OREGON Fish & Wildlife Marine Resources

31st annual

Pink Shrimp Review

2020: Thirty-one years of giving you the scoop!

What's Inside

Have Questions?

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www.dfw.state.or.us/MRP/shellfish/commercial/shrimp

This newsletter provides a summary of Oregon's 2019 pink shrimp (*Pandalus jordani*) season including trends in the fishery, its stock and information relevant to stakeholders. Oregon's pink shrimp fishery is managed as a sustainable fishery in cooperation with fishermen, processors, scientists and managers.

The 2019 pink shrimp season was fairly slow when compared to recent high volume years. Volume was moderate (26.9 million pounds); however catch rates were the lowest since 2004. Count per pound of shrimp was good (125 shrimp/lb.), contributing to a high price per pound ($0.75/lb.). High price per pound value helped compensate for low catch rates while still maintaining a fairly high (19.9 million dollars) total ex-vessel value.

Overall, it was a lot of hard work! Trips were longer than many of this eras' shrimp fishermen are accustomed.

The 2020 pink shrimp season will begin April 1 and extend through October 31.

2019 Season

26.9 million pounds landed

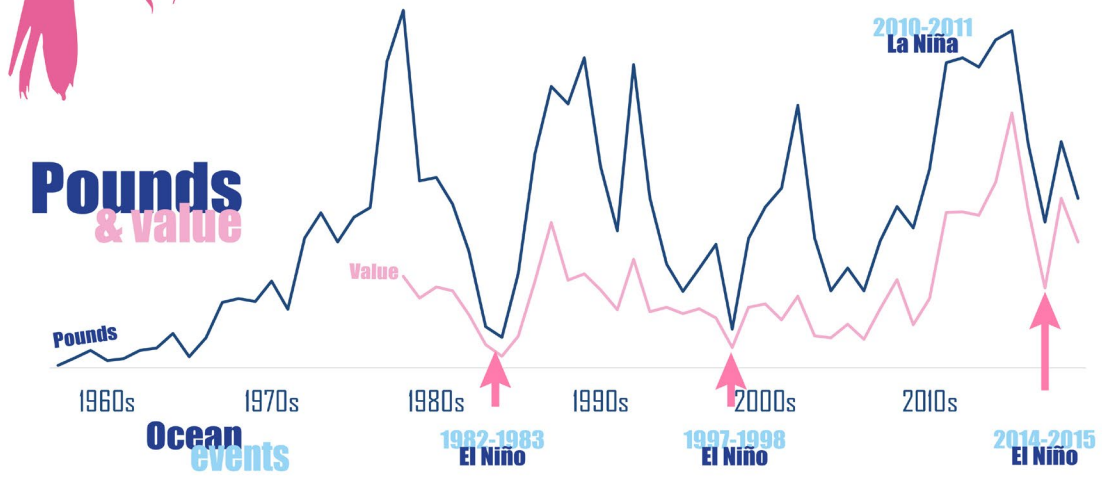
$19.9 million ex-vessel value

78 vessels

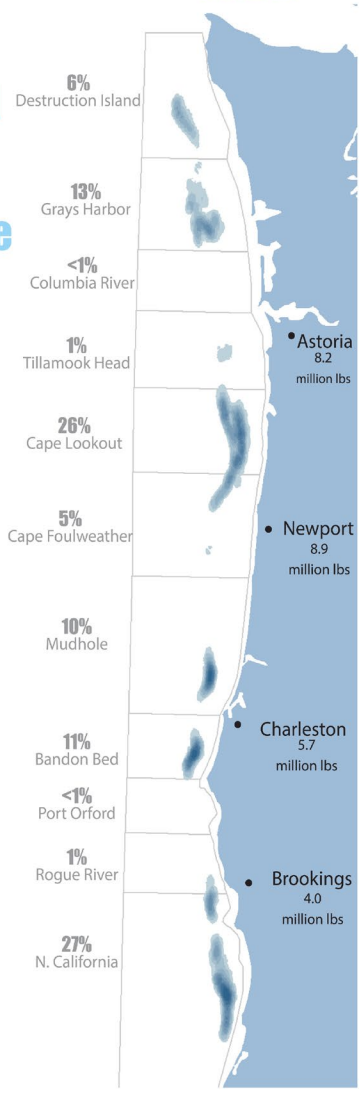
70% Age 1 shrimp
27% Age 2 shrimp
3% Age 3 shrimp

Lowest catch rate since 2004

3rd Highest price per pound



Catch area



Finishing up the Section 6 Grant

In a cooperative project, Oregon (ODFW), Washington (WDFW) and California (CDFW) state fish and wildlife agencies applied for and received a Section 6 Grant. These grants support states in management, research, monitoring, and/or outreach activities that have direct conservation benefits for species listed under the Endangered Species Act (ESA). In this grant, we assisted the west coast shrimp trawl fleet in the conservation of eulachon *Thaleichthys pacificus*, an anadromous smelt listed in the ESA as "Threatened".

Eulachon smelt

The Materials

We used Section 6 grant funds to purchase LEDs and worked with shrimp biologists across the west coast to develop three, double sided, deck-ready information sheets, which were then distributed to active shrimp vessels in 2019.

Identification sheets

- Geared towards fishermen, scientists and interested public: Describes the sustainability and life history of pink shrimp.
- Geared towards fishermen and scientists: Identification of common bycatch (roundfishes and flatfishes).
- Geared towards the most interested fishermen and scientists: Identification of uncommon bycatch.

LEDs

- A one year supply of green Lindgren Pittman LEDs.

Team photo of Section 6 distribution materials. LEDs and information sheets describing fishery sustainability, pink shrimp life history, and bycatch identification for flatfishes, roundfishes, unusual fish and invertebrates.

2019 Distribution

Working with WDFW and CDFW, we distributed 100 sets of LEDs and identification sheets. We distributed these sets through Westport, WA (10); Astoria, OR (19); Newport, OR (19); Charleston, OR (26); Brookings, OR (19); and Eureka, CA (7). In addition, we distributed identification sheets to the NMFS observer program and other interested scientists.

Gear Surveys

As we distributed LEDs and identification sheets, we collected data on aspects of each vessels gear. Gear in the shrimp fishery advances quickly, and periodically we've performed these surveys in order to understand gear changes, and help assure our stock assessments relate to past data. Also, it's nice to chat about gear with the fleet, these are always nice conversations.

We are in the midst of publishing a report comparing shrimp gear surveys from 1991, 2011, 2017, and 2019; look for this report to be available during 2020.

What's Next?

This was a ***ONE TIME*** program, not a new program to make LEDs available each year. It continues to be the responsibility of each vessel operator to assure compliance. While the cost of LEDs may be an extra operating cost, the gains from reducing bycatch are expected to be cost effective in most years (e.g. less bycatch sorting) and significantly reduces bycatch rates of the ESA listed eulachon smelt. The latter point is critical to the sustainability of the shrimp fishery.

We have some leftover materials to distribute prior to June 30, 2020. We don't have as much staff time this year, so please get in touch with the port biologist you've worked with in the past as you get ready for shrimp season.

For 2020:

- Each active shrimp vessel that ***DID NOT*** receive LEDs and information materials in 2019 is eligible for 24 LEDs and a set of information sheets.
- Each shrimp vessel that ***DID*** receive materials in 2019 is eligible for 6 LEDs, you MUST receive these at the port where you received materials last year. We have extra information sheets for you as well, if needed.

In 2019, catch was low (26.8 million pounds), but nearly the average value (19.9 million dollars) even when compared to recent high value years. While low count shrimp resulted in a high average price per pound (supporting its value), reduced shrimp populations and consequent low catch rates resulted in lower total catch.

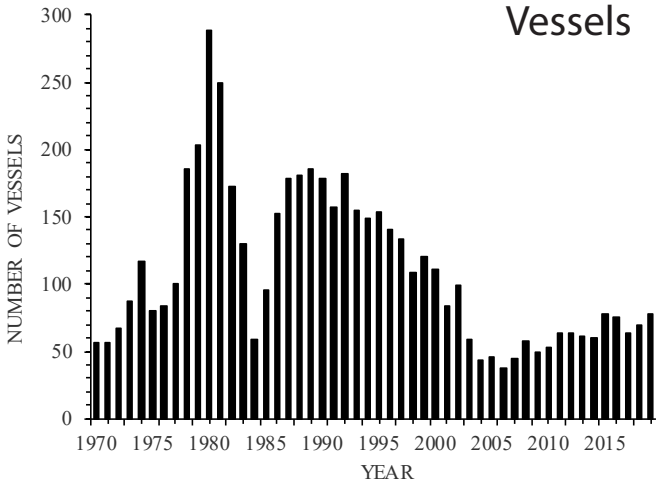


Figure 2. Annual number of vessels landing pink shrimp into Oregon: 1970-2019.

Landings Data

Oregon pink shrimp landings for 2019 were 26.8 million pounds, 9 million lower than 2018 (Figure 1). 78 vessels participated in 2019, 8 more than 2018 (Figure 2).

