

### FURTHER RECORD OF LITTLE KERN GOLDEN TROUT, *SALMO AGUABONITA WHITEI*, IN THE LITTLE KERN RIVER BASIN, CALIFORNIA

In a recent study of phenetic variation among six populations of golden trout, *Salmo aguabonita* Jordan, collected in 1973 from the Sierra Nevada, California, we reported the presence of at least two significantly distinct phenetic groups of golden-like trout resident within the upper Little Kern River basin (Gold and Gall 1975a). The first was represented by two samples, one from the Little Kern River near Peck's Canyon Creek, and the other from lower Soda Springs Creek near its confluence with the Little Kern River. Subsequently, Gold (1975) reported that this group occupied a cluster point in phenetic hyperspace approximately halfway between that occupied by rainbow trout (*Salmo gairdneri* Richardson) and that by *S. aguabonita aguabonita*—the golden trout subspecies from the South Fork of the Kern River and Golden Trout Creek.

The second phenetic group was represented by a single sample from upper Soda Springs Creek, above a series of natural barriers which prevent the upstream migration of trout from lower Soda Springs Creek and the Little Kern River. Phenetically, this group was found to be much more closely related to the geographically distant populations of *S. a. aguabonita* than to the samples from lower Soda Springs Creek and Little Kern River situated only 10-11 km (6-7 miles) downstream (Gold and Gall 1975a). This evidence, plus some differences in chromosome karyotype (Gold and Gall 1975b), and a remarkable similarity in morphology between the upper Soda Springs Creek trout and Evermann's (1905) first description of the Little Kern golden trout, led us to hypothesize that the upper Soda Springs Creek trout represented a "pure" population of the endemic, and now threatened (Miller 1972; Fisk 1972), Little Kern golden trout, *S. a. whitei* Evermann.

Subsequently, a search was undertaken for additional populations that might represent "pure" Little Kern golden trout. In June 1974, 20 specimens were removed by angling from Deadman Creek, a northern tributary of Soda Springs Creek, and tested for phenetic similarity with the upper Soda Springs Creek population. Trout were caught at random sites along the creek, but always upstream from a series of natural barriers which prevent any upward migration of trout from below.

Ten meristic characters were examined on all specimens in the same manner as described in Gold and Gall (1975a). All data were subjected initially to frequency distribution analysis using the mean, variance, and Fisher's third and fourth moment statistics (Sokal and Rohlf 1969). Evaluation of the distributions revealed that all ten characters were distributed approximately normally. Slight deviations from normality were invariably leptokurtotic and were considered as being due to small sample size.

The means of the ten characters for both populations were compared by "t" tests, with each test having 111 degrees of freedom.

Means of 8 of the 10 characters were found not to differ significantly at the 5% probability level (Table 1). Of the two means which differed significantly between the two samples, one (scales above the lateral line) differed at the 5% probability level but not at the 2% level. The reduced number of vertebrae in the Deadman Creek trout was highly significant ( $P < 0.01$ ), and was the only clear cut difference between the two samples.

TABLE 1  
Observed Means and Standard Errors of 10 Characters for 20 Deadman Creek and 93 Upper Soda Springs Creek Trout, and the Results of "t" Test Comparisons Between Means

Character	Mean $\pm$ S.E.		Pooled $\dagger$ standard error	"t"
	Deadman Creek	Upper Soda $\dagger$ Springs Creek		
Pyloric caeca.....	30.6 $\pm$ 0.4	32.2 $\pm$ 0.4	0.884	1.753
Fin rays				
Pelvic.....	9.6 $\pm$ 0.1	9.5 $\pm$ 0.1	0.197	0.761
Dorsal.....	12.2 $\pm$ 0.1	11.9 $\pm$ 0.1	0.241	1.245
Anal.....	11.5 $\pm$ 0.1	11.5 $\pm$ 0.1	0.230	0.217
Pectoral.....	15.4 $\pm$ 0.1	15.5 $\pm$ 0.1	0.192	0.260
Branchiostegal rays.....	11.1 $\pm$ 0.1	11.3 $\pm$ 0.1	0.202	0.990
No. vertebrae.....	59.9 $\pm$ 0.1	60.8 $\pm$ 0.1	0.209	4.067**
Gill rakers.....	17.8 $\pm$ 0.2	18.2 $\pm$ 0.1	0.326	1.227
Scales along lateral line.....	181.0 $\pm$ 1.2	181.8 $\pm$ 0.9	2.112	0.379
Scales above lateral line.....	35.2 $\pm$ 0.3	36.6 $\pm$ 0.3	0.684	2.050*

$\dagger$  From Gold and Gall (1975a).

$\dagger$  The pooled standard error for the "t" tests was computed after Sokal and Rohlf (1969) using a weighted analysis for unequal sample size.

\*  $P < 0.05$ .

\*\*  $P < 0.01$ .

The high degree of similarity (8 of 10 means) strongly indicates taxonomic identity between the two populations. The differences between them may be the result of environmental variation. This could be true for the different vertebral numbers observed, since relatively slight alterations in environmental variables (specifically temperature) are known to modify this character in salmonids (Tåning 1952; Garside 1966). Also, slight population divergence by chance alone might be expected since these two populations may have been isolated from each other for some time.

Since both the Deadman Creek and upper Soda Springs Creek populations are sufficiently isolated from each other, and from the trout populations of lower Soda Springs Creek and the Little Kern River, the two populations, although isolated, very probably represent a single form of golden trout long resident in the upper Little Kern basin. This would appear to support our earlier finding that relatively "pure" populations of Little Kern golden trout still reside in waters of the Little Kern River basin. Furthermore, the finding of a second population, closely related phenetically to the upper Soda Springs Creek population and hence by inference distantly related to the lower Soda Springs and Little Kern River populations, reinforces our earlier contention that the trout of lower Soda Springs Creek and the Little Kern

River are not the endemic golden trout of the region, but rather remnants of golden  $\times$  rainbow hybridization (as suggested by Dill 1945, 1950). This contention was supported by the fact that the lower Soda Springs Creek and Little Kern River trout were phenetically intermediate between *S. gairdneri* and *S. a. aguabonita* (Gold 1975), and by the close phenetic relationship observed between *S. a. aguabonita* and the upper Soda Springs Creek golden trout (Gold and Gall 1975a).

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