

Home address:  
K. M. Svensson  
1581, Långgöl.  
Kallinge l.  
Sweden

Göteborg Febr. 4. 1961.

Dear Bob,

Thanks for the letter I received a few days ago. I sent you a letter with a check of \$9 enclosed just a few days before I got your letter so it seems like the letters have "met on the ocean" - or maybe somewhere between Sputnik and Crazy Horse, Wyoming -

I hope you have received it by now. If I don't hear from you in the near future I will understand you have received it.

Please forgive me for not sending the check before. I will real soon write to Mr. Lestvitz and thank him for the three books we got from him, it was very nice of him.

I surely am looking forward to receive the publications you wrote about and my home address (above) is best to

case - my parents will always forward mail to me.

Guess what, Bob, it looks like I will be moving west once more. An Irish power company contacted me last fall and wanted me to come to Ireland for about three months this spring to help them organize their newly started <sup>(first)</sup> salmon hatchery. I just had a letter from them and, after the salary have been settled, I will be going over there around April 1st. They'll pay the fare back and forth. What do you think of that? I've got a job anyhow and it will be a merit for me. If all the fish don't die, that is - - -.

I'll write to you when I get there, and tell you how it turns out with the fish. Also, of course, I may say a few words about the famous Irish eyes smiling on the green island it self -.

Sincerely

Ken.

January 8, 1962

Dr. Robert Rush Miller  
Museum of Zoology  
University of Michigan  
Ann Arbor, Michigan

Dear Bob:

In pawing through a big accumulation of reprints, I come across a paper by Seth Benson and Bob Behnke, in which they synonymize Salmo evermanni with S. clarkii and henshawi. The authors represented the case very well, and I think there can be no question that they are correct. We have, of course, deleted the San Geronio trout from the California list.

This finding knocks one of the props out of the body of evidence indicating the effect of Pleistocene cold on the distribution of animals along the Pacific coast, but I think that the evidence is good.

I suppose you've noticed the small reference, in the quotation to Bryant, 1929, on the hybridization of trout in the Santa Ana River.

One of us should have thought of this possibility before. I suppose it is really rubbing it in somewhat when I recall that I've argued with you on the status of this trout before, indicating my idea that it should be ranked only as a subspecies of S. clarkii, for you have been holding to the view that at least provisionally it should be retained as a distinct species. I never could see the logic of that interpretation.

Cordially,

Carl L. Hubbs

cc: Dr. Seth B. Benson  
Dr. Robert J. Behnke  
Mr. W. I. Follett

THE UNIVERSITY OF BRITISH COLUMBIA

VANCOUVER 8, CANADA

INSTITUTE OF FISHERIES

May 16th, 1962.

Dr. Robert J. Behnke  
Department of Zoology  
Berkeley 4  
California, U.S.A.

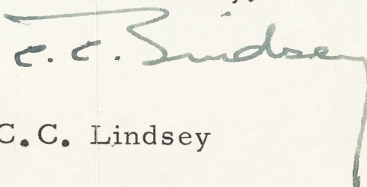
Dear Dr. Behnke

A few months ago I went to some effort to track down whitefish specimens described by Bajkov, but drew a blank. Some fish may have been left by him in our office building in Winnipeg, since vacated, but these are apparently lost. He evidently brought no fish to Nanaimo (whose collection is now at U.B.C.). He died in the Northwestern United States. I think your chances of locating "argenteus" specimens are remote if Dr. W.B. Scott does not know their whereabouts.

Regarding Salmo clarkii alpestris, it is true that, as you and Dymond noted, they have an unusually high scale count. However I cannot at the moment answer your important question whether or not all reported and disjunct localities share this character. Dymond did not see fish from most places where he was told they occurred, nor have I. I very much doubt that they all are the same, and I plan to collect to check this point. The areas are peculiarly inaccessible and may, in some cases, require helicopter transport. In the meantime I can only say that I don't see how there could be a valid subspecies with such a distribution in a recently glaciated area.

The discrepancy in scale counts in S. gairdneri from Loon Lake is not surprising. I once assigned a class of students to count scales on trout from Loon Lake. The ranges of counts extended from 133 to 172 scales, with means by different workers ranging from 140 to 162. The only reliable comparisons in scale count between different populations are, in my opinion, those made by one worker. In the Loon Lake comparisons we published, all counts were made by Mr. J.W. Cartwright. I believe he counted diagonal rows at a level about 6 rows above the lateral line (where possible) and included scales right out to the caudal fin. This might explain the discrepancy of 10 or 15 scales between his counts and yours.

Yours sincerely,



C.C. Lindsey

- fecundity  
of 71 - 72

alpestris

loon lake scale counts

UNIVERSITY MUSEUMS  
THE UNIVERSITY OF MICHIGAN  
ANN ARBOR, MICHIGAN, U.S.A.

Make copy  
for Zahntz

MUSEUM OF ZOOLOGY

March 4, 1964

Dr. Paul R. Needham  
Department of Zoology  
University of California  
Berkeley 4, California

Dear Paul:

I have made proportional measurements (30) of 12 males, 12 females, and the holotype (?) of the Arizona native trout and counts (14) of the same 25 specimens. I wish to do more counts on additional material before summarizing the meristic data but the measurements have been summarized (separately for the sexes and holotype) and are ready for typing. I have also done some writing on the manuscript.

It is too early yet to say definitely whether I will call this fish a full species (Salmo apache) or make it a subspecies (and of what?). I did find one strong basibranchial tooth on a 120 mm. male, and may find more when the other specimens are examined. In view of the cutthroat-like spotting, this rare occurrence of another cutthroat character bolsters the view that the Apache trout may have originated through past hybridization between S. clarki and S. gairdneri.

We are right in the throes of moving into our new seven-story wing and I won't be able to do much with this study for several weeks. If you can hold off sending your manuscript until the end of March this would help.

Cordially,

Bob

Robert R. Miller  
Curator of Fishes

RRM:mv

- Ray Simons - letter - IV:9:64 - Golden trout  $2n = 58$   
lowest of Salmo. - no dif. between lewisii - humboldtii  
at nos. arm no. mason - 107  
counts 63-70



WHEN REPLYING  
PLEASE QUOTE FILE NO. 42-03-6

DEPARTMENT OF RECREATION AND CONSERVATION

Box 225,  
Williams Lake, B. C.,  
January 8, 1964.

Mr. Robert J. Behnke,  
Department of Zoology,  
University of California,  
Berkeley 4, California, U.S.A.

Re: Research - Fish - Rainbow Trout - Kootenay Lake

Dear Mr. Behnke:

Your letter of December 12th concerning meristic differences among rainbow trout from Kootenay Lake has been passed on to me by Mr. Sparrow. I do not know how much information you require for your manuscript, or whether the amount of information I presently have is of any value to you.

Examination of specimens from two areas within Kootenay Lake is not yet complete. I have examined the parent fish and have found differences significant at the .01-.05 level with two standard errors either side of the mean in lateral line scale counts and pyloric caecae. Differences were also evident in vertebral counts and gill raker counts, however these were not so significantly different as were the previously mentioned counts. The two groups of fish were separated and artificially spawned and reared under identical conditions. Some counts of the F1 offspring have been made. It is too soon yet to conclusively state the magnitude of differences between the two F1 groups. Differences do exist however, in vertebral counts and in patterning and distribution of parr marks on the young fish. In addition, observations in the hatchery clearly show that one group is distinctly cannibalistic whereas the other group is not in the least cannibalistic.

I am afraid that at the present time I cannot give you any more information than this. I am hoping however to obtain additional samples of the young fish for further analysis of pyloric caecae, gill rakers and lateral line scale counts. If you would be interested in this information when it is available I will be only too glad to forward it to you. On completion of the meristic studies it is our plan to publish this information in the Journal of the Fisheries Research Board of Canada.

Yours truly,

J. W. Cartwright,  
Regional Fisheries Biologist.

JWC/rw  
c.c. to H. Sparrow  
F. P. Maher

OREGON STATE UNIVERSITY

CORVALLIS, OREGON 97331

SCHOOL OF AGRICULTURE and AGRICULTURAL EXPERIMENT STATION

Reply to: THE DEPARTMENT OF  
FISH AND GAME MANAGEMENT

May 22, 1964

Dr. Paul R. Needham  
Department of Zoology  
University of California  
Berkeley, California

Dear Paul:


My belated answer to your question about the Katpooth, Cathlapooth (or Cathlapootl) River is that Prof. Dimick has looked into the matter and believes it to be the Lewis River. Fred Evenden did some snooping into trout type localities when he was a student here and came up with the same.

The best way to settle the question would be to find access to some replicas of old trading post maps and try to orient the river by its relationship to Fort Vancouver.

I must apologize for not answering sooner. This has been a busier term than usual.

Do you know of any students who wish to pursue an M.S. or Ph.D. on a pond limnology and fish production study?

Sincerely,

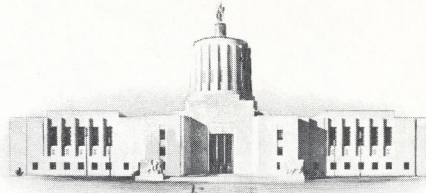


Carl E. Bond  
Associate Professor of Fisheries

CEB/mj



Commissioners  
Joseph W. Smith, Klamath Falls  
Chairman  
John P. Amacher, Winchester  
Vice-Chairman  
Tallant Greenough, Coquille  
Wayne E. Phillips, Baker  
J. Pat Metke, Bend



Mailing Address  
P. O. Box 3503  
Portland, Oregon 97208

STATE OF OREGON  
OREGON STATE GAME COMMISSION  
1634 S. W. ALDER STREET  
PORTLAND

June 3, 1964

Mr. Paul R. Needham  
Professor of Zoology-Fisheries  
Department of Zoology  
University of California  
Berkeley, California 94720

*Fossil salmon  
Oeyno -  
La Rivers*

Dear Paul:

A check with the Oregon Historical Society reveals that the stream identified by Sir John Richardson as the "Katpootl" is now known as the North Fork Lewis River. This would be in the State of Washington.

