

ABSTRACTS FROM THE SINKS SYMPOSIUM

The following abstracts are from the “Sinks Symposium—Exploring the Origin and Management of Fishes in the Sinks Drainages of Southeast Idaho.” The Idaho Chapter of the American Fisheries Society sponsored the symposium in Pocatello 27 February 2002. For more information related to the symposium contact Rob Van Kirk: vankrobe@isu.edu.

GEOGRAPHY AND FISHES OF THE SINKS DRAINAGES OF SOUTHEASTERN IDAHO

Robert W. Van Kirk
Department of Mathematics
Idaho State University, Pocatello, ID 83209

Bart L. Gamett
Salmon-Challis National Forest
P.O. Box 507, Mackay, ID 83251

The Sinks Drainages are a collection of closed surface drainage basins in southeast Idaho consisting of five U.S. Geological Survey hydrologic cataloging units: Beaver-Camas (17040214), Medicine Lodge (17040215), Birch (17040216), Little Lost (17040217), and Big Lost (17040218), in order from east to west. The streams of these basins originate in the Pioneer, Lost River, Lemhi, and Centennial mountain ranges and flow generally east and south, eventually sinking into the fractured basalts of the Snake River Plain. Adjacent drainages with surface connections to major river systems are the Big and Little Wood, Salmon, and Henrys Fork in the Snake River basin, and the Red Rock in the upper Missouri River basin. Twenty-seven fish species and three hybrids have been documented in the Sinks Drainages. However, because the Sinks Drainage streams are isolated from these major river basins, the origin of their aquatic fauna is not clear. Stocking of nonnative fish species into Sinks Drainage streams began in the 19th century, further confounding the problem of determining the native fish assemblages of these streams. It is possible that bull trout (*Salvelinus confluentus*), a federally listed species under the Endangered Species Act, and cutthroat trout (*Oncorhynchus clarki*), a state species of special concern, are native to at least some of the Sinks streams. Thus, refined knowledge of historical and current presence/absence of these species has important implications for management of fish and related resources in the Sinks Drainages.

GEOLOGIC AND HYDROLOGIC HISTORY OF THE SINKS DRAINAGES

Paul K. Link

Department of Geosciences
Idaho State University, Pocatello, ID 83209

The Sinks Drainages have been controlled by topographic uplift and subsidence of the northeast-migrating Yellowstone hotspot over the last 17 million years. From Oligocene to middle Miocene (30 to 12 Ma), drainage was eastward from the eroded roots of the Idaho batholith and probably into the Missouri River. As the topographic bulge associated with the hotspot began to affect eastern Idaho (10 to 4 Ma), the Snake River Plain became an uplifted volcanic plateau, and drainage was radial, away from the volcanic locus. The Lost River, Lemhi, and Beaverhead ranges were uplifted, and the Big and Little Lost Rivers drained northward into the Salmon River. Ancestral Medicine Lodge and Camas creeks drained eastward into the Green River. Pliocene to Holocene subsidence of the Snake River Plain resulted in northward migration of the headwaters of the now south-draining Big and Little Lost rivers and Birch Creek and integration of the west-flowing Snake River, likely near its present location. Pleistocene construction of the northeast-trending Axial Volcanic High and northwest-trending basaltic rift zones resulted in isolation of the northern drainages from the Snake River. The result was formation of the Big Lost Trough and Lake Terreton basins and the modern Sinks Drainage pattern. Pleistocene to Holocene connections among Sinks Drainage streams occurred via common drainage into a lake system on the Snake River Plain. Periodic Pleistocene connections with the Snake River were also likely. Recent volcanism on the Yellowstone Plateau and desiccation of the Snake River Plain lakes produced the present drainage system.

EVOLUTION AND HISTORICAL DISTRIBUTION OF FISHES IN WESTERN NORTH AMERICA IN RELATION TO THE SINKS DRAINAGES

Robert J. Behnke

Department of Fishery and Wildlife Biology
Colorado State University, Fort Collins, CO 80523

