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Hutton Spring Tui Chub and Foskett Spring Speckled Dace Investigations

ANNUAL PROGRESS REPORT

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INTRODUCTION

Several morphologically diverse, allopatric populations of tui chub inhabit the five endorheic basins of south-central Oregon (Bills 1977; Harris 2000). The Hutton tui chub (*Gila bicolor* ssp.) is represented by a single population that inhabits Hutton Spring on the southwest side of Alkali Lake in Lake County, Oregon (Figure 1). The Alkali Lake basin reached its maximum depth of approximately 83 meters covering 2,301 square kilometers from 46,000 to 32,000 years ago. During this time period there was a connection between the Alkali basin and Fort Rock basin (Silver and Summer Lakes) to the west (Bills 1977). Currently, Alkali Lake desiccates annually. Morphometric and meristic data supports classification of Hutton Spring tui chub as a distinct subspecies (Bills 1977). Recent mitochondrial DNA analysis (Harris 2000) suggests a grouping of the Hutton Springs tui chub with populations of tui chub from the Abert and Summer Lake basins in Oregon. Additional genetic, morphometric, and meristic data are needed to further address this question (Harris 2000; Dr. Douglas Markle, pers. comm.).

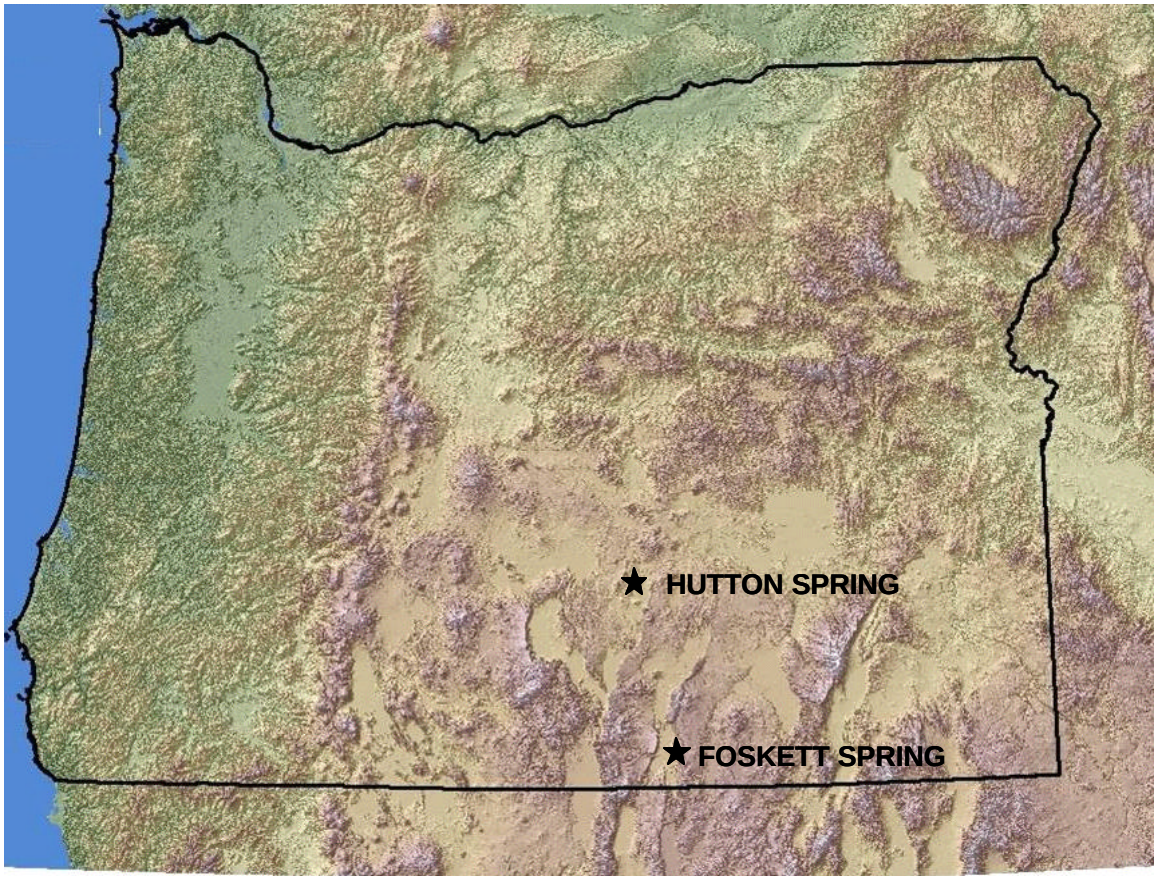

Figure 1. Map showing the locations of Hutton Spring and Foskett Spring, Oregon.