Sincerely,

P. W. SCHNEIDER  
DIRECTOR

By

A handwritten signature in blue ink, appearing to be 'R. C. Holloway', written over a horizontal line.

R. C. Holloway, Chief  
Information & Education Division

RCH:flo

I sent this story query to  
all the mags. None of  
them would bite.

Statement:

In 1950, in an almost inaccessible high-mountain stream in Colorado, we collected specimens of a subspecies of cutthroat trout (the "greenback trout") supposed by scientists and fish-and-game people alike to have been extinct for many decades. The matters of how we got to this stream, and how we got the fish, and how we got back out (it wasn't easy!) make a good story.

Elements:

Bill and Dorothy (my brother-in-law and my sister) and I had been, for years, collecting cutthroat trout in Colorado, for Bob Miller, Curator of Fishes at the University of Michigan Museum, who was making a study of the original distribution of various species and subspecies. Our collecting involved certain difficulties: 1) It meant hiking-in, and in high, rough mountain country; for wherever the fish-planting trucks could go, exotic fish had been planted. 2) The Game & Fish Dept. of the state was, at times, rather antagonistic; for a period of a few years we couldn't get a collecting permit, and had to "violate", and watch out for game wardens! (Somehow, both these things only added to the fun of doing the work.)

We got wind of this high-mountain lake and its small outlet stream, from a fellow who had hiked in, and had caught a string of cutthroat trout in the lake. The fellow was not an ichthyologist; but he was familiar with the ordinary native cutthroat. And these didn't look quite right to him! (Needless to say, he had fried and eaten the fish, and had not preserved any of them as scientific specimens.)

The "greenback trout" hadn't shown up in anybody's fish collections for 30 or 40 years or more, and was presumed to be extinct.

But -- here was an unusual looking trout. And here was the place that the "greenback" might be, and ought to be, if there were, by any small chance, any left. For this was in the right drainage, a tributary of the North Platte River, the original home of the critter. And it was so darned high and inaccessible that it would not be (1) "fished out", (2) ruined by stream pollution, or (3) full of planted fish of other species, which would have driven out the "greenback".

It was enough. We knew we had to go in and get some of those trout, if it killed us. And it nearly did!

January 1964

The stream, a mile or so below the lake, lay at 11,000 feet elevation. No roads, or even trails. The 6 or 8 miles from where we left our pickup took us all day. The toughest hiking imaginable -- no trail, heavy timber, downed trees, brush, etc. Over high ridges, down into and up out of steep, deep canyons. Almost vertical rock cliffs to scale.

Late afternoon, when we got to the stream. Cloudy, with a few cold drizzles. I was so exhausted that all I could do was set up the mountain ("GI") tent, and get in it and conk out.

Dorothy and Bill went after fish. Tried, first, to capture them with a hook and line; the trout weren't biting. So, nothing to do but seine (we had a rag of a minnow seine). They had no seining clothes, or swim clothes, along; and they didn't want to get any of their clothes, even underwear, wet. So they worked naked. Cold air, windy, rainy, cold water. And a million mosquitoes. But they captured the fish.

Supper over a campfire. Then a big campfire, until 11 P.M. Raked the coals away, and pitched the tent on the warm ground. (Blankets are heavy to pack. We had two--one for me, one for Bill and Dorothy.) It gets cold, at that elevation, even in the summer. But we had heat from the ground below us (an old woodsman's trick).

The hike out, the next day, a repetition of the hike in. Only a lot easier (downhill!). Even so, all hands exhausted when we got to the pickup.

Forty miles to Kremmling. No formaldehyde, in the local drugstore. Finally got some ice cubes, and kept the fish the rest of the day.

Eighty miles into Laramie. Got formaldehyde, fixed the fish for preservation. Later, shipped them to Professor Miller.

→ Word came back from Miller: "You have resurrected the greenback trout!"

#### Photos:

I have a few b&w (and I think, one or two color) pix of scenery, etc. They can be pieced-out, easily, with photos from your stock -- anything in the line of mountains, streams, timber, etc.

If you want them -- but I'm sure you won't -- I could dig up some portraits of the three of us.

And -- I have a color photo (Kodachrome negative and enlarged print), which is almost-professional in quality, of the fish itself. It is a beautiful thing. (And it is an exclusive.)

Qualifications, Scientific:

I have been a professional fresh-water fisheries biologist and fish management expert for 30 years. I have worked for the Conservation Departments of Wisconsin, Michigan, New Mexico, and Louisiana, and the U.S. Fish & Wildlife Service. I have carried out an assignment in Colombia, South America, for FAO of the United Nations. I have worked and travelled in Alaska, Mexico, etc. I got my graduate-college training, and doctoral degree, at the University of Michigan. I am listed in the Biological Section of American Men of Science; and I am a member of various learned and professional societies.

Qualifications, Writing:

I am recognized, in my own professional field, as an excellent writer of technical articles.

But nontechnical ("popular") writing is something else, of course. Frankly, I don't know whether I can do it well, or not. I have published virtually nothing in that line. A few bits of things -- such as an article in the now defunct AMERICAN WOODSMAN (I don't think that my piece was what put it out of business!).

I have spent the past year and a half writing, free-lance, a book, "Fish Management", dealing with the administration and management of the fresh-water sport fisheries of North America. It is semitechnical to technical, and is slanted primarily at administrators, field men, technicians, and students; but is intended also to be understandable and usable by the more serious of the fishermen. The manuscript is now in the hands of a publisher (Gordon B. Laing, at Ronald Press, is handling it), for evaluation. I sure hope it gets published!

UNIVERSITY OF WASHINGTON

SEATTLE, WASHINGTON 98105

5  
May 8, 1964

College of Fisheries

Dear Bob;

It seems that I'm always apologizing for my procrastination in answering your letters. I've been giving a series of seminars here, at U.B.C. and at Oregon State during the past 4 weeks on thesis topics and on some related osteological-anatomical studies.

Don't hesitate to use whatever information you wish, including that on the golden chromosomes, since I feel that it matters very little where and how it first appears. In regard to the possible hybrid origin of the golden trout, the chromosome morphology alone seems to offer no supporting information. In fact the diploid number and arm number could be cited as evidence opposed to such a theory. The diploid number is numerically closer to the rainbow trout and perhaps more important is less than in the rainbow. On the other hand, the arm number appears to be equivalent to that of the cutthroat. I think that any conclusions on these circumstances pertaining to relationships or origin are highly premature at the present time. If cytological information is to be used to decide this question, it seems that the answer must await studies of meiotic chromosome pairing and segregation in hybrids of rainbow, cutthroat and golden trouts. Such studies could provide an index of the relative time at which the species diverged as well as suggesting the "stem species" from which the extant species were derived.

I think your consideration of chromosome pairing in rainbow x cutthroat is a reasonable summary of possibilities. I doubt, however, that irregular pairing is to be expected due to the ease with which the two species hybridize in nature where the opportunity to do so is afforded them.

Perhaps the enclosed thesis draft has some bearing upon our current inadequacy toward resolution of this problem. One serious disadvantage not voiced in the thesis is the fact that we don't know much about the rates of change in the individual populations which display altered chromosome morphology. The pink-chum hybrid illustrates the possibility that such changes may in some cases proceed very rapidly in that a reduction in mean number below that expected is displayed following the first mating of hybrids.

Further difficulty is illustrated by the chromosome antics displayed in the Atlantic salmon. As you quite reasonably commented, despite it's highly anadromous nature, that species has a low number of metacentrics and has not apparently followed the specializing tendency that the freedom of anadromy might confer. If you are able to accept the basis of the anomalous paucity of metacentrics to be the consequence of shifts in centromere position (discussed in thesis), then this species has about 13 pairs of "long" acrocentrics in the diploid complement which have a numerical history of change from 52 "short" acrocentrics, to 26 metacentrics, to the final 26 "long" acrocentrics. I am currently trying to verify this by several DNA comparisons, although the length data seem fairly convincing.

One of several obvious deficiencies in the thesis consideration of pink-chum hybrids is the fact that no additional  $F_2$ 's of other Oncorhynchus species

were available. Until such hybrids are studied, I doubt that we can do much more than speculate about the possible contribution of hybridization to explain the wide range in diploid numbers. It is clearly evident that one species must have diverged numerically before hybridization could operate on numerical differences.

Concerning the wholly-acrocentric complement of Esox lucius in conjunction with the stability of that species, I wonder if other mechanisms (i.e. inversions) might not contribute to restricted recombination freedom? We are completely ignorant of the cytogenetics of this species - which doesn't necessarily have to be equivalent to the salmonid situation.

I was never able to secure material of Salmo gilae but expect that it may be forthcoming this fall. Your opportunity to collect Salmothymus, Hucho etc. is certainly enviable and badly needed. I am enclosing a brief preservation schedule which should be satisfactory to obtain good embryonic material. Storage in a refrigerator above freezing is essential if delays in study or shipment are anticipated. I would be delighted to look at this material at any time. I'm still trying to work out a good field method with fair prospects for success.

Please be assured that the heavy-handed thesis treatment of generic validity of Oncorhynchus is not without support of skeletal and chondrocranial material. What are your opinions on the matter? Do you think this should be formally proposed, or should the thesis consideration, along with anatomic data, be published in a way merely to suggest the shaky basis of Oncorhynchus-Salmo distinction? Your point that the ethmoid stands as the best character is well taken. However, I have good specimens to show:

1. not all Salmo ethmoids are notched
2. some precocious adult Oncorhynchus have pointed (not finger-like) snouts much like Salvelinus (which incidently displays a notched snout in local S. malma)
3. further characters said by Norden to typify the genera are all variable and intergrading

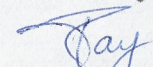
Do you have any O. masou specimens to spare? I need a few in the 4-8 inch size range (I've asked for 4 from the U.B.C. collection).

