# NATIVE CUTTHROAT TROUT OF WYOMING

## IV: Evaluation of 1978 Collections

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This is the fourth report dealing with the evaluation of relative purity of various trout populations in Wyoming.

The 1978 report (III) included a distribution map showing the original ranges of the six subspecies of cutthroat trout native to Wyoming. The greenback cutthroat trout, Salmo clarki stomias, is native to a small area in southeastern Wyoming (South Platte River basin) and has probably been extinct in the state for many years. The cutthroat trout native to the upper Missouri River basin (excluding Yellowstone River drainage), S. c. lewisi, is restricted to the extreme northwest corner of the state and persists in only a few small streams.

This report concerns the examination of five samples of trout from the Yellowstone and Snake River drainages (S. c. bouvieri), two samples from the Green River basin (S. c. pleuriticus), one sample from theBear River drainage (S. c. utah), and two samples of unusual golden trout hybrids from Washakie and Lower Deep Creek lakes.

An update of information is provided on Bear River cutthroat trout for the purpose of facilitating the selection of populations to be used as brood stock for hatchery propagation.

Some of the samples did not have precise locality data (or the label was unreadable) and I have assigned these samples to S. c. bouvieri on the basis of their taxonomic characters.

The samples from Hidden Creek, Leidy Lake, and Turquoise Lake are considered to represent pure populations of S. c. bouvieri, although they are

recognizeably distinct from each other. The sample from the headwaters of Big Sandstone Creek represents a pure form of the Little Snake drainage S. c. pleuriticus. Coantag Creek probably contains a pure population of S. c. utah, but only three specimens were available for study. The hybrid golden trout of Washakie Lake may possess unique genetic recombinations of practical value in fisheries management.

Yellowstone-Snake River Drainages, Salmo clarki bouvieri:

In previous reports I pointed out that the name S. c. lewisi, long associated with Yellowstone cutthroat trout, is incorrect. The name lewisi is correctly applied to the subspecies native to the Upper Missouri basin (not including the Yellowstone drainage) and is a distinctly different subspecies.

Hidden Creek:

Two samples of 11 specimens were examined from Hidden Creek, a tributary to the Thoroughfare River in the headwaters of the Yellowstone drainage. These specimens are resident stream trout (not migratory from Yellowstone Lake). However, they have a similar appearance to Yellowstone Lake trout in the spotting pattern and have similar numbers of gillrakers (19-22 [20.1] ) and scales above the lateral line (40-47 [43] ) and in the lateral series (168-200 [179] ). They differ from Yellowstone Lake cutthroat by averaging about 10 fewer pyloric caeca (25-39 [32.3] ) and about 9 fewer basibranchial teeth (8-17 [13.2] ). Evidently, during an early stage in the evolution of Yellowstone Lake, several thousand years ago, the Lake was much larger in size. After downcutting occurred at the upper falls of the Yellowstone, the lake level dropped and some stocks were isolated from the lake and its

direct tributaries. These isolated stocks such as Hidden Creek and Sedge Creek (above Turbid Lake) became resident stream fish and initiated some genetic divergence from the main body of trout in Yellowstone Lake. The well developed gillrakers in Hidden Creek (and Sedge Creek) specimens, indicate that they were subjected to lacustrine selective pressures in their recent evolutionary history. The Hidden Creek trout are still similar in appearance to Yellowstone Lake trout and can only be differentiated on the basis of mean differences in pyloric caeca and basibranchial teeth. The Sedge Creek trout, on the other hand, isolated in a very small environment, evidently initiated more rapid differentiation and have a strikingly different spotting pattern than Yellowstone Lake trout.

I detect no sign of a hybrid influence in the Hidden Creek trout and consider them as a pure population of S. c. bouvieri, representing an isolated stock, separated for a few thousand years from the Yellowstone Lake cutthroat.