The native fishes of the Sinks Drainages are derived from former connections to contiguous drainages: upper Snake, Wood (middle Snake), Salmon (Columbia), and Beaverhead (upper Missouri). The shorthead sculpin (*Cottus confusus*) is the only fish native to all five Sinks Drainages. The shorthead ancestor could have come only from the Salmon River. Its dispersal to the other drainages probably occurred via Lake Terreton, which connected them until about 10,000 years ago. This suggests that the ancestors of all other native species arrived after Lake Terreton's desiccation. The mountain whitefish (*Prosopium williamsoni*), native only to the Big Lost drainage, illustrates unresolved problems concerning native fishes of the Sinks Drainages. Cutthroat (*Oncorhynchus clarkii*) and bull (*Salvelinus confluentus*) trout are typical inhabitants of first and second order streams in the region. Sculpins (*Cottus*), speckled dace (*Rhinichthys osculus*), and mountain sucker (*Catostomus platyrhynchus*) would be likely to occur in second and third order streams. The mountain whitefish is typically found in third and fourth order streams. Thus, it would be expected that transfer of whitefish into the Big Lost drainage should have

included all associated species that also occur in lower order streams. Of these, only the Paiute sculpin (*C. beldingi*) appears to be native to the Big Lost. The distribution of other fishes assumed to be native to the Sinks Drainages is similarly problematic. Introductions of fish by humans over the past 120 years add to the difficulty of making a definitive determination of the native fish fauna of the Sinks Drainages.

PRELIMINARY BIOGEOGRAPHIC ASSESSMENT OF THE SINKS DRAINAGES BASED ON AQUATIC INVERTEBRATES

Daniel L. Gustafson
Department of Ecology
Montana State University, Bozeman, MT 59717-3460

The Sinks Drainages do not form a natural zoogeographic unit. The smallest area that includes the Sinks Drainages that has a unique invertebrate fauna also includes the Boise headwaters, the Wood rivers, the Salmon headwaters, the Henrys Fork and the Missouri headwaters. This larger area formed the northwest limits of the upper Snake paleoriver. This river was not connected to the Columbia River, but flowed east and then later across the southwest states to various outlets before its capture by the Columbia. Volcanic eruptions and uplift from the Yellowstone hotspot disrupted this drainage and eliminated much of the original fauna. Some extinction-resistant taxa survived in the Big Lost, Little Lost, and Birch drainages, but no endemic taxa are yet known in medicine Lodge or Beaver-Camas. Miocene relict taxa of the Northern rocky Mountain Refugium have not been found in the Sinks Drainages or Henrys Fork but these do occur immediately to the north. Late-arriving species from the Great Basin into the upper Snake do not occur north of the Snake River, except in the lower Henrys Fork. The absence of the mussel *Margaritifera* in the Sinks Drainages suggests that no ancestral salmonids lived or survived there; existing salmonids arrived later by more limited transfers, natural or anthropogenic. Other fish species may have survived the original drainage breakup in the Big and Little Lost Rivers. These were most likely derived from upper Snake River, except in the Little Lost, where transfer from the Salmon drainage to the north is indicated.

THE DISTRIBUTION AND POTENTIAL ORIGIN OF SCULPIN SPECIES IN THE SINKS DRAINAGES

Bart L. Gamett
Salmon-Challis National Forest
P.O. Box 507, Mackay, ID 83251

Donald W. Zaroban
Orma J. Smith Museum of Natural History
2112 Cleveland Blvd., Caldwell, ID 83605-4432

Three sculpin species are known from the Sinks Drainages: shorthead (*Cottus confusus*), Paiute (*C. beldingi*), and mottled (*C. bairdi*). The shorthead sculpin has been found in all

five Sinks Drainages. Distribution patterns and geomorphic evidence suggest that the shorthead entered one or more of the Sinks Drainages from the Salmon River at least 10,000 years ago. The species then likely gained access to other streams via Lake Terretton. Morphological assessments and preliminary genetic analysis indicate that the shorthead sculpin of the Sinks Drainages are distinct from shorthead sculpin in other drainages. The mottled sculpin is found in the Beaver-Camas, Medicine Lodge, and Birch drainages but is not known from the Big Lost River and Little Lost River drainages. Distribution patterns and geomorphic evidence suggest that the mottled sculpin entered the Medicine Lodge Creek and Beaver-Camas Creek drainages from the Henrys Fork within the last few thousand years and that the occurrence of mottled sculpin in Birch Creek is either a reporting error or due to anthropogenic introduction. The Big Lost River is the only drainage within the Sinks known to contain Paiute sculpin. It is unclear how or when this species entered this basin. Early sampling efforts and distribution patterns suggest that this species is native to the drainage. Additional genetic analyses are being pursued to help clarify the origin of the sculpin in the Sinks Drainages and assess how much genetic change has occurred in these species since they were isolated.

