

# GRAYS HARBOR NATIVE CHAR

## A LITERATURE REVIEW

### 1.0 INTRODUCTION

The Grays Harbor federal navigation channel starts in the ocean and continues through Grays Harbor to the Chehalis River near the city of Aberdeen in Grays Harbor County, Washington. The navigation channel is about 23.5 miles long (covering about 1,300 acres) and is broken up into 11 reaches. The U. S. Army Corps of Engineers (Corps) dredges annually to maintain the channel's dimensions. The work usually involves dredging selected areas that have developed shoals as well as maintaining turning basins. The upstream reaches are within the river's thalweg near the mouth of the river. These reaches, especially the turning basins, often require more extensive dredging to meet the target channel dimension because they more easily accumulate the river's bedload.

Concern has been expressed by the U. S. Fish and Wildlife Service (USFWS) that maintenance of this project may impact native char (*Salvelinus confluentus* and *S. malma*). Specifically the USFWS believes that channel maintenance dredging could exclude fish from their habitat by the reduced water quality associated with the dredging plume and also result in the loss of benthic and fish resources by disturbing the river or estuary bottom. In order to address these concerns, the Corps has agreed to implement several "conservation measures" to minimize any potential impacts to native char.

One of the conservation measures was conducting an in-depth literature search regarding the occurrence of native char in Grays Harbor and to assess the need for a monitoring program for Grays Harbor native char. This paper reports the results of that review supplemented by interviews with U. S. Forest Service, Washington Department of Fish and Wildlife and Grays Harbor Community College researchers that have conducted field studies over the past 35 years in the Chehalis and adjacent basins.

### 2.0 LIFE HISTORY OF NATIVE CHAR

Compared to other salmonids, native char have more specific habitat requirements (Reiman and McIntyre 1993) that appear to influence their distribution and abundance. Critical parameters include water temperature, cover, channel form and stability, valley form, spawning substrates, and migratory corridors (Fralely and Shepard 1989; Goetz 1989; Rieman and McIntyre 1993). Water temperature is especially critical. Water temperatures in excess of 15°C (59°F) are thought to limit native char distribution (Fralely and Shepard 1989).

All life history stages of native char are associated with complex forms of cover, including large woody debris, undercut banks, boulder and pools (Oliver 1979; Fralely

and Shepard 1989; Goetz 1989). Juvenile and adult native char frequently inhabit side channels, stream margins and pools with suitable cover (Sexauer and James 1997).

Preferred spawning habitat consists of low gradient streams with loose, clean gravel (Fraley and Shepard 1989) and water temperatures of 5 to 9°C (41-48°F) in late summer to early fall (Goetz 1989). For the coastal subpopulations of native char, Martin and McConnell (1999) suggest that native char will only be located in streams with a glacial source ensuring that water temperatures will be maintained within their tolerance limits.

Native char typically spawn from August to September during periods of decreasing water temperatures. Migratory native char frequently begin spawning migrations as early as April and have been known to move upstream as far as 250 km (155 miles) to spawning grounds. For successful spawning and egg incubation, native char require very cold water with spawning occurring in the early fall of the year as the temperatures drop below 48°F (9°C) and the successful incubation of the eggs requires temperatures below 40°F (5°C). In this region, the downstream limit of successful spawning is always upstream of the winter snow line (Kraemer 1999). For successful spawning to occur, reaches in the headwaters of the basin would be used.

Brown (1992) noted that there are four life forms of native char, each exhibiting a specific behavioral or life history pattern. The adfluvial form matures in lakes or reservoirs and spawns in tributaries where juveniles rear for one to three years (Fraley and Shepard 1989; Holton 1990). Fluvial native char stocks have a similar life history except that they move between mainstem rivers and smaller tributaries. Bull trout are anadromous in coastal and Puget Sound drainages but to a lesser degree than Dolly Varden (Leary and Allendorf 1996; Haas and McPhail 1991). Individuals of these three migratory forms often make extensive migrations (Fraley and Shepard 1989; Holton 1990). Anadromous individuals will migrate between basins (Kraemer 1999).

