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A short history of *Pteronarcys californica* and *Pteronarcella badia* in the Logan River, Cache County, Utah

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The salmonflies, *Pteronarcys californica* and *Pteronarcella badia* (Plecotpera: Pteronarcyidae) were once abundant in the Logan River. In a 1927 paper, James Needham wrote "*Pteronarcys californica* abounds in the clear waters of Logan River below 6000 feet. It is undoubtedly one of the most important insect species of the stream. Its greatest abundance seems to be in trash piles that gather against the upstream side of the larger rocks in midstream where it finds both food and shelter. Fifty or more well-grown nymphs could be taken on a screen by dislodging a single large stone (Needham, 1927)". In later pages of this publication he comments as well on the abundance of *Pteronarcella badia* in the Logan River.

I first noticed that Pteronarcyidae were absent in the Logan River about 10 years ago, but I did not know they had once been common until about 5 years ago. It always seemed a bit strange to that they were not in the Logan River as both species are very common in the Blacksmith Fork River - the Logan River's largest tributary stream that drains the basin just to the south of the Logan River. Anyway, for the last 5 years I have been on a somewhat of quest to find these species in the Logan River and its tributaries and to work at summarizing the history of collections of these species in the Logan River. I have attempted to locate all the published papers and graduate student theses that report data on aquatic insects in the Logan River (Table 1). I have also reviewed the museum specimens both here at Utah State University and at Brigham Young University (Table 1).

Table 1. History of Pteronarycidae collections in the Logan River, Cache County, Utah.

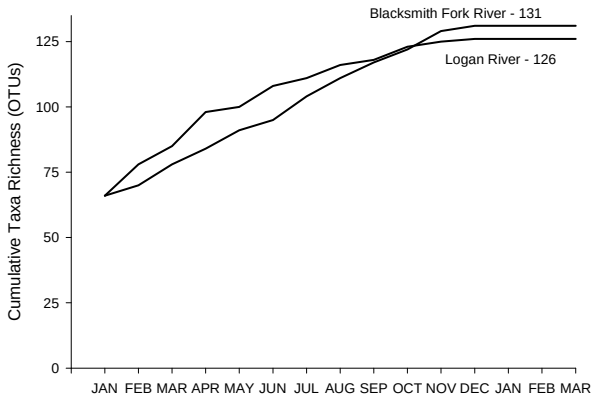
Date	Collector	Source	Comments
1926-27	J.G. Needham	UT Ag Station Bulletin 201	Abundant
1937	G.F. Knowlton	Cited in Mutlag Thesis	Abundant
1941	Unknown	USU insect Collection	
1946	G.F. Edmunds	USU insect Collection	
1950s	Arden Gaufin	BYU insect Collection	
1951	D.S. Mutlag	USU MS Thesis	Abundant
1958	Unknown	USU insect Collection	
1961	Unknown	USU insect Collection	
1965	Unknown	USU insect Collection	
1966	N.A. Erman	USU MS Thesis	A few *Pteronarcys californica* collected at Mendon Bridge
1978-1980	T.G. Osborn	USU PhD Thesis	No Pteronarcyidae collected
1992-2004	Vinson	> 200 collection trips	No Pteronarcyidae collected

From the records I have collected to date it seems they disappeared from the Logan River sometime during the early to mid 960s. My last collection record for Pteronarcyidae in the Logan River was by Nancy Erman (Professor Emeritus U.C. Davis). From Figure 2 in her MS Thesis, she reported collecting a few *Pteronarcys* in the Logan River at the Mendon Bridge on 7 September 1966. The cause of their demise has been a mystery. Possible, but somewhat unlikely, explanations I have thought of include a chemical spill, herbicide treatments for broad-scale sage brush eradication during the 1960s, and snow and ice melting chemicals used on Highway 89 that parallels much of the river. Unfortunately, I have yet to find any data to support any of these ideas.

What has also been baffling to me is why they have not been able to recolonize the Logan River over the last 40 years if it was a one-time chemical spill that eradicated

them. This suggests a continual source of pollution or something else that prevents their establishment. Pteronarcyidae are not the best fliers, so dispersal would likely be slow, but I'd have thought that after 40 years they would have made some inroads into the Logan River. They can be collected today in the Blacksmith Fork River just upstream of its confluence with the Logan River, so nymphs should be drifting down into the Logan River and I would think that some of the adults would have flown up the Logan River during this time. I have never found any nymphs in the Logan River just upstream from the confluence with the Blacksmith Fork River.

