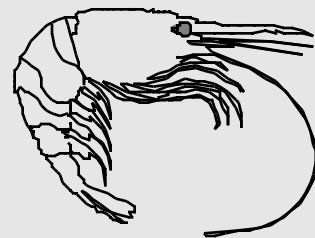




# Annual Pink Shrimp Review

Oregon Department of Fish and Wildlife

ODFW Marine Region, Marine Science Dr., Bldg. #3, Newport, OR 97365  
(503) 867-4741



TO: OREGON SHRIMP INDUSTRY  
FROM: BOB HANNAH, PINK SHRIMP PROJECT LEADER  
SUBJECT: OPENING OF 1992 COMMERCIAL FISHERY FOR PINK SHRIMP  
DATE: 20 MARCH 1992

It's nearly time to start catching pink shrimp again, so we thought we'd put together the latest information on the 1991 season, along with some results of recent research. If you come across any interested parties who didn't receive a copy of this newsletter, please have them call us and we'll send a copy right out to them.

## 1991 Commercial Fishery

Approximately 21.7 million pounds of ocean pink shrimp (*Pandalus jordani*) were landed in Oregon during 1991, about 10.3 million pounds less than in 1990 (Figure 1). The 1991 catch was below the ten year average annual catch of 27.2 million pounds. The catch by area in 1991 was highly variable from month to month (Figure 2), unlike 1990 when most of the catch occurred along the central coast during the first half of the season.

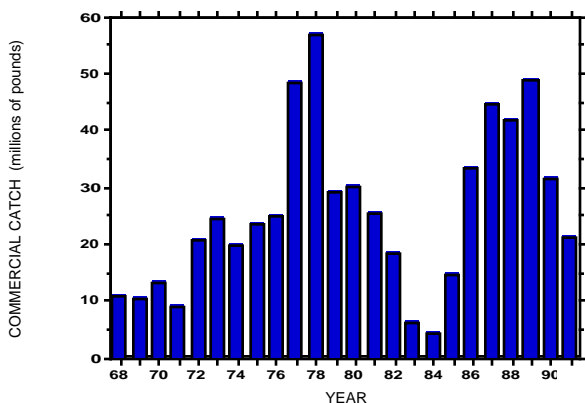


Figure 1. Oregon pink shrimp commercial catch (millions of pounds), 1975-1991. Includes all pink shrimp landed annually in Oregon ports.

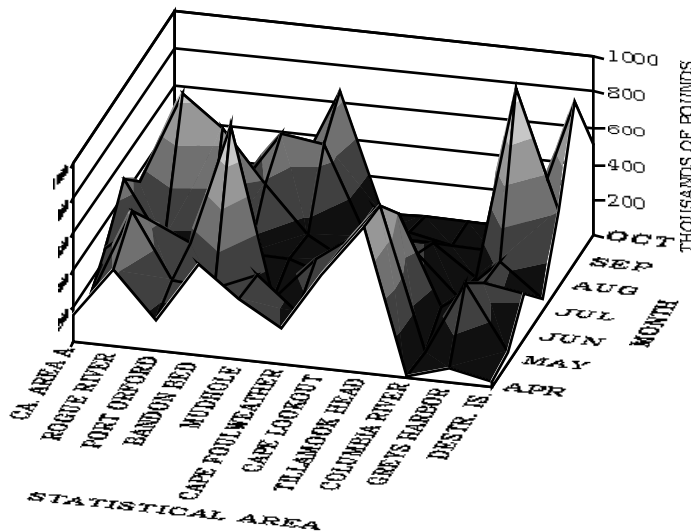


Figure 2. Total monthly catch (1000's of lb) of pink shrimp by area (preliminary), 1991

Monthly landing totals were below average during 1991 for each month except August, when landings peaked at about 4.1 million pounds. The 1991 season was unusual in that early season landings were depressed, making monthly landings more uniform throughout the season. The effects of the 1989 year class failure were apparent in the poor showing of two year old shrimp. In recent years, early season (April, May and June) landings have typically been composed primarily of age-1 and age-2 shrimp. The relative absence of age-2 shrimp this year meant that fishermen had a harder time finding large volumes of shrimp while still maintaining an average count below 160 shrimp/lb. The average count per pound was much higher in 1991 than in 1990 (Figure 3) due to the relative absence of age-2 shrimp.