Shrimpers made 970 individual trips last year (Figure 3). The average landing was substantially decreased in 2019 (27,682 pounds per trip), the lowest since 2006 (Figure 4).

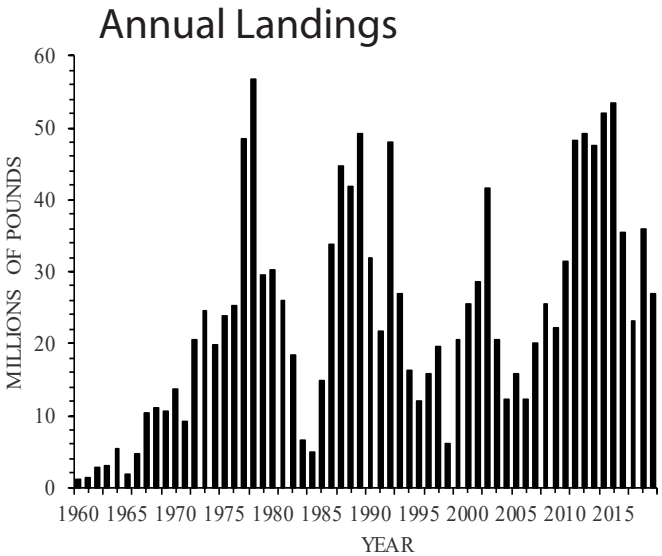


Figure 1. Annual landings of pink shrimp into Oregon: 1957-2019.

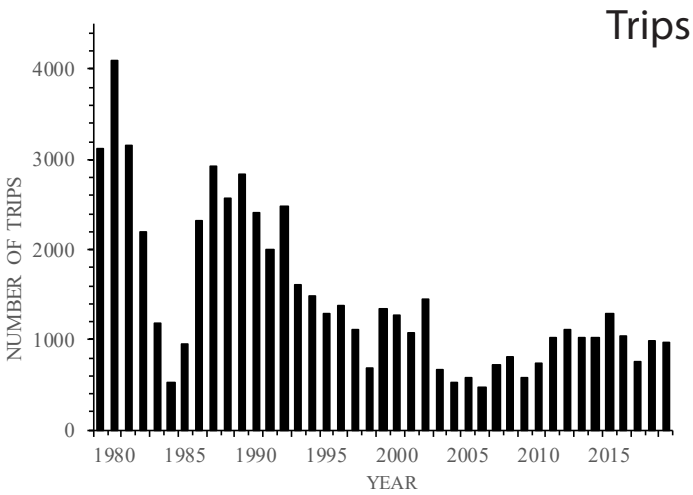


Figure 3. Annual number of trips landing pink shrimp into Oregon: 1979-2019.

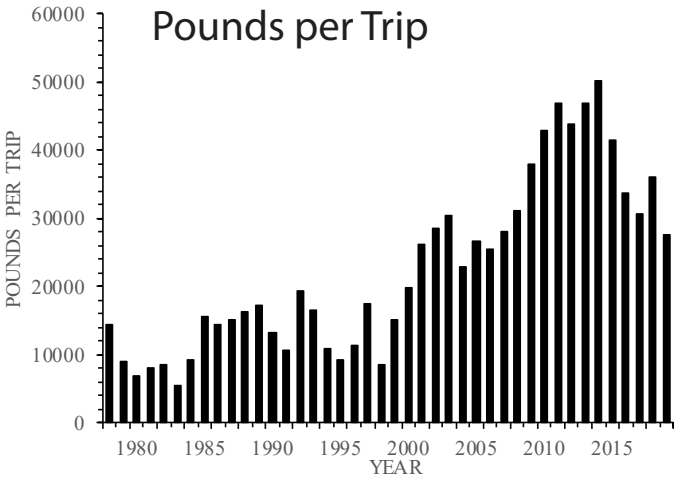


Figure 4. Annual average catch-per-trip (pounds) for pink shrimp vessels landing into Oregon: 1978-2019.

2019 Catch Area

Catch in 2019 was nearly split evenly between areas north and south of Heceta Head, OR (about halfway between Newport and Charleston). This is a departure from recent trends heavily focused on the southern harvest area (Figure 5 and 7).

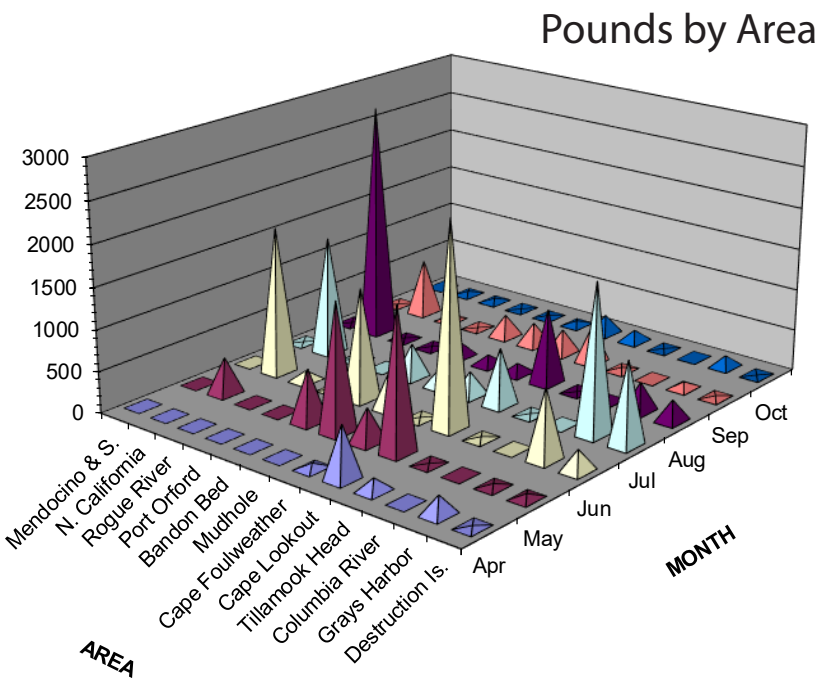


Figure 5. Estimated weight of pink shrimp caught in each area by month that were landed in Oregon during 2019.

Catch rates reduced quickly in 2019 as the total shrimp volume was not as high as recent years. Catch rates were a little better down south (Figure 6).

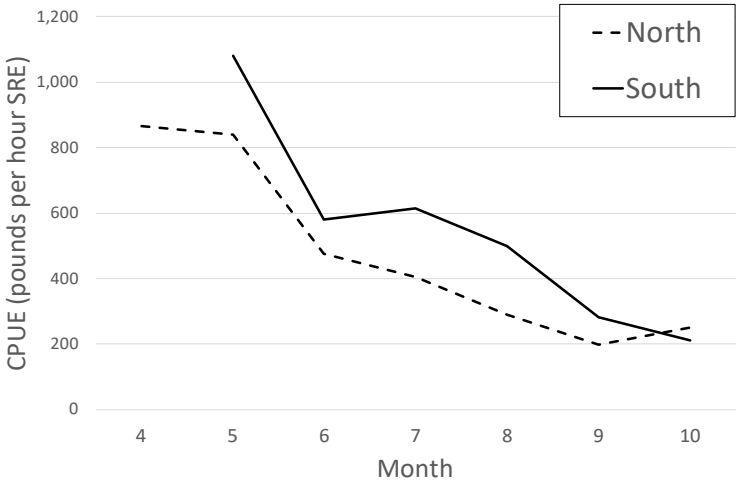


Figure 6. Catch rates of pink shrimp (lb/SRE) by month in 2019, grouped by north and south areas.

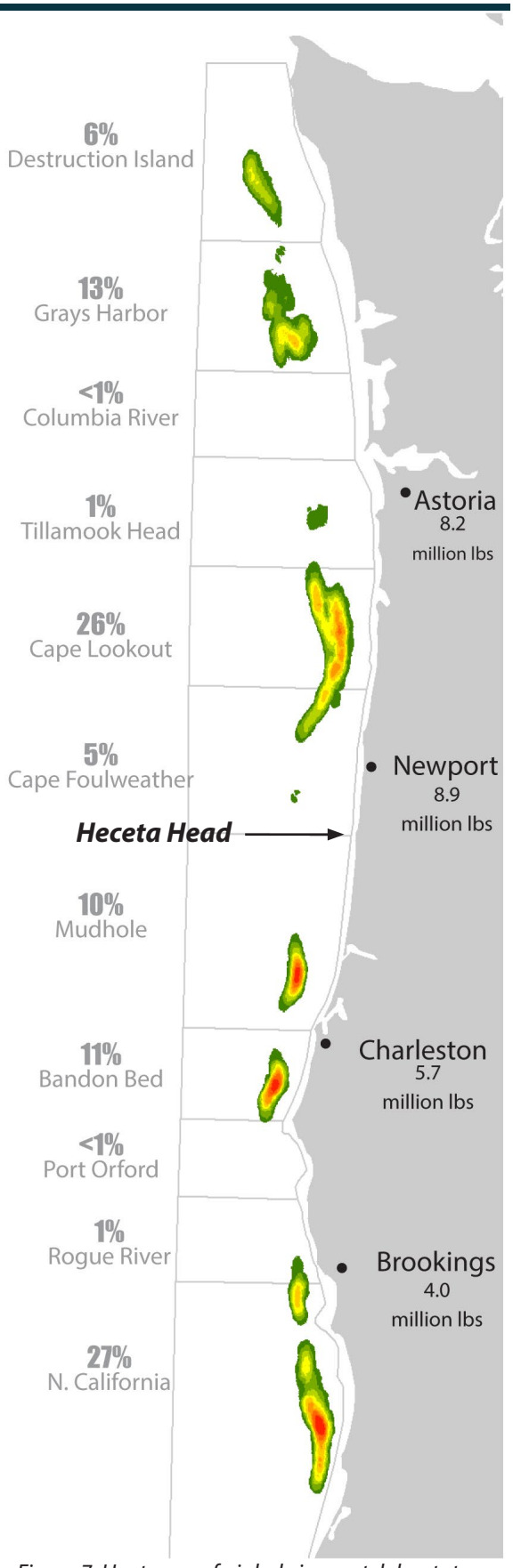


Figure 7. Heat map of pink shrimp catch by state statistical areas for 2019 Oregon landings, and amount of pounds delivered to each port.