I am most interested in any remarks, criticisms or questions you may have on the thesis. The only reason I would like to have the rough manuscript returned is to avoid the nuisance of printing another set of photos which are to be put in a personal ozalid copy.

Do you plan to attend the discussion on salmonid taxonomy to be held in Fort Collins?

Your comments on the thesis need not waste a lot of your time unless you feel inclined otherwise. Best regards.

Sincerely,



Raymond C. Simon  
Fisheries Biologist

enc. thesis  
preservation method

UNIVERSITY OF WASHINGTON  
COLLEGE OF FISHERIES  
SEATTLE 5, WASHINGTON

June 16, 1964

Mr. Robert Behnke  
University of California  
Department of Zoology  
Berkeley 4, California

Dear Bob;

Thanks for your comments on the thesis and on the matter of Salmo-Oncorhynchus distinction. I don't have any definite publication plans other than a loose deadline of late July to gather osteological and literature evidence together to show the invalidity of generic distinction for Oncorhynchus.

I'm sorry that I can't suggest a field method for preparation of cornea that is any more reliable than the one outlined previously. One definite way of improving results is to allow the slide to stand at least one week after staining and sealing to permit the stain to intensify. The leukocyte technique will not be tried again for at least two weeks, since I'm stuck at present with finishing a paper on histopathology of trout liver tumors. If this is at all promising, I'll let you know at once, since the benefits of such a method should be considerable.

The specimens of cherry salmon have not been received from U.B.C. as yet, but I feel fairly sure they will be sent. The specimens you have kindly offered are not really necessary, since new specimens of coastal cutthroat from Lake Whatcom show substantially what was desired with respect to the ethmoid cartilage.

I had two reasons for omitting Svårdsons data on Thymallus from the thesis treatment; (i) I suspect that he may have misinterpreted the centromere position in a large number of chromosomes which he considered to be metacentric (ii) for the sake of brevity, only Salmoninae were discussed. The time is nearly ripe for a review of chromosome morphology in Salmonoids, but I hope to sample several local genera including clupeids before attempting the project. I can't be sure that this project will ever come to fruition since it depends in good measure on the sort of position that I'm able to secure. Such an undertaking would be difficult to the point of distraction if it were to be done on a spare-time basis. With any luck, I may be able to continue chromosome work on an active basis and further add more reliability to interpretations by coincident studies of DNA homologies.

I hope you are successful in obtaining samples of Salmothymus embryos. Two reprints are enclosed for your correspondence with Hadzisce.

I don't have any first-hand knowledge of the coastal-inland intermediates in cutthroat from the Columbia, but hybridization experiments should be able to document homology of chromosomes in these two populations. Again,

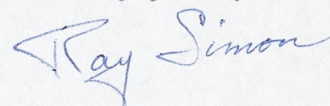


my ultimate employment will have a good bit to do with my possible personal involvement. I certainly hope someone will be able to take a good look at these and other hybrids from the viewpoint of chromosome pairing and homology.

The next couple of months will be very important for me in dictating diversion, or continued scrutiny, of my current interests. I surely hope the latter is possible.

Hope to see you at the Colorado sessions in August. Best regards.

Sincerely yours,

A handwritten signature in blue ink that reads "Ray Simon". The signature is written in a cursive style with a large, stylized "R" and "S".

Raymond C. Simon  
Fisheries Biologist

April 6, 1966

Dear Bob:

I thought you would be interested in the trout info from Florida. Dr. Yerger, our Ichthyology class, and myself went over to the trout area last weekend. We did not see any but talked to the people at Eglin AFB and found out that it was Turtle and Live Oak Creeks which are tribs of East River of Pensacola Bay, still in Okaloosa County, Florida. I think these are different from those I gave you from Yerger's memory.

That Colorado job sounds good. You could do an updated fishes of Colorado on the side.

*Most sincerely,  
Camm*

THIS SIDE OF CARD IS FOR ADDRESS



Dr, Robert Behnke  
Museum of Vertebrate Zoology  
Wildlife-Fisheries  
University of California  
Berkeley, California 94720

UNIVERSITY OF CALIFORNIA, BERKELEY

BERKELEY • DAVIS • IRVINE • LOS ANGELES • RIVERSIDE • SAN DIEGO • SAN FRANCISCO



SANTA BARBARA • SANTA CRUZ

MUSEUM OF VERTEBRATE ZOOLOGY  
WILDLIFE-FISHERIES

BERKELEY, CALIFORNIA  
January 7, 1966

Mr. F. Haimson  
Section for USSR and Eastern Europe  
National Academy of Sciences  
National Research Council  
2101 Constitution Ave.  
Washington, D. C. 20418

Dear Mr. Haimson:

I am sending two reports on my Soviet exchange visit. One may be useful, especially for anyone living in an apartment in Leningrad. The other report is a note submitted to Copeia, a scientific journal.

As mentioned in the reports, the ten month exchange visit was an enriching and rewarding experience. I wish to express my sincere gratitude to the Academy for the opportunity to participate.

My wife and I are both in fine health now, and expecting our first child in March.

I will teach a course in ichthyology this spring, so I expect to be in Berkeley until June.

Sincerely,

Robert J. Behnke

RJB:pg  
encls.

UNIVERSITY OF CALIFORNIA, BERKELEY

BERKELEY • DAVIS • IRVINE • LOS ANGELES • RIVERSIDE • SAN DIEGO • SAN FRANCISCO



SANTA BARBARA • SANTA CRUZ

MUSEUM OF VERTEBRATE ZOOLOGY  
WILDLIFE-FISHERIES

BERKELEY, CALIFORNIA

January 11, 1966

Dr. A. N. Svetovidov  
Zoological Institute  
Academy of Science  
Leningrad B-164, USSR

Dear Dr. Svetovidov:

I am sending you a copy of a note submitted to Copeia about my exchange visit. Please show it to Barsukov so he may check the translation of his good-will message.

Last week there was a national science meeting in Berkeley and several of our leading ichthyologists such as Hubbs, Miller, Myers, and Follette were here. They told me they had received greetings from you and from Barsukov also. The group at the National Museum is working on a new classification of fishes, but I don't know when this might be published.

I just received a copy of the work on acclimatization of Oncorhynchus in the Barent and White seas, sent by Barsukov. Give him my sincere thanks, because such publications have very limited distribution and it may have been some years before I would have known about it. Please let me know if there are any publications anyone at your laboratory wants. About one month ago, I sent in subscriptions to the Canadian Journal and to Copeia in Barsukov's name; tell him to let me know when he receives them.

I will be in Berkeley until July, but my present position teaching ichthyology is only temporary and I must find a new job. I will keep you informed when I change my address.

At this time of year we often think of what the weather is like in Leningrad, and we are glad to be in California.

May this find you all well and happy.

Sincerely,

Robert J. Behnke

RJB:pg  
encls.

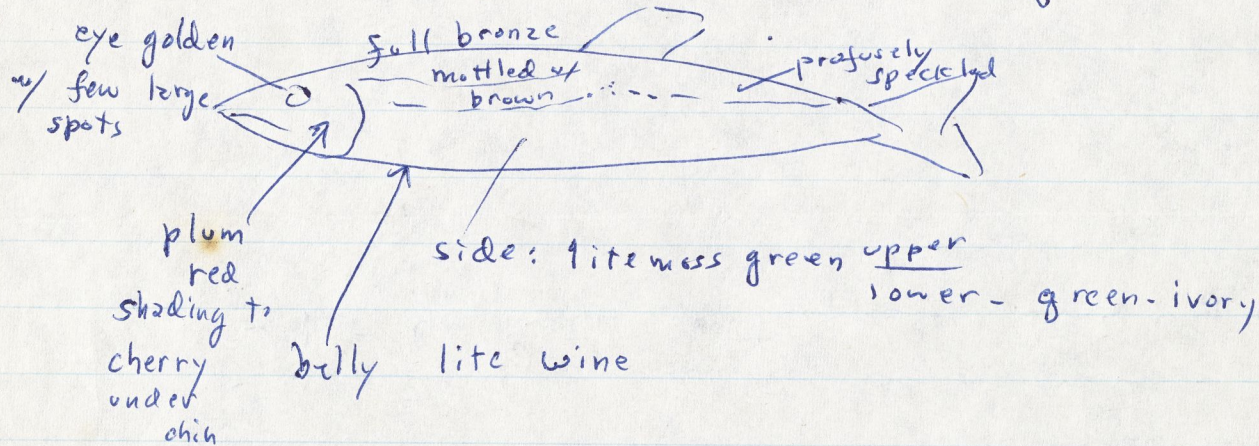
what kind of cuts. ( upper lake  
Roxy Ann  
upper slide lake cuts in  
stream

- Rare & endangered species - fragling introduction
- possible improvements
- Refuge areas
- 5 species found - 3 way hybrids
- observations → ecologies - spawning areas
- or streams & lakes
- acknowledgements - helicopter flight

Dick Takes

- Stinking records

Greenbank · coll. Aug. 23, 1950 - Red Canyon  
branch of Roaring Fork R. - approx. 1 mi. below Roxy Ann  
Lake. 20 specimens - color notes from a 12 in. spec.



\* (chin - cherry red - paired fin cherry lower edge  
- olive green above

d. & a. fins - pink edge -

lateral band - lite wine as belly

very accentuated throat slash -  
trail peters out long before reaching lake.

hiked about 10 mi. - coll. only one spot.

