

# Informational Leaflet 9

## KITOI BAY RESEARCH STATION - IT'S DEVELOPMENT, ACCOMPLISHMENTS AND FUTURE

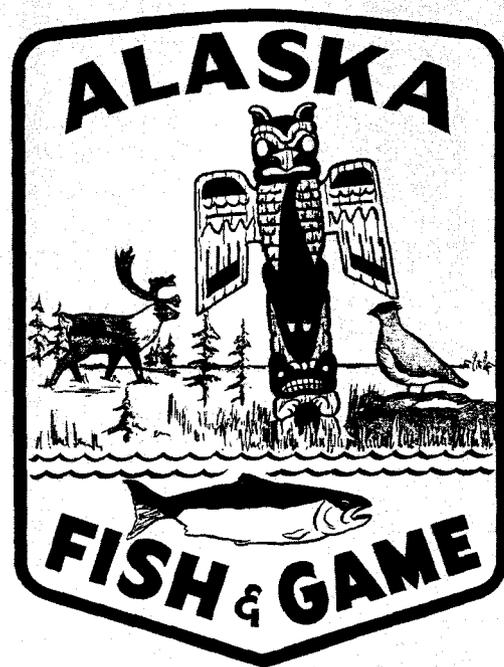
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Accomplishments and Future

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## INTRODUCTION

The Alaska Department of Fish and Game is proud of the Kitoi Bay Station on Afognak Island and the research being accomplished there. It is the purpose of this leaflet to attempt to inform the fishing industry and the general public on the objectives and accomplishments of the research being carried out there and to explain how the work is being done by the department in the management of the fisheries of Alaska.

The station was originally established primarily to study all phases of the freshwater life history of red salmon and particularly in reference to determining the feasibility of utilizing lake systems that are presently not producing salmon. There are many lakes in Alaska that are potentially red salmon producers except that they have barriers such as waterfalls and other obstructions that prevent salmon from ascending to the spawning grounds. The cost of building fishways and otherwise opening these lakes to red salmon and stocking them is very great. Therefore, we must learn practical means of stocking the lakes with fry or adults and the rate in which they should be stocked.

The Kitoi Bay site on Afognak Island was selected after an extensive search of Alaska's coastline. Several factors were taken into consideration. It was essential to find an area containing several lakes not now producing red salmon because of barriers but capable of rearing salmon. The area also had to have a lake which had a natural run of red salmon so the experiments could have reliable controls. Such a situation was found to exist at Kitoi Bay and in 1953 a field camp was established there. The station has grown from a tent on the beach to a well-equipped laboratory.

An experimental hatchery was constructed to rear red salmon to the fry stage and to incubate additional eggs to the eyed stage. The production of fry is devoted almost entirely to experimental plantings of the various lakes near the station. The objective is to learn the optimum number of fry for a particular lake system. Incidental to this program it has been possible to produce some coho fry for the Sport Fish Division and some red salmon have been planted in Frazer Lake for the Commercial Fisheries Division.

At the present time the station consists of the hatchery, a chemical and biological laboratory, and living quarters for the scientific personnel and their families. Since Kitoi is an isolated station it has been impossible to persuade people to remain at the station for any length of time unless their families accompany them.

The station as we see it today was completed with a minimum of funds and largely through the labors of dedicated personnel. Last year research was expanded to studies of pink salmon and predators that prey on young salmon. Special spawning channel study facilities are being built. This expansion of studies in combination with development of year round study programs has necessitated the improvement of the water supply of the hatchery including the installation of a control dam and pipeline and a hydro-electric plant. When this construction is finished in the summer of 1962, the station will be essentially complete. While research efforts have been productive over the years, we look forward to increasing the output of research findings now that the physical plant is nearly complete.

The present staff consists of a senior investigator working on red salmon and his assistant, and a senior investigator working on pink salmon with an assistant assigned to this project also. In addition, there is a full-time maintenance man and about six seasonal biological aids.

## CURRENT RESEARCH ACTIVITIES

### Lake Rehabilitation Studies

We have found that by removing predator and competitor fishes from sockeye salmon rearing lakes we can increase both growth and survival. We are now in the process of determining how many fry should be stocked in rehabilitated and unrehabilitated lakes. These findings have direct application to projects being contemplated by our commercial and sports fish divisions. Shall we attempt to get barren areas into production by guess work or do we wish to know exactly how many fry to put into a given lake system for highest production?

Fisheries people have for years faced the problem, is the size of smolt leaving a lake related to saltwater survival and return? Experiments started at Kitoi Bay in 1961 are designed to answer this question. If the smaller one year old sockeye salmon smolts have just as good saltwater survival as the larger, older smolts, then smaller smolts should be gotten out of the rearing lake. If they holdover in the lake the food supply is taxed and this means less production.

In the summer of 1961 the techniques developed at the Kitoi Station were put to use in other lake systems. Results of a five day survey of Afognak Lake showed the lake to be quite productive and capable of producing many more sockeye salmon than now use the system. In 1962 the Division of Biological Research in cooperation with the Division of Commercial Fisheries, will start a program to increase the numbers of sockeye in Afognak Lake (there was a total run of about 40,000 in 1961). The ultimate goal is to at least double and possibly triple the present production.

