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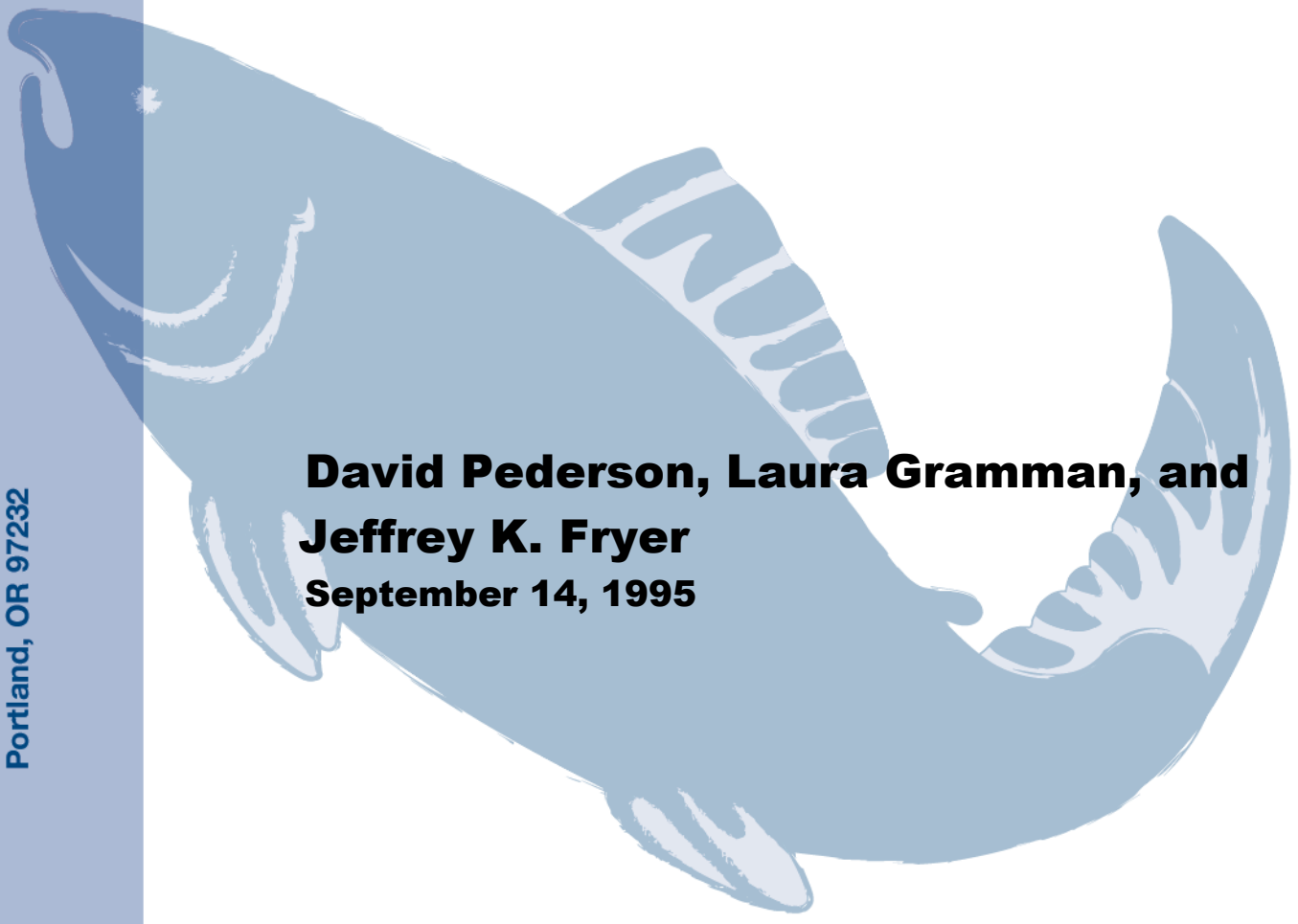
CRITFC

TECHNICAL REPORT 95-05

# Investigations of Adult Salmonids at Bonneville Dam for Gas Bubble Trauma, 1995



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## Introduction

Since 1987, the Columbia River Inter-Tribal Fish Commission's (CRITFC) Stock Assessment Project has conducted research on adult salmon runs at Bonneville Dam. These studies were established to monitor the age and length-at-age composition of Columbia Basin salmonids and to design and develop salmon stock identification techniques (Fryer et al. 1992a, 1992b, 1995; Fryer and Schwartzberg 1991a, 1991b, 1991c, 1992, 1993a, 1993b, 1994a, 1994b; PST 1985; Schwartzberg and Fryer 1988, 1989a, 1989b, 1990a, 1990b).

In 1995, the National Marine Fisheries Service (NMFS) requested that CRITFC increase its sampling effort at Bonneville Dam an additional two-days-per-week (14 May 1995 through 24 June 1995) to evaluate the effect of increased spill over mainstem dams on adult migrating salmon. NMFS was particularly concerned whether elevated nitrogen levels in the water might result in gas bubble trauma in fish. CRITFC agreed to perform the requested studies using methods employed in its Stock Assessment projects to examine and evaluate the physical condition, level, and nature of any injuries noted among fish sampled.

## Methods

Sockeye (*Oncorhynchus nerka)* and chinook salmon (*O. tshawytscha)* and steelhead (*O. mykiss*) were trapped and examined at the Bonneville Dam Fisheries Engineering and Research Laboratory, located at river km 225 on the mainstem Columbia River. Sampling was conducted three days-per-week during the period between 14 May and 24 June 1995 for 6 to 8 hours-per-day. It was estimated that 3.1 to 4.2% of the adult salmonids passing Bonneville Dam would be sampled.