Talked to rancher ~~also~~ nearest habitant - approx. 15 mi. from coll. site - Rancher said he

sometimes fished Rocky Am L. in past years and caught large trout - thought they were natives. - No sign of human trespass.

- practically no doubt they are native.

- Not Yellowstone c Trapper L. stock only by Truck.

John Greenbank  
2060 North 15th St.  
Grand Junction, Colo. 81501



Dr. Robert E. Vincent  
Coop. Fishery Unit  
Colo. State Univ.  
Fort Collins, Colo.



Colorado Cooperative Fishery Unit  
Colorado State University  
Fort Collins, Colorado 80521

September 15, 1967

Dr. R.R. Miller  
Museum of Zoology  
University of Michigan  
Ann Arbor, Michigan 48104

Dear Bob:

Enclosed is a copy of a letter to Clark Hubbs containing some unpublished information on western Salmo which you may want for your files.

I had a fine time at the National Museum for 3 weeks this summer. I examined a good deal of material and came across many of your notes in the bottles. Could you advise how I may confirm a doubtful locality record? The USNM collection has 2 specimens labeled #17074, Salmo pleuriticus, Puerco River, New Mexico, coll. W.G. Shedd, August 1875. The catalog lists #17074 as representing 10 specimens, collected in August 1874, original number 128. There are two Puerco rivers in New Mexico; one tributary to the Rio Grande, the other to the Little Colorado. Other specimens probably from the same expedition are 17070-170710 - C.E. Aiken, Sept. 20, 1874, Pagosa, Colo.; 17067-69 - H.C. Yarrow, August, 1874, Rio Brazos, New Mexico, 17072 - W.S. Shedd, Aug. 1874, Chama R., New Mexico, 17073 - Cope, Sept., 1874, Tierra Amarilla. You have probably encountered problems and I hope I may benefit from your historical sleuthing. Do you recognize the expedition? Where was their route and itinerary published?

Sincerely yours,

Robert Behnke  
Assistant Unit Leader

RB/dch  
Encl: 1

[Apr 1968]

The following are answers to your questions. I have not gone into great detail in the answers, this is rather hard to do in written answers.

Why are cypha-elegans intergrades more abundant than either parent form in Lake Powell? This fits in with the idea expressed in the evolution section that elegans is more abundant in the extremities of the basin and cypha more abundant in the middle portion. Since the beginning of the Pleistocene, as the Grand Canyon area became less torrential, cypha began to move out. This brought it into contact with elegans and hybridization resulted. The Lake Powell area would fit the position of a hypothesized zone of hybridization. This hypothesis would be supported if fish from the Grand Canyon area were mainly cypha. This appears to be the case since of the 15 fish from the Lee's Ferry to Glen Canyon Dam area, 10 were cypha. This hypothesis suggests fertile hybrids that in time swamp out the parent forms in certain areas, such as Lake Powell. Movement into the upper part of the Green River by these hybrids has produced this morphology in that area and explains why few real good or extreme cypha are found there. The one cypha from the upper Green was the least extreme of the 16 fish.

Based on the specimens available, a robusta-elegans hybrid would not produce a cypha-elegans intergrade. The meristic characters of tables 1, 2 and 3 indicate that this is possible, but the body measurements suggest otherwise. This is shown in the 3 fish that were hypothesized to be robusta-elegans intergrades. These 3 were quite different from the elegans-cypha group in the taximetrics program. It is less likely that a robusta-elegans cross would produce a more abrupt hump and longer snout than found in either parent. It is possible that a robusta-cypha hybrid would not be easily determined and would appear much the same as an

elegans-cypha hybrid. I think this is a possibility, but several factors suggest this may not be happening, at least to any extent. Differences in ecology, general habitat preference, if realized as it appears now would decrease the chance of these 2 forms getting together. The upper Green would be an exception to this. The meristic data again suggests that some of the intergrades may be robusta-cypha crosses but the body measurements do not. The body measurements for these intergrades are usually inbetween elegans and cypha or closer to cypha. A robusta-cypha cross would be expected to deviate from an elegans-cypha cross in some characters, especially body proportions. If the hypothesized line of phylogeny is correct, and cypha evolved from elegans, it would seem unlikely that cypha would lose the reproductive isolation with robusta that elegans apparently evolved, although it would be possible. Therefore this question of a cypha-robusta cross is not completely clear, but it appears that it is not realized.

What type of speciation would be hypothesized for cypha if it speciated in the Grand Canyon, ecological or sympatric speciation? Mayr defines sympatric species as those whose normal crusing ranges overlap. Therefore sympatric speciation would be speciation in the presence of the parent form.

Ecological speciation is, to me, a misnomer. I believe this means that the isolation was caused or is caused by ecological factors instead of geologic. Therefore better terms may be sympatric ecological speciation and allopatric ecological speciation. In the case of cypha, I would hypothesize that a population of elegans became isolated in the Grand Canyon area and that there was little immigration or ~~em~~igration in this population. The isolation was caused by the torrential conditions that provided more of an ecological barrier than a geologic one to the fish. Therefore this

population of elegans became allopatric with the parent population and the isolating mechanism was ecological; thus we have allopatric ecological speciation.

I think Mayr would say about the same as I did above, only he would stick the words geographic isolation in for sure. He may even contend that the torrential conditions created an actual physical barrier to elegans and therefore refute the ecologic implications. Hubbs on the other hand would probably call this ecological speciation, but hedge around enough so he couldn't be pinned down.

RECEIVED  
BSF&W-200. 2

APR 15 1968

F M S  
COLORADO COOP.

UNIVERSITY OF CALIFORNIA, SAN DIEGO

BERKELEY • DAVIS • IRVINE • LOS ANGELES • RIVERSIDE • SAN DIEGO • SAN FRANCISCO



SANTA BARBARA • SANTA CRUZ

SCRIPPS INSTITUTION OF OCEANOGRAPHY

POST OFFICE BOX 109  
LA JOLLA, CALIFORNIA 92038

August 1, 1969

Dr. Robert Behnke  
Colorado Cooperative Fishery Unit  
Colorado State University  
Fort Collins, Colorado 80521

Dear Bob:

We are very grateful to you for your letter of July 9 and for sending on Steve Berwick's undergraduate research paper. Bill Follett sent on Berwick's specimens, which I've utilized and am designating paratypes, to be retained at Cal. Acad.

On reading your letter and glancing over the paper I get a blurry memory of chatting for a few moments with John Hopkirk and Steve Berwick in 1966, around some busy work with Bill. That was before we had worked over the very distinct, highly localized endemic, so I just had the impression that the form was distinct. Particularly because we found carp and black bass as well as the chub and dace and heard that Nevada Fish & Game had something to do with the springs, we were running down the idea that the minnow may have been introduced (they weren't, of course; both are very distinct subspecies).

It took some glancing over the MS to find the derivation of the name schlubi. Either schlubbsi or hubblutzi would have been less obscure and classically a little bit better formed (or less poorly formed). However, had the name appeared I suppose that Schultz and I should have been proud of the joint tribute. Maybe now that Steve has gained some years and especially has joined the Ivy League, he'd do better now. I was surprised to learn that Steve has gone in for game management ~~is~~ at Yale -- not that he's doing so, but that Yale would engage in anything so mundane.

I'll have to apologize to John Hopkirk over my slur about him having messed up the specimens in examining them. He had written labels for them and I got the idea that he had done the work on the specimens.

The rakers on the outer side of the first arch are unusually few, as one of the many distinctive features of Gila bicolor isolata. Our counts for a large series average 11.14. Steve's average of 10.36 probably means that he often missed a rudiment. His tooth counts are low, with one count of 2 -- no doubt he missed counting some alveoli. We find 3 teeth on the right side occasionally in all three cyprinid species in the area we cover, and we review the reduction to 3 in American minnows. ~~One~~ welcome lead in Steve's writings is the indication that Kimsey in 1951 reported 3 teeth for

some specimens in Eagle Lake. He probably overlooked some alveoli too, but we need to refer to his paper.

We do not regard the "Siphatelis" of the Humboldt system as referable to subspecies bicolor, but treat it as a subspecies, Gila bicolor obesa.

We have made extensive comparison of isolata and the two other new endemic subspecies with good series of obesa from near Lovelock and Carlin, roughly topotypic of obesa, and from Bishop Creek near Wells, where there is a slight approach toward the spring endemics. We were surprised to read in Steve's opus that you hadn't taken "Siphateles" in the Humboldt system. Maybe it's getting scarce there, and maybe you were more concerned with trout water. If you did fish chub waters there and failed to get chubs, we'd like to know. Despite the very general replacement of Western native fishes by introductions, it's hard to believe that "Siphateles" has gone down the road.

You don't say when or whether you wish the report by Berwick returned. It does have information of interest and we'd like to hold it while we're polishing off our paper. Our report looks like small book-size now. We'll be happy to make a copy available as you request.

I'll write separately on trout.

Cordially,

*Carl L. Hubbs*  
Carl L. Hubbs

cc: W. I. Follett  
John Hopkirk  
R. R. Miller

CLH:bns

STATION  
No. 100  
No. 100  
No. 100

Hubb's  
- Berwick  
paper

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SCHOOL OF FORESTRY AND CONSERVATION  
WILDLIFE-FISHERIES

BERKELEY, CALIFORNIA 94720

July 17, 1970

Dr. Donald W. Seegrist  
Northeastern Forest Experiment Station  
6816 Market Street  
Upper Darby, Pennsylvania 19082

Dear Seegrist:

This will acknowledge receipt of your letters of June 15 and June 30, and of the "flood" manuscript that has been in your possession for some four months.

