

Trip Report of the Shellfish Meeting at Brinnon, Washington.  
Prince William Sound Pot Shrimp Fisheries Management as compared  
to Hood Canal, Washington and British Columbia, Canada.

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Brief review of the Pot Shrimp Fishery in Prince William Sound

The Prince William Sound Pot Shrimp Fishery for spot (Pandalus platyceros) and coonstripe (Pandalus hypsinotus) shrimp began as a small fishery in 1960. During the 1960's and 1970's fishery landings were minor compared to other shellfish fisheries in the Prince William Sound Area or other pot shrimp fisheries in Alaska, British Columbia and Washington State. From the late 1970's and throughout the 1980's effort and catch increased yearly.

Today spot shrimp accounts for 95 percent of the 230,000 - 250,000 pound annual harvest. The annual ex-vessel value is \$750,000 to the commercial fleet. Approximately 80 commercial vessels and numerous sport and subsistence users enjoy the resource. Major fishing areas are located from Port Valdez along the North Shore to Port Wells, throughout fiords in the Northwestern and Western Sound and around the islands of Knight, Chenega, Perry and Green.

Shrimp pots are longlined and fished singly. The depth of adult shrimp concentrations ranges from approximately 25 to 110 fathoms. The only gear regulation currently in effect, to protect shrimp, is the requirement of biodegradable twine attached to the pot in a manner which initiates a timed release opening to allow shrimp to escape lost fishing pots.

Fishery statistics are received through mandatory fish ticket sales slips and logbook data. Although mandatory, sales slips are late and in some cases not submitted. The Department of Fish and Game is attempting to convince commercial operators the importance of obtaining accurate fisheries statistics to judge the impact of the current harvest level. Commercial catch is recorded by statistical areas to apportion effort and catch. Current average harvests per pot range from .2 to 1.2 pounds of tails per pot. Non-commercial harvest statistics are not available.

Prior to 1982 fishing occurred during all life history events. In 1982, due to the rapid expansion of catch and effort, the fishery was closed during the peak egg bearing period of the winter months December through March. A guideline harvest range of 75,000 - 145,000 pounds was also established to allow assessment of the stock during rapid expansion. Length frequency data, incidence of egg bearing females and a growth and migration tagging program on adult spot shrimp began by the Department of Fish and Game during this period.

The guideline harvest range was increased again by the Alaska Board of Fisheries for 1985. In addition three harvest areas were established. Two are year around experimental areas to test the effects of continuous fishing on shrimp stocks and to provide an economic alternative to commercial fishermen. The third area was reserved for fishing during the spring and fall. The guideline harvest level increased to 150,000 to 200,000 pounds for this time restricted fishery however harvests do occur during egg bearing and egg release periods. The total area annual harvest was now over 230,000 pounds. Both experimental all year areas have provided economic alternatives to the fleet. Both catch and effort diminished during 1987 in the most productive of the two all year areas from 1986 and 1985 levels.

The tagging project was recently completed. Results for Prince William Sound suggest two molting periods, spring and fall. Average annual growth of adults is approximately 3 millimeters. Multiple recapture of the same female has shown that they are capable of producing more than one egg clutch and adults are available for capture four or five years after entering saleable size of 30 millimeters. A near egg free period from May through mid-August was shown through the logbook program. Migration, from the tagging study, appears to be negligible.

Issues to be addressed are; 1) fishing during the egg bearing or egg release season. 2) Gear regulations to allow the release of small shrimp. 3) Compare size frequency data over time to evaluate the effects of our current harvest level. 4) Monitor the size of egg bearing females over time to detect changes in fecundity. 5) define life history events of juvenile spot shrimp.

### British Columbia Pot Shrimp

British Columbia - Total catch from the North and South Coasts has been approximately 1.2 million pounds a year. Total allowable catch is determined in-season based on the average number of egg bearing and potential egg bearing shrimp in commercial gear. Commercial effort continues until the average number of egg bearing and potential egg bearing shrimp drops below guidelines set by the Department of Fisheries and Oceans. The harvest is taken by 250 vessels. Similar to Prince William Sound Management Area, British Columbia's pot shrimp fishery began with a rapid expansion in catch and effort in 1978. A management plan was instituted as a result of the sudden expansion. The plan allows harvests to occur on stocks while attempting to maintain a brood stock. The key feature of this plan is to ensure a predetermined level of spawners are maintained at all times.