Cottonwood Lake:

Unknown locality. Four specimens, labeled "Cottonwood Lake", but with additional locality data washed off the label, are probably the result of the introductions of Yellowstone cutthroat trout and the fine-spotted Snake River trout. Three of the specimens are typical of Yellowstone Lake cutthroat trout in all characters. One specimen has a profusion of small spots and is quite distinct from the other three. The three "Yellowstone" specimens have 20-22 gillrakers on the anterior portion of the first left gill arch and 6-9 rakers on the posterior side. The finely spotted specimen has 16 rakers on the anterior side and 2 on the posterior.

Although the data are very sparse, I interpret the specimens to indicate that Cottonwood Lake was originally barren of trout. Many years ago, Yellowstone Lake cutthroat trout were introduced and became established. In recent years the lake was stocked with fine-spotted Snake River cutthroat (or stocked in a lake tributary to Cottonwood Lake). If this interpretation appears to contradict other information, I would suggest a larger sample be obtained from this lake in 1979.

Leidy Lake (R114WI43N):

I identify these specimens as a probable pure population of S. c. bouvieri, native to Leidy Lake. They possess some distinctive traits that distinguish them from Yellowstone Lake trout. The general appearance of the 8 specimens is typical of Yellowstone Lake trout and the scale counts and pyloric caeca counts are similar to Yellowstone Lake trout (average of 43 above lateral line, 181 in lateral series, and 41 caeca). The gillrakers of the Leidy Lake trout are clearly distinct from Yellowstone Lake trout. On the posterior side of the first gill arch, two specimens have one small raker and six specimens have no rakers (posterior arch is smooth). Yellowstone Lake Trout have 5-14 posterior rakers on the first arch and this is a strongly inherited character, not under environmental modification to any extent. Yellowstone Lake trout established in new environments still have 5-14 posterior rakers. Leidy Lake is in the headwaters of Leidy Creek, tributary to Spread Creek of upper Snake River drainage. The geographic separation between the large-spotted cutthroat trout (S. c. bouvieri)and the Snake River fine-spotted cutthroat (undescribed subspecies) is in this area. In previous collections I found the native trout in the Spread Creek drainage to be large-spotted (bouvieri); both subspecies were found in the

Gros Ventre drainage immediately to the south of Spread Creek, but the fine-spotted subspecies is more prevalent in the Gros Ventre. South of the Gros Ventre, all tributaries down to Palisades Reservoir contain the fine-spotted form.

Leidy Lake should receive special recognition for management purposes and should not be stocked.

Turquoise Lake. No locality.

Sent from Lander Office. Five specimens of cutthroat trout from Turquoise Lake represent a distinctive population of S. c. bouvieri. The specimens differ from all others examined by possessing very large, round spots, few in number, and restricted almost entirely to the posterior half of the body. In this character they resemble the Sedge Creek trout mentioned above. The Turquoise Lake trout are clearly not derived from Yellowstone Lake or any other known source of cutthroat trout propagated in hatcheries. Besides the spotting pattern, the other taxonomic characters of the five specimens are quite distinct from most other members of this subspecies. I counted 17-20 (18.8) anterior gillrakers and 0-3 posterior rakers. There is a low number of scales in the lateral series (143-162 [152] ) and a low number of basibranchial teeth (1-4 [3] ). The number of pyloric caeca is relatively high (44-50 [46] ).

Although the sample size is small, the spotting is uniform with little variation. The meristic characters are distinctive. There is no indication of a hybrid influence. The Turquoise Lake population is judged to represent a pure population that has been isolated for some time and, as with Leidy Lake, should receive special management considerations to preserve the unique genotype.

Green River Basin, Salmo clarki pleuriticus:

In previous reports I discussed the fact that there are two distinct types of S. c. pleuriticus native to the Green River basin in Wyoming. The typical form with medium size spots is native to the upper Green River proper and its tributaries. A form with very large spots is native to the Little Snake drainage (Yampa River Tributary). These two forms were illustrated in Allen Binns publication, "Present status of indigenous populations of cutthroat trout in southwest Wyoming" (Fish. Tech. Bull. 2).