I have had a complete belly-full of the bickering over authorship and credit for a piece of work conducted for ten years by Paul Needham with budgetary support by the University of California and to which you contributed virtually nothing. Consider yourself damn lucky that these data were made available to you for completion of thesis requirements. The idea that you now "own" these data is a laugh-in, particularly when the actual preparation of the present MS was done by Gard in a period of two months, under my supervision and editing. All data were checked back on original pump-and-drain records to eliminate possible errors, without any help from you. Going still further back, you may remember that I essentially wrote the flood section of your thesis which ~~virtually~~ <sup>initially</sup> was fuzzy and unconvincing. And now you propose to publish this paper in your own name! By God Seegrist, I'll give you credit for one thing -- you have a colossal gall!

The MS is now going through one more critical reading and final checking by me. Reluctantly I will still submit it under your name, with Gard as junior author. Any more static from you and it will be submitted as a post-mortem paper by Needham (Gard, jr. author) and a footnote acknowledging your participation in the initial compilation and analysis of data.

As regards the second MS concerning the trout populations, I acknowledge your critical comments concerning weaknesses in the data. If you wish to withdraw from junior authorship of that one, feel free to do so. I still intend to make the most of the data that we do have, whatever shortcomings there may be. If you accept junior authorship, I will expect some help from you in checking and rechecking the compilations and computations as we did with the first MS -- a standard procedure in

Dr. Donald Seegrist  
July 17, 1970  
Page 2

preparation of a paper for publication in case you have forgotten. This involves a bit more input on your part than "evaluating it and sending a formal review" as proposed in your letter of June 30, 1970. I expect Gard back some time in August, at which time work on the second paper will be resumed, with or without your participation.

Sincerely,

A. Starker Leopold

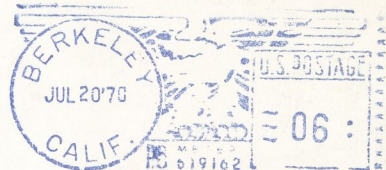
ASL:na  
cc: ✓ Robert Benke

UNIVERSITY OF CALIFORNIA  
SCHOOL OF FORESTRY AND CONSERVATION  
WILDLIFE-FISHERIES  
BERKELEY, CALIFORNIA 94720

0476

*Starker L. chewing out Segnit*

Dr. Robert J. Behnke  
3429 East Prospect  
Fort Collins, Colorado 85021





PAUL LAXALT  
GOVERNOR

STATE OF NEVADA  
DEPARTMENT OF FISH AND GAME

1100 VALLEY ROAD, RENO, NEVADA • TELEPHONE 784-6214

MAIL: P.O. BOX 10678, RENO, NEVADA 89510



FRANK W. GROVES  
DIRECTOR

IN REPLY REFER TO:

November 18, 1970

Dr. Robert J. Behnke  
Colorado Cooperative Fishery Unit  
Colorado State University  
Fort Collins, Colorado 80521

Dear Dr. Behnke:

This package contains cutthroat collected from Hendry's Creeek, Goshute Creek and Hampton Creek.

The Hendry's Creek fish were collected higher on the stream than the other fish that I collected for you. There is a natural barrier about one-half mile above the previous collection site which may be of such a nature to prevent any upstream movement of fish. The fish in this package were collected above this barrier. It may be that you will find a difference between these fish and the other. I will be very interested in finding out what you find in the way of basibranchial teeth. If there is a difference, and you feel that these fish have not hybridized with rainbow and are in fact a pure strain, I may initiate a chemical treatment program to remove the fish from the stream below the barrier.

The Goshute Creek and Hampton Creek trout were collected on November 16, 1970 so they have not been preserved very long. The Goshute Creek trout are all descendants from 54 Pine Creek stock planted on July 17, 1960.

Dr. Behnke

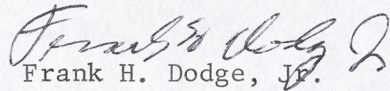
-2-

November 18, 1970

The Hampton Creek cutthroat are all descendants from 44 Pine Creek stock planted on June 23, 1953. To me there appears to be a definite difference in body conformation between the Goshute-Hampton Creek trout and the Pine Creek and Hendry's Creek trout.

I hope to collect trout from four streams in the Deep Creek Mountains of Western Utah sometime in December. I will send you specimens of any cutthroat collected.

Sincerely,



Frank H. Dodge, Jr.  
Fish and Game Agent II  
Nevada Dept. of Fish and Game  
P.O. Box 1109  
Ely, Nevada 89301

FHD:gp

July 31, 1970

Mr. John R. Glenn  
District Ranger  
U. S. Department of Agriculture  
Forest Service  
Humboldt National Forest  
Baker, Nevada 89311

Dear Mr. Glenn:

About 17 years ago this Museum received from the Nevada Fish and Game Department a sample of cutthroat trout from Pine Creek, on the west slope of Wheeler Peak, flowing into Spring Valley in White Pine County, Nevada. I reported to Ted Frantz that this represented a pure cutthroat trout, with an unusually high number of basibranchial teeth (23-34), which I was unable to assign to any known subspecies. I then strongly urged that, although introduced into Pine Creek from the western Bonneville basin, this distinctive trout should be protected by prohibiting the introduction of exotic rainbow trout or other species into Pine Creek. It was felt then that this cutthroat might be extinct elsewhere.

Recently Dr. Robert J. Behnke (Colorado State University) has examined a fresh collection of the Pine Creek cutthroat and confirmed my findings, and he has learned that the same subspecies (undescribed) still persists within its native range in Hendrys Creek on Mt. Moriah, within the extreme western edge of the Bonneville basin just north of Wheeler Peak.

These, then, may represent the only known surviving populations of a new cutthroat trout and hence are deserving of protection against any action by man that would either damage or destroy them.

It is my understanding that a request to build a mining road into Hendrys Creek is pending and that evaluation of such a road by fishery specialists of Nevada Fish and Game and the U. S. Forest Service indicates that such construction would threaten the native trout.

The State of Nevada already has placed the Pine Creek cutthroat on its official list of rare and endangered fishes (under the name Salmo clarki utah); hence this population (as well as transplanted stocks) are now legally protected.

Mr. John R. Glenn

-2-

July 31, 1970

I urge that the Hendrys Creek native cutthroat receive like protection and wish to go on record as being vigorously opposed to any form of environmental disturbance that will pose a threat to this relict fish. There are all too few pure stocks of cutthroat trout now surviving in western United States.

Very sincerely,

*RRM*  
Robert R. Miller  
Chairman, Conservation Committee  
American Society of Ichthyologists  
and Herpetologists  
Chairman, Endangered Species Committee  
American Fisheries Society  
Professor of Zoology

RRM:mw

cc: R. J. Behnke  
J. E. Deacon  
C. L. Hubbs

NEVADA  
DEPARTMENT OF FISH AND GAME  
P.O. Box 10678  
RENO, NEVADA 89510

Nevada Department of Fish & Game  
P. O. Box 1109  
Ely, Nevada 89301

*Boeds - Hendry  
- Miller → Glenn  
Hendry  
Pine Ark*

*Protect Wildlife . . .  
Conservation Is Everybody's Job*

Dr. Robert J. Behnke  
Colorado Cooperative Fishery Unit  
Colorado State University  
Fort Collins, Colorado 80521





# THE DENVER POST

THE VOICE OF THE ROCKY MOUNTAIN EMPIRE

DENVER, COLORADO 80201

650 15<sup>TH</sup> ST.

Oct. 28, 1970

Mr. Robert Behnke  
Colorado Cooperative Fishery Unit  
Colorado State University  
Fort Collins, Colo.

Dear Mr. Behnke:

Thank you for your help in the column about greenbacks. I'm herewith returning the photos.

I've had some interest expressed by various readers in the subject matter of the column. One guy called up to say he's sure he has caught greenbacks in a lake called Spring Creek Reservoir above Gunnison. I told him I didn't know what significance it might hold for you, even if the cutthroats he caught there are, in fact, greenbacks. I did promise I would give you his name and phone number--John Jevons, business phone 222-0761, home 985-5381.

Good luck in your efforts to re-establish eastern slope greenbacks. And thanks for the written reports on the question of stocking versus quality fishing. Your feelings on this subject run quite parallel to mine, apparently.

Sincerely yours,

Bob Saile

UNIVERSITY OF CALIFORNIA, SAN DIEGO

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SCRIPPS INSTITUTION OF OCEANOGRAPHY

POST OFFICE BOX 109  
LA JOLLA, CALIFORNIA 92037

January 4, 1971

Dr. Robert J. Behnke  
Colorado Cooperative Fishery Unit  
Colorado State University  
Fort Collins, CO. 80521

Dear Bob:

I find that among the dozens of items that I should have taken care of more promptly, comments on your good letter of July 6, and on the reprint of the very finely presented discussion of new approaches to the systematics and phylogeny of salmonids.

I hope that Dr. Watanabe discussed with you some of his very extensive findings on the Formosan salmon (trout?). I judged from my discussion with him, along with the examination of a number of specimens and almost countless photographs, that there is only one salmonid in Formosa. I just wonder if there may not have been some transposition of specimens or labels that led to labeling of the "paratype" at Stanford. I did find it a bit hard to communicate with Watanabe, because his imperfect command of English and his enthusiasm for relatively inconsequential details rather clouded our discussion. There does seem to be quite an amount of information suggesting that the red-spotted salmonids of Japan and Formosa may very well indeed represent an approach to the common ancestor of modern forms of Parasalmo (whatever we decide on the status of that group) and Oncorhynchus.

Just recently I have seen Bob's manuscript on Salmo apache, after he had the benefit of your helpful suggestions. I note a number of points of agreement and a number of disagreements in your interpretations and Bob's. This is not particularly bothering me.