The Hutton tui chub was listed as threatened under the federal Endangered Species Act in 1985 (U.S. Fish and Wildlife Service 1985). Hutton Spring is located on private land and the habitat is in good condition, primarily due to conscientious long-term land stewardship by the landowner. The habitat is currently fenced from cattle grazing

and is in stable condition (U.S. Fish and Wildlife Service 1997; present study). Hutton Spring has been diked and has a pool approximately 11 meters long, 3 meters wide, and 2 meters deep and is surrounded by rushes. A second unnamed spring (3.3 meters wide and 0.7 meters deep) was reported to contain Hutton Spring tui chub (Bills 1977) but was not located in recent surveys; the existence of a second population is questionable (U.S. Fish and Wildlife Service 1997). Prior data describing the abundance of the Hutton Springs tui chub population are limited. In 1977, Bills (1977) visually estimated less than 300 Hutton Spring tui chub in Hutton Spring and approximately 150 tui chub in the smaller unnamed spring.

Speckled dace (*Rhinichthys osculus*) are geographically widespread throughout the western United States and occur in many isolated subbasins and interior drainages in south-central Oregon. The Foskett speckled dace (*R. osculus* ssp.) is represented by a single population that inhabits Foskett Spring on the west side of Coleman Lake in Lake County, Oregon and was listed as threatened under the federal Endangered Species Act in 1985 (U.S. Fish and Wildlife Service 1985). The Foskett speckled dace became isolated in Foskett Spring at the end of the Pluvial period (~9,000-10,000 years ago). Foskett Spring is a natural spring that rises from a springhead pool, flows through a narrow spring brook into a series of shallow marshes, and then disappears into the soil of the normally dry Coleman Lake. A second population in Dace Spring, located approximately 0.8 kilometer south of Foskett Spring, was established from an introduction of 100 fish from Foskett Spring in 1979-1980 (Williams et al. 1990); however recent surveys have failed to document their continued existence at this location. In 1987, the U.S. Bureau of Land Management (BLM) acquired, through exchange, the 65 hectare parcel of land containing Foskett and Dace Springs. Both sites were fenced to exclude livestock.

Data describing the abundance of the Foskett speckled dace population are limited. Bond (1974) estimated, by visual approximation, the population in Foskett Spring at 1,500 to 2,000 fish. In 1986, a visual estimate of more than 300 dace representing three size classes was reported in Dace Spring (Williams et al. 1990). In 1997, mark-recapture population estimates were obtained from both Foskett and Dace springs (Dambacher et al. 1997). The Foskett Spring estimate was 27,787 fish (95% confidence intervals: 14,057-41,516). The majority of the fish (97%) were found in the downstream open water pool located outside the cattle exclosure. In 1997, only 19 fish were estimated to occur in Dace Spring (Dambacher et al. 1997). All were found in a concrete trough that was installed east of the spring. In addition, only large fish were collected from Dace Spring, suggesting minimal recent recruitment had occurred. Access back to the spring from the trough was thought to be limited (U.S. Fish and Wildlife Service 1997) and may have reduced the ability of dace to return to the spring to spawn. No dace have been collected from Dace Spring in recent years (A. Munhall, personal communication).

