

- "brailing" to bring salmon caught in their nets to the deck for sorting so non-targeted salmon can be released unharmed.
- Severely limiting the number of chinook gill net fishers can keep when they fish for pink and sockeye salmon
- Requiring reef net fishers to release all chinook in sockeye, pink and coho fisheries

WDFW also is working with the commercial fishing industry to develop a long-range plan to better monitor the incidental catch of non-targeted species and develop new ways to harvest fish from plentiful stocks while minimizing harm to protected fish. The National Marine Fisheries Service, as well as other federal agencies and the tribes, participated in the development of these goals, which are the foundation for commercial and sport fishing seasons.

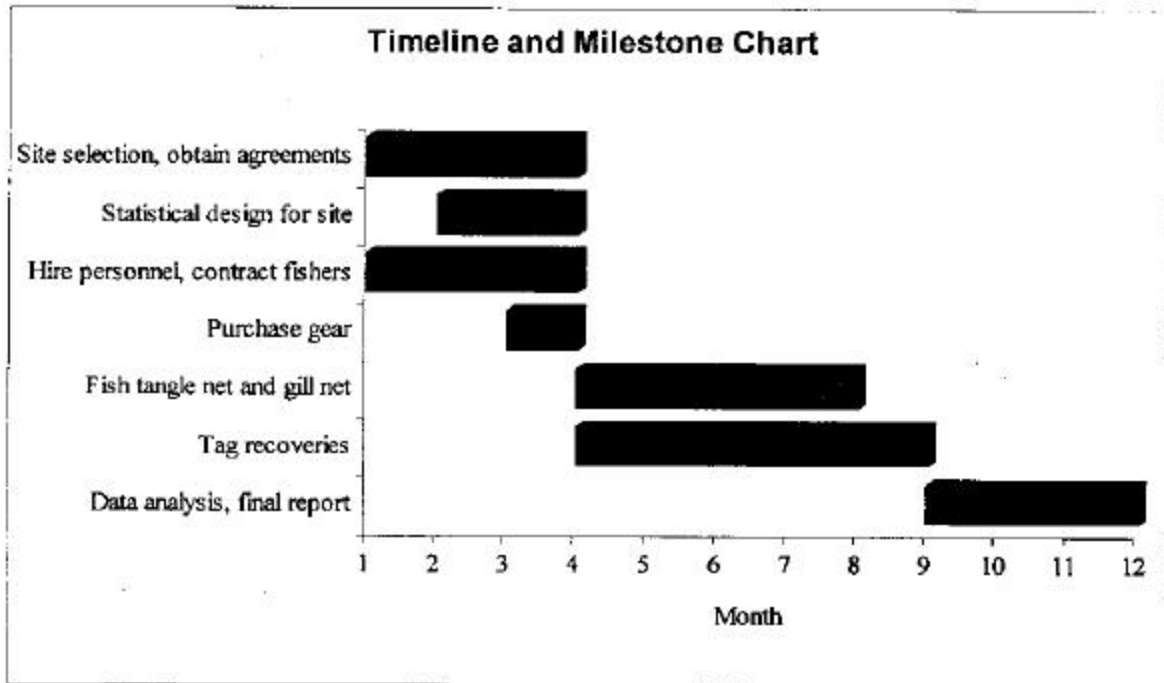
While WDFW is able to fund efforts such as mass marking hatchery fish, developing selective recreational fisheries, and implementing fishing and gear restrictions, the agency's budget is insufficient for assisting commercial and tribal fishers to develop new gears. The National Oceanic and Atmospheric Administration's (NOAA) Fisheries Strategic Plan Objective 3, Sustainable Fisheries, has as a performance measure to "Minimize by-catch to the extent practicable, and minimize the mortality of unavoidable by-catch". Strategies to achieve this objective include "We (NOAA) will work in cooperation with the fishing industry and gear manufacturers to improve gear selectivity, design and field test new gear designs and modifications, and evaluate gear regulations". The objectives of this study are therefore compatible with this Strategic Plan and with minimizing the economic impacts of protecting stocks listed under the Endangered Species Act.

We are unable to support this project without external funding. Because the project aligns with the goals and objectives of both NOAA and WDFW, a partnership seems appropriate. In addition, if this gear type is successful, it will be useful to fishers outside the boundaries of Washington State, further meriting federal cost-sharing.