The total number of hours fished by vessels landing in Oregon decreased to the lowest level since 1985, but still remained relatively high (Figure 4). The number of vessels landing pink shrimp into Oregon ports decreased to 157 during 1991, down from 179 in 1990. Also, the number of trips decreased to 1,990 from 2,403

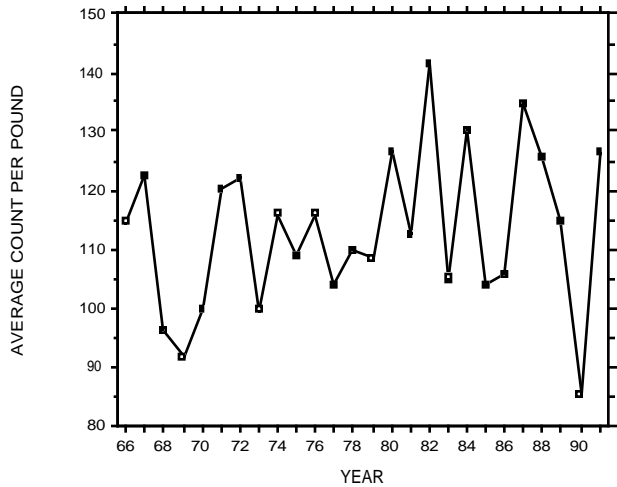


Figure 3. Average (catch weighted) count per pound of Oregon pink shrimp, 1966-1991.

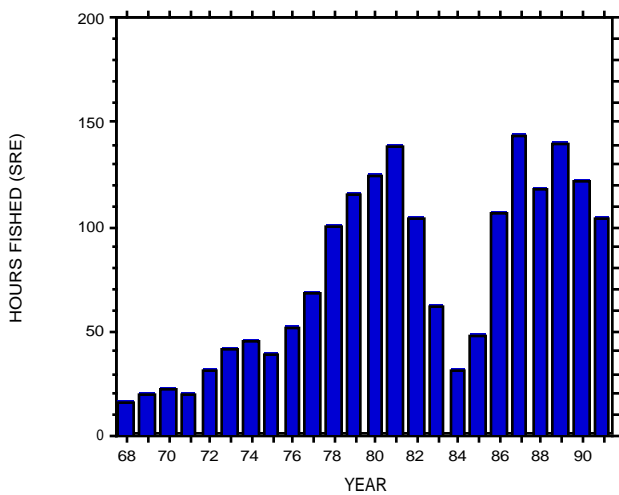


Figure 4. Fishing effort (single-rig equivalent hours) for pink shrimp landed in Oregon ports, 1968-1991 (preliminary).

during this time. Catch per unit effort (CPUE) for the 1991 season was the lowest seen since 1984 (Figure 5). CPUE was highest on the south

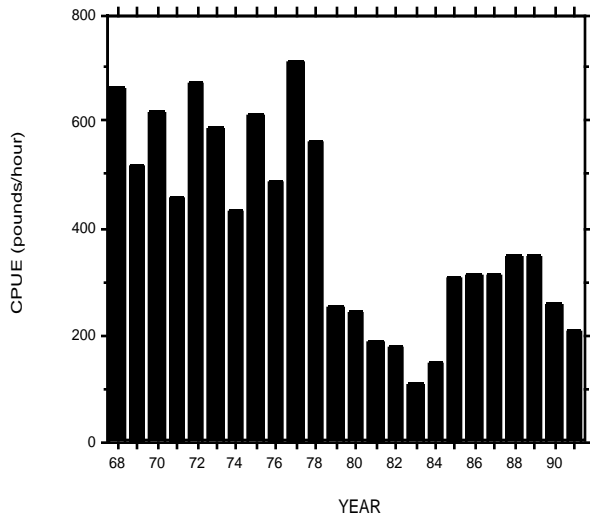


Figure 5. Catch per unit of effort (CPUE=pounds/hour) for vessels landing pink shrimp into Oregon ports, 1968-1991. Includes CPUE for all landings of pink shrimp into Oregon ports.

coast early in the season and was sharply less north of about Cape Blanco for the entire season (Figure 6).