A good example of native char life history is the Skagit River subpopulations. The Skagit River supports the largest population of native char in Puget Sound. Native char spawn in most if not all of the accessible upriver areas in the drainage. Anadromous, fluvial, adfluvial and resident fish all exist in the watershed and, in many cases, overlap geographically (WDFW 1998).

Life histories of the stocks in the Skagit, in the areas accessible to anadromous and non-anadromous fish are complex. Spawning occurs in the upriver areas as water temperatures decrease to around 8°C. In many cases, fluvial, anadromous, and resident adults spawn in the same areas. After spawning, while resident adults remain in the area, fluvial adults move throughout the upper river area and remain in pools throughout the winter, spring and early summer. They return to their spawning staging areas in late summer. Anadromous adults, after spawning, begin the downriver migration from late fall through the winter and enter the estuary area in the spring. They remain in the estuary until early to mid-summer to begin the upriver spawning run again. Anadromous native char migrate as smolts in the spring, return to the lower river in the fall, overwinter

in the lower river, then move to the estuary in late winter and early spring (WDFW 1998).

The migratory forms of native char are generally of the most concern throughout their southern and inland range. Stream resident native char spend their entire lives in smaller, high elevation streams, apparently moving little and seldom reaching a size of over 300 mm (12 inches)(Brown 1992). Size ranges for stream-resident native char populations in Oregon and Washington are usually from 115 to 300 mm (Goetz 1989). These size ranges are important when determining the origin of native char captured in estuaries and/or the lower reaches of streams and rivers. Native char captured throughout Grays Harbor and in the lower Chehalis Rivers, for example, generally exceed 457 mm (WDFW 1998) suggesting that they are anadromous.

### **3.0 NATIVE CHAR IN THE GRAYS HARBOR WATERSHED**

The Coastal-Puget Sound native char segment encompasses all Pacific coast drainages within Washington, including Puget Sound. No native char exist in coastal drainages south of the Columbia River. Ten native char subpopulations occur in five river basins in the Coastal analysis area: Subpopulations include Coastal Plains-Quinault River (5), Queets River (1), Hoh River-Goodman Creek (2) and Quillayute River (1). One subpopulation has been identified for the Chehalis River (Federal Register 1999), although there is insufficient information to assign stock status with confidence (WDFW 1998).

Subpopulations of native char in the southwestern portion of the coastal area appear to be in low abundance. Linth (2001), McConnell (2001), Samuelson (2001) and Mongillo (1993) indicate that the information on the presence of a native char subpopulation in Grays Harbor or the Chehalis River is largely anecdotal and that no hard evidence exists to suggest that such a subpopulation exists. There is insufficient information to assign stock status with confidence (Mongillo 1993; WDFW 1998). Because this is the southern extent of coastal bull trout and Dolly Varden (native char), abundance may be naturally low in systems like the Chehalis, Moclips and Copalis Rivers (WDFW 1998). It should also be noted that the Willapa River, the next river to the south, has no native char (COE 2001).

There is a general paucity of information relating to native char in the Chehalis River and Grays Harbor estuary. Although the literature suggests that a subpopulation of native char is found in this area, confirming data are limited (Brix 1974; Brix and Seiler 1977, 1978; Mongillo 1993; Seiler 2001; Linth 2001; McConnell 2001; WDFW 1998; Samuelson 2001).

Seiler (2001) stated that during seining studies conducted in the “mid-70s” along the shoreline of Moon Island (near the Hoquiam Airport), they “routinely caught Dolly Varden”. (Bull trout were not recognized as a species until later.) Brix (1974) reported the results of seining surveys on the Chehalis, Satsop, Wynoochee and Humptulips Rivers and in the Grays Harbor estuary. Two fish, identified as Dolly Varden (*Salvelinus*

*malma*) were captured. One fish was captured from a sampling location near Oakville in the Chehalis River and one was collected at Moon Island in the estuary. Brix (1981) reported capturing a single Dolly Varden on three separate occasions (March, May and June) in the Grays Harbor estuary in 1977. No other Dolly Varden were reported captured in seining efforts between 1973 and 1980. Unfortunately, lengths were not recorded in these studies.