The required level of spawners varies monthly due to local shrimp life history events and the reduction of males, transitionals, and females due to the commercial fishery. These predetermined levels were arrived at from test fishing in Knight and Kingcome Inlets from 1973 to 1982 using a round pardiac trap (60 x 60 x 24 cm.) on a 24 hour soak with herring bait. These areas are major production areas in the pot shrimp fishery. The index is largest in April at 3.8 spawners/pot and declines to 1.0 spawners/pot by March. Using the spawner index during in-season management requires multiple vessel analysis in a given area of fishing. This limits usefulness to only the South Coast fishery which receives the most effort.

Sampling in-season is labor intensive. One full time employee devotes 5-6 months a year to travel to obtain the necessary samples throughout the year. Sampling does not occur each month of the year, however an index is available if samples are taken. Variations of trap type, soak time, bait and experience of each fisherman are not taken into account. Sex determination of shrimp is accomplished by visual inspection of pleopods while on board each vessel. Due to the limitations of sampling a large geographic area, some management areas are closed without obtaining management information on stock condition prior to the closure.

In 1984 the fishery was closed in late winter due to indices of spawners per pot below the predetermined levels set by the DFO. This may signal that the monthly spawner indices do not sustain a fishery. Intuitively, I believe an index of between 1 and 4 spawners/pot is a very low level of fecundity considering the average egg count per female at Petersburg, Alaska was less than 4000 eggs. As a comparison, a Dungeness crab may carry 1.0 million eggs, a Tanner crab 250,000. Catch per unit of effort when fishing on one spawner/pot would be extremely low and perhaps unprofitable. In addition the harvest rate of females appears high and most females probably only produce one egg clutch before being harvested which is contrary to their ability and life expectancy. In response to inherent problems with this style of management the DFO will now set aside six experimental areas, along their coast, to evaluate their stocks. Specific areas of research will focus on A) developing stock assessment techniques (effort standardization) B) artificial manipulation of a stock to understand the affect of various exploitation rates on recruitment. Some stocks will be heavily fished while others will remain at high stock abundance as they will not be fished or

lightly fished. Along with recruitment monitoring, natural and fishing mortalities, growth rate, density dependent growth, survival and catchability will be assessed. The commercial fleet will be allowed to do the majority of the fishing under a special permit with researchers sampling the catch at the beginning and end of each fishery as well as during the closed season. Ultimately this information will be used to formulate new management plans for fishery managers.

Implementation of a minimum size limit of 30 mm carapace length proved to be unenforceable. As a result new mesh restrictions will take effect April 1988, for each of the three predominant gear types.

- A) Soft Mesh Traps - 1.5 inch mesh on the entire pot.
- B) Solid Sided Traps - Tunnels must use mesh such that a square peg 3/4 inch will pass through unobstructed or four slots at least 5/8 inch wide for the entire length of the trap.
- C) Wire Mesh Traps - Four opposing tunnels required, the web of each tunnel must allow a 7/8 inch square peg to pass through unobstructed. The lower side of each tunnel must extend to the bottom edge of each trap and be at least one half the length of the trap side. Alternatively wire mesh traps may have the bottom and two opposing sides constructed of mesh to allow the passage of a 3/4 inch peg.

A parasitic barnacle has been reported from the North Coast fishery of the genus Sylon. There is speculation that this barnacle may cause castration. Infection rates have been recorded to 40%.

Other research projects will focus on locating larval concentrations and factors which effect changes in year class strength. Jim Boutillier, who has been at the center of Canadian pot shrimp research, indicated that stocks are to be utilized, however, overexploitation can also force the entire closure of a fishery for a long time. Concerning growth rate, he acknowledges variations with latitude and the need for a lower harvest rate on slower growing longer lived animals.