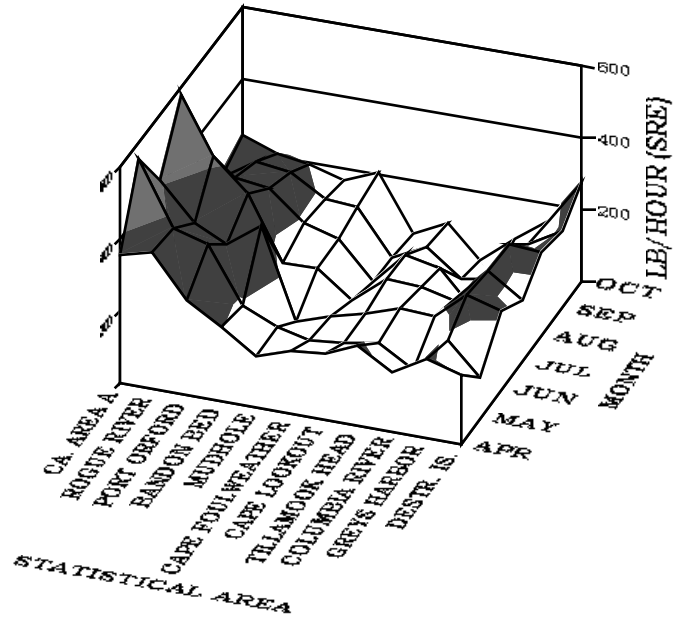


Figure 6. Catch per unit effort (preliminary) by area and month for the 1991 pink shrimp fishery.

Growth of age-1 shrimp was slower during 1991 than in 1990. Mean carapace lengths at age-1 were generally at or below the lower end of the range seen since about 1978. Age-2 shrimp were slightly larger at age than in 1990 but were still at the lower end of the size range seen since 1978.

Larval survival was apparently better in 1991 than in 1990. Age-zero shrimp were observed in all areas sampled during October 1991 with levels suggesting better recruitment than in 1990. The percentage of age-zero shrimp in areas 19 and 20 reached 16.8% and 24.0% respectively during October 1991, much higher than in 1990. Samples from areas 30 and 32 showed a slight decrease from 1990 levels of 2.1% and 0.7% respectively.

The sex composition of pink shrimp in the fall of 1991 was characterized by moderate levels of age-1 (primary) females when compared to recent years, and was much higher than the low levels seen in 1990. This increase was expected due to the low abundance of age-2 and age-3 shrimp at the end of the season. However, the moderate levels seen in 1991 may be further evidence that the 1990 brood was not exceptionally strong. This may mean fewer two year-old shrimp in the upcoming season.

## Research

### Ovigerous Females

One research project which we completed this past year is an assessment of the potential impact of catching egg-bearing shrimp. We receive comments almost every year from south coast fishermen and processors asking why we allow trawl fishing in April when so many shrimp are still ovigerous (with eggs). The commenters often suggest delaying the season opening to allow these shrimp to release larvae before being caught. In an effort to address these concerns, we compiled all of the available data on the harvest of egg-bearing shrimp, coastwide, and attempted to quantify the impact that catching these shrimp could be having on the population. The following is a brief synopsis of our findings and the possible implications for future shrimp management.

The average percentage of egg-bearing shrimp in the catch is highest in April in southern areas and highest in October in northern areas. Generally, when levels of egg-bearing shrimp are elevated in one area, they are also higher in other areas (Figures 7 and 8). Spring of 1989 was a good example of this, when high levels of egg-bearing shrimp were encountered coastwide. The percentage of egg-bearing shrimp in October in northern areas ranges from nearly zero to over 20% in some years. In April on the south coast, levels range from nearly zero to over 15% of the catch. These graphs demonstrate that while large catches of egg-bearing shrimp do not occur every year, they are a fairly frequent event.

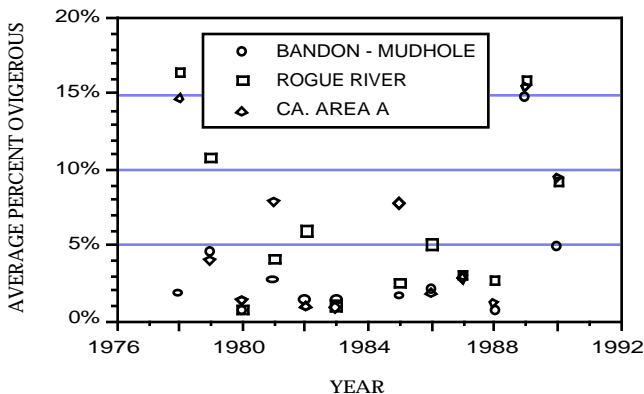


Figure 7. The average percentage of egg-bearing shrimp in the April catch for the southern fishing areas.