Now I will disagree with you in a small way regarding the very interesting findings regarding the cutthroat trout of extreme western Utah. It does not surprise me in the least that you found the trout of the Snake Valley drainage to be distinct from those in the main part of the Bonneville Basin. I think it highly probable that the drainages from Mt. Wheeler and Mt. Moriah retained probably permanent stream interconnection, and at least intermittent connection for a long time after the axial stream of the Snake Valley was disconnected from the rest of the Bonneville System by the dessication of the Great American Desert. Nor am I surprised, in fact I would expect, that the trout of the two mountain drainages would be much alike as well as dissimilar from the rest of the Bonneville area. We now have quite a number of instances in which the minnows of the Great Basin have become differentiated in different parts of a single endorheic basin ~~have become well differentiated~~, almost certainly within the last few thousands of years, and I certainly would expect trout to be subject to differentiation at least as rapidly as minnows. <sup>of</sup>

I agree with you quite fully on your appraisal of the value of the new approaches, and with your reservation that the new approaches are an addition and not a substitution for the old.

From the side lines I am noting with interest the new findings regarding the trout of Pit River system and southern Oregon. I am just in the throws of describing the nonparasitic lamprey, a derivative of Lampetra (Entosphenus) tridentata, that lives in various parts of the Pit and Klamath systems, but so far as we can find, nowhere else in the wide range of the Pacific lamprey, from northern Baja California to southern Japan. In mentioning the distinctiveness of the fauna, with interesting relicts, in the area where the new lamprey occurs, I shall probably quote a few lines from your 1970 paper. If by chance in your field work or accumulation

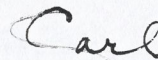
January 4, 1971

of specimens you have gathered any information regarding the lampreys of the Pit-Klamath complex, I would be glad to hear from you, as soon as it is convenient, as I am striving desperately to get the paper into press, here in the Transactions of the San Diego Society of Natural History, so it will be published in time for the new form to be named and discussed in a world revision of the lampreys that I am coauthoring with Ian C. Potter, as the first chapter in the new book coming out on Biology of Lampreys.

I am very happy that you came out with your brief account of the Coregoninae. I like your idea that Leucichthys is more primitive than Coregonus. The mouth structure itself certainly indicates a more generalized condition, but I would not cast out the idea that the bottom-feeding type may have given rise to an open-water type. That may well have occurred in the derivation of Prosopium gemmifer in the Bonneville basin. In connection with the lavaretus complex, that you so dramatically present, I am much more inclined to accept, or at least not to discard, the idea of sympatric speciation.

I think you should have been accorded a technical knockout in your brief encounter with Svårdson, a good mutual friend.

Cordially,



Carl L. Hubbs

cc:Dr. Robert Rush Miller

Hubbs

- Hubbs - 53a 1971 -

✓

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DEPARTMENT OF NATURAL RESOURCES  
NEW YORK STATE COLLEGE OF AGRICULTURE  
A STATUTORY COLLEGE OF THE STATE UNIVERSITY  
CORNELL UNIVERSITY

February 9, 1971

*Mailing Address:*

*Fernow Hall, Cornell University  
Ithaca, N. Y. 14850*

FISHERY SCIENCE  
FOREST SCIENCE  
WILDLIFE SCIENCE  
NATURAL RESOURCES  
OUTDOOR RECREATION

Dr. Robert J. Behnke  
Colorado Cooperative Fishery Unit  
Colorado State University  
Fort Collins, Colorado 80521

Dear Bob:

Just a brief note to say that I made a quick review of your contribution to the SCOL Conference "The salmonid fishes of recently glaciated lakes". I am very much impressed with this analysis and commend you highly for your undertaking. While I do not pretend to be an "expert" in the field of fish distribution, much of your rationale seems reasonable and at least develops a theory, in many instances, that would be deserving of more intensive examination.

It is most unfortunate that more work has not been done with fontinalis. We have about reached the point where we feel we may have to work some systematics into our current study. During the next year or so, we will probably have five to eight different stocks of brook trout in our Adirondack hatchery. These will be reared under identical conditions and the material should be very useful for both the conventional approach as well as for looking at serum proteins etc. Incidentally, we have run into what looks like a real good example of hybrid vigor between the New York domestic strain brook trout and the one from near James Bay in Ontario. Another year we hope to get into somewhat more sophisticated genetical approach to make the best use of this apparently superior growth and survival rate.

On page 27 you state that namaycush "appears to be strikingly stable". Perhaps this is generally so, but some rather striking variations are apparent even in a limited area like New York State. As I may have told you, the survival of Finger Lakes strain lake trout in Adirondack ponds is virtually nil. This experiment has been tried on three different occasions and the results have always been the same. The reciprocal planting has never been tried, mostly because the supply of hatchery fish of the Adirondack strain lake trout is in very short supply. Sometime we intend to incorporate it into our Cayuga Lake studies, since we are already involved in a full scale field program.

Dr. Robert J. Behnke

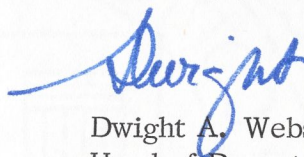
February 9, 1971

We have an interesting population of lake trout in a couple lakes on the Adirondack League Club where we have had studies underway for a long time. Unfortunately we do not know very much about this population, except that it was the only salmonid present in the chain of lakes under primitive conditions. The usual condition is for both brook and lake trout to be present or brook trout alone. The balance of the fauna consisted of two or three species of minnows. These fish are extremely slow growing, rarely exceeding 12 to 13 inches and retain juvenile characteristics through most of their life. They have extremely large eyes and the lower lobe of the caudal fin is invariably larger than the upper. We have never been able to find spawning stocks of fish up until the time of ice formation. This is unusual inasmuch as Adirondack lake trout spawn early, usually by mid-October.

John -  
Have you  
seen these?

Do you anticipate some extra time for travel when you participate in the Symposium next summer? If so, we would like to have you visit Cornell and see some of our facilities and if time permits, visit some of the Adirondack area. We are arranging a tour for a couple of the Swedish participants and perhaps you might like to join this group; we are not sure whether this will precede or follow the Symposium.

Sincerely yours,



Dwight A. Webster  
Head of Department

DAW:cmw

Webster

Webster

IN REPLY REFER TO:



UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

P. O. Box 3007, University Station  
Laramie, Wyoming 82070

March 10, 1971

Dr. Robert J. Behnke  
Fish and Wildlife Service  
Colorado Cooperative Fishery Unit  
Colorado State University  
Fort Collins, Colorado 80521

Dear Dr. Behnke:

You pose a very interesting question about the speciation of cutthroat trout during the last glaciation. This is something we might best discuss in person with maps in front of us, rather than by correspondence, because of all the ramifications that may be involved--especially the time required to speciate.

How about another possibility: We know that a huge landslide dam blocked the Snake River in the middle of the Snake River Canyon upstream from the present Palisades Reservoir. This event occurred more than 50,000 years ago and the dam lasted long enough for 400 feet of sediment to accumulate in the lake. The last two glaciations did not get downstream this far. It seems to me that there may have been a longer time, larger area, and less hostile climate for speciation behind this dam, before it breached.

Star Valley did not have any isolation as far as I know during glacial times but may have had one earlier in the Pleistocene because of structural displacement in "The Narrows." When you are in Laramie for a visit with George Baxter, why not stop in for a discussion?

Sincerely yours,

*J. D. Love*  
J. D. Love





UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

IN REPLY REFER TO:

6532.1  
M-18

CRAIG DISTRICT OFFICE  
P.O. BOX 248  
455 EMERSON STREET  
CRAIG, COLORADO 81625

May 19, 1971

Dr. Robert Behnke  
Asst. Fisheries Unit Leader  
Colorado State University  
Fort Collins, Colorado 80521

Dear Dr. Behnke:

Last week two of our personnel were able to get into Beaver Creek to sample the fish population. They collected 19 specimen that varied in length from about five to ten inches.

We're not too optimistic about any of the specimen being the fish in question. The Game, Fish and Parks Commission stocked 3000 rainbow and 8500 natives in the creek from 1965 through 1967. Some of our specimen appeared to be hybrids between rainbows and natives.

WE are currently allowing the fish to preserve in formalin and will send them to you when they are ready. We would appreciate hearing the results when you finish studying them. Additional data such as location, etc., will be enclosed with the fish.

Please let us know if we can be of any further assistance.

Sincerely yours,

*Keith E. Norris*

Keith E. Norris  
District Manager

[Ca 1971-72]



UNITED STATES  
DEPARTMENT OF THE INTERIOR  
NATIONAL PARK SERVICE

IN REPLY REFER TO:

N1423

Dr. Robert Behnke  
Colorado Cooperative Fishery Unit  
Colorado State University  
Fort Collins, Colorado 80521

Dear Bob:

Sorry to be so slow in replying to your letter of September 12, but I just returned from vacation.

Doug Houston and I are enthusiastic about your proposed native trout study in Yellowstone and Grand Teton Parks. Funding for such a study may be difficult at the present time, however. We have made commitments for two other studies in Grand Teton and were recently informed that no money will be available this year for either of them. You may have better luck with our Washington office than we have though.

One of the major problems involving cutthroat trout distribution in the Snake River headwaters may be prior artificial stocking. Few of the back-country streams have been stocked in the last 20 years, but the practice was widespread during the 1930's. Most of the cutthroat trout that were planted then came from Yellowstone Lake eggs. I know, for example, that the cutthroat trout in both Dime Creek and Owl Creek are comparatively large-spotted. Whether these fish are indigenous or the progeny of planted fish I don't know. I would suggest a thorough review of stocking history be made before collecting work in the field is begun. I have observed that the Wyoming Game and Fish Department's stocking records before about 1940 are usually not very complete. A review would probably involve records from the old Bureau of Fisheries, the Forest Service, and the State of Wyoming. All of these agencies were stocking fish in the upper Snake River drainage during the 1920's and 1930's.