#### Washington Pot Shrimp

Washington - The Hood Canal Pot Shrimp Fishery can be considered an inland waters fishery where access to the grounds is easier than in Canadian or Alaskan pot shrimp fisheries. Total harvest is 180,000 - 200,000 pounds which accounts for 70% of Puget Sound shrimp production. Approximately 8,000 sport harvesters take 75% of the catch, while 120 commercial operators harvest the remainder. The sport season opens during the third week of May while the commercial season opens during the first week of June.

The fishery is currently managed by obtaining preseason length frequency samples along with catch per unit of effort before the season. From this information a season length is set for both commercial and sport operators, taking into account current effort trends. WDF makes in-season effort surveys by counting the number of pots fishing both commercial and sport. Logbooks and fish tickets are mandatory for commercial operators to determine cpue and total harvest. Logbooks and questionnaires are distributed to a percentage of the sport harvesters based on their effort surveys to track their performance. The Hood Canal fishery is compact and an

entire effort survey of the grounds can be conducted in six hours.

The fishery collapsed in the mid 1970's. As a result the State of Washington decided to control effort through pot limits of 50 for commercial operators and two for each sport harvester. A 10 pound bag limit restriction is placed on each sport harvester. All gear must use mesh to allow a 7/8" square peg to pass through.

Catch per unit of effort of the collapsed fishery was .25 pounds per pot during 1974 and 1975. The fishery was totally closed in 1976 with a limited reopening in 1977. Today the initial cpue is 3.0 pounds per pot of whole shrimp and declines to approximately .6 pound or an 80% decline by the season end. Production is twice the level of the 1970's with relatively stable levels of recruitment.

Both British Columbia and Washington agree that individual maximum growth may be density dependent. In Hood Canal during the mid 70's when the stock was low, shrimp grew to 50 - 55 mm carapace length. Today with stock conditions improved shrimp are seen in the 40 - 45 mm size range. At face value this seems interesting, however the effects of fishing on growth/molt as well as the size of male transition to females has been documented to occur at an earlier age where intense commercial harvest reduces the number of large females in the population.

#### Recommendations for the Prince William Sound Pot Shrimp Fishery

Based on discussions at the meeting, possible changes to our fishery may be to shift the fishery away from the egg bearing and egg release periods. These periods appear to occur from mid-September to mid-April, however, there may be some temporal differences within the Sound. Test fishing by the Department could define this season further. Since total population estimates have not been developed, thereby permitting precise harvest of a defined portion of the stock, a conservative alternative approach permits harvest only when females do not have eggs. This allows for maximum reproductive advantage to those individuals which have reached the egg bearing size.

A summer or early fall season would take advantage of annual somatic (body) growth. Since the value of the product is determined by size, growth should increase the value to the fishermen.

Vessel time should be allocated to obtaining size frequency analysis in selected locations only. A key feature of this plan, if adopted, would be thorough consensus among the public and the Department that each nook and cranny or favorite fishing hole cannot be sampled. Other sampling constraints are vessel time, capability and input from the public. This sampling would allow a yearly look at the stocks for recruitment trends which could be used to adjust the harvest range to the lower, middle or upper end. This annual "look" may not satisfy opponents of the current management plan, however, it may help refute some of their allegations about spot shrimp biology and appropriate harvest levels.

Due to the relative value of this fishery a proposed five day annual index would seem appropriate. Three survey sites could be fished per day with

three depths per survey site. Three sites would be located along the North Shore, three sites in the Port Wells, Culross Pass area and three sites near Knight and Chenega Islands.

The 1989 spring shellfish board meeting will consider changes to pot shrimp fishing in Prince William Sound. At that meeting the Department plans to present an analysis of the Montague Strait Experimental Harvest Area along with the Eastern Harvest Area which will contain a recommendation to retain or eliminate these areas.

Prince William Sound is also in need of a mesh requirement to allow non-marketable shrimp to escape and prevent wastage. In general 30 mm carapace length appears to be the consensus among biologists in B.C. and Washington to allow escapement, however since growth/molt is less in Alaska, and saleable size may also differ, we will have to decide which size is best for this fishery. Work should begin to address this gear requirement. Notice should be sent to all participants informing them of possible gear changes.

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