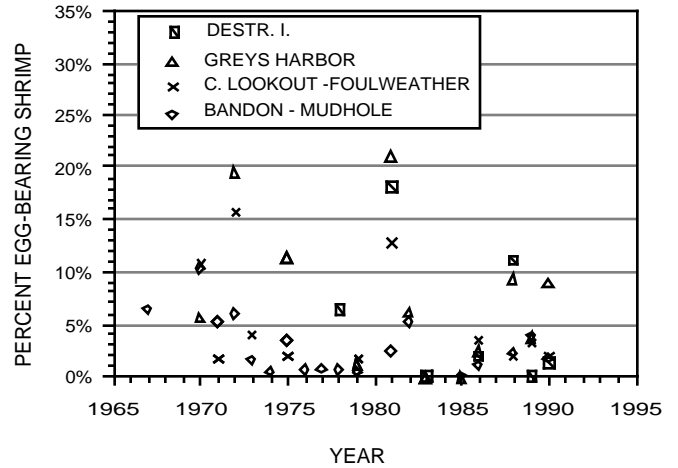


Figure 8. The average percentage of egg-bearing shrimp in the October catch for the northern fishing areas.

The important measure, however, is not the percentage of the catch that shows eggs, but rather the percentage of the total female population which is caught before completing larval release. Our estimates of the percentage of female shrimp which were caught before completing larval release, for April, on the south coast, are shown in Figure 9. As you can see, in about three out of twelve years more than 5% of the females on the south coast are caught before releasing their larvae, with levels above 15% occurring occasionally.

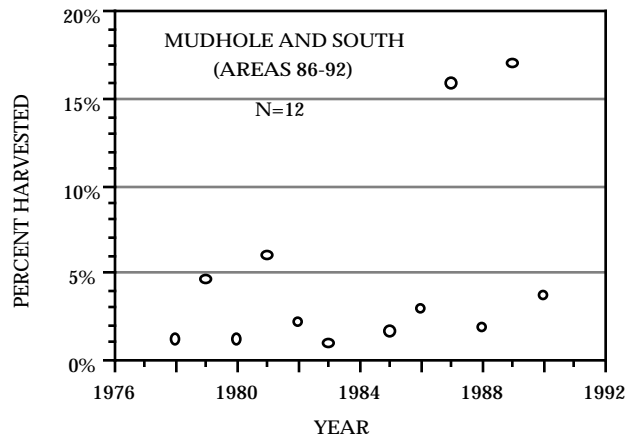


Figure 9. The estimated percentage of the female shrimp population captured before completing larval release (south coast only).

There are two reasons why these impacts on the south coast could be important, while similar catches in October on the north coast are probably not. First, as far as we know, any female shrimp in October will be egg-bearing sooner or later, so there's really nothing special about egg-bearing shrimp in October. Many of these shrimp will not survive through the winter to complete larval release, so harvesting them

should not heavily impact the population. In April, however, these shrimp will be releasing larvae very soon and most of them would survive and complete larval release if they were not caught. In fact, most would still be available for harvest shortly after larval release, and could be caught with much less potential impact on the stock's reproductive output. Second, we've noted that when the shrimp stock is depressed, it is usually weakest on the south coast. We have evidence that shrimp larvae released later, after the spring transition in currents, may have a better chance of surviving than shrimp larvae released earlier. Although we have no direct evidence to prove it, the coincidence of large catches of egg-bearing shrimp in April and the weakness of recruitment in southern areas in some years suggests that reducing these catches might improve shrimp recruitment.

The data on the percentage of egg-bearing shrimp by day of the month (Figure 10) suggests that a very minor modification of the season opening date would largely reduce the impact on the spawning population. With the exception of the southernmost area, Area 92, an opening date of April 15th would nearly eliminate the catch of egg-bearing shrimp. An April 15th opener would still allow some harvest of egg-bearing shrimp in Area 92, but should substantially reduce the impact.

Biologists from the California Dept. of Fish and Game have been in favor of such a change in the opening date for shrimp for quite some time. We believe that Oregon and Washington fishermen would also benefit directly and indirectly from such a change, through better protection of the egg-bearing females. While the loss of two weeks of fishing time is a substantial change, we believe that such a change would have virtually no impact on total catch. We would like to receive comments from fishermen and processors regarding this type of season change.

