U.S. Fish & Wildlife Service

PATHOGEN SCREENING AND GILL NA^+/K^+- ATPASE ASSESSMENT OF SOUTH DELTA CHINOOK 2017 RELEASE GROUPS

Ken Nichols

September 2017

US Fish and Wildlife Service
California-Nevada Fish Health Center
24411 Coleman Fish Hatchery Rd
Anderson, CA 96007
(530) 365-4271 Fax: (530) 365-7150
http://www.fws.gov/canvfhc/

SUMMARY

The California-Nevada Fish Health Center performed a general pathogen screening and smolt physiology assessment of Chinook release groups. Health assessments were performed on dummy-tagged cohorts of the 13 April and 27 April release at the Durham Ferry release site. A total of 60 fish (30 fish per health assessment) were examined after a 48 hour holding period at the release sites. No significant signs of health problems and no *Tetracapsuloides bryosalmonae* was detected in 60 fish examined. No significant difference in smolt development (assessed by gill Na+/K+-ATPase activity) was observed between release groups. There were no findings to indicate differences in survival or outmigration performance between release groups.

Recommended citation for this report is:
Nichols, K. 2017. Pathogen Screening and Gill Na^+/K^+- ATPase Assessment of South Delta Chinook 2017 Release Groups. U.S. Fish & Wildlife Service, California-Nevada Fish Health Center, Anderson, CA. Accessible at: http://www.fws.gov/canvfhc.

Notice:
The mention of trade names or commercial products in this report does not constitute endorsement or recommendation for use by the Federal government. The findings and conclusions in this report are those of the author and do not necessarily represent the views of the US Fish and Wildlife Service.

BACKGROUND

As a component of the South Delta salmonid survival studies examining reach-specific survival and distribution of migrating juvenile Chinook salmon in the San Joaquin River and Delta, the California-Nevada Fish Health Center conducted a general pathogen screening and smolt physiological assessment. The objectives of the health assessments were to evaluate the juvenile Chinook used in the studies for specific fish pathogens and assess smolt development to help explain differences in survival and migration performance between release groups. Similar pathogen screening and physiological assessments have been conducted on Chinook used in various studies in the south Delta since 1996. In the majority of these past studies, juvenile Merced River Hatchery Chinook were utilized, and occasionally significant infections with the myxozoan parasite *Tetracapsuloides bryosalmonae*, the causative agent of Proliferative Kidney Disease (PKD), were observed (Foott, Stone and Nichols 2007; Foott 2012).

METHODS

STUDY FISH

Health assessment groups were cohorts of acoustic tagged juvenile Chinook salmon reared at the CDFW Merced River Hatchery. The health assessment groups shadowed their tagged cohorts through handling, tagging (dummy tagged), transport, and in-river holding. Groups of 30 juvenile Chinook salmon were sampled on 13 April and 27 April, 2017 (Table 1). Fish were held for 48 hours in the San Joaquin River at the Durham Ferry release site before fish health assessments were performed.

Table 1. Sample date, location and average fork length (FL, ±SE) of juvenile Chinook salmon fish health assessment groups.

Date	Location	FL ± SE (mm)
13 April	Durham Ferry	87.9 ± 0.6
27 April	Durham Ferry	93.1 ± 0.8

SAMPLE COLLECTION AND LAB ASSAYS

Fish were euthanized; fork length was recorded; any signs and symptoms were noted; and tissues were sampled for lab assays (USFWS and AFS-FHS 2014). Gill tissues were collected to assess smolt development, and 16 samples from each sample date (32 total samples) were analyzed by gill Na^+/K^+-Adenosine Triphosphatase (gill ATPase) assay (McCormick 1993). Samples of gill, liver, kidney and intestine tissues were collected from 30 fish from each group for histopathological examination (Humason 1979).

Results and Discussion

Fish Condition

A total of 60 Chinook salmon (30 per sample date) were examined from the health assessment groups. There was no mortality over the holding period. Minor hemorrhaging at the suture site (Figure 1) was observed in only 1 of the fish, and no other external signs (pale gills, scale loss or hemorrhaging) were noted.

Figure 1. Minor hemorrhaging around sutures on dummy-tagged Chinook after 48 hours holding at the release site. Minor hemorrhaging is visible around sutures of lower fish and the upper fish has no visible hemorrhaging.