GENETIC ANALYSIS TO INFER THE ORIGIN OF MOUNTAIN WHITEFISH *PROSOPIUM WILLIAMSONI* IN THE BIG LOST RIVER

Andrew Whiteley

Wild Trout and Salmon Genetics Lab, University of Montana, Missoula, MT 59812

Bart L. Gamett

Salmon-Challis National Forest, P.O. Box 507, Mackay, ID 83251

We analyzed mountain whitefish (*Prosopium williamsoni*) from the Big Lost River and surrounding watersheds at 32 allozyme loci and four microsatellite loci. Populations analyzed from surrounding watersheds were from the Snake River above and below Shoshone Falls and from the Salmon River. Mountain whitefish from the Big Lost River appear to have entered the system via the upper Snake because the Big Lost River population shares allozyme and microsatellite alleles with the upper Snake populations but not with the Salmon River populations. The Big Lost River mountain whitefish population is characterized by an extreme lack of genetic variation; of the 32 allozyme loci analyzed, only one was variable. Heterozygosity at the four microsatellites was zero, greatly reduced from upper Snake populations, where the average heterozygosity at the same four loci was 0.294. Finally, mountain whitefish from the Big Lost River are highly genetically differentiated from surrounding populations. This fact is best demonstrated by fixation of a unique allele in the Big Lost River population at one of the microsatellite loci. We can infer from these data that genetic exchange has not occurred between whitefish in the Big Lost River and surrounding watersheds for a long time period. Genetic and morphological differences may warrant consideration of Big Lost River mountain whitefish as a separate subspecies.

SETTLEMENT OF SOUTHEASTERN IDAHO, WITH REFERENCE TO FISHERIES RESOURCES

Ron Hatzenbuehler
Department of History, Idaho State University, Pocatello, ID 83209
Ron HatzenbuehlerDepart

When European-Americans arrived in what became southeastern Idaho, they began living in an environment that Indians had been using for probably 10,000 years. Because no single location offered sufficient resources year round, native people migrated seasonally, making a living without diminishing the resources of any single area. Archaeological evidence indicates that the native people of eastern Idaho relied on aquatic resources, primarily whitefish (*Prosopium williamsoni*), cutthroat trout (*Oncorhynchus clarki*), and salmon (*Oncorhynchus* spp.). The first permanent European-American settlements in Idaho Territory date to the 1860s, when members of the Church of Jesus Christ of Latter-Day Saints moved northward from Cache Valley, Utah. Large-scale settlement of Idaho and the other western states came with the introduction of the railroad. In 1874, the first railroad, the narrow gauge Utah Northern, entered Idaho Territory at Preston. By 1880, the railroad had reached the Montana border. In 1885, the entire 245 miles of narrow gauge track from Pocatello to Silver Bow, Montana was widened. Other railroads later linked outlying cities, including Mackay (1901) in the Sinks Drainages. The railroad brought not only people and economic expansion; it also brought nonnative fish. Historical records indicate that trout were not native to the Big Lost River, but in 1896 or 1897 wagons went from Mackay to Blackfoot to get fish that had been transported there by train. These fish were stocked into the Big Lost. In June 1914, the railroad brought 100,000 trout to Mackay for introduction into Warm Springs Creek, a Big Lost tributary.

THE ORIGIN OF FISHES IN THE SINKS DRAINAGES OF SOUTHEASTERN IDAHO: A SUMMARY

Bart L. Garnett
Salmon-Challis National Forest, P.O. Box 507, Mackay, ID 83251

Historical records, distribution patterns, and geomorphic history suggest that only a few fish species are native to the Sinks Drainages. There is strong evidence that shorthead sculpin (*Cottus confusus*), Paiute sculpin (*C. beldingi*), mottled sculpin (*C. bairdi*), mountain whitefish (*Prosopium williamsoni*), and cutthroat trout (*Oncorhynchus clarki*) are native to at least some of the Sinks Drainages. Rainbow (*O. mykiss*) and bull trout (*Salvelinus confluentus*) are apparently not native to the Big Lost, Birch, Medicine Lodge, and Beaver-Camas watersheds, but it is unclear whether these species are native to the Little Lost. If so, they likely entered this watershed within the last 10,000 years via headwater transfer from the Salmon drainage. Shorthead sculpin, which appear to be native to all five of the Sinks Drainages, likely entered one or more of the Sinks streams at least 10,000 years ago from the Salmon River drainage and subsequently dispersed to the remaining streams through glacial Lake Terreton. It is unclear how or when Paiute sculpin, which are known only from the Big Lost River drainage, entered this system. Mottled sculpin and cutthroat trout appear to be native only to the Medicine Lodge and Camas-Beaver drainages and appear to have entered

these streams from the Henrys Fork drainage within the last 10,000 years. Thus, the cutthroat is the Yellowstone subspecies *O. c. bouvieri*. Mountain whitefish, which are known only from the Big Lost River drainage, appear to have migrated from the Snake River at least 10,000 years ago and may represent an endemic subspecies.

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