(e) Federal, State and Local Government Activities and Permits

The fisheries in this study will be conducted as test fisheries. Test fisheries in Washington do not require permits, but do require formal agreement with affected tribes. All agreements will be made during the fishing area selection process. The Puget Sound Fisheries Management Plan requires additional notification of any tribe that may be affected by or interested in the test fishery. All notifications will also be made during the fishing area selection process. The WDFW attorney will be consulted during this process to ensure all activities fall within test fisheries, and that all legal requirements are met. Geraldine Vander Haegen and Lee Blankenship will be responsible for obtaining all agreements and making notifications.

(f) Project Statement of Work



Our project design has three parts: Preparation, data collection and data analysis. Because the project schedule depends on the timing of the fisheries, the actual time line may have to be adjusted. Geraldine Vander Haegen is responsible for overseeing completion of the project.

Part I: Preparation

This part of the project includes final site selection, hiring technicians, contracting with fishers, obtaining permits and purchasing gear.

1. **Area Selection and Statistical Design:** Obtain agreement between co-managers on specific sites and times for testing selective fishing gear. Several sites with the following characteristics for testing the gear will be selected: proximity to areas where visual tags are likely to be recovered, appropriateness of the site for the gear and the probable presence of fish. Given the rapid changes in fisheries management and fishery conditions in Washington, sites that we could select now might not be useable by the time the study starts. However, numerous appropriate sites exist, and we will select alternate or additional sites as necessary. Site selection will be done by the applicants and the fishery co-managers in each area. The final details for testing the gear, such as the number of samples to collect, the number of days to fish, etc. will be unique to each site, and will be set before any fishing begins by the biologists involved, with the advice of WDFW biometricians Dr. Annette Hoffman and Pete Hahn. We do not expect that we will be able to address all of the objectives at each site. Rather, it will take a combination of sites and replicates to answer our questions.

To begin the process, we are considering two potential sites for testing our gear. The first site is a fishing area of the Suquamish Tribe at Miller Bay, WA. The Suquamish Tribe has a directed gill net fishery for coho at this site, but their access is restricted by the need to reduce harvest on adult chinook returning to a nearby hatchery. At this site, we would be able to test how well the tangle net can catch coho, the target species, and how well we can live release chinook. Because of the proximity of the hatchery to which the chinook are returning, we will also have an opportunity to evaluate the long-term survival of released chinook. Jay Zischke, Harvest Management Biologist for the Suquamish Tribe, has expressed his support for this project.

A second potential site is the Deschutes River system in Olympia, Washington. The river drains into man-made Capitol Lake and then into Puget Sound. A run of fall chinook was established in 1947 and is maintained by hatchery production. This population is currently listed under the Endangered Species Act, however, because it is not a native stock, it is possible that it will be excluded. If so, this stock would be a good candidate for our study. Because of potential conflicts with sport fishers, we would not use a conventional gill net at this site. Rather, we would fish the tangle net and release all fish caught to estimate the post-release mortality. All fish returning to the Deschutes River must enter Capitol Lake through a narrow opening. At this site, we could capture and release a large number of chinook as they migrate towards the hatchery. Net pens are available for holding adults. Tests at this site would be in cooperation with the Squaxin Island Tribe, and the WDFW staff at Tumwater Falls Hatchery. Rebecca Bernard, Fish Biologist for the Squaxin Island Tribe has expressed support for this project.

All impacts or take of fish will be consistent with the agreements, policies and management principles of the fishery co-managers. Throughout the project, we will host meetings with the co-managers and local fishing groups to obtain support, information, to modify the project when necessary, and to report on progress. Geraldine Vander Haegen and Lee Blankenship will oversee site selection and obtain agreements with affected co-managers.

2. **Personnel:** We will hire a technician for 6 months, from month 3 through 8, to assist with preparation and all aspects of data collection. This position will be at the WDFW Scientific Technician 3 level. WDFW requires that new positions first be advertized in-house, but if no suitable candidates are found, it can be opened up to everyone. With the assistance of involved tribal biologists, Geraldine Vander Haegen will be hire and supervise the technician.

Depending on the site fished, we will either contract with fishers on a per day basis, in which case they will not keep the catch, or we will cooperate with fishers to collect data during fisheries when they would keep the catch of target species. In general, if we are fishing the tangle net, we will contract on a per day basis, but if we are collecting data about a conventional gill net catch, we will post the technician on board a boat by agreement with volunteer fishers. With the help of involved tribal biologists, Geraldine Vander Haegen and Lee Blankenship will be responsible for procuring contracts and agreements with fishers. All contracts will be procured by competitive bids from at least three fishers that meet specific criteria for the study. Criteria will include such things as the seaworthiness of their boat, ability to adapt the boat to the project, and the experience of the fishers. Known reliable fishers in each area will be contacted.