### Ocean Environmental Conditions

Another research project which was completed this past year was our study of how the ocean environment influences shrimp recruitment. We

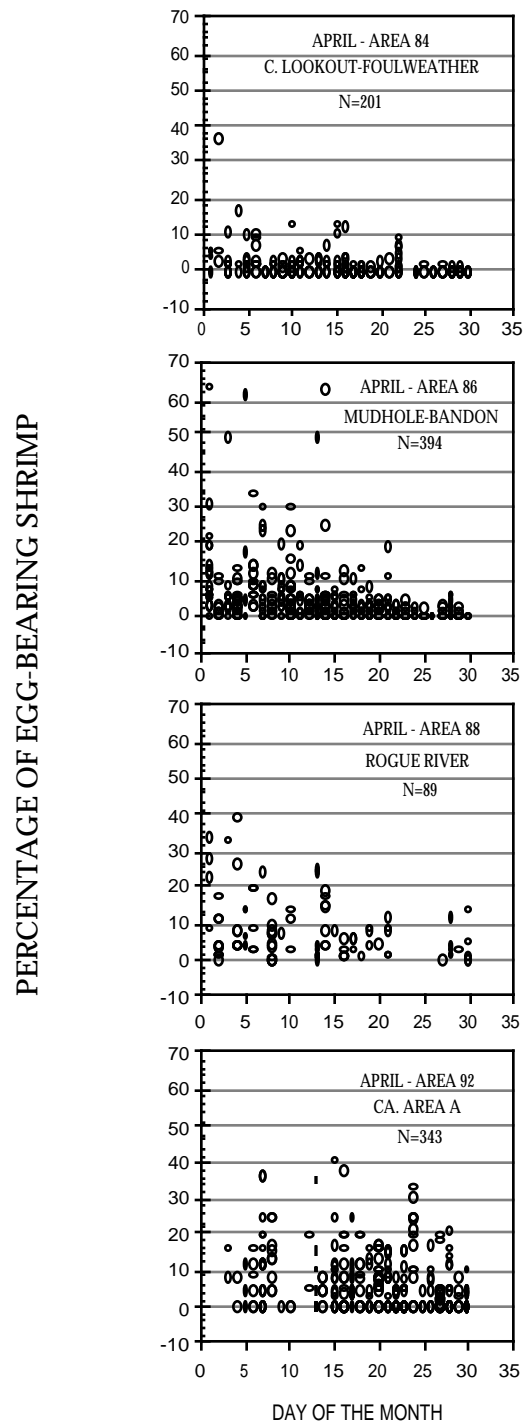


Figure 10. The percentage of egg-bearing shrimp in April samples for south coast fishing areas, by sample date.

identified two environmental factors which seem to be important for the survival of shrimp larvae and pre-recruits. First, a strong spring transition in weather conditions and currents at the time of larval release is correlated with good shrimp recruitment the following year. The spring transition occurs when the northwest winds blow strong enough in March and April to reverse the dominant currents from northward to southward. The transition is probably best

reflected in the magnitude of the March-April drop in sea level which occurs (Figure 11). This event signals the onset of the upwelling season and probably provides for beneficial transport of shrimp larvae, which have just been released at this time.

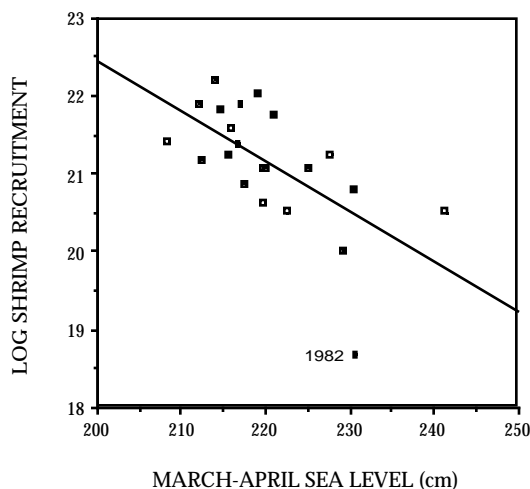


Figure 11. The natural log of the pink shrimp recruitment index versus mean sea level at Crescent City, California, in March-April of the year of larval release. Data shown are for spring larval release for the years 1967-88.