The Recovery Plan for the threatened and rare native fishes of the Warner Basin and Alkali Subbasin states that these two taxa will probably not be delisted in the near future because of their extremely isolated ranges and potential for degradation of these habitats from localized events (USFWS 1998). The primary recovery objective for these two taxa is the long-term persistence through preservation of their native ecosystems. The plan further states that the conservation and long term sustainability of these species will be met when: 1) long-term protection of their respective habitats, including spring source aquifers, springpools and outflow channels, and surrounding lands is

assured; 2) long-term habitat management guidelines are developed and implemented to ensure the continued persistence of important habitat features and guidelines include monitoring of current habitat and investigation for and evaluation of new spring habitats; and 3) research into life-history, genetics, population trends, habitat use and preference, and other important parameters is conducted to assist in further developing or refining criteria 1) and 2), above. Actions needed to meet these criteria include protecting fish populations and habitats, conserving genetic diversity of fish populations, ensuring adequate water supplies are available, monitoring of listed fish populations and habitat conditions, and evaluating long-term effects of climatic trends on recovery of these fish populations.

The purpose of this investigation was to determine the status of populations of federally listed Hutton Spring tui chub and Foskett Spring speckled dace and their habitats.

METHODS

The Oregon Department of Fish and Wildlife's Native Fish Investigations Project used baited minnow traps to obtain mark-recapture population estimates of Hutton tui chub and Foskett speckled dace. We fished traps overnight at Hutton Spring and during the day (7 hours) at Foskett Spring. We marked all fish captured with a partial caudal fin clip and returned them to the water. Fish were returned to the approximate location where they were captured. The following night (or day), we again fished the traps and recorded the total number of marked and unmarked fish captured. We estimated population abundance using single-sample mark-recapture procedures (Ricker 1975). We calculated 95% confidence intervals using a Poisson approximation (Ricker 1975). Traps were fished at locations that included the variety of habitat types present at each location. We measured both total length (TL) and standard length (SL) on a sample of approximately 125 fish from each location.

We recorded physical habitat parameters at each location. The open water area (m^2) and vegetated surface area (m^2) of each spring location was measured using a laser range finder (+/- 0.5 m). At Foskett Spring, we estimated wetted surface areas by measuring channel length and channel widths along regularly spaced transects. Areas were summed for each distinct habitat type (spring pool, spring brook, bullrush marsh, cattail marsh). Water depth was measured using a graduated depth staff (+/- 0.01 meter). Water temperature (^oC) was recorded using a Hobo® recording thermometer at 5-hour intervals from early-June through late-August. We used a Global Positioning System (GPS) to record site locations (UTM coordinates). Each site was photographed.

RESULTS

Hutton Spring Tui Chub

The tui chub population estimate obtained in Hutton Spring on 30 August 2005 was 809 fish. The 95% confidence limits for this estimate were 703 to 932 fish (Table 1). This estimate includes tui chub ranging from 44-123 mm TL (36-103 mm SL). Length-frequency analysis suggests a broad age composition with a pronounced peak at ~ 70 mm (Figure 2).

Table 1. Mark-recapture population estimate details for Hutton Spring tui chub, August 2005.

Marked	Catch	Recaptures	Estimate	95% Confidence limits lower	95% Confidence limits upper
418	368	190	809	703	932