Effort

Effort was similar to recent years, but lower than historic numbers (Figure 8).

Effort was highest in June through August of 2019, when catch rates were moderate (Figure 9). Hours of effort are displayed in units of Single Rig Equivalent (SRE) hours, meaning that single rig hours are counted 'as is' and double rig hours are multiplied by 1.6.

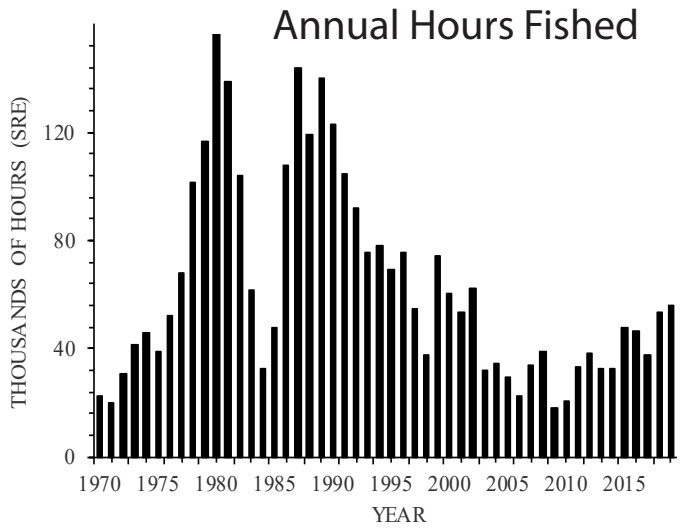


Figure 8. Annual hours (SRE) spent trawling for pink shrimp that were landed in Oregon: 1968-2019.

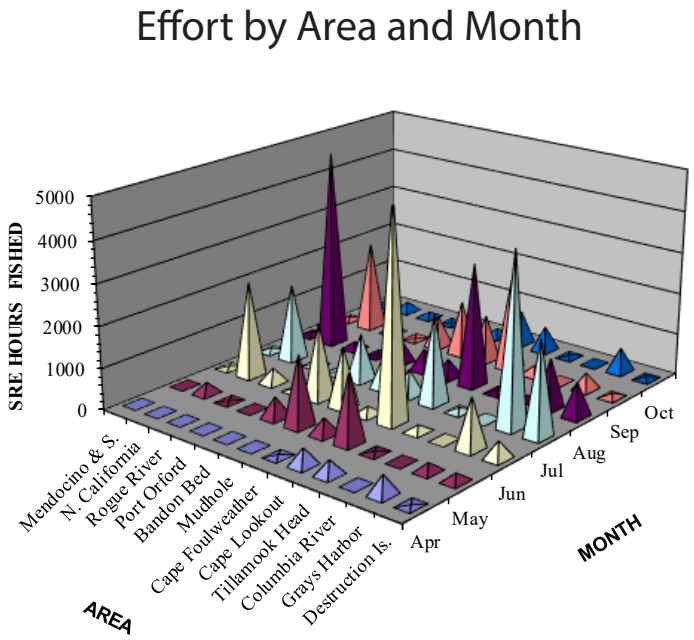


Figure 9. Estimated total hours (SRE) spent trawling for pink shrimp in each area by month during 2019.

Efficiency

Annual efficiency, expressed in Catch Per Unit of Effort (CPUE) was 488 lbs of shrimp/ hour SRE (305/ hour in double rig terms). This was the lowest CPUE since 2004 (Figure 10).

With a relatively low overall stock, CPUE dropped off quickly in 2019 (Figure 11).

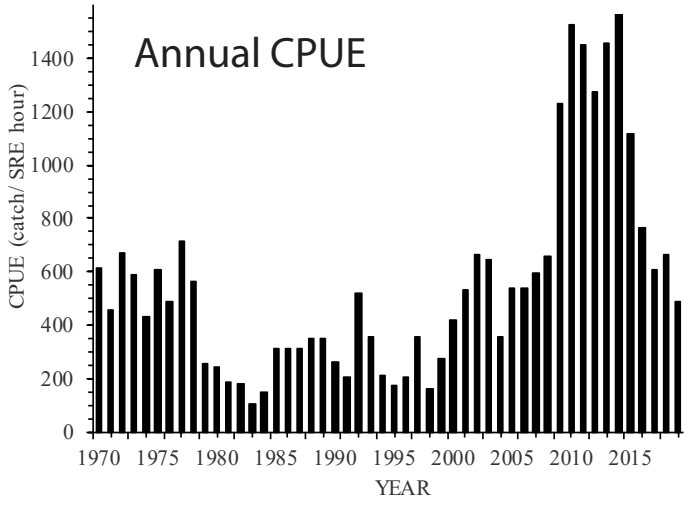


Figure 10. Annual average pounds of pink shrimp caught per hour (SRE) for vessels landing pink shrimp in Oregon: 1968-2019.

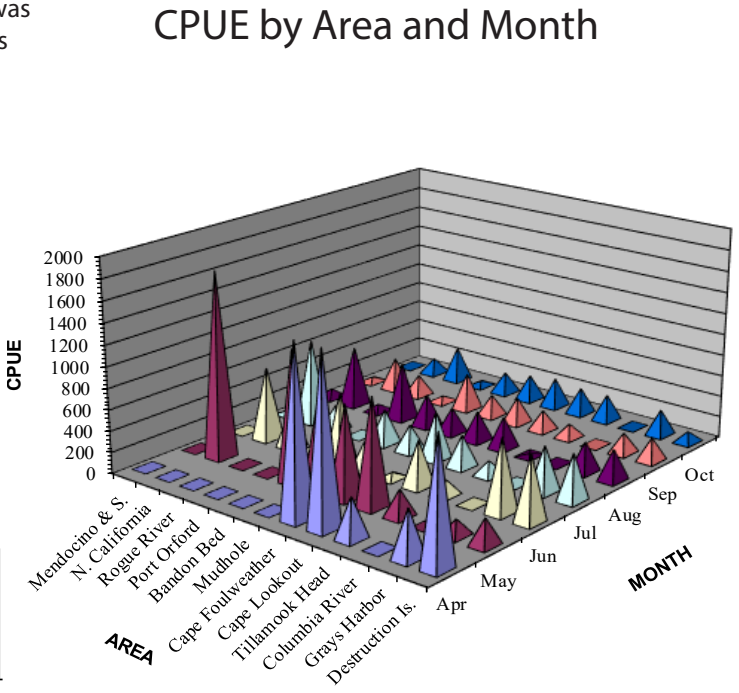


Figure 11. Estimated average pounds of pink shrimp caught per hour (SRE) by area and month for vessels landing pink shrimp in Oregon during 2019.

Value

Value was high in 2019 ($19.9 million), anchored by a high price per pound, rather than volume. Despite the low volume, 2019 was the 8th highest value of all time (Figure 12).

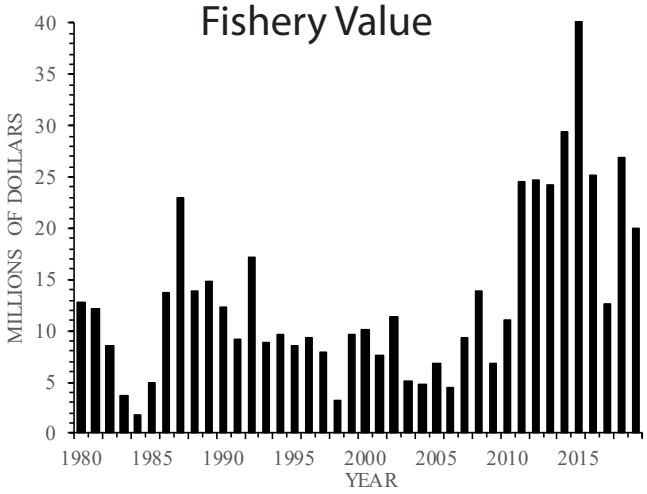


Figure 12. Annual ex-vessel value (in USD) of pink shrimp landed into Oregon: 1978-2019.