The other variable which seems to be important is the strength of the southerly winds during the winter following larval release. The strength of the winter atmospheric circulation effects currents, sea levels, and sea temperatures along the Oregon coast, and is strongly influenced by events occurring thousands of miles away, such as El Niños. You can see the effect on shrimp recruitment using the Bakun upwelling index from the January-February period (Figure 12). When this index is strongly negative, recruitment is depressed. When this index is nearer zero, shrimp recruitment is better. The way in which this probably effects shrimp is that when winter southerly winds are strong throughout the Pacific region, we get a lot of northward transport of water, and then get less southerly flow of nutrient rich subarctic water throughout the following spring and summer. If this weakness in southward flow depresses zooplankton populations, then natural mortality rates of shrimp could be increased.

So, how do these variables look for the incoming age-1 year-class? The spring transition in 1991 was about average, and we saw good numbers of age zero shrimp last fall, although they were

small in size. However, the January-February mean Bakun index was -148, strongly negative. This suggests that we may see an average to weaker than average age-1 year-class in 1992. I should state that our environmental model is far from perfect, only giving an indication of whether we can expect a better than average recruitment or worse than average. In summary, the age-zero abundances last fall and the 1991 spring transition suggest an average level of recruitment, while the winter Bakun index suggests that recruitment will be somewhat weaker than average.

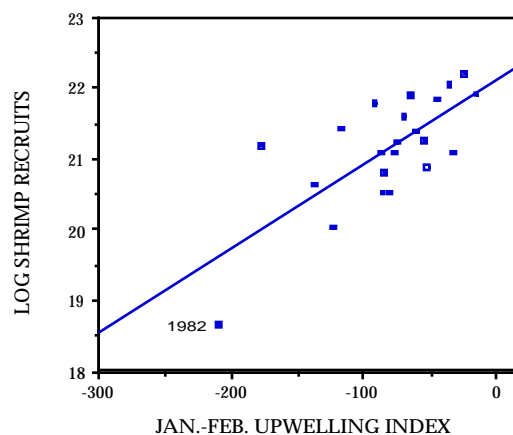


Figure 12. The natural log of the pink shrimp recruitment index versus the mean upwelling index at 45° N. latitude, 125° W. longitude, during January-February of the year following larval release. Data shown are for spring larval release, 1967-88.

## Gear Survey

As many of you know, we conducted a small survey of fishing gear in 1991. Probably one of the most surprising findings (to us!) in this study was that most fishermen are still not using the best scales to estimate count-per-pound at sea. Due to the lack of age three shrimp which we can expect this year (from the 1989 year class failure), we may have some count problems in the first half of this season. The Oregon State Police will be actively monitoring count again this year, and the Washington Dept. of Fisheries is stepping up their work with the Washington Patrol. The best way to protect yourself is to get a good scale and monitor the count frequently. We recommend a magnetically dampened triple beam scale, that can be read to the nearest one gram. For more information on where to get these scales, or for questions regarding any of the information in this newsletter, please contact us at (503) 867-4741.

One final note; California may be actively

enforcing their mesh size regulation again this year, possibly including at-sea enforcement. If you fish in California waters, you need to be fishing a codend with a minimum mesh size of 1-3/8" between the knots. Our survey showed that almost all Oregon vessels, including south coast vessels, are currently fishing codend mesh which is too small to be legal in California.

Washington, on the other hand, is seriously considering dropping their mesh regulation entirely, so northcoast vessels are not likely to have a problem with mesh.

### **Domoic Acid Sampling**

At the request of industry, we embarked on a sampling project to gather pre-season shrimp samples to test them for the presence of domoic acid. Considering the food habits of pink shrimp and their off-shore distribution, it seems a remote possibility that they would have any effects from domoic acid. However, the pink shrimp fishery is an important and valuable one, and we wanted to do whatever we could to address this issue before the start of the season. This study

was conducted in cooperation with the Oregon Dept. of Agriculture, Washington Dept. of Fisheries, and the Washington Dept. of Agriculture. We'd especially like to thank Nick Rusinovitch and the crew of the Ginger B for taking us out to collect the domoic acid samples, and Seafood Sales of Astoria for processing the samples. This sampling project could not have been accomplished without their generous assistance.

As we expected, the results of the domoic acid sampling for shrimp were all **NEGATIVE**. Given the location and wide coverage of the samples tested, we've decided not to collect further pre-season samples, although it is possible that the Dept. of Agriculture will collect some market samples after the season starts. As a footnote, we also submitted a squid sample from off Cascade Head for domoic acid testing, just in case this fishery gets going again this year. This sample also tested negative for domoic acid.



**Oregon Department of Fish and Wildlife  
Marine Region  
Marine Science Dr., Bldg. #3  
Newport, OR 97365**