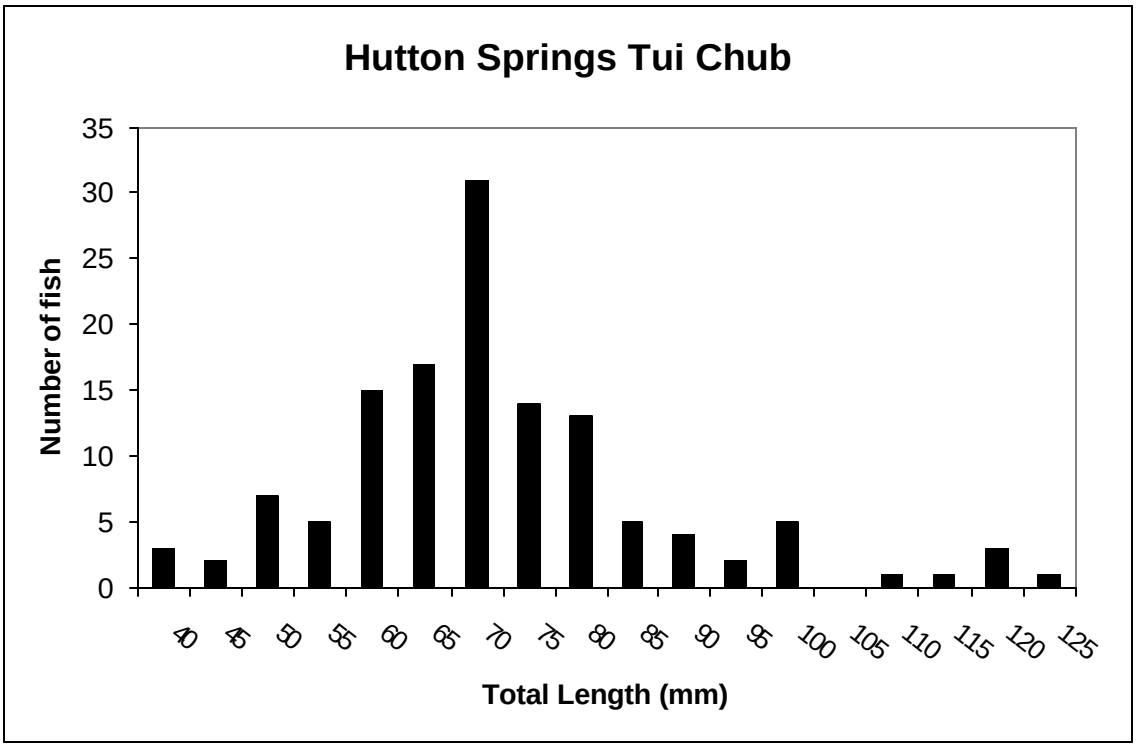

Figure 2. Length-frequency histogram for Hutton Spring tui chub, August 2005.

The spring temperatures measured in Hutton Spring from 9 June through 28 August 2005 averaged 15.9°C (range 14.4-16.7°C). Daily fluctuations were typically less than 1°C. Unvegetated open water habitat at Hutton Spring totaled 36 m^2. The spring pool was surrounded by bullrush (*Scirpus* sp.). The total habitat available for chub, including the vegetated perimeter of the spring pool was approximately 100 m^2. The total extent of the surrounding bullrush marsh was approximately 330 m^2. Water depth of the spring pool averaged 1.2 m with a maximum depth of 2.1 m. A staff inserted into the silt stopped at a layer of hardpan at 3.3 m. Photos of Hutton Spring tui chub and the spring habitat are located in **APPENDIX A**.

Foskett Spring Speckled Dace

The speckled dace population estimate obtained in Foskett Spring on 30 August 2005 was 3,147 fish. The 95% confidence limits for this estimate ranged from 2,535 to 3,905 fish (Table 2). Over half ($\hat{N}$ = 1,627) of the population was located in the spring pool, 20 percent of the population was located in the spring brook ($\hat{N}$ = 636), and smaller proportions (14% and 11%) were located in the tule marsh ($\hat{N}$ = 425) and cattail marsh ($\hat{N}$ = 353) respectively. In 2005, the abundance was significantly lower and the distribution of fish was substantially different from 1997 (Table 3).

Compared to 1997, the number of dace in the spring pool was significantly larger in 2005 (1,627 versus 204) and the number of dace in the cattail marsh was substantially smaller in 2005 (353 versus 26,881). The lower population abundance estimated in 2005 is probably a result of the reduction of open water (wetted) habitat in the cattail marsh in 2005 (average depth <0.05 m) (Table 4), compared to 1997 (Dambacher et al. 1997). However, large numbers of young-of-the-year dace were observed in the cattail marsh in 2005 (note: young-of-the year fish were too small to be sampled efficiently and were not included in either the 1997 or 2005 estimate). The wetted areas of the other habitat types (spring pool, spring brook, tule marsh) were similar in 1997 and 2005.

The 2005 abundance estimate includes dace ranging from 20-79 mm TL (16-61 mm SL). Length-frequency analysis suggests the presence of multiple age-classes, with three apparent peaks (Figure 3).

Table 2. Mark-recapture population estimate details for Foskett Spring speckled dace, August 2005.