Brix and Seiler (1977, 1978) collected downstream salmonid migrants in the upper Chehalis River at RM50 to evaluate coho production. Four different species of salmonids were collected during the two years of study. It was determined that the trapping effort collected 10% of all downstream migrants. No Dolly Varden were collected.

For the last several years, WDFW has operated smolt traps during the spring of the year in the lower Skagit River near the town of Burlington in order to enumerate migrating juvenile salmon smolts. During this sampling effort, native char smolts were captured and released as incidental catch. By assuming that trap efficiency is at a lower level (50%) than that measured for coho, a rough estimate for native char smolt out-migration since 1990 was computed. This would probably be a minimum estimate since capture avoidance would be greater because native char migrate at a larger size and probably use lower areas in the water column during migration than coho. Estimates ranged from a low of 14,490 in 1997 to a high of 48,965 in 1994 (WDFW 1998). Thus, it would seem that if native char are present in the basin, trapping efforts for other salmonids would have successfully collected native char.

Native char have been caught in the anadromous zone of the Chehalis River in the spring and fall. Most of the fish collected were 457 mm or larger (WDFW 1998; McConnell 2001) suggesting that these fish are anadromous. These fish appear to be single in or out migrants and could be native to other coastal streams (McConnell 2001).

In recent years, there have been even fewer reports of incidental catches of native char in the Chehalis River Basin. In 1997, a single juvenile native char was captured in a downstream migrant trap on the mainstem of the Chehalis River (WDFW 1998). Samuelson (2001) has been sampling in the Grays Harbor estuary, in the lower Chehalis River and in overwintering side channels in the Wynoochee for the past 10 years and has not yet captured a native char.

Although little historical and current information is known concerning native char in these river basins, habitat degradation caused by farming, logging, water diversions, dams, grazing, roads and mining in the past has adversely affected other salmonids (WDFW 1998). Habitat degradation in these basins is assumed to have similarly affected native char (Federal Register 1999).

Water quality in the Chehalis River is impacted by pulp mills in the lower river which produce effluents that vary from benign to lethal over a period as short as one day. Logging, agriculture and grazing in the Chehalis Basin degrade habitat by removing

riparian vegetation, increasing silt loads and decreasing large woody debris. The basin has a relatively low gradient that is not ideal for native char (WDFW 1998).

Water temperature could be limiting, forcing native char spawning to be at higher elevations as they move south. As noted above, water temperature above 15°C is believed to limit native char distribution (Fraley and Shepard 1989) with preferred spawning temperatures to be below 9°C (48°F). Washington Department of Ecology Water Quality Monitoring Stations throughout the Chehalis River basin indicates that as far upstream as RM 101 temperatures exceed 15°C for the summer and early fall months (the preferred time for spawning) and did not reach 9°C until November (WDOE 2001). Temperature may be a limiting factor in the successful spawning and rearing of native char within the basin. Thus, bull trout populations are small (COE 2001).

Native char have not been documented in the East or West Forks of the Humptulips (Martin and McConnell 1999). There is one anecdotal report of a single Dolly Varden being caught near Stevens Creek (about 5.5 miles downstream of the confluence of the east and west forks). However, there is general agreement that the Humptulips River watershed is not likely to support native char populations. According to Martin and McConnell (1999), two primary reasons support this conclusion: (1) other north coast stocks are only reported in rivers with a glacial source (e.g. Queets and Quinault Rivers) and the Humptulips does not a glacial source and (2) native char are generally easy to catch (given the proper tackle), yet there is no documentation of historical or current presence in the watershed. In other rivers, adults are seen holding in pools and are easily caught by anglers. This is not the case in either the Humptulips or Chehalis Rivers (McConnell 2001). Seining efforts in the Wynoochee, Satsop, Skookumchuck, Newaukum and Wishkah Rivers between 1973 and 1980 did not collect a single native char (Brix 1981) suggesting that these rivers also do not likely support native char populations.