A sample of 7 specimens from Teepee Creek, a tributary to Tosi Creek in the upper Green River drainage above Kendall, represent the typical form. The Teepee Creek population, although phenotypically resembling S. c. pleuriticus, is hybridized with rainbow trout and perhaps other subspecies of cutthroat trout. Three of the specimens lack basibranchial teeth and scale counts above the lateral line (34-43) and in the lateral series (156-178) are much too low for pleuriticus (40-48 and 170-200+ typically expected in pure populations). For identification purposes I would classify these specimens as S. c. pleuriticus because they certainly have more pleuriticus heredity than S. gairdneri heredity, but using the ranking system devised by Binns (cited above) I would grade the Teepee Creek sample as "B— or C+" pleuriticus.

A sample of 10 specimens from the headwaters of Big Sandstone Creek (Little Snake drainage) in Carbon County (R87 T14) represents what I consider to be a pure population of the large-spotted, Little Snake drainage pleuriticus. The specimens are very uniform in appearance. All have basibranchial teeth (6-21 [11]). Scale counts are high, 44-52 (47) above the lateral line and 175-205 (188) in the lateral series. Pyloric caecal counts are low (29-34 [34]). It has been mentioned

in previous reports that the small headwater tributaries in the Little Snake drainage are the greatest "stronghold" of the rapidly vanishing S. c. pleuriticus. The headwaters of Big Sandstone Creek appears to be as pure as any sample yet examined and could be considered as a possible source for introductions into new waters. Before this is done, however, the degree of isolation should be checked. In 1970 I collected specimens in a downstream area of Big Sandstone Creek (below confluence with Douglas Creek) and some hybrid influence was detected in these specimens. Can the hybrids in lower Big Sandstone Creek reach the headwaters where the 1978 sample was obtained, or is there a physical barrier isolating the population?

Bear River Drainage, Salmo clarki utah:

Three specimens from Coantag Creek, a headwater tributary to Hobble Creek (Smith Fork) were examined. I have previously sent my diagnosis of these specimens to Allen Binns. They are typical of pure S. c. utah of the Bear River drainage in spotting pattern and other taxonomic characters; however, the sample size is too small to make a more positive declaration on their purity.

Problems have arisen concerning the creation of a base of genetic diversity (heterozygosity) in a brood stock of S. c. utah maintained at the Daniel Hatchery. The present stock is derived from a few spawners from Raymond Creek. In last year's report I cited Raymond Creek and upper Giraffe Creek to contain the purest populations of S. c. utah known from the Bear River drainage. I also cited Alice Lake fish as probably pure, but they do have recognizeable differentiation from the trout of Raymond and Giraffe Creeks. It was planned to obtain spawn from Giraffe Creek trout to add to the Raymond Creek brood stock to broaden the base of heterozygosity. In

1978; however, trout from the Idaho section of Giraffe Creek exhibited indications of a hybrid influence. Dr. Richard Wallace, University of Idaho sent me the results of his examination of Giraffe Creek trout from Idaho. The 1978 Idaho sample and the 1977 Wyoming sample are clearly not a single, homogeneous population. The Wyoming sample has basibranchial teeth present in 33 of 34 (97%) specimens. Basibranchial teeth are absent in about 15% of the Idaho specimens. Due to the slight movement typical in small streams, it is not unusual to find slight differences in samples taken from different parts of the same stream. Obviously, the trout in the Idaho section of Giraffe Creek have been exposed to hybridization. Idaho Fish and Game records indicate stocking with Henry's Lake cutthroat trout, but the absence of basibranchial teeth in 15% or more of the population definitely indicates a rainbow trout influence.

Dr. Wallace recommended that no further stocking be made in Giraffe Creek in Idaho. From the example of the trout in other waters of the Thomas Fork and Smith Fork drainages, it can be expected that the non-native genes will be "weeded out" by natural selection and the Giraffe Creek trout should essentially revert to its pure form before the effects of hybridization spreads into Wyoming sections of the stream. Allen Binns sent me a photo of an unusual specimen from Giraffe Creek. The specimen has virtually no spots on the body. I have observed this phenomenon in other S. c. utah populations (Trout Creek, Utah) and believe it is due to a rare combination of genes and not from a hybrid influence (the Paiute Trout, S. c. seleniris is an isolated population of Lahontan cutthroat trout, in which all of the fish exhibit an essentially spotless body).