Pathogen Screening

No obligate bacterial or viral pathogens were detected in 60 salmon sampled. Other bacterial isolates (presumptive environmental contaminates) were observed in 27% (16/60) of samples. No significant signs of infection were observed in histological examination of kidney, liver, gill and intestine tissues, and no *T. bryosalmonae* was detected in the 60 kidney sections examined. No histopathological signs suggestive of health problems or survival differences were seen in the release groups.

Gill Na^+/K^+-ATPase Activity

No significant difference between median gill Na^+/K^+ ATPase activity levels between release groups were observed (Figure 2, $p=0.4909$, Wilcoxon rank sum test). Activity levels of 94% (30/32) of the fish assayed had activity levels consistent with Chinook smolts (>6.7, CA-NV Fish Health Center unpublished data). These results suggest smolt development in both release groups were similar at the time of release.

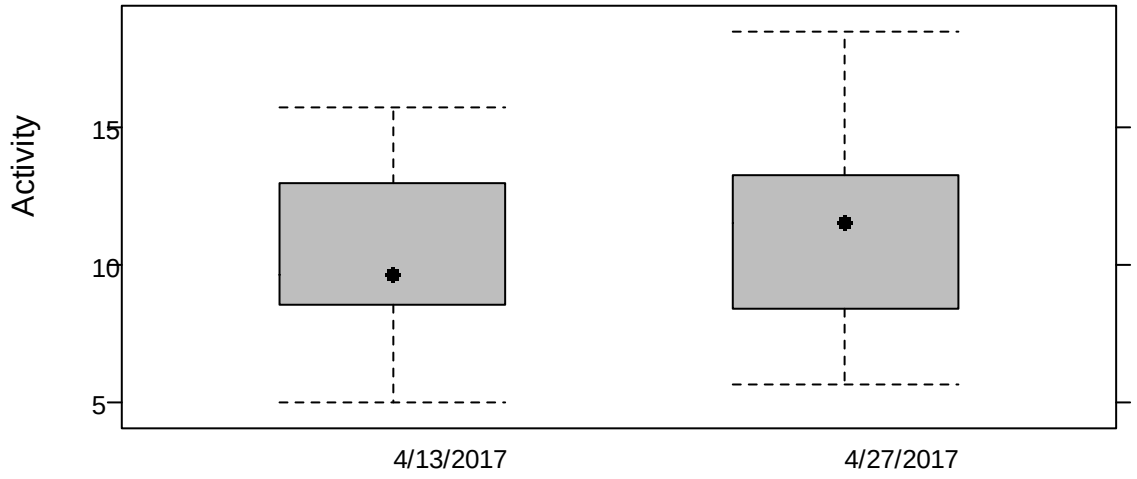

Figure 2. Boxplot around median gill Na^+/K^+-ATPase activity (µmol ADP * mg protein^{-1} * hr^{-1}) for Chinook health assessment groups. Medians with the same letter are not significantly different (P<0.001, Kruskal-Wallis test). There were 16 fish sampled from each health assessment group.

REFERENCES

Foott JS. 2012. FY2012 Technical Report: Pathogen screening and gill Na-K-ATPase assessment of juvenile Chinook salmon used in south delta acoustic tag studies. U.S. Fish & Wildlife Service California-Nevada Fish Health Center, Anderson, CA. Accessible at: http://www.fws.gov/canvfhc.

Foott JS, R Stone and K Nichols. 2007. Proliferative Kidney Disease (Tetracapsuloides bryosalmonae) in Merced River Hatchery juvenile Chinook salmon: mortality and performance impairment in 2005 smolts. California Fish and Game 93: 57-76.

Humason G L. 1979. Animal Tissue Techniques, 4th edition. W H Freeman and Co., San Francisco.

McCormick S D. 1993. Methods for Nonlethal Gill Biopsy and Measurement of Na+, K+- ATPase Activity. Canadian Journal of Fisheries and Aquatic Sciences. 50: 656-658.

USFWS and AFS-FHS (U.S. Fish and Wildlife Service and American Fisheries Society-Fish Health Section). 2014. Standard procedures for aquatic animal health inspections. In AFS-FHS. FHS blue book: suggested procedures for the detection and identification of certain finfish and shellfish pathogens, 2016 edition. Accessible at: http://units.fisheries.org/fhs/fish-health-section-blue-book-2016/