We will consult with BC fishers and researchers evaluating the tangle nets on the Fraser River . We will progress quickly by using the expertise developed there. Mr. Mark Pctrunia, a Fraser River fisher, has expressed interest in sharing his experience with handling and fishing

techniques. Because Mr. Petrunia is the only fisher with experience using this gear, this will be a sole source contract.

3. **Purchase and prepare gear:** Because tangle nets are not widely used, they must be custom made, so we will purchase the nets we will need for this study. Gill net boats will require little modification except the set up of a recovery tank for tagged fish. The holding tank on most gill net boats can be outfitted with a pump and hose to supply fresh water to live fish, and to revive fish when necessary.

Vehicles for the technician and principle investigators will be leased from WDFW on an as-needed basis. Office space and storage space for equipment will be provided at existing WDFW facilities in Olympia, WA. Computers will be provided by WDFW. Boats for actual fishing will be provided by the fishers as part of their contract. Boats for checking fish held for observation will be leased from WDFW as-needed. Net pens for holding adults will be provided by WDFW or other agencies if existing facilities have space available. Supplies such as safety gear, rain gear, data forms and other small sampling equipment will be purchased. Geraldine Vander Haegen, the technician and involved tribal biologists will be responsible for obtaining necessary equipment. The technician will maintain and repair all equipment except private boats.

4. **Notification:** Before fishing, appropriate hatchery personnel, biologists, spawning ground surveyors, and fishers will be alerted to look for the tags, and about how to contact us. As much as possible, we will visit with these groups in person and share the project goals and objectives with them. We will distribute information sheets requesting that the following information be provided for each tag recovered: the tag number, the location where it was recovered, the date when it was recovered and how it was recovered (e.g. sport fishery, spawning ground survey, etc.). Biologists and hatchery personnel will be asked to grade live fish according to the 5-tiered grading system. Spawning ground surveyors will indicate whether the fish had spawned.

Part II Data Collection

This part of the project involves the actual fishing and egg viability studies. The technician will be completely involved in data collection, with the assistance of Geraldine Vander Haegen, tribal biologists, hatchery personnel, contracted fishers, and occasionally other WDFW biologists. Geraldine Vander Haegen will oversee data collection.

1. The tangle net will be fished on several different occasions at several sites in each fishing area. Depending on the fishing area, a conventional gill net will either be fished simultaneously or the gear fished will be randomized by fishing day. A technician will be posted aboard during all fishing trips. The technician will be trained in handling and releasing fish, collecting biological data, tagging fish and releasing fish.
2. In tests of selective fishing gear made in British Columbia, the handling and release procedures of the fish were the most important determinants of a fish's chance for survival (Brent Hargreaves, Fisheries and Oceans Canada, pers. comm.). We will standardize handling and release procedures of fish, and require that the fishers and technicians use the least stressful methods for releasing and reviving fish possible. The experience of fishers already successful with this gear will greatly speed our progress.

3. The tangle net and conventional gears will be fished in several different locations and target as many different species as possible. Sites and gears used on any given day will be randomized. We expect the tangle net will have a lower catch per unit of effort than conventional gill nets, because careful release of non-target fish must not be rushed. For every set that the net is fished, location, depth, start and end times, weather conditions, water temperature, length of net set and hang ratio (the amount of slack in the net) will be recorded.
4. During every fishing trip, the catch of salmonids will be extensively characterized and the fish will be tagged before release. Any species other than a salmonid will be counted then released immediately. All salmonids will be brought on board and placed in a holding tank supplied with fresh water, and held until all fish in the set have been released from the net. Holding and handling time will be kept as short as possible, and the next set will not begin until all the fish from the previous set have been processed.

Live salmon will be gently restrained, and the following data will be collected from every fish or from a representative group depending on the size of the catch: species, marks or tags already present, fork length, sex, age (by removal of non-regenerated scales), seal marks and any indications that the fish had already been released in another fishery (e.g. the presence of hooks, line scarring). Each fish will be visually checked for scarring, surface bruising, scale loss, and liveliness and then graded based on the following criteria developed by Fisheries and Oceans Canada for selective fishing experiments:

Grade A	No obvious surface bruising, marking or scale loss; undamaged and fish active in the water.
Grade B	Some evidence of slight damage, less than 5% scale loss, but no significant surface damage, less than fully active.
Grade C	Evidence of bruising, more than 5% scale loss, and other surface markings.
Grade D	Fish not lively in the water.
Grade E	Dead.