At $0.75 per pound, the average price was the third highest of all time (Figure 13). Values all nominal (i.e. not adjusted for inflation) .

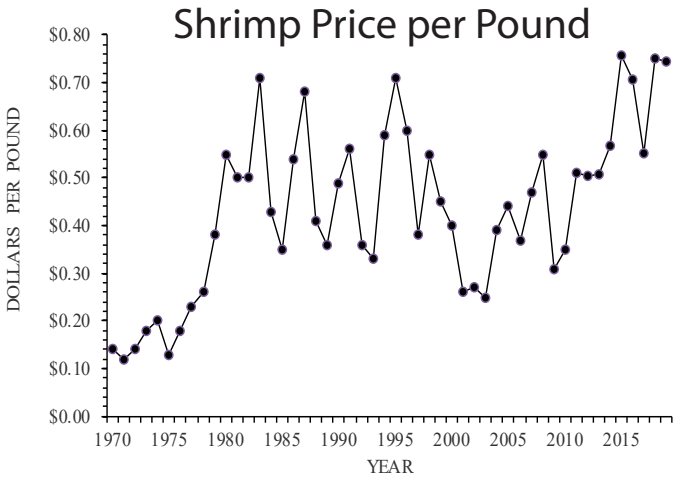


Figure 13. Annual average ex-vessel price-per-pound of pink shrimp landed into Oregon: 1968-2019.

Age and Size

Pink shrimp live short lives and grow quickly; annual catch is typically composed of 3 year classes (age 1, 2 and 3). In most years, catch depends heavily on age one shrimp.

In 2019, numbers of (individual) shrimp in the catch was approximately an average age composition; 70% were age one shrimp, 27% age two, and 3% age three (Figure 14).

By weight, older shrimp (age two and three) make up about 47% of the catch by weight (Figure 15), despite only being about 30% of the catch by numbers.

Overall, this age composition produced an average of 125 count per pound, just above the long term average (Figure 16).

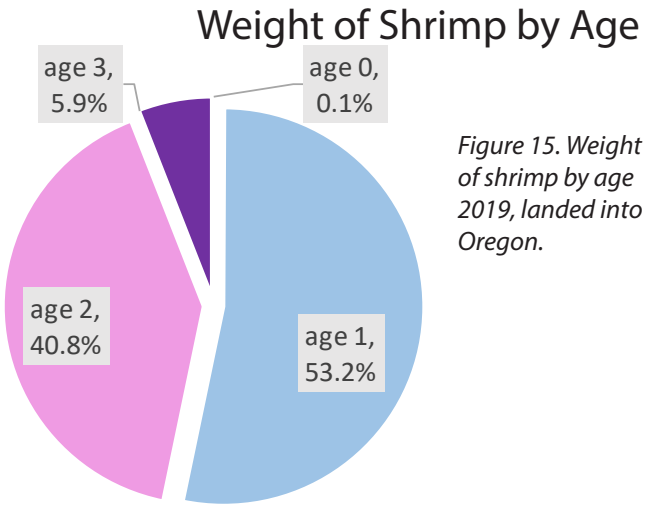


Figure 15. Weight of shrimp by age 2019, landed into Oregon.

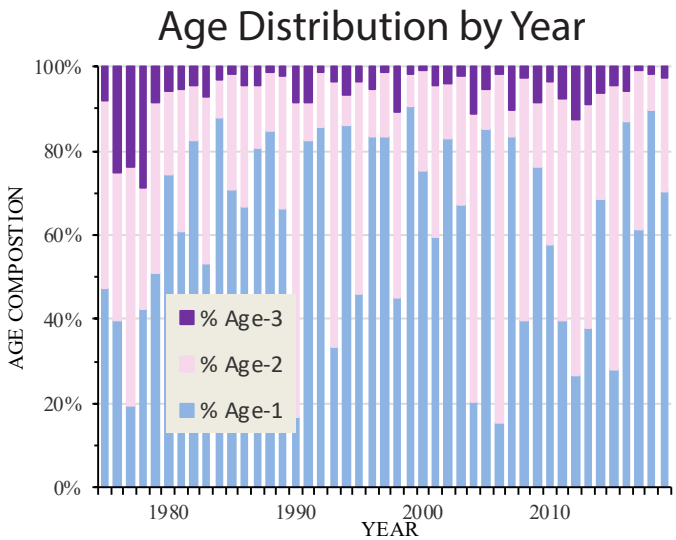


Figure 14. Annual percent age composition of pink shrimp landed into Oregon: 1975-2019.

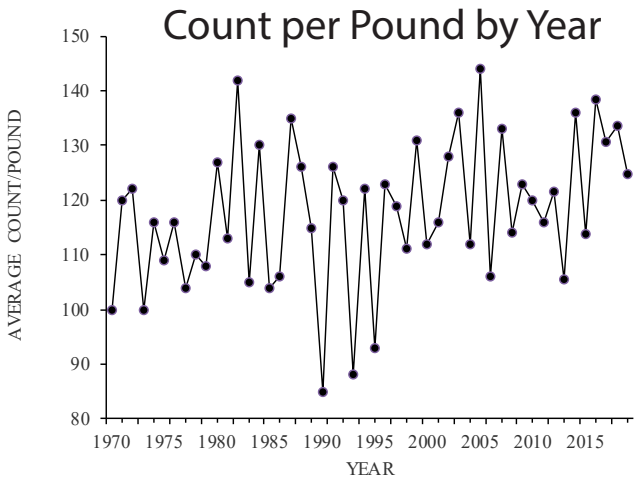


Figure 16. Annual average (catch weighted) count per pound of pink shrimp landed into Oregon: 1966-2019.

Here we describe some of the indicators which may provide a loose "forecast" of what to expect next season.

Take this with a grain of salt.

To take something with a "grain of salt" is an idiom which implies viewing with some skepticism. A likely origin of this saying is from Pliny the Elder's Naturalis Historia. Pliny was a Roman naturalist.

Environmental Conditions

By comparing long-term shrimp population data to environmental data, we can forecast shrimp abundance in the next year. The number of shrimp which recruit to the fishery have a strong relationship to oceanographic conditions during their larval period (Figure 17). Specifically, sea level height at Crescent City, CA during the pink shrimp's larval period has shown a strong link to recruitment levels in Oregon, the lower the sea level, the greater the shrimp recruitment.

Why sea level? While it may not matter to a pink shrimp if there's a few extra inches of water above their head or not, the average height of the sea where it meets land does correlate to environmental conditions that are known to affect shrimp larvae (larval transport, food supply from upwelling, etc).

In 2020, shrimp catch will be composed of three year classes (those born in 2017, 2018, and 2019).

2019 year class: According to the model, the conditions which larval pink shrimp experienced in 2019 were okay when compared among the past 41 years, it was in the 56th percentile (i.e. a little bit better than average). Age one recruitment is typically the largest component of the fishery.

2018 year class: In 2020, we expect only a small portion of the catch to be these shrimp (born in 2018) because larval conditions were in the 54th percentile (mediocre) and were 70% of last year's catch. Age two shrimp are often a lesser component of catch given their longer exposure to natural and fishery mortalities (which occur at a high rate given their short lives).

2017 year class: In 2020, we expect few age three shrimp. Catch of age two shrimp last year was good and larval conditions in 2017 were in the 78th percentile (excellent!). Age three shrimp are often the smallest component of catch as they are approaching the end of their lives.

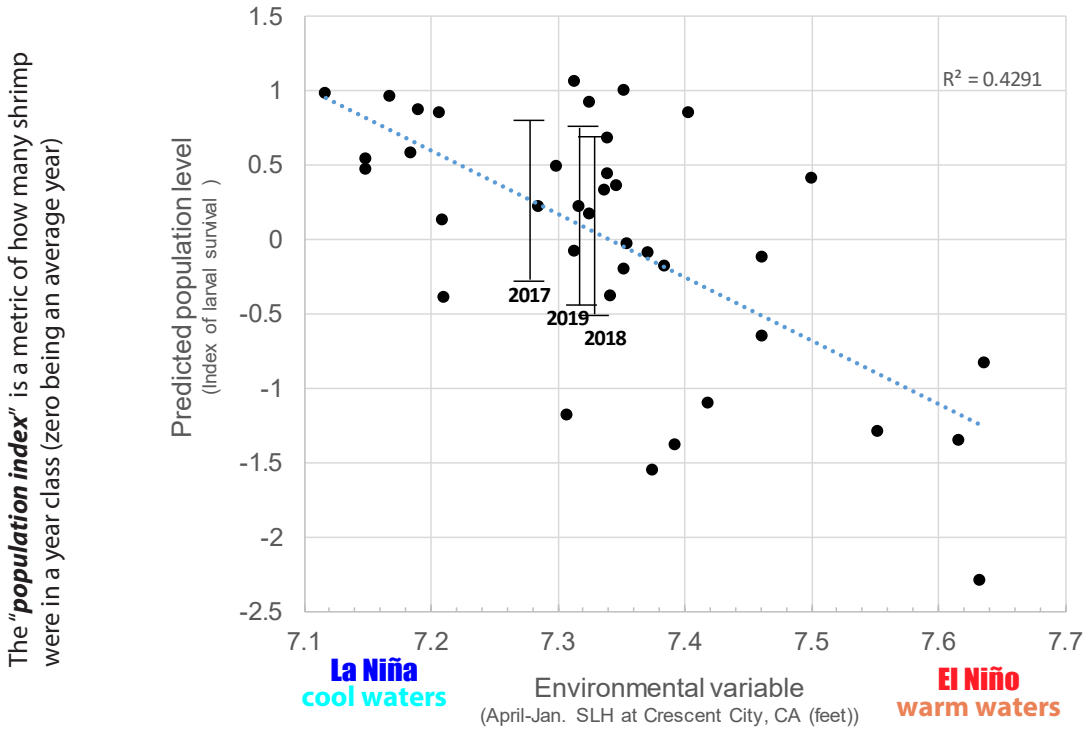


Figure 17. Pink shrimp population model.