In view of the potential contamination of Giraffe Creek fish, I would recommend that they not be used in 1979 to develop the brood stock of S. c. utah. Samples should be made in 1979 and every year or two thereafter to check their purity. If subsequent samples are similar in purity to the 1977 sample, I would see no reason not to use Giraffe Creek fish in the future.

A larger sample from Coantag Creek should be examined. The remote location of this creek suggests a good possibility that they are pure.

Alice Lake fish could be used in brood stock development and would stimulate heterozygosity (based on their divergent characters) and would likely endow some lacustrine adaptations into the brood stock. However, the resulting spotting pattern would likely be highly variable.

More spawners from Raymond Creek should be used also to obtain a fair sample of the heterozygosity present in that population. In any event, the objective of creating heterozygosity by using fish from different populations is definitely to be commended, particularly when the pure populations are so limited in numbers. The resulting brood stock should yield offspring much more adaptable and successful when stocked into new waters than if only a single source was used.

Washakie Lake and Lower Deep Creek Lake:

Specimens from Washakie Lake (N=7) and Lower Deep Creek Lake (N=10) were sent from the Lander office for identification. These specimens are golden trout hybrids.

Unfortunately, the specimens were gutted and in poor condition. The specimens from Lower Deep Creek Lake evidently had been frozen and thawed

several times and they partially distintegrates on examination. The only characters that could be obtained from these specimens were scale counts (but very difficult) and observations on coloration and spotting.

The spotting pattern on the Washakie Lake fish definitely indicates hybridization between golden trout (S. aguabonita) and rainbow trout (S. gairdneri). The strong coloradion indicates a predominance of golden trout. The high scale counts (150-198) also indicates a strong golden trout influence. Golden trout freely hybridize with both rainbow and cutthroat trout and in the upper Wind River drainage hybrids between all three species are not uncommon.

The significance of the Washakie Lake trout is not their taxonomic status, but rather their genetic constitution that results in large size. Fish of 10 lbs. and more have been known from this lake. It has long been known that desirable qualities such as rapid growth and survival is often obtained from crossing distinct strains of hatchery trout, wild and hatchery strains and between rainbow and cutthroat trout.

The unique and potentially useful aspect of the Washakie Lake trout is that the hybridization here has been completely under natural selection for many generations and the unique genetic combinations have been rigorously selected for survival under natural conditions.

I would advise that some experimental propagation and stocking of new waters be made from the offspring of the Washakie Lake trout to test the possibility that the Washakie Lake trout is a valuable genetic resource which could increase trout production and produce trophy size trout when introduced into new waters. This would be a "try it and see" situation, but from a theoretical viewpoint, the chances of success are good.

I have frequently noted that hybrids of golden trout with rainbow trout and with cutthroat trout attain a much greater size than do pure golden trout. In Alpine Lake, on the Wind River Reservation, golden trout reached a maximum weight of about 2 lbs. In 1960's Snake River cutthroat trout were inadvertently stocked into lakes in the watershed and hybridization occurred in Alpine Lake. Hybrids attained weights of 5-6 lbs. Almost certainly, the "world record" golden trout reputedly from Cooks Lake, Wyoming, was actually a golden-rainbow hybrid.

The specimens from Lower Deep Creek Lake were in such poor condition that no real conclusions can be reached. My overall assessment is that they are less influenced by hybridization than is the Washakie population. Scale counts are higher (42-53 above lateral line and 183-210 in lateral series) and from what could be made out of the coloration and spotting they appeared to be quite typical of golden trout, S. aguabonita.

To obtain a more definitive analysis of both the Washakie Lake and Lower Deep Creek Lake populations, to ascertain the relative influence of golden trout, rainbow trout, and perhaps, cutthroat trout in their ancestry, further samples should be taken and preserved in formalin.