					95% Confidence limits	
Location	Marked	Catch	Recaptures	Estimate	lower	upper
Entire Site						
	493	515	80	3147	2535	3905
Spring Pool						
	204	253	31	1627	1157	2281
Spring brook (rock dam to rock bridge)						
	19	19	3	100	41	200
Spring brook (rock bridge to tule marsh)						
	111	124	21	636	423	951
Tule Marsh to fence						
	119	77	21	425	283	636
Cattail Marsh outside fence						
	40	42	4	353	156	695

Table 3. Comparison of 2005 and 1997 population estimates for Foskett Spring dace.

					95% Confidence limits	
2005						
Location	Marked	Catch	Recaptures	Estimate	lower	upper
Spring pool	204	253	31	1,627	1,157	2,281
Spring brook (rock dam to rock bridge)	19	19	3	100	41	200
Spring brook (rock bridge to tule marsh)	111	124	21	636	423	951
Tule marsh to fence	119	77	21	425	283	636
Cattail marsh outside fence	40	42	4	353	156	695
Combined	493	515	80	3,147	2,535	3,905
1997						
Spring pool	38	46	8	204	90	317
Spring brook (rock dam to tule marsh)	82	92	10	702	321	1,082
Tule marsh to fence	-	-	-	not sampled		
Cattail marsh outside fence	606	619	13	26,881	13,158	40,605
Combined	726	757	31	27,787	14,057	41,516

Table 4. Wetted habitat dimensions at Foskett Spring, August 2005.

Habitat type	Length (m)	Avg. Width (m)	Avg. Depth (m)	Area (m^2)
Spring pool	11.0	3.0	0.25	33.0
Spring brook	69.5	1.1	0.19	73.0
Tule marsh	152.0	0.6	0.20	86.1
Cattail marsh	223.0	2.4	0.04	528.5
Sedge marsh	142.0	0	0.00	1.4

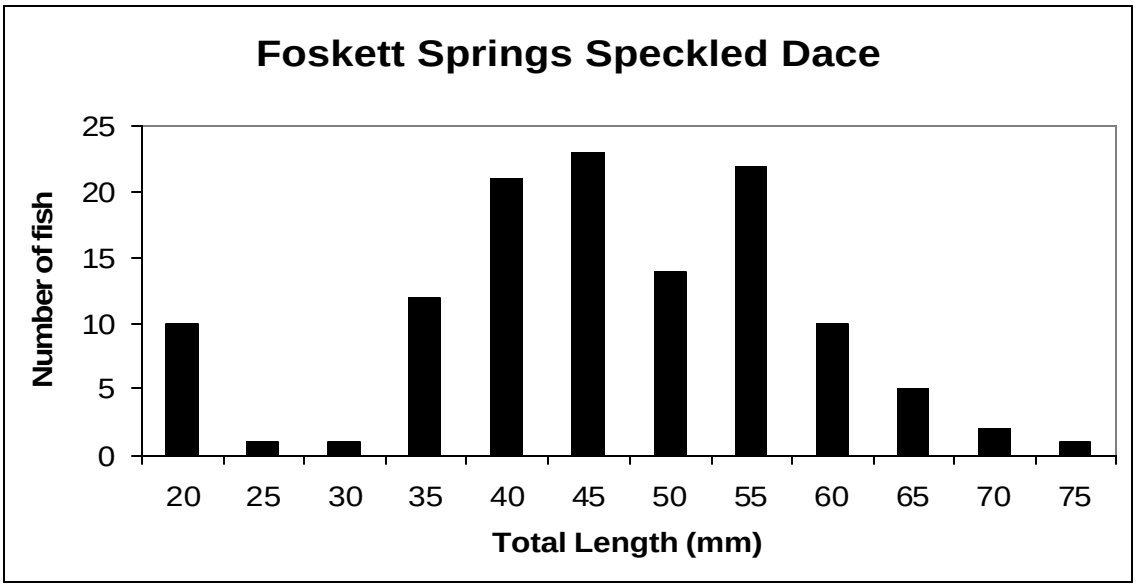

Figure 3. Length-frequency histogram for Foskett Spring speckled dace, August 2005.