The Queets and Quinault Rivers support subpopulations of bull trout (WDFW 1998). All four life forms occur in these rivers (McConnell 2001). Some anadromous life forms may migrate from these rivers into Grays Harbor and perhaps into the rivers. These appear to be single fish or small groups of fish that are not local and do not spawn locally (McConnell 2001).

The US Forest Service has conducted summertime and fall spawning ground surveys for a number of years in the Humptulips, Wynoochee and Quinault Rivers. If native char were in the rivers in any number they would have been observed. In other rivers, adults are seen holding in pools and are easily caught by anglers (given the proper tackle). This is not the case in the Humptulips or Chehalis Rivers (McConnell 2001).

Further, as suggested by data from the Skagit River, if a subpopulation does exist (in the Chehalis River), smolt traps used for coho enumeration would capture more outmigrants than have been reported. Similarly, seining efforts by Samuelson (2001) over the past 10 years in the estuary, Chehalis and Wynoochee Rivers have not been successful in collecting a single bull trout.

#### **4.0 CONCLUSIONS REGARDING NEW FOR A MONITORING PROGRAM**

In the final rule for determination of bull trout as a threatened species, it was noted that ten native char (bull trout) subpopulations occur in five river basins in the Olympic Peninsula/Coastal area of their range. One of these subpopulations is reported to occur in the Chehalis River/Grays Harbor basin (USFWS 1999). Mongillo (1993) stated that there is no information on the population of native char in the Chehalis River other than they are known to exist. Samuelson (2001) has monitored sites in the estuary, in the Chehalis and Wynoochee Rivers and in Grays Harbor for the past 10 years and has not captured a native char.

Monitoring for native char and other salmonid species has been on-going in the estuary and the rivers draining into the estuary for 30 years with the result that very few specimens have been collected. The lack of data indicating the presence of native char would not seem to warrant a sampling or monitoring program for this species. The on-going work by the U. S. Forest Service and Grays Harbor Community College will continue to provide insight into this species. The consensus among these researchers is that although native char may exist in the watershed, there is no evidence to confirm their presence. Thus, establishment of a monitoring program for Grays Harbor native char is not recommended.

#### **5.0 SUMMARY**

Very little data exists regarding the presence (or absence) of native char in Grays Harbor and the Humptulips, Hoquiam, Wishkah, and Chehalis Rivers. Single fish have been captured above the anadromous zone of the Chehalis River or in the estuary on only two occasions: at RM 50 in 1997 (WDFW 1998) and near Oakville in 1973 (Brix 1974).

Martin and McConnell (1999) suggest that subpopulations are located only in watersheds with a glacial source. None of the Grays Harbor coastal rivers have such a source. Temperatures in each of these coastal rivers exceed 15°C (59°F) during the summer months and temperatures remain above 9°C (48°F) until November (WDOE 2001), thus likely limiting habitat available for native char. Further, native char have not been observed in these rivers nor have they been caught by fishers. Thus, it would appear that the native char that have been taken in Grays Harbor are anadromous and are a subpopulation from a different watershed, most likely the Queets or Quinault Rivers.

Thus establishing a formal monitoring program for this Grays Harbor native char is not recommended.