Each dot on this graph represents a year (1979-2016).

Vertical lines labeled with year represent the range of population expected, given the environmental conditions in the year they are released as larvae.

The "***environmental variable***" used is sea level height (SLH) from April to January in Crescent City, CA.

Sampling Data

Crustaceans lack hard structures for aging, such as ear bones (otoliths) used in fish aging; thus other means must be used. Pink shrimp simultaneously release eggs, grow quickly, and live short lives. These three attributes allow for age assignment using statistical (multimodal distribution) analysis. In this way, ages of shrimp are determined by bulk measurement of their size over time. Size measurements (carapace lengths (CL)) are aggregated then compared to other time periods to determine age and growth.

Each graph tells a story; in the example below (Figure 18), there are many age one shrimp, then a few age two and three. While a single graph is like a snapshot, comparing changes in these graphs over time tells a story. The horizontal (X) axis of these graphs indicates the size of the shrimp (larger as you move to the right); the vertical (Y) axis shows the relative amount of each size group (not total abundance). The "lumps" of these graphs are caused by the central tendency of each age group; thus changes to relative amounts of age classes can be tracked along multiple graphs. Arrows track year classes and indicate rate of growth as time goes on. These graphs look a little complex at first, but once understood, it becomes easy to visualize (Figure 19).

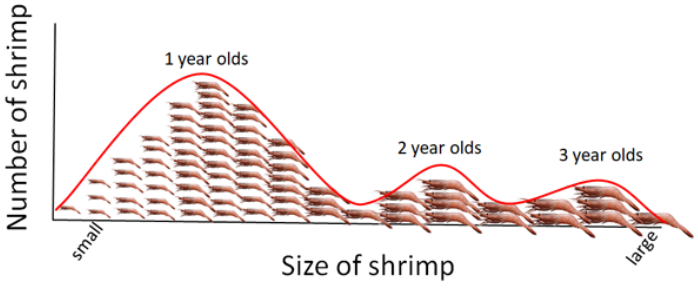


Figure 18. Hypothetical multimodal size distribution of pink shrimp.

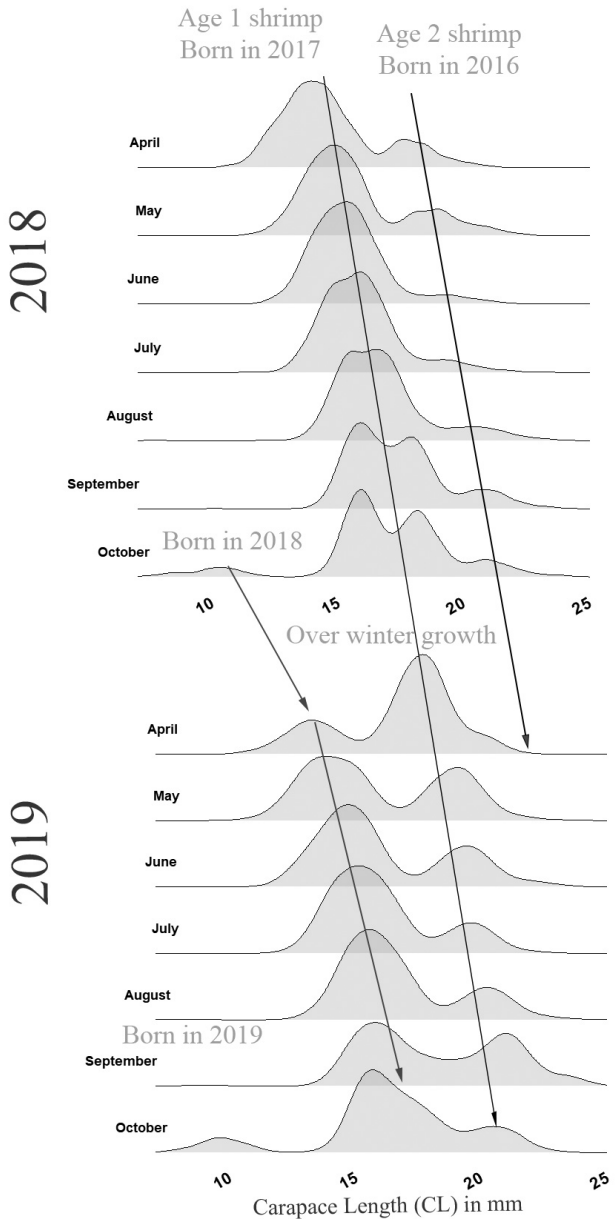


Figure 19. Pink shrimp size distributions by month (2018 and 2019). Note: Shrimp born in 2017 (age 1 in 2018 and age 2 in 2019) were a major component of catch in both years.

New Forecasting Methods

In this edition, we attempt to forecast next year's catch in two different ways.

1. Forecast from environmental data:
We examine environmental conditions over the past few years then weight a forecast of each year depending on expected contribution of each year class (e.g. age 1 shrimp are typically the primary component of catch, therefore environmental data from previous year are heavily weighted, whereas environmental conditions from 3 years ago are less heavily weighted).

2. Forecast from sampling data:
In this forecast, we look at last year's catch of each age class, rank them according to previous generations of shrimp, then weight each rank to project what next season might be like.

[We have some analysis to do in 2020 which should sharpen up our math skills, so we will probably continue to sharpen this analysis up as well. We don't expect this to be highly accurate, but it does provide a ball park idea of what to expect in 2020.]

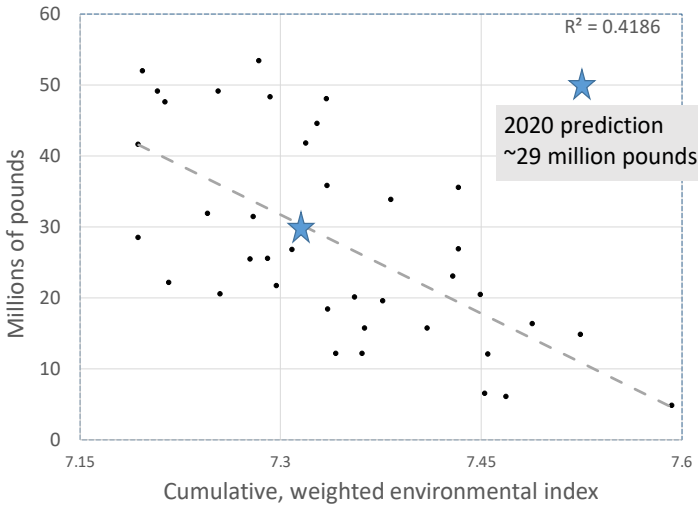


Figure 20. Cumulative, unified forecast of Oregon shrimp catch based on environmental factors.

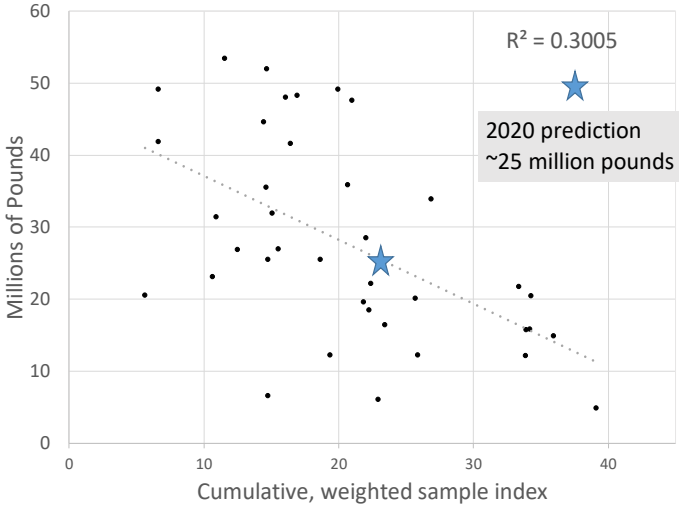


Figure 21. Cumulative, unified forecast of Oregon shrimp catch based on sampling data.

This new cumulative, unified forecasting is based on the typical percentage of weight contribution of each age class to the current years catch. The environmental model predicts 2020 to be a 29 million pound season (Figure 20), while the sampling data model predicts a 25 million pound season (Figure 21).