Each fish was placed in a sampling tank, anesthetized, and carefully examined for external signs of gas bubble trauma using a headband binocular magnifier. Held with two hands at the water's surface within the sampling tank, the specimen could be easily rotated along the long axis of the body enhancing the inspection of both lateral sides of the body and within the mouth cavity. The external signs of gas bubble trauma included in the examination were the presence of distended eyes and/or vesicles in the mouth, operculum, and between fin rays (Beiningen and Ebel 1970). Particular attention was paid to the head, the

operculum plates forward and to the areas between, and at the insertion point of, each fin ray. After examination, fish were allowed to recover in freshwater and released. (For a more detailed description of the methods, please see appendix A.)

## Results

Three-hundred ninety-seven chinook salmon, 235 steelhead, and 184 sockeye salmon were inspected for gas bubble trauma at Bonneville Dam between 14 May and 24 June, 1995 (Table 1). The proportion of the run sampled during this period ranged from 4.8% of the chinook to 6.2% of the sockeye salmon. No indication of gas bubble trauma was found in any fish sampled.

## Discussion

No visible signs of gas bubble trauma were observed in our study at Bonneville Dam between 14 May and 24 June.

In a separate co-operative research study conducted with the Yakama Indian Nation, the Confederated Tribes of the Umatilla Indian Reservation, and the Washington Department of Fish and Wildlife at the Hanford Reach, Washington, no visible signs of gas bubble trauma were noted in the approximately 185,000 juvenile fall chinook salmon sampled for this study.

Although no visible signs of gas bubble trauma were noted in any of the studies previously mentioned, it is possible that a fish can be suffering from gas bubble trauma but not exhibit external indications visible to the unaided eye (Weitkamp and Katz 1977).

## REFERENCES


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**Table 1. Number of salmonids examined for gas bubble trauma at Bonneville Dam 14 May to 24 June, 1995.**

| Date | Chinook | Steelhead | Sockeye |
|---|---|---|---|
| 05-15-95 | 34 | 11 | 0 |
| 05-17-95 | 34 | 6 | 0 |
| 05-19-95 | 17 | 8 | 0 |
| 05-22-95 | 25 | 7 | 0 |
| 05-24-95 | 29 | 10 | 0 |
| 05-26-95 | 25 | 11 | 0 |
| 05-30-95 | 14 | 6 | 0 |
| 05-31-95 | 7 | 2 | 0 |
| 06-02-95 | 12 | 7 | 0 |
| 06-05-95 | 15 | 13 | 2 |
| 06-07-95 | 24 | 7 | 3 |
| 06-09-95 | 25 | 8 | 4 |
| 06-12-95 | 28 | 8 | 11 |
| 06-14-95 | 17 | 19 | 16 |
| 06-16-95 | 14 | 23 | 16 |
| 06-19-95 | 23 | 19 | 26 |
| 06-21-95 | 18 | 32 | 43 |
| 06-23-95 | 36 | 38 | 63 |
| Total | 397 | 235 | 184 |
| % of Run Sampled[a] | 4.8 | 5.4 | 6.2 |

[a]Estimated by dividing the number of fish sampled by the total number of adult fish counted at Bonneville Dam fishways (CRITFC 1994).

## Appendix A

## GAS BUBBLE TRAUMA MONITORING PROCEDURES

Equipment Requirements: One Optivisor binocular headband magnifier (2.5x magnification), one tape measure or measuring board, one camera (with flash, if there is inadequate light for photography).

Materials Required: Tricaine methanosulfonate (anesthetic), Clipboard and datasheet.

Monitoring Procedures:

1. Anesthetize the fish using tricaine methanosulfonate (MS-222).

2. Once the fish is anesthetized, raise the fish to the water's surface. Leave as much of the fish in the water as possible.

3. While wearing the Optivisor binocular headband magnifier, start the observation at the caudal fin. As the fin is fanned out, look for signs of bubbles at the posterior end of the tail and between the fin rays. Also, run your fingers over the fin to feel for bubbles. Repeat this observation procedure on the rest of the fins in the following order: dorsal, anal, ventral, and pectoral.

4. While the fish is on its right side and gilling, look for obvious white, or blood depleted areas along the gill. Do not lift the operculum to examine gills unless obvious gill damage is observed.

5. Look at the operculum and inner mouth for external sign of bubbles.

6. Look for "popeye", the protrusion of the eyeball from the orbit.

7. Observe the head region for signs of skin loss or peeling.

8. Look and feel the lateral line on both sides for gas bubbles.

9. For each fish, record the species and length in the appropriate location on the Gas Bubble Trauma Monitoring Datasheet. If no signs of gas bubble trauma are present, write N in the column labeled "Gas Bubbles Present". If signs of gas bubble trauma are present, write Y on the sampling form and record a description of the symptoms as well as any other pertinent information in the comment section.

10. Take a picture of any fish showing signs of gas bubble trauma. Record the picture number on the gas bubble trauma datasheet.

11. If fish are coming through the sampling area too rapidly to permit the thorough examination described in steps 1-9 without subjecting fish to a potential overdose of tricaine methanosulfonate, do not use the headband magnifier. Instead, briefly scan the fish using the unaided eye. On the monitoring datasheet, place a U in the column labeled “Gas Bubbles Present” if no signs of gas bubble trauma are immediately apparent. (If signs of gas bubble trauma are apparent, place a Y in the column and make every effort to give the fish the more thorough investigation described in steps 2-10. If time does not permit any examination of a fish for gas bubble trauma, put a dash (“-”) in the “Gas Bubbles Present” column.