The lack of Pteronarcyidae in the Logan River is one of the few differences that I have found in the invertebrate faunas in the Logan and Blacksmith Fork Rivers. In 2001, I collected aquatic invertebrates at 5 locations throughout each river each month and found the faunas to be remarkably similar (see graph to the right). Current habitat conditions are similar between the Logan and Blacksmith Fork Rivers. There seems to be less fine sediment input and deposition in the Logan River then the Blacksmith Fork River and there is less development in terms of summer homes in Logan Canyon as compared to Blacksmith Fork Canyon. Discharge and water temperature regimes are similar between the two rivers and they do not seem to have changed in the Logan River since the 1960s. Overall, the Logan River within Logan Canyon remains a beautiful stream and habitat and water quality conditions have not changed much since 1960, at least not enough to prevent salmonflies from living in the river.



In June 2001, I conducted a transplant experiment where I moved, a mix of immature *P. californica* and *P. badia* nymphs into the Logan River and to a control site in the Blacksmith Fork River. I collected nymphs near the mouth of the Blacksmith Fork River and placed them in 10 cm diameter PVC tubes that were about 30 cm long. A 2 mm mesh screen was on placed on the ends of each canister to allow for a continuous flow of water through the tubes. The canisters were placed in cobble riffles and

attached to metal rods, which held them tight against the substrate. The canisters were camouflaged with rocks and debris. Small stones, sticks and stream conditioned leaves and detritus were added to each tube for habitat and food.

Nymphs were transplanted to an upstream site in the Blacksmith Fork River near the confluence with the Left Hand Fork of the Blacksmith Fork River and in 3 locations in the Logan River; near Rendezvous Park, at the Dewitt Picnic Area and just upstream from the confluence with Temple Fork (Figure 1). On 26 June 2001 3 nymphs were placed in the Blacksmith Fork River near the confluence with the Left Hand Fork of the Blacksmith Fork River and 5 nymphs were placed near Rendezvous Park on the Logan River.

On 6 July 2001, a tube with 10 nymphs was placed in the Logan River near Dewitt Picnic Area and one with 14 nymphs was placed just upstream from Temple Fork. The tubes were checked for nymph survival and replenished with detritus about every 2 to 4 weeks (Table 1).

All canisters were undisturbed and all nymphs survived up until sometime after 14 October 2001. When we checked the canisters on 17 November, the canister at Temple Fork had been vandalized and all of the nymphs were gone. All other canisters were undisturbed and their nymphs were alive. On 22 January 2002, the canister in the Blacksmith Fork could not be located. All other canisters were undisturbed and their nymphs were alive. On 19 April the canister at Rendezvous Park could not be located. The canister at Dewitt was undisturbed and all nymphs were alive. On 15 September, the canister appeared undisturbed, but all nymphs except 1 were dead. The last nymphs remained alive until the canister was checked on 16 November 2002, when the nymph was found, but it was dead. In the absence of vandalism or loss, *P. californica* and *P. badia* nymphs were able to live in the Logan River for more then a year. Why 9 of 10 nymphs died in the Dewitt canisters 12 to 15 months after being introduced is unknown. They have may reached maturity and conditions were unsuitable or they were unable to crawl from the canister and emerge.