The number of dead salmon will be recorded by species, and biological data, including the probable cause of death (e.g. seal attack, entanglement) will be noted.

Once the biological data are collected, the fish will be tagged with a brightly colored numbered jaw tag, revived, dipped in a mucous stimulating bath (such as acetic acid) and released. Jaw tags have a high retention rate and are obvious for spawning ground surveyors or fishery recoveries. The numbering will allow us to relate the survival of each recaptured fish to its condition grade when it was originally captured in the tangle net.

Other studies have shown 80% of the hooking mortality of adult salmon occurs within 2 to 3 days of release (Bendock and Alexandersdottir 1993; Mongillo 1984; Warner 1979) and within 15 minutes for first year ocean fish (Gjernes et al. 1993). In this study, we will assume that short-term mortality occurs within 24 hours after capture, because 24 hours is the longest we expect fish can be held without incurring holding effects. To estimate the proportion of released fish that survive at least 24 hours, we will hold up to 10 fish per day for 24 hours in individual PVC and canvas containers or net pens, if available. Fish will be randomly selected from each species and each condition grade at capture. The fish will be dipped in a mucous-stimulating bath and placed into a container or the net pen. The containers are perforated to allow water circulation and will be attached to an anchor line in calm, but sufficiently aerated, water close to the fishing site. After 24 hours, the condition of the fish will be noted, based on the 5-tiered

grading system. All live fish will be immediately released.

References:

- ▶ Bendock, T & M. Alexandersdottir. 1993. Hooking mortality of chinook salmon released in the Kenai River, Alaska. *N. Amer. J. Fish. Manage.* 13:540-549.
- ▶ Mongillo, P.E. 1984. A summary of salmonid hooking mortality. Washington Department of Game, Fish Management Division, Seattle.
- ▶ Warner, K. 1979. Mortality of landlocked Atlantic salmon hooked on four types of fishing gear at the hatchery. *Prog. Fish-Cult.* 41:99-102
- ▶ Gjernes, T., A.R. Kronlund & T.J. Mulligan. 1993. Mortality of chinook and coho salmon in their first year of ocean life following catch and release by anglers. *N. Amer. J. Fish. Manage.* 13:524-539.

Part III Data Analysis and Reporting

Data will be analyzed by Geraldine Vander Haegen and Lee Blankenship with the assistance of tribal biologists. The biometrician will be consulted throughout the experiment and analysis to ensure the results are statistically defensible. The results will be reported in semi-annual reports and submitted to a peer-reviewed journal for publication.

(g) Participation by Persons or Groups Other Than the Applicant

Successful completion of this project depends on the participation of tribes with interests in the areas we select for test fisheries. To date, the Squaxin Island and Suquamish tribes have expressed their support for this project, and their willingness to participate in selecting sites and testing gears within their areas. Rebecca Bernard, Fish Biologist will be the lead for the Squaxin Island Tribe, and Jay Zischke, Harvest Management Biologist will be the lead for the Suquamish Tribe. As other sites are considered for test fisheries, we will work with the affected tribes and fishers. All the fishing will require either voluntary or contracted participation of tribal or non-tribal gill netters.

WDFW and tribal hatchery and stream survey crews will participate in recovering tags. Statistical advice will be provided by WDFW biometricians Dr. Annette Hoffman and Pete Hahn. Regional WDFW and tribal biologists will be consulted in each area where we have test fisheries. John Sncva (WDFW) will read scales for aging fish. WDFW attorney Evan Jacoby will be consulted on any legal matters. WDFW administrative personnel will assist with contract procurement, personnel hiring, computer support, etc.

(h) Project Management

Geraldine Vander Haegen, WDFW Fish and Wildlife Biologist and Lee Blankenship, WDFW Research Scientist are the principal investigators (resumes attached). Other principal participants in the project include tribal biologists and WDFW biometricians. The principal investigators will manage this project. Site selection and statistical design will be coordinated and reviewed by the principal investigators and co-managers with the advice of Dr. Annette Hoffman. The principal investigators will obtain all necessary agreements and contracts. Geraldine Vander Haegen will manage the budget, oversee and participate in, data collection and supervise the technician. In consultation with WDFW biometricians, the principal investigators will analyze the data and Geraldine Vander Haegen will provide all reports.