## 6.0 REFERENCES

- Brix, R. 1974. 1973 studies of juvenile salmonids in rivers tributary to Grays Harbor, Washington. Washington Department of Fisheries, Management and Research Division. 6 pp. plus appendices.
- Brix, R. 1981. Data report of Grays Harbor juvenile salmon seining program, 1973-1980. Washington Department of Fisheries. Progress Report No. 141.
- Brix, R. and D. Seiler. 1977. Upper Chehalis River smolt trapping study, 1976. Washington Department of Fisheries. Progress Report No. 25.
- Brix, R. and D. Seiler. 1978. Upper Chehalis River smolt trapping study, 1977. Washington Department of Fisheries. Progress Report No. 48. 9 pp plus appendices.
- Brown, L. G. 1992. On the zoogeography and life history of Washington's native char; Dolly Varden *Salvelinus malma* (Walbaum) and bull trout *Salvelinus confluentus* (Suckley). Washington Department of Fish and Wildlife Report No. 94-04. 47 pp.
- Federal Register. 1999. Endangered and threatened wildlife and plants; Determination of threatened status for bull trout in the coterminous United States; Final Rule. Vol 64(210): 58909-58933
- Fraley, J. J. and B. B. Shepard. 1989. Life history, ecology and population status of migratory bull trout (*Salvelinus confluentus*) in the Flathead Lake and River system. Montana. Northwest Science 63(4): 133-143.
- Goetz, F. Biology of the bull trout (*Salvelinus confluentus*), literature review. Willamette National Forest, Eugene, OR.
- Haas, G. R. and J. D. McPhail. 1991. Systematics and distributions of Dolly Varden (*Salvelinus malma*) and bull trout (*Salvelinus confluentus*) in North America. Can. J. Fish. Aquatic Sciences 48:2191-2211.
- Holton, G. D. 1990. A field guide to Montana Fishes. Montana Department of Fish, Wildlife and Parks. Helena, Montana.
- Kraemer, C. 1999. Bull trout in the Snohomish River System. Washington Department of Fish and Wildlife, Mill Creek, WA July 1999.
- Leary, R. and F. Allendorf. 1996. Sympatric bull trout and Dolly Varden in the Olympic Peninsula and Puget Sound area of Washington. Wild Trout and Salmon Genetic

- Laboratory Report 96/2. Division of Biological Sciences. University of Montana, Missoula, Montana 59812.
- Linth, J. 2001. Habitat Biologist. Washington Department of Fish and Wildlife. Telephone conversation with Dave Des Voigne, January 19, 2001.
- Martin, D. and R. McConnell. 1999. East/West Fork Humptulips River Watershed Analysis. USFS and Rayonier, Inc. Unpublished manuscript.
- McConnell, R. 2001. Fisheries Biologist. Pacific Ranger District, U. S. Forest Service. Telephone conversation with Dave Des Voigne. February 12, 2001.
- Mongillo, P. E. 1993. The distribution and status of bull trout/Dolly Varden in Washington. Washington Department of Wildlife, Fisheries Management Division, Olympia, WA. Report 93-22.
- Oliver, C. G. 1979. Fisheries investigations in tributaries of the Canadian portion of the Libby Reservoir. Fish and Wildlife Branch, Kootenai Region.
- Reiman, B. E. and J. D. McIntyre. 1993. Demographic and habitat requirements for conservation of bull trout. USDA Forest Service. Intermountain Res. Sta. General Technical Report. INT-302.
- Samuelson, D. 2001. Professor of Fisheries, Grays Harbor Community College. Telephone communication with Dave Des Voigne, April 12, 2001.
- Seiler, D. 2001. Habitat Biologist, Washington Department of Fish and Wildlife. Telephone Conversation with Dave Des Voigne. January 19, 2001.
- Sexauer, H. M. and P. W. James. 1997. Microhabitat use by juvenile trout in four streams located in the eastern Cascades, Washington. pp. 361-370 In Mackay, W. C., M. K. Brown and M. Monita (eds.). Friends of the Bull Trout Conference Proceedings.
- U. S. Army Corps of Engineers (COE). 2001. Personal communication. Comments and input into this draft document to Dave Des Voigne. April 11, 2001.
- U. S. Fish and Wildlife Service. 1999. Endangered and threatened wildlife and plants: Determination of threatened status for bull trout in the conterminous United States: Final Rule. 50 CFR Part 17.
- Washington Department of Ecology (WDOE). 2001. Ambient monitoring data. Six year water quality summary.  
[www.ecy.wa.gov/programs/eap/fw\\_riv/data/rv23a160.html](http://www.ecy.wa.gov/programs/eap/fw_riv/data/rv23a160.html)

Washington Department of Fish and Wildlife (WDFW). 1998. Washington State salmonid stock inventory: Bull trout/Dolly Varden. Washington Department of Fish and Wildlife. 437 pp.