Logan River Map

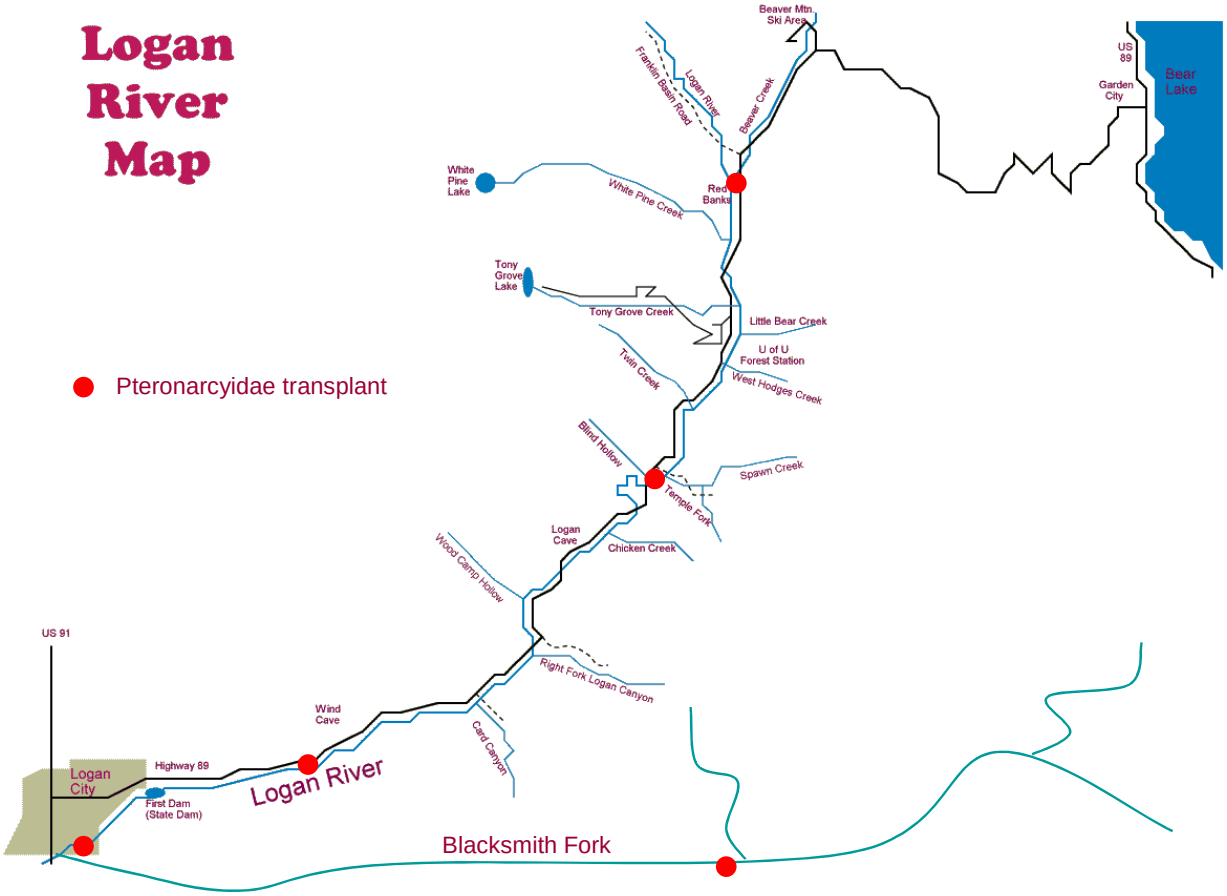


Table 1. Summary of *Pteronarcys californica* and *Pteronarcella badia* transplant experiment conducted in the Blacksmith Fork and Logan Rivers during 2001 and 2002. A blank cell indicates the canister was undisturbed and the nymphs appeared to be alive and well. A shaded cell indicates that the experiment at that site had been terminated because of loss of the canister or the nymphs.

		Logan River		
Date	Blacksmith Fork River	Rendezvous Park	Dewit Campgroundt	Temple Fork confluence
26 June 2001	3 nymphs transplanted	5 nymphs transplanted		
30 June 2001			10 nymphs transplanted	9 nymphs transplanted
6 July 2001				
30 July 2001				
16 August 2001				
22 September 2001				
14 October 2001				
17 November 2001				Canister disturbed, all nymphs gone
16 December 2001	Canister missing			
22 January 2002				
27 February 2002				
15 March 2002				
19 April 2002				
17 May 2002		canister missing		
14 June 2002				
15 July 2002				
15 September 2002			9 dead, 1 alive	
15 October 2002				
16 November 2002			1 dead	

Table 2. Summary of *Pteronarcys californica* and *Pteronarcella badia* transplant experiment conducted from the Blacksmith Fork to the Logan River during 2004 and 2005. A blank cell indicates the canister was undisturbed and the nymphs appeared to be alive and well. A shaded cell indicates that the experiment at that site had been terminated because of loss of the canister or the nymphs.

	Nymphs in canisters	Nymphs rele`Rendezvous Park	Dewit Campgroundt	Temple Fork confluence
26 June 2001	nymphs transplanted	5 nymphs transplanted		
30 June 2001			10 nymphs transplanted	9 nymphs transplanted
6 July 2001				
30 July 2001				
16 August 2001				
22 September 2001				
14 October 2001				
17 November 2001				Canister disturbed, all nymphs gone
16 December 2001	Canister missing			
22 January 2002				
27 February 2002				
15 March 2002				
19 April 2002				
17 May 2002		canister missing		
14 June 2002				
15 July 2002				
15 September 2002			9 dead, 1 alive	
15 October 2002				
16 November 2002			1 dead	

Transplant activities

Summer 2004 - The BugLab and Trout Unlimited meet to formulate a plan to reintroduce salmonflies to the Logan River. With the consent of the US Forest Service and the Utah Division of Wildlife Resources, we plan a four year project with two relocations each year.