### Pink Salmon Studies

Kitoi Bay Station is suited for research on pink salmon as well as sockeye salmon. Significant results from pink salmon research initiated in 1960 have already been obtained.

For example, we now know that natural survival of pinks in Big Kitoi outlet stream is higher than survival recorded for many other streams in Alaska. An area not much bigger than 20,000 square feet has produced close to a million fry and can produce more. We need to learn why this is true so that other similar areas in Alaska can be discovered and utilized for maximum production.

### Predator Studies

Much has been learned about predators of young pink salmon. We found that about 25,000 sculpins (bullheads) lived in Big Kitoi outlet stream. From

examination of stomachs of these fish during the pink fry migration we calculated that in the spring of 1961 one hundred thousand, or 12 percent, of the pink fry were probably eaten by sculpins. Studies are underway to learn how this predator can be controlled. This year the sculpin population in Big Kitoi outlet was eradicated with toxaphene. The management implication is that this method of predator control is applicable to any salmon stream not containing resident fish. Theoretically this experiment should increase the production of pink fry in Big Kitoi streams by 12 percent.

Studies of dolly varden trout in Little Kitoi Lake have developed several facts of immediate importance to fishery management. First, the dollies winter over in the lake, go to sea with sockeye smolt in spring and return to the lake with adult sockeye in the fall. This means that a lake dolly population can be easily controlled by merely placing a trap at the lake outlet. Second, we found that in the two or three month period the dollies remain in saltwater they gain as much as a pound in weight depending on their original size and their condition is greatly improved. This means that if dollies are harvested commercially they should be captured on their way into and not out of a lake system.

#### A LOOK TO THE FUTURE

What can we do at Kitoi Station in the future to help solve urgent fisheries problems? Here are some of the things we can accomplish:

1. Ladder the falls now blocking Big Kitoi Lake to gain access to the 360 acres of rearing area it contains. The lake can then be rehabilitated and planted with fry raised in the Kitoi hatchery. We could, potentially, achieve a run of 100,000 sockeye salmon.
2. Find answers to problems of required density of eggs for highest production from upwelling spawning channels now being developed at Kitoi Station. These experiments may give us a type of artificial spawning channel to install in streams with low discharge.
3. Construction of a lateral-flow artificial spawning channel in Big Kitoi outlet after the control dam is built will enable us to compare lateral flow channels with upwelling channels, and help answer the question of how many fish should we allow in the streams to spawn and which part of spawning run is most productive.
4. In 1962 a lake near the Kitoi Station will be treated with toxaphene. This is an experiment designed to tell us how long a lake in this area remains toxic and how long it takes for the food organisms to "come back". These answers are urgently needed since chemical eradication of undesirable species of fish is a most promising tool in any rehabilitation work on barren areas.
5. Kitoi Bay Research Station is ideally situated for both freshwater and marine research. It will be of benefit to Alaska to encourage scientists from universities and other research agencies to study at Kitoi. With increased housing facilities we expect to have many more visiting scientists in the future.

Reports published as a result of research at Kitoi Bay Research Station

Dugdale, Richard and Vera

1959 Nitrogen fixation in lakes. Science.

1961 Sources of phosphorus and nitrogen for lakes on Afognak Island. Limnology and Oceanography.

Meehan, William R. and L. Revet

n.d. The effect of tricaine methanesulphonate (MS 222) and/or chilled water on oxygen consumption of sockeye salmon (*Oncorhynchus nerka*) fry. Progressive Fish Culturist. (in press)

Mossman, Archie

1957 Hooded mergansers at Afognak Island, Alaska. The Condor.

Sheridan, William L.

n.d. An easy method to obtain salmon eggs for incubation. Progressive Fish Culturist. (in press)

1961 Summary of knowledge of certain factors influencing survival of salmon in freshwater. Informational Leaflet #3, Alaska Department of Fish and Game. (Mimeo)

n.d. Airborne fish transport tank. Progressive Fish Culturist. (in press)

Sheridan, William L., William R. Meehan and L. Revet

1961. Preliminary survey of Afognak Lake. Informational Leaflet #5, Alaska Department of Fish and Game. (Mimeo)

Vincent, Robert

n.d. Notes on geology, history, land mammals, birds and plants of Kitoi Bay. (Processed - ADF&G Library)

1958 The larger plants of Little Kitoi Lake. American Midland Naturalist.

1958 Observations of red fox behavior. Ecology.

Wallace, James

1959 An investigation of the trophic status of certain lakes in the Kitoi Bay area, Afognak Island, Alaska. Master's thesis, University of Kentucky.

Reports being prepared for distribution

Meehan, William R.

- n.d. Factors influencing production of sockeye salmon in lakes of the Kitoi Bay area.
- n.d. Effects of removal of predator and competing lake fish population on production of introduced sockeye salmon.
- n.d. Distribution and abundance of fish food organisms in Big Kitoi outlet stream.

Parker, Robert R.

- n.d. Age and growth studies on sockeye salmon smolt in lakes in the vicinity of Kitoi Bay.

Sheridan, William L. and William R. Meehan

- n.d. Predation by sculpins on pink salmon fry in Big Kitoi outlet stream.

Sheridan, William L. and W.H. Noerenberg

- n.d. Size differences between pink salmon fry from Sheep Bay, Prince William Sound and Big Kitoi outlet, Afognak Island.

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