To give some context of the variability expected, for last years ~27 million pound season the predictions would have been 31 (environmental model) and 35 million pounds (sampling model), so, it's still just a guess.

Regulation Info

Key regulations that apply to **Oregon** pink shrimp deliveries				
		Fishing off CA*	Fishing off OR**	Fishing off WA***
Areas	0-3 miles	No fishing	OR permit needed	No fishing
	3-200 miles Key closed areas	Delgada Canyon, Tolo Bank, other closed areas (see CA regs)	Nehalem Bank, Daisy Bank, Stonewall Bank, Heceta Bank, Coquille Bank	Grays Canyon (see WA regs)
Mesh size		Minimum 1-3/8"	No minimum	
BRD		≤ ¾" spaced rigid grate		
LEDs		5 LEDs in central 16 feet of each net, spaced 4 feet apart (More LEDs may be used)		
Count per pound		≤160 shrimp/ pound		
VMS declaration		Required		
Season		April 1- October 31		
Groundfish by-catch****		Groundfish: 500 lb/day, multiplied by the number of days of the trip, not to exceed 1,500 lb/trip. The following sublimits also apply and are counted toward the overall 500 lb/day and 1,500 lb/trip groundfish limits: lingcod 300 lb/month (minimum 24" size limit); sablefish 2,000 lb/month; canary, thornyheads, and yelloweye rockfish are PROHIBITED. All other groundfish species taken are managed under the overall 500 lb/day and 1,500 lb/trip groundfish limits and do not have species specific limits. The amount of groundfish landed may not exceed the amount of pink shrimp landed.		

*CA Regulation details: http://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=162327, pages 106-110.
**OR Regulation details: https://www.dfw.state.or.us/OARs/index.asp
***WA Regulation details: https://wdfw.wa.gov/fishing/commercial/shrimp#
**** NMFS groundfish limits

Research Priorities

Here, we address three research areas, in priority order: 1) shrimp population dynamics, 2) non-target catch and 3) ecosystem effects. Although we address each priority every year, we don't necessarily have planned activities for all three every year.

Priority 1: Shrimp Population Dynamics

Our documentation and analysis of pink shrimp population dynamics is the highest priority of our program. Understanding changes in the shrimp population and comparing it to past populations, environmental data and other factors is critical to our ability to detect and address overfishing. ODFW's pink shrimp program has a thorough, long term dataset of shrimp populations which is central to our ability to assure it is fished sustainably.

Accomplished in 2019:
We calculated annual indices on the number of shrimp using fish ticket, logbook and biological sample data. ODFW biologists entered data for ***10,055*** shrimp tows and measured ***15,865*** shrimp. We use these data to understand the effects of fishing and the environment on shrimp stocks.

We centralized ***38*** years of shrimp logbook data consisting of data from ***422,825*** shrimp tows. These data were assembled for bioeconomic analysis in collaboration with NOAA, but will be maintained for future spatial analysis.

We continued to work with Washington and California to develop a regional stock assessment of pink shrimp (historically Oregon is used as an index of the entire stock).

Planned for 2020:
In 2020 we will revisit our shrimp population model (Figure 17). We reevaluate this model every other year to assure our management strategy is still appropriate and to ensure findings from the past are still tenable. Importantly, the model has shown that pink shrimp recruitment is primarily driven by environmental conditions and that the number of spawners may only be limiting in very low abundance years.

In 2020, we hope to work closely with WA and CA to improve sampling and fishery effort analysis.

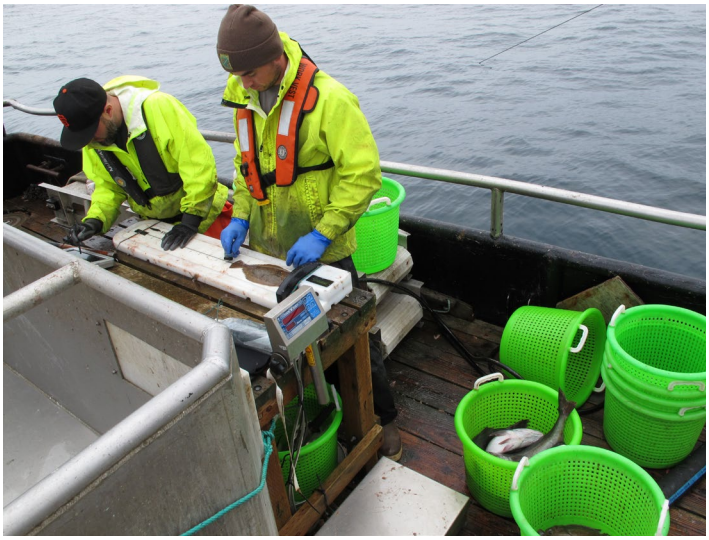
Priority 2: Non-Target Catch

Accomplished in 2019:
In January 2020, Pacific State Marine Fisheries Commission (PSMFC) research biologist, Mark Lomeli, in collaboration with ODFW and other researchers published the results of a study that looked at the bycatch reductive effects of LED fishing lights alone, without a BRD (aka shrimp grate or excluder).

Captain Cody Leach and crew of F/V Ms Julie with PSMFC and ODFW researchers checking out the split hopper (June 2018)

Fishermen and researchers get a reminder of why we use BRDs!

We performed 9 days of at sea work aboard the F/V Ms. Julie in 2018 using LEDs on one side of the net and none on the other. Analysis showed that again, LEDs were strongly effective in the reduction of eulachon smelt bycatch (~70% with LEDs alone). An interesting result of this work is that bycatch of many rockfishes and flatfishes actually increased when using LEDs in the absence of BRDs (Figure 22 from Lomeli et al. 2019). This result solidifies the need of using these two required bycatch devices in tandem.



Mark Lomeli (PSMFC) and Josh Harwager (ODFW) count and measure fishes caught, to quantify differences in catch efficiency using LEDs on the footrope.

Non-Target Catch (cont.)

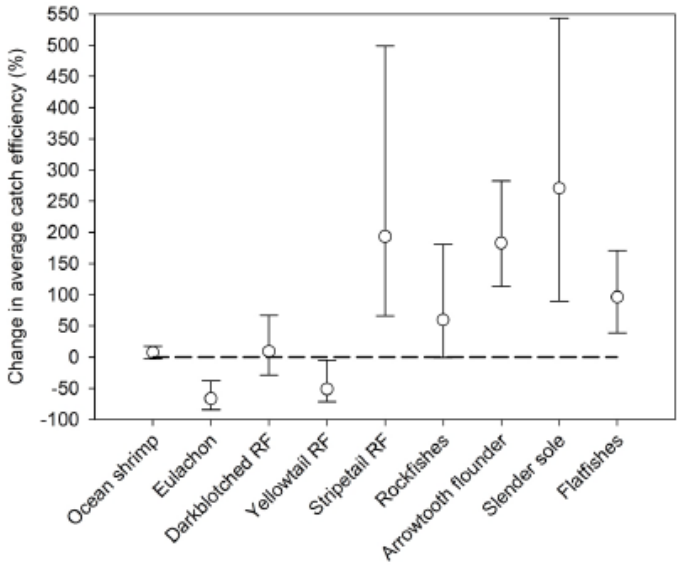


Figure 22. Change in average catch efficiency (%; ±95% CIs) between the illuminated and unilluminated trawls. Values below zero indicate more ocean shrimp or a given species of fish were caught in the unilluminated trawl, and vice versa for values above zero. From Lomeli et al. 2020.

Planned for 2020:
Shrimp logbooks proved to be a useful tool in examining bycatch rates for Marine Stewardship Council (MSC). In 2020, we will work with shrimpers to keep collecting this great data.

We intend to look into grant monies to study the industrial use of LEDs in an effort to help shrimpers use them most efficiently.

Priority 3: Ecosystem Effects

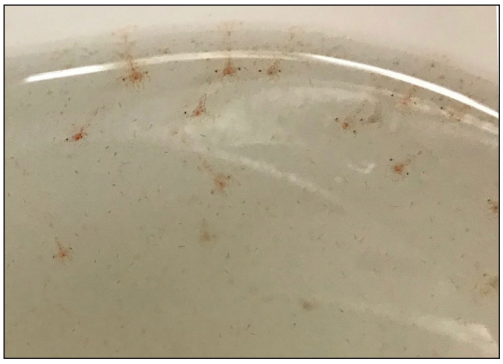
Accomplished in 2019:
The Oregon State University (OSU) and ODFW collaborative research project evaluating the potential effects of changing ocean acidification and temperature levels on larval pink shrimp continued in 2019.

Crew of F/V Ocean Invictus, OSU and ODFW researchers sort through shrimp, looking for egged volunteers.

Ecosystem Effects (cont.)

In 2019, Captain Jim "LJ" Burns and the crew of the F/V Ocean Invictus took a group from ODFW and OSU to collect egged shrimp out of Charleston on April 2, 2019. Shrimp were transported to the HMSC in Newport for experiments. Many shrimp survived the trip and testing continued for the second year. In 2020, we'll complete the field portion of this grant.