December 11, 2004 - several thousand nymphs moved from the Blacksmith Fork to the Logan River.

April 23, 2005 - about 60 volunteers showed up at the Blacksmith Fork Bridge and over a couple hours we collected several thousand nymphs. We moved these nymphs to the Preston Valley Campground on the Logan River and released them.

May 20th - May 28, 2005 - About 1,300 adult salmonflies were moved from the Blacksmith Fork to the Logan River at Woodcamp Campground. This group of adults was put at Woodcamp, rather then Preston Valley so that if we collect nymphs at this site in the future it will tells us that the adults that were released were able to successfully mate and lay their eggs. The BugLab collects aquatic invertebrates at this site each month, so if reproduction was successful we should collect nymphs in about 6 months. We collected the eggs from 5 females and found that each female had about 350 eggs. The number of eggs carried by each female ranged from 97 to 588. Each egg is about 0.6 mm is size.

June 15, 2005 - Evidence of adult emergence on the Logan River was found at the old highway cutoff upstream from Birch Glen. Several exuvia of Pteronarcys californica were collected at this site.

Winter 2005/2006 - two nymphs collected from the Logan River at Woodcamp Campground. These were young of year nymphs, which means they hatched from eggs that were laid by the adults we transplanted in the spring of 2005.

April and May 2006. More than 2,000 nymphs and 600 adults moved from the Blacksmith to the Logan River.

Winter 2006/2007 - no nymphs located in the Logan River by USU entomology class.

April and May 2007. More than 2,000 nymphs and 1,000 adults moved from the Blacksmith to the Logan River.

Literature cited

Erman, N. A. 1968. Occurrence and distribution of invertebrates in lower Logan River. Master Thesis, Utah State University. 72 pages.

Mutlag, D. S. 1955. A study of aquatic insects of Logan River, Utah. Master's Thesis, Utah State Agricultural College, Logan. 46 pages.

Needham, J. G. and R.O. Christenson. 1927. Economic Insects In Some Streams of Northern Utah. Logan, UT: Utah Agricultural Experiment Station Bulletin 201:1-36.

Osborn, T.G. 1981. Stream insect production as a function of alkalinity and detritus processing. PhD Dissertation, Utah State University, Logan. 165 pages.

Logan Basin Graduate Theses, <1990

Bridges, D.W. 1963. Abundance, movements, harvest, and survival of brown trout and whitefish in a section of the Logan River, Utah. Master Thesis, Utah State University. 55 pages.

Brown, L.G. 1972. Early life history of the mountain whitefish, Prosopium williamsoni, in the Logan River, Utah. Master Thesis, Utah State University. 40 pages.

Cerven, D.R. 1973. Overwinter mortality of trout in Temple Fork of the Logan River. Master Thesis, Utah State University. 63 pages.

Clark, W.J. 1958. The phytoplankton of the Logan River, Utah, a mountain stream. Master Thesis, Utah State University. 95 pages.

Erman, N. A. 1968. Occurrence and distribution of invertebrates in lower Logan River. Master Thesis, Utah State University. 72 pages.

Fleener, G. G. 1950. Life history of cutthroat trout, Salmo clarkia Richardson, in the Logan River, Utah. Master Thesis, Utah State University. 83 pages.

Greswell, R.E. 1973. An evaluation of stress induced mortality of stocked catchable-size trout in Temple Fork of the Logan River. Master Thesis, Utah State University. 35 pages.

Mutlag, D. S. 1955. A study of aquatic insects of Logan River, Utah. Master's Thesis, Utah State Agricultural College, Logan. 46 pages.

Osborn, T.G. 1981. Stream insect production as a function of alkalinity and detritus processing. PhD Dissertation, Utah State University, Logan. 165 pages.

Pechacek, L. S. 1950. Harvest of wild and stocked fish from the Logan River drainage. Master Thesis, Utah State University. 103 pages.

Riley, L. E. 1987. Angler's attitudes toward the fisheries management policies of the Logan and Blacksmith Fork Rivers, Utah. Master Thesis, Utah State University. 75 pages