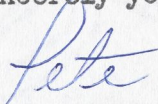
I would also suggest that extensive collections be made in the Pacific Creek-Atlantic Creek complex. As far as I know, no good systematic collecting work has been done in this area and much of the present information is by word-of-mouth. I did mention in my thesis that there were no cutthroat trout spawning runs in lower Pacific Creek. Such runs were observed as late as 1930. If cutthroat trout spawning

still occurs in lower Pacific Creek, it is probably scattered and sporadic. I have little first-hand information about cutthroat trout populations in the Pacific Creek drainage within the Teton Wilderness Area (Whetstone, Gravel and Mink Creeks), but understand that they are relatively sparse.

Enclosed are some cutthroat trout Doug Houston and I collected on August 26, 1969 from the lower half mile of Owl Creek. Owl Creek is the major tributary to Berry Creek which enters Jackson Lake from the west near the north end. The approximate location is in sections 27 and 28, Township 47 North, Range 116 West (unsurveyed).

Please keep us informed on any progress that you might make on this study. Good taxonomic data would certainly give us some ammunition to use in preserving and restoring native trout populations in this area.

Sincerely yours,



Peter S. Hayden  
Aquatic Research Biologist  
National Park Service

# STATE OF MONTANA



DEPARTMENT OF

## FISH AND GAME

Helena, Montana 59601  
December 8, 1971

Dr. Robert Behnke  
Assistant Unit Leader  
Colorado Cooperative Fishery Unit  
Colorado State University  
Fort Collins, Colorado 80521

*recd. 12/13  
- Mont. Regions  
- Hanzell's Thesis?*

Dear Bob:

I am enclosing your manuscript on cutthroat and rainbow trout. Thanks very much for letting me borrow it. I trust the day will come when you can make whatever adjustments you feel are necessary and have it published. It will be a valuable contribution. Perhaps by then you can add more information on the various cutthroat in this area.

Also, I am enclosing a copy of the notes I prepared on the cutthroat trout planted from Montana hatcheries. As you no doubt suspect and as the notes indicate, there has been a haphazard mixing of cutthroat strains. We are now more systematic and have settled basically on a Yellowstone cutthroat as represented by specimens you have already examined (coded in our IBM records as 13), and westslope cutthroat from our Jocko River Trout Hatchery brood stock (IBM code 12). I am sending these notes as a matter of information thinking you might be interested. I am confident that even sketchy information, as this is, of what has been planted from our hatcheries will help us interpret the fish we take in the wild. As the notes imply we have recoded our IBM fish planting records to specify, where possible, what cutthroat strains were planted in individual waters.

In a separate package, we are sending specimens of our westslope cutthroat brood stock from the Jocko River Hatchery and also cutthroat specimens from Silver Creek to add to those I gave you at the Salt Lake City meeting. We are particularly interested in the Jocko River Hatchery brood stock since, after considerable effort, this is the best westslope cutthroat we have been able to come up with. As indicated in the enclosed cutthroat notes, this stock is based on spawn taken from Hungry Horse Creek and another tributary of Hungry Horse Reservoir in 1965 and 1967.\*

As I mentioned at Salt Lake City, we are interested in the fish from Silver Creek since according to our records this stream, although easy to reach, was never stocked. Apparently, it was considered too polluted with

Dr. Robert Behnke  
December 8, 1971  
Page 2

mine wastes. We are now being pressured to plant it. The determination of whether or not these are pure cutthroat will help us decide how firm a stand to take.

I sent the Superintendent of the Jocko River Trout Hatchery a copy of your instructions on fish preservation but he evidently did not understand the importance of not crowding too many into a jar. I hope they are not too poorly preserved for your purposes. Also, I hope we dampened the toweling used to ship the fish sufficiently so they are not dried out when they reach you.

Again, thanks for all the help you've given us.

Best wishes for the Holiday Season,

*George*

GEORGE D. HOLTON  
CHIEF FISHERIES BIOLOGIST

GDH/pl  
Encls.

\*Hungry Horse Reservoir is a large Bureau of Reclamation Reservoir in northwest Montana near town of Columbia Falls. It is on South Fork of Flathead River (Columbia River Drainage). The South Fork Drainage, above Hungry Horse Dam, is largely in the Bob Marshall Wilderness Area. This is an extensive area that we have tried to reserve for indigenous cutthroat trout and Dolly Varden.

*- rainbows in res?*

# STATE OF MONTANA



DEPARTMENT OF

## FISH AND GAME

Helena, Montana 59601  
March 18, 1971

Dr. Robert J. Behnke  
Colorado Cooperative Fishery Unit  
Colorado State University  
Fort Collins, Colorado 80521

Dear Bob:

We have a brood stock of cutthroat trout, the progenitors of which we believe were from Yellowstone Lake. We have produced good lake fishing with progeny from this stock. However, in recent years there has been an excessive number of fish with deformities such as crooked tails or one eye. This has led us to believe it would be desirable to strengthen our stock by the addition of new fish.

Through a cooperative program with the Park Service, we procured eggs from McBride Lake, Yellowstone Park, in July 1969. Fish from these eggs are being held at our Big Timber Hatchery and are now two years old. They average about 11 inches and 3/4 pound. We will be able to take eggs from them in 1972.

Before mixing these McBride Lake fish with our original brood stock, we want to be reasonably sure that the McBride Lake stock is essentially the same as Yellowstone cutthroat and not adulterated with rainbow or other trout strains. Earlier this year I wrote to Jack Dean for a history of fish planting in McBride Lake; a copy of his letter is enclosed.

In line with Jack's suggestion, we are wondering if you would have time to examine specimens from both our original brood stock and from the McBride Lake stock to see how they compare with Yellowstone Lake cutthroat. We will appreciate it greatly if you can.

Sincerely,

GEORGE D. HOLTON  
CHIEF FISHERIES BIOLOGIST

GDH/pl  
Encl.



UNITED STATES  
DEPARTMENT OF THE INTERIOR  
FISH AND WILDLIFE SERVICE  
BUREAU OF SPORT FISHERIES AND WILDLIFE  
P. O. Box 184  
Yellowstone National Park, Wyoming 82190

RECEIVED  
JAN 27 1971  
FISHERIES DIVISION

January 25, 1971

George D. Holton  
Chief Fisheries Biologist  
Montana Fish and Game Department  
Helena, Montana 59601

Dear George:

According to our stocking records, both rainbows and cutthroats were stocked in McBride Lake 30-40 years ago. Here's our stocking information:

<u>Year</u>	<u>Month</u>	<u>Species</u>	<u>Size</u>	<u>Number</u>	<u>Hatchery</u>
1936	Sept.	Rainbow	Fingerling	9,180	Bozeman
1940	July-Sept.	Cutthroat	Advanced Fry	7,500	Lake
1941	July-Sept.	Cutthroat	Fingerling	9,650	Lake

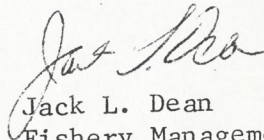
The success of these plants is unknown, George. Cutthroats are native to McBride Lake. There is some mixing of populations from adjacent Slough Creek during high water levels. A barrier several miles downstream on Slough Creek has prevented the upstream movement of rainbows into this portion of the Park. During our work on Upper and Middle Slough Creek, we have not observed any trout with rainbow characteristics.

In 1969 we submitted trout from the Lake Abundance (Slough Creek watershed) rotenone treatment to Dr. Behnke at Colorado State University. We consider him to be the best trout taxonomist in the Rocky Mountain area. He examined these fish and reported they were identical with specimens from Yellowstone Lake. He has not examined any specimens from McBride Lake. If you can spare a few of your larger specimens, Dr. Behnke might be willing to give an opinion on them.

We have heard rumors of golden trout in a lake near the headwaters of Slough Creek. This area has not been surveyed by your biologists yet and the rumor remains unconfirmed.

Our immediate interest in your computer program is in connection with confidence limits on creel census studies. Specifically, we need this type of information on the count and interview portions of several census programs. Could this be arranged?

Sincerely,

A handwritten signature in cursive script, appearing to read "Jack L. Dean".

Jack L. Dean  
Fishery Management Biologist  
Yellowstone Fisher Management  
Investigations



Holton - cutthroat

~~Wyo.~~ Mont,

# STATE OF MONTANA



## DEPARTMENT OF

## FISH AND GAME

Helena, Montana 59601

April 2, 1971

Dr. Robert J. Behnke  
Assistant Unit Leader  
Colorado Cooperative Fishery Unit  
Colorado State University  
Fort Collins, Colorado 80521

Dear Bob:

Thanks very much for your letter; I sent a copy of it and your instructions on preserving fish specimens to Tom Morgan, Superintendent of our Yellowstone River Trout Hatchery at Big Timber, Montana. He is custodian of our Yellowstone cutthroat stocks and will send you the specimens.

The cutthroat John Peters mentioned were from Goose Lake on the Beartooth Plateau in southeastern Montana. Fish from this lake have never comprised one of our brood stocks. We did take eggs there twice in recent years feeling that this stock would be desirable for other lakes in the area. However, neither time did we get enough eggs to be worthwhile. Then too, the fish we raised from them were not judged to be suitable as brood fish in terms of growth rate, etc., and all have been planted out.

For the past couple of years, as time permitted, I have gathered information on cutthroat brought into and planted from Montana hatcheries. As you might suspect, it is a complex picture with much intermixing of strains and incomplete records as to where certain strains were planted. I am now endeavoring to summarize the history of cutthroat handled in our hatchery system. This should be done in a couple of months and I will send you a copy.