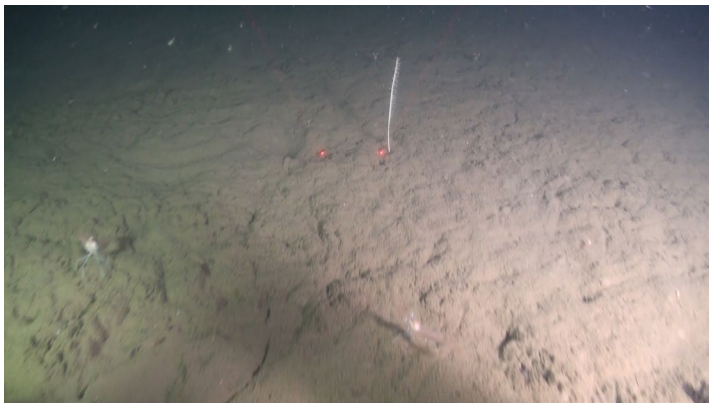
Captain Jim "LJ" Burns, never afraid of getting his hands dirty on the back deck.



Larval pink shrimp swimming around in treatment containers at HMSC, Newport.

Planned for 2020:
This year's egged shrimp collection is planned for mid-March, as part of a larger project looking at larval behavior of shrimp and crab aboard OSU's R/V Oceanus.

We were able to find funding and attempted to revisit the Nehalem Banks habitat study site in fall of 2019, alas, the ROV had a breakdown. We're hoping to visit this in 2020.



Pink shrimp and sea whips occupy the muddy substrates in the vicinity of Nehalem Banks, OR; site of a shrimp habitat study.

Logbooks

We use fishery logbooks to understand the fishery and the stock; skippers are excellent at keeping these valuable records. Over time, the way we enter these logbooks and use the information has changed, as a result, we have a few messages we'd like to share about them.

- Please begin a new page for each trip
- Please use continuous numbers for each trip (i.e. if there are 15 tows in the trip the final one would be #15, the first tow of the next trip would be #1 again)
- Please use 24 hour time (e.g 1500 rather than 3 pm)
- Please estimate the fish bycatch for each tow
- Please use Lat/Lon rather than LORAN

Thank you!

MSC News

In our annual check-in with MSC (March 2019), we provided updates on fishery and sustainability issues. ***One particularly useful piece of information was a summary of fish bycatch from logbooks.*** The data matched well with other data sources (Figure 23) and provides a constant, accessible data stream. For this reason, we are going to bring more focus on this component of logbooks.

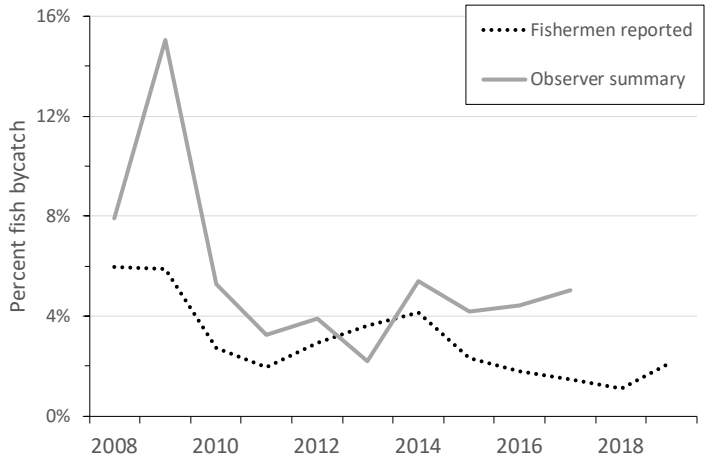


Figure 23. Bycatch rates from fishermen's logbooks (dotted line) and observer (solid line) 2008-2018. Note the general similarity.

Essential Fish Habitat

Essential Fish Habitat (EFH) areas designated by NOAA, are intended to protect areas of high value for fish and invertebrate populations. Some changes have been made to EFH areas for 2020, last modified in 2006. The process which made these changes is described here:

https://www.fisheries.noaa.gov/west-coast/habitat-conservation/essential-fish-habitat-west-coast

Essential Fish Habitat (cont.)

Changes from this recent effort include the modification of how groundfish trawlers may access Rockfish Conservation Areas (RCAs) along the west coast. Because of the effectiveness of bycatch reduction in the pink shrimp fishery, RCAs hadn't restricted shrimping, so no change (for shrimpers) there.

Our analysis of the last 10 years of shrimp logbook data (Figure 24) show EFH areas have been avoided, however changes to EFH areas may affect a very small amount of shrimping. In particular, near Garibaldi, two new areas (Garibaldi Reef North and South) adjoin shrimping grounds (Figure 24B). Next, a new site in front of Coos Bay (Arago Reef) adjoins the extreme edges of shrimp grounds (Figure 24C). Among the hundred thousand or so records, we only had a few tows recorded in these areas.

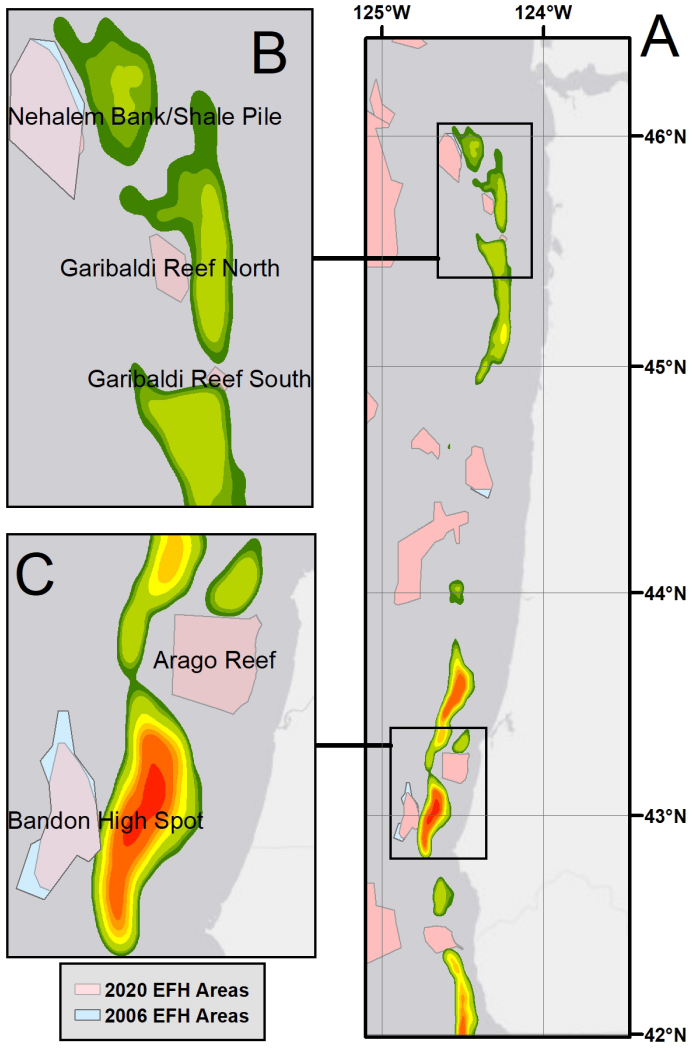


Figure 24. (A) Chart of 2020 EFH areas (pink) and 2006 EFH areas (blue) compared to shrimping areas, 2009-2018 (graduated colors from green to red). Inset charts of Garibaldi (B) and Charleston/ Bandon (C) areas with logbook data and EFH areas.

Season Considerations

In two 2019 meetings, the Oregon Trawl Commission (OTC) considered the viability of the April 1 season start date, in the light of increased fleet efficiency, potential effects to egged shrimp and economics. A key question was whether seven months is needed to catch the surplus stock of shrimp. The advantage to waiting, would be to allow shrimp to grow and become more valuable; the disadvantage would be having less time on the water and potential losses via natural mortalities of shrimp. Conversation among the group was heated but respectful, all did agree that sustainability and maximization of shrimp was desirable.

At ODFW, we're going consider the concerns conveyed on this subject as we analyze quantitative fishery information. In 2020 we're going to 1) continue our collaboration with NOAA and University of Washington researchers on the bioeconomics of the west coast shrimp fishery and 2) revisit the shrimp recruitment model. These two items will aide consideration of the season start date.

Prior to this current effort, bioeconomics of the shrimp fishery were analyzed in 2004. This study found that natural mortality, fishing mortality, and market factors confounded a clear answer (i.e. all must be considered and may not be known). It did find that generally, strategies for maximizing revenue strongly favor a late season start when natural mortality was low (Figure 25 a); however the benefit was not as great when natural mortality was high (Figure 25 b)(Gallagher, Hannah and Sylvia 2004).

A lot has changed since this 2004 analysis, including increased fishing power of the fleet and split pricing, more heavily favoring large shrimp. We're looking forward to helping develop this analysis and share it with you.