The spring temperatures measured in Foskett Spring from 8 June – 29 August 2005 averaged 18.3°C (range 18.2-18.7°C). Daily fluctuations were less than 0.4°C. Vegetation surrounding the spring, spring brook, and marshes includes *Scirpus* sp., *Juncas* sp., *Mimulus* sp., saltgrass, thistle, Kentucky bluegrass, and nettles. Photos of Foskett Spring speckled dace and the spring habitats are located in **APPENDIX B**.

DISCUSSION

Populations of the federally listed Hutton tui chub and Foskett speckled dace were monitored in 2005 and both appear to be healthy (near carrying capacity). Examination of length-frequency data suggests that multiple age-classes were present in both populations. Presence of young-of-the-year fish at both locations provides evidence of recent recruitment. Both spring locations are fenced to exclude cattle and no exotic fish species were found to be present. The fish appeared to be in good condition with no obvious external parasites.

Habitat, although limited, was in good condition. Encroachment by aquatic macrophytes may be limiting population abundance at both sites. The decline in abundance of Foskett speckled dace since 1997 is probably due to the reduction in open water habitat. Exclusion of cattle improves water quality, yet may be responsible for the reduction of open water habitats at these locations. If increasing the carrying capacity of these species is a goal, then restoration efforts to increase open water habitats at these springs is advised. Restoration of Dace Springs and the unnamed spring near Hutton Spring, combined with the introduction of Foskett speckled dace and Hutton tui chub into these locations, respectively, could reduce the risk of extinction and aid in recovery of these species.

Future monitoring of these fish populations and their spring habitats, including monitoring of proposed restoration and introduction sites, to track fluctuations in abundance and the quantity and quality of available habitat should be part of a long-term management plan for these fishes. Ideally, population estimates should be obtained and habitat conditions should be evaluated at least every three years. The methods we employed in 2005 provided population estimates with reasonable precision (13-15% at Hutton Spring and 19-24% at Foskett Spring) and will allow us to detect reductions in abundance of 19% (198 fish) at Hutton Spring and 25% (609 fish) at Foskett Spring. The proportions of each population that we handled can be reduced during future sampling, using knowledge we obtained from 2005 surveys. Using current estimates of abundance and knowledge of the levels of trapping necessary to capture these fish, the proportion of each population handled while obtaining future abundance estimates can be reduced to ~25 percent. We recommend that future investigations also include the collection of key life history information for these spring fishes (population age structure, age and size at maturity, longevity, and spawning timing/duration).

ACKNOWLEDGEMENTS

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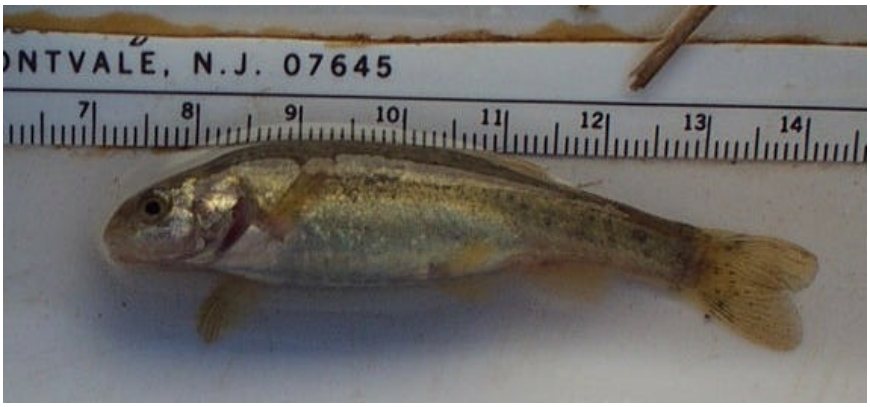
APPENDIX A Photographs of Hutton Spring tui chub and the spring habitat.

APPENDIX B. Photographs of Foskett Spring speckled dace and the spring habitats.



Foskett speckled dace

Spring pool

Spring brook

APPENDIX B. (continued).

Tule marsh

Cattail marsh

3406 Cherry Ave. NE
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