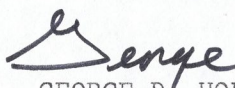
The papers you sent on golden trout are excellent. I am pleased to see this sort of work done. Records from the Bozeman Hatchery confirm the information given that goldens were brought to Montana by U. S. Bureau of Fisheries in 1907. Then too, we have a record of them being brought to our Anaconda Hatchery from the Mount Whitney Hatchery in California in 1931. No doubt, other shipments have been brought in but we would have to search the hatchery logs to confirm this.

Dr. Robert J. Behnke  
April 2, 1971  
Page 2

The latest information we have from our district biologists is that there are about 30 lakes in Montana that contain golden trout. We have tried not to put them in lakes where there were other trout or to plant other trout on top of them. However, I suspect there has been hybridization in some of the lakes.

We have had a hatchery brood stock of goldens in the past but do not at present. This summer for the first time in several years we hope to get some golden spawn from lakes on the Beartooth Plateau for planting other lakes. If you are interested, we would be happy to send you specimens from our golden lakes as we sample them. Or, if it would be of particular interest to you, we could make a special effort to search out lakes in which we feel there may be unadulterated goldens and send you specimens from these.

Kindest personal regards,



GEORGE D. HOLTON  
CHIEF FISHERIES BIOLOGIST

GDH/pl

STATE OF MONTANA  
DEPARTMENT OF FISH AND GAME  
HELENA, MONTANA 59601



Dr. Robert J. Behnke  
Assistant Unit Leader  
Colorado Cooperative Fishery Unit  
Colorado State University  
Fort Collins, Colorado 80521



- John's paper

- Terry Marble

-

- Geo. Holton

- John's paper

- + Golden Fossil  
paper.

- Lakontar cuts?

STATE OF MONTANA  
DEPARTMENT OF FISH AND GAME  
HELENA, MONTANA

*Office Memorandum*

**TO** : Dr. Robert J. Behnke  
**FROM** : Thomas F. Morgan  
**SUBJECT**: Fish Specimens For Identification

**DATE**: May 17, 1971

I will be sending the fish from Big Timber, Montana on the 19 th of May by parcel post. The following is a brief history of the fish.

Mc Bride Lake Ct. Native

The eggs were taken June 9, 1969 from fish caught at the outlet, in the lake, and from the inlet. Lee Mills park bio;ogist collected the fish with a portable shocking machine and the eggs were taken by Tom Morgan Supt. of the Big Timber Hatchery. The eggs were transported by helicopter to the road and hauled by truck to the hatchery.

Mc. Bride lake is located in Yellowstone Park. The outlet from the lake empties into Slough Creek above the rapids. Slough Creek drains into the Lamar River and then into the Yellowstone River. Mc Bride Lake is located in the North central part of Yellowstone Park, the elevation is 6500 ft. Cooke City is the closest town. Surface acres is 22.9 and the location is in Sec. 35 Range 111 West Tn. 58 North.

Yellowstone Lake Ct. Native

The original eggs were taken from Yellowstone Lake fish about 15 years ago. They were taken to the State Fish Hatchery at Emigrant and when it was closed the fish were brought to the Big Timber Hatchery in 1965 where they have been held since. We have no record of what part of the lake the original eggs were taken.

Thomas F. Morgan, Supt.  
State Fish Hatchery  
Big Timber, Montana 59011



WHEN REPLYING PLEASE STATE

OUR FILE No. 9-01.....

YOUR FILE No.....

DEPARTMENT OF RECREATION AND CONSERVATION  
FISH AND WILDLIFE BRANCH  
VICTORIA, BRITISH COLUMBIA

November 1, 1971.

Dr. Robert Behnke,  
Assistant Unit Leader,  
Colorado Co-op Fish Unit,  
Colorado State University,  
Fort Collins, Colorado. 80521.

Dear Bob:

Having inadvertently been responsible for your lack of attendance at the A.F.S. meeting here, and being personally unable to attend this years meeting, I was more than pleased to receive your letter. One of these days perhaps we will both get to the same meeting again, somewhere. With the present travel restrictions imposed on us it will probably be in B. C.

I really appreciated the paper you sent along. I found it very stimulating and thought provoking as I am sure will the rest of our staff. I am enclosing the publication you requested and if I can be of help in any way let me know.

I notice you made no mention of any cutthroat in this province and since I am sure you must have done some collecting here I can't help but wonder how some of the implications of your paper might apply to us. I would be interested in knowing what, if anything, you know of the Yellowstone cutthroat of south-eastern British Columbia, and whether or not you have sufficient specimens from that area. I am afraid we are also guilty of messing around with coastal cutthroat stocks which until recently we imported from wherever they happened to be available for planting in this area.

Since Cas Lindsey left we just don't have a "conscience" around to give us biological hell occasionally and keep us from becoming completely management or production oriented. We would certainly welcome a visit anytime you could arrange it and I would do everything possible to help if you wanted to



arrange a trip for collection purposes (or any other).

I am sending along the latest edition of The Fresh-water Fishes of British Columbia, as I thought you might not have a copy, as well as the publications you requested.

Best regards,



R. C. Thomas,  
Assistant Chief,  
Fisheries Management.

RCT:nj

Encl.



# STATE OF MONTANA



## DEPARTMENT OF

## FISH AND GAME

Helena, Montana 59601

May 6, 1971

Dr. Robert Behnke  
Assistant Unit Leader  
Colorado Cooperative Fishery Unit  
Colorado State University  
Fort Collins, Colorado 80521

Dear Bob:

The specimens from our Yellowstone cutthroat brood stock and McBride Lake stock were killed and put in formalin last Monday and should be shipped about the middle of next week. I am sorry it has taken us so long to get these to you; however, our hatcheryman was waiting for assistance from the district fish manager.

Enclosed are three cutthroat taken last summer from a stream near Helena. The trout habitat in the stream is very poor due to overgrazing and cutthroat such as these are the only trout present and their numbers are few. We have been requested to plant some beaver ponds in the headwaters of the stream but before we do so I would be interested in knowing whether these are fairly pure cutthroat or a rainbow x cutthroat hybrid. I will appreciate any advice you can give on this.

Sincerely,

A handwritten signature in cursive script that reads "George".

GEORGE D. HOLTON  
CHIEF FISHERIES BIOLOGIST

GDH/pl  
Encls.

UNITED STATES DEPARTMENT OF AGRICULTURE  
BUREAU OF PLANT INDUSTRY

WASHINGTON, D. C.

PLANT INDUSTRY DIVISION  
BUREAU OF PLANT INDUSTRY  
WASHINGTON, D. C.

PLANT INDUSTRY DIVISION  
BUREAU OF PLANT INDUSTRY  
WASHINGTON, D. C.

Montana cuts

## DEPARTMENT OF FISH AND GAME

G. Ray Arnett, Director  
 987 Jedsmith Drive  
 Sacramento, CA 95819



May 12, 1970

Dr. Robert Behnke  
 Colorado Cooperative Fishery Unit  
 Colorado State University  
 Fort Collins, Colorado 80521

Dear Dr. Behnke:

In response to your letter of April 24 regarding intraspecific variability of salmonid fishes I am sending, under separate cover, a copy of our only report to date on the results of our studies comparing the harvest rates of four different strains of rainbow trout in Beardsley Reservoir. In addition to the greater harvest rates of Kamloops, which I believe are due to higher survival rates rather than greater vulnerability, we also observed differences in morphology, with Kamloops being more "slender" and domestics very "deep bodied". In nearly all instances the domestics, at any given length, were heavier than Kamloops. This may be due to diet, but I am convinced there must be genetic differences involved.

In 1968, we began testing groups of hybrids of the domestic Virginia and Hot Creek strains in Beardsley. These fish are products of selective breeding experiments being conducted by Dr. Graham Gall of the University of California at Davis to improve the quality of catchable trout brood stocks. Preliminary results are shown in the following table which indicate these hybrids still fall short of contributing to the fishery at Beardsley in the same measure as Kamloops.

Strain or variety	Number planted	Number caught			Percent
		1968	1969	Total	
Kamloops	9,990	657	395	1,052	10.53
Virginia	10,150	195	102	297	2.92
Hot Creek	10,150	51	9	60	0.59
V x H	10,150	230	54	284	2.79
H x V	10,150	284	53	337	3.32
(H x V) x (V x H)	10,150	222	39	261	2.57
(V x H) x (H x V)	10,150	83	10	93	0.91

Dr. Gall is keeping track of the growth and survival of these hybrids in the hatchery, and is comparing their starch-gel electrophoretic patterns. Perhaps you would care to write to him regarding aspects of his investigations.

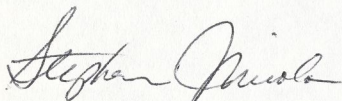
In 1969, we planted fingerlings of several different strains and hybrids, including Kamloops, steelhead, cutthroat, Shastas, V x H, and a domestic strain of Oregon rainbows, in six coldwater reservoirs of the Sierra Nevada. We are just now gathering creel census data on these fish so it will be a while before results are analyzed. Some of the same groups have been planted again this year.

May 12, 1970

In my opinion there can be little doubt that domestic rainbow trout of the strains used in California hatcheries are far less suited for fingerling management programs than are fingerlings of wild origin such as the Kamloops. Historically, and even in recent years, domestic fingerlings have comprised the bulk of the rainbow trout planted in back-country lakes and coldwater reservoirs. These fish may do well where competition and predation are absent or reduced, but in many of our reservoirs and some of our lakes these conditions are severe.

The biggest problem we have with the Kamloops is in our inability to adjust our hatchery operations to meet their production requirements (e.g., the use of automated equipment to reduce handling). For these and other problems relating to difficulties in obtaining reliable supplies of eggs, their use in the near future on any widespread basis does not appear likely.

Yours truly,



Stephen J. Nicola  
Associate Fishery Biologist  
Coldwater Reservoir Studies

SJN:cmh

cc: Shapovalov  
Gall