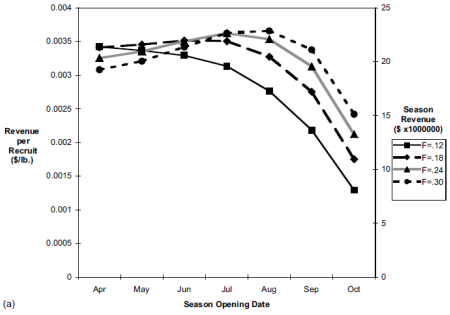
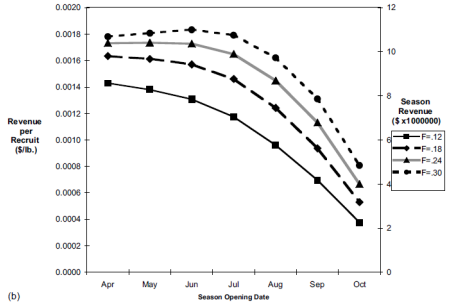


Figure 25. Revenue per recruit model in low natural mortality (a, left) and high natural mortality (b, below), from Gallagher et al., 2004.



Note that revenue increases substantially when season is delayed and natural mortality is low (a) but makes little difference when natural mortality is high (b)

Shrimp Width

Over the years, some skippers have expressed interest in allowing flexibility for BRD grate size (legal requirement is ¾" spacing). The research that supported this regulation showed reduced bycatch of all species, including significant reductions of eulachon and hake, without any change to shrimp catch (Hannah et al. 2011).

We are open to an industry/ODFW cooperative revisit of this, but we'd need some volunteers (we'd be in your way a little). Some have been concerned with large shrimp being excluded, we looked into if anyone else had studied this and found that someone had. An Australian fishery studied similar size shrimp and even smaller BRDs (16, 18 and 20 mm, compared to our 19.1mm spacing). They found that, bar spacing can be reduced to the maximum width of the shrimp without shrimp loss expected (Broadhurst, Millar and Dingle 2018). To this point, we measured some shrimp to see how wide our shrimp were compared to the bar spacing.

We found that the size where shrimp may begin to be excluded was around 30 mm carapace length (28 count/lb) a size we've never seen in 50 years of sampling. The largest pink shrimp we've ever found was 29.1 mm, caught off Bandon in 1993. This shrimp was so notable, Steve Jones (retired shrimp biologist) kept at his desk for years and handed it down.

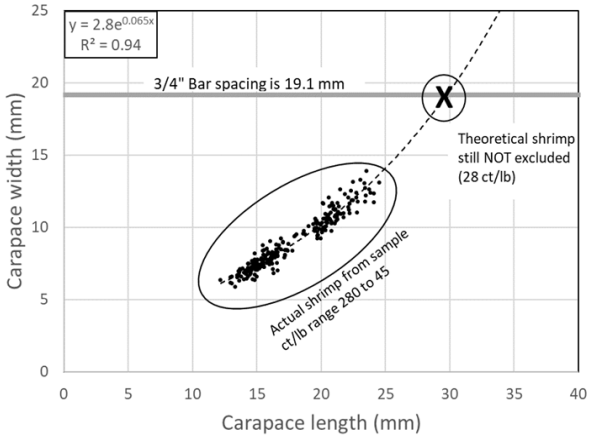


Figure 26. Pink shrimp carapace length compared with carapace width. Note that shrimp would have to be less than 28 count prior to exclusion, considering Broadhurst, 2018.

The largest known pink shrimp ever caught (by F/V Billie Jean and collected by ODFW Biologist Neil Richmond). This shrimp caught at Bandon bed in 1993, would have been less than 30 count!

ICWPF 2019

ODFW staff presented at the International Cold Water Prawn Forum (ICWPF) at St. Johns, Newfoundland, Canada in November 2019. Our talk and discussion mainly described our sustainability certification criteria and discussed some of our future directions (linked here). New perspectives were gained from the robust Atlantic *Pandalus borealis* fishery as well as emerging fisheries and methods worldwide.

A highlight of the trip was seeing the world's largest flume tank located in the Marine Institute and discussing fishing technology with industry and researchers.

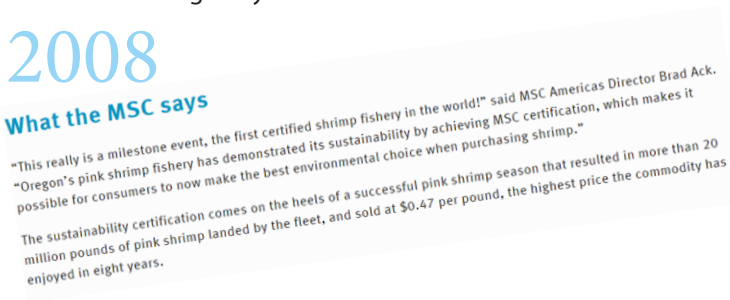
Dr. Paul Winger of the Fisheries and Marine Institute of Memorial University of Newfoundland, Canada presents information to an international group of shrimp fishermen and scientists regarding fisheries research in front of the worlds largest flume tank with a scaled twin trawl.

MSC Flashback

2008…after the 2007 season when this was the first shrimp fishery certified "sustainable" by Marine Stewardship Council (MSC).

Times have changed, in particular, check the numbers in pounds (~20 million) and price ($0.47/ lb.) that are touted as "impressive" here.

We've had some great years in between then and now.


2008

What the MSC says

"This really is a milestone event, the first certified shrimp fishery in the world!" said MSC Americas Director Brad Ack. "Oregon's pink shrimp fishery has demonstrated its sustainability by achieving MSC certification, which makes it possible for consumers to now make the best environmental choice when purchasing shrimp."

The sustainability certification comes on the heels of a successful pink shrimp season that resulted in more than 20 million pounds of pink shrimp landed by the fleet, and sold at $0.47 per pound, the highest price the commodity has enjoyed in eight years.

Acknowledgments

This annual newsletter is created primarily for Oregon's pink shrimp industry. We wish to thank the hard-working fishermen, plant staff, vessel owners and other industry members for their continued cooperation and assistance.

We thank Shawn Ruzzi for shrimp length/width measurements.

We appreciate Captain Jim "LJ" Burns and the F/V Ocean Invictus, vessel and crew for being so accommodating and helping accomplish the April 2019 egged shrimp collection.

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Literature

Literature cited:

Broadhurst, M. K., R. B. Millar & A. Dingle (2018) Minimizing Nordmøre Grid Bar Spaces in an Australian Penaeid Fishery. Marine Fisheries Review, 80, 29-33.

Gallagher, C. M., R. W. Hannah & G. Sylvia (2004) A comparison of yield per recruit and revenue per recruit models for the Oregon ocean shrimp, Pandalus jordani, fishery. Fisheries Research, 66, 71-84.

Hannah, R. W., S. A. Jones, M. J. M. Lomeli & W. W. Wakefield (2011) Trawl net modifications to reduce the bycatch of eulachon (Thaleichthys pacificus) in the ocean shrimp (Pandalus jordani) fishery. Fisheries Research, 110, 277-282.

Lomeli, M. J. M., S. D. Groth, M. T. O. Blume, B. Herrmann & W. W. Wakefield (2019) The efficacy of illumination to reduce bycatch of eulachon and groundfishes before trawl capture in the eastern North Pacific ocean shrimp fishery. Canadian Journal of Fisheries and Aquatic Sciences, 77, 44-54.

New reports available:

Lomeli, M. J. M., S. D. Groth, M. T. O. Blume, B. Herrmann & W. W. Wakefield (2019) The efficacy of illumination to reduce bycatch of eulachon and groundfishes before trawl capture in the eastern North Pacific ocean shrimp fishery. Canadian Journal of Fisheries and Aquatic Sciences, 77, 44-54.

Evolution of Bycatch Reduction / Pink Shrimp Life History: Groth, S.D., Bancroft, M.P., 2019.

Common Bycatch in the Pink Shrimp Fishery (Flatfishes/ Roundfishes): Bancroft, M.P., Groth, S.D., 2019.

Unusual Bycatch in the Pink Shrimp Fishery (Fishes/ Invertebrates): Bancroft, M.P., Groth, S.D., 2019.

Who We Are

ODFW's mission is to protect and enhance Oregon's fish and wildlife and their habitats for use and enjoyment by present and future generations.

The pink shrimp fishery project is managed with the following long term objectives:

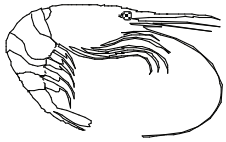
1. Maximize biomass yield from the ocean shrimp fishery, consistent with detecting and addressing any significant growth or recruitment overfishing that develops.

2. Operate the fishery, to the extent possible, under a stable regulatory environment that allows vessel operators maximum flexibility in deciding where, when and how to fish for ocean shrimp.

3. Through collaborative research with vessel operators and the sharing of research findings, develop and implement measures to minimize direct bycatch mortality, the unseen mortality of animals that escape capture and any adverse effects on seafloor habitat from the operation of the fishery.

Oregon's pink shrimp project is spread out among the major ports of Oregon to:
1. Collect fishery dependent data (biological samples and logbooks)
2. Assist and communicate with shrimpers.

Good Luck Shrimping in 2020!



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OREGON Fish & Wildlife Marine Resources

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