equipment mounted on a specially designed "hayladder" frame (Figure 19). On one groundline, we removed a 30 foot center section completely. After reviewing video footage of each style, we conducted the second phase during a four-day catch experiment testing a shrimp trawl with "typical" groundgear (Figures 17 pg 6 & 20B pg 10) against a matched trawl that had the center 30 feet of the groundline removed (Figure 20A pg 10). Groundlines were switched between nets at the end of the first and third days, for a balanced statistical sampling design. Each net had a rigid-grate BRD with ¾" bar spacing and no accelerator panels were used.

Figure 18. A detached "heavy" groundline. Note that the groundline is covered continuously with rubber "doughnuts" (3" & 8" diameter) from wingtip to wingtip.

Figure 19. The "Hayladder" mounted inside the shrimp trawl, extending out in front of the fishingline. A camera and light point back for a view of the groundgear in action.

Figure 20A & 20B. Views showing a shrimp trawl we used in our groundgear experiment last summer. The top photo shows the trawl with the center section of groundline removed, with just droppers remaining. The bottom photo shows the "doughnut" covered center section in place. A recording inclinometer is shown in the lower photo.

The video analysis of the four groundline styles is in progress and won't be finalized until later this year. As anticipated, the trawl without a central 30 feet of groundline had the least apparent impact on fish and invertebrates. The catch analysis is complete and there are some very tantalizing results that may help us down the road with our attempt to reduce eulachon bycatch.

Overall, the net without a center 30 foot section of groundline caught about 22% less shrimp and about 34% less eulachon. While this is a lot of shrimp loss, we think that it's possible that lowering the fishing line height of the net without the center 30 feet of groundline might reduce shrimp loss down to tolerable levels, without putting many more eulachon into the net. We plan to test this hypothesis during the 2011 season.

BRD Use in 2010

Three of the 53 vessels (one unknown BRD type) that landed shrimp into Oregon during 2010 used soft-panel BRDs. These vessels will now be required to use rigid-grates to participate in the fishery. Of the 49 vessels known to have used rigid-grates during 2010, 19 (38.8%) used rigid-grates with bar spacing greater than one inch. Soft-panels were used on an estimated 2.5% of the shrimp trips in 2010, while rigid-grates were used on 97.5% of trips. Based on the 2010 vessel count, we estimate that 23 vessels will be required to replace their rigid-grates before shrimping in 2011. Another 22 vessels (those with 1.0" and 0.875" spacing) will be required to replace their rigid-grates before shrimping in 2012. Seven vessels (about 13%) were already using ¾" rigid-grates in 2010, so no change will be required for those vessels.

MSC Update

Shrimp project staff met in early April with Marine Stewardship Council (MSC) representatives for the Oregon shrimp fishery annual surveillance audit. It was the third audit since initial certification in 2007. Staff described progress toward fulfilling performance conditions necessary for maintaining certification.

Observer News

When eulachon became formally ESA listed, National Marine Fisheries Service (NMFS) observer data became a vital tool for managing the Oregon pink shrimp fishery. The data is currently our only real means of estimating eulachon catch in the shrimp fishery. Recent efforts by NMFS to increase observer coverage rates and identify smelt to species will help improve estimates of eulachon catch. Shrimpers need to recognize that the data is needed by managers and industry alike. Please welcome observers on your vessels when you're selected. We need them!

The target rate for observed trips during the 2011 shrimp season is 20%, as it was during 2010. That's sharply higher than the 8.7% coverage rate achieved in 2009 and should really help to refine catch estimates of eulachon by shrimpers. Also, Washington-based shrimpers were observed for the first time during 2010 which may help define spatial and temporal eulachon catch patterns by shrimpers along the west coast in the future.

Enforcement Issues

The Oregon State Police (OSP) will be inspecting rigid-grates and measuring bar spacing at the beginning of the 2011 season, to ensure compliance with the current rigid-grate 1.0" maximum bar spacing requirement. ODFW staff will be meeting with OSP officers to establish a protocol for taking the measurements.

No count-per-pound issues occurred during the 2010 season.

Shrimp Project Resources

ODFW shrimp project staff strive to do quality research and to make results available to all interested parties through a variety of publications, including this newsletter. The Annual Pink Shrimp Review generally focuses on season summaries and historical comparison, along with topical items of direct importance to the shrimp industry. Although it's an integral part of managing the shrimp fishery in the long-term, much of our work concerning environmental and shrimp population modeling and research is either skimmed over or simply not covered in the newsletter. We want to try closing that apparent gap by listing recent publications (either published or in-press) that describe our recent progress on these research topics. Please contact us for copies of the research papers listed below:

Hannah, R. W. (in press). Use of a pre-recruit abundance index to improve forecasts of ocean shrimp (*Pandalus jordani*) recruitment from environmental models. CalCOFI Rep.

Hannah, R. W. (in press). Variation in the distribution of ocean shrimp (*Pandalus jordani*) recruits: links with coastal upwelling and climate change. Fisheries Oceanography.

Hannah, R.W., S.A. Jones, W. Miller, J. S. Knight. 2010. Effects of trawling for ocean shrimp (*Pandalus jordani*) on macroinvertebrate abundance and diversity at four sites near Nehalem Bank, Oregon. Fish. Bull. 108:30-38.

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We especially want to thank the skippers and crews of the shrimp vessels Kylie Lynn (Figure 21) and Miss Yvonne (Figure 22). Their expertise was essential for successful completion of the eulachon research conducted during 2010.

Good Luck Shrimping in 2011!

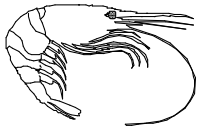

Figure 21. Left to right; crewman Justin Briggs, skipper Corey Rock and crewman Justin Wimpress, posing with the "Hayladder" on the F.V. Kylie Lynn.. Note; the light and camera are visible on the lower crossbar.

Figure 22. Crewman James Thomas (left) and skipper Jeff Boardman "doin' the hard stuff" aboard the F.V. Miss Yvonne.

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