Appendix D. Summary of preliminary findings of Little Kitoi Lake sockeye salmon marking study.

---

by Robert Markle and Steven G. Honnold
Alaska Department of Fish and Game

INTRODUCTION

A sockeye salmon *Oncorhynchus nerka* brood stock development project began at Little Kitoi Lake, Afognak Island, in 1989. Originally an underyearling stocking program, the project was diversified in to include presmolt and age-1 smolt (1994), as well as early (1992) and late run sockeye salmon releases. In 1992, a marking program was implemented in an effort to determine the success of different stocking strategies (FTP 92A0085) and the straying rate of adult returns produced from 0-check and age-1 smolt releases. The project proposal was submitted for review in January 1993, and signed off on April 12, 1993 (geneticist signed FTP only). Stocking strategies were to be evaluated by the survival from stocking to adult return. Straying rate was to be assessed by the percentage of Little Kitoi Bay origin adults observed in escapements at Paul's and Afognak Lakes. Although examination for marks at Little Kitoi fish pass commenced in 1994, the first substantial return data were gathered in 1996.

Smolt Outmigration

Sockeye salmon presmolt stocking of Little Kitoi Lake commenced in October 1994 (Markle and Honnold *in press*). Age data from the 1995 and 1996 indicated the majority of 1994 planted presmolt migrated as age-1 smolt. Outmigration monitoring in 1995 and 1996 has indicated preliminary "presmolt to age-1 smolt" survival rates ranging from 32% to 64% (Markle and Honnold *in press*; Appendix A).

The early run Afognak Lake presmolt stocked in Little Kitoi Lake exhibited a survival rate of 64% for the 1994 release and 32% for the 1995 release. Late run presmolt stocked into Little Kitoi Lake (Upper Station/Little Kitoi Lake parent stock) exhibited a survival rate of 52% for the 1994 release and 50% for the 1995 release. It is believed that the beginning of the outmigration in 1996 began prior to monitoring, therefore leading to an underestimation of 1995 presmolt survival rates.

No appreciable outmigration of 1994 released presmolt was detected following the potential second year (1996) of lake residency (Markle and Honnold *in press*). The majority of presmolt stocked in both 1994 and 1995 emigrated at age-1 in 1995 and 1996, respectively. As a result, the balance of the planted presmolt were attributed to lake mortality. Based on the 1994 age at smolt data, no appreciable second year outmigration of 1995 released presmolt is expected in 1997.

-Continued-

A zero-check release into Little Kitoi Lake in July 1995 displayed a 48.8% outmigration within two weeks of release with an additional 430 (<1%) fish outmigrating in 1996 as age-1 smolt (Markle and Honnold *in press*).

Aging was complicated by the fact that scales of planted fish appeared to contain a "false check" (Dave Kaplan, personal communication). Presumably, this false check was the result of stress during planting, or the related change in environment. This anomaly was first noted during 1996 scale aging and was also evident in adult escapement scale samples. Aging has relied on scale patterns to distinguish the small remnant "wild" (Little Kitoi Lake was originally a barren system and had several stocks of sockeye planted in the late 1950's and early 1960's) sockeye population from planted populations. Tight circuli distinguishing wild propagated smolt and broad, uniform circuli distinguishing hatchery reared smolt (David Kaplan, personal communication). This false check may have caused assigning 1. freshwater age to fish that may have been 0. age in adult samples from years prior to 1996.

Adult Escapement

Salt water zero-check releases are assumed to have exhibited extremely poor survival due to the low magnitude of adult returns following stocking and few observed marks in escapement samples. Escapement age analysis did not reveal any age 0 returns; however, the number of age-0 fish may have been under reported due to the possible false checks as described above. Age 0 smolt releases were discontinued in 1996. Although Little Kitoi sockeye escapements in 1992 and 1993 exceeded 4,500 fish, this was considerably less than expected. In 1994, escapement declined drastically to 2,402 sockeye. Escapement continued to decline in 1995 to 1,180 sockeye. The cause of the 1994 and 1995 decline is unknown.

In 1996, sockeye escapement rebounded to 5,628 fish, and is believed due largely to presmolt lake stocking. The observation of marked fish at Little Kitoi fish pass indicates that the 1996 escapement was dominated by sockeye released in 1994. Lake released presmolt were the dominant year class with a mark-based estimate of 1,559 returning as jacks. This represented 1.3% of the estimated presmolt observed outmigrating in 1995. The mark-based estimate may well be low considering the potential differential mortality of marked fish may be underestimating stock contributions by approximately 40% (ADF&G unpublished data).

Fresh water release of zero-checks occurred in 1990 and 1993; however, survival estimates are not available as neither group was marked. The 1993 release was smaller than expected due to a large mortality of unknown origin (possibly IHNV).

Adult return data collected in 1997 and 1998 will be critical to determining the success of the presmolt release strategy, as well as confirming the existence and extent of differential mortality

-Continued-

of marked fish. Commercial catches in Duck, Izhut, and Kitoi Bays Sections have mirrored changes in sockeye escapement, except with regard to the 1995 harvest. While the 1995 sockeye salmon harvest approximately equaled the 1993 harvest, the 1995 escapement (1,180 sockeye) was only 24% of the 1993 escapement. The majority of the 1995 sockeye harvest took place in Duck Bay; this may indicate that the commercial harvest in this section may have a low Kitoi sockeye component. Further investigation of the stock composition in the Eastside Afognak District is needed.

Straying

An effort to determine if Kitoi released sockeye have strayed is inconclusive. Since 1994, a portion of the sockeye escapements at Afognak and Paul's Lakes have been examined for marks. No definitive identification of Kitoi released sockeye salmon has been determined based upon scale or otolith aging. Examination goals set by Department biometricians have proven unrealistic to attain (original goals: 13,000 salmon at Afognak Lake and 7,500 salmon at Paul's Lake). The significance of the examination data has yet to be statistically determined. Definitive identification of "marked" fish has been complicated by the existence of natural fin loss. For this reason, the origin of "simple" finclipped fish (one fin removed) are difficult to attribute.

In 1996, a total of 74 sockeye returned to Kitoi Bay Hatchery via Big Kitoi Creek. The hatchery and Big Kitoi Creek are thought to be the most likely site for straying due to its proximity to Little Kitoi Lake. The fact that planted fish were reared there, however, may induce a small portion of age-1 smolt to imprint on the hatchery water source prior to release into net pens at Little Kitoi estuary. Although no marked fish were found, the majority (>90%) are believed to be late run fish from Little Kitoi Lake, based on return timing. Using the estimated escapement of 2,850 sockeye for the age-1.1 Little Kitoi early run, the nine age-1.1 sockeye found at the hatchery represent a straying rate of 0.3%. Assuming all 62 sockeye attributed to the late run were from the 1994 Upper Station brood stock planting and the Little Kitoi escapement of this stock was 1,312 sockeye, the straying rate was 4.5% (ADF&G, unpublished data). This rate is likely inflated as there is no age data available on the late returning hatchery sockeye confirming that all were of the 1994 Upper Station stock. Furthermore, it does not take into account sockeye which returned to Little Kitoi Bay after the fish pass was unattended. The large number of adults necessary to examine for marks to allow for statistically valid analysis of straying rate is problematic. Current funding and manpower levels assigned to this portion of the evaluation program are not sufficient to continue the examination of adults at Paul's and Afognak Lakes.

Markle, R and S.G. Honnold. *in press*. Summary of Little Kitoi Lake sockeye salmon marking. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 4K97-xx, Kodiak.