MONITORING OF MIGRATORY BULL TROUT IN THE JARBIDGE RIVER, 1999

Bureau of Land Management
Challenge Cost Share

and

U.S. Fish and Wildlife Service
Funding

Fred E. Partridge
Regional Fishery Manager

and

Charles D. Warren
Regional Fishery Biologist

Idaho Department of Fish and Game

April, 2000

Prepared for the Lower Snake River District Office
Bureau of Land Management
Technical Bulletin 2000-01

ABSTRACT

Downstream movements of fish in the East Fork and West Fork Jarbidge Rivers were monitored from early September to the end of November 1999 with fish weirs and box traps. Five bull trout (*Salvelinus confluentus*) were captured in both traps, three in the West Fork and two in the East Fork. This was an increase from 1997 when only one bull trout was captured. The 1999 bull trout ranged in length from 250 to 355 mm. Other species sampled included rainbow/redband trout (*Oncorhynchus mykiss*), mountain whitefish (*Prosopium williamsoni*), bridgelip sucker (*Catostomus columbianus*), shorthead sculpin (*Cottus confusus*), longnose dace (*Rhinichthys cataractae*), and speckled dace (*R. osculus*).

Nearly ten times as many mountain whitefish were sampled in the East Fork (755) as in the West Fork (78). Numbers of other species were similar in the East and West Forks. Rainbow trout and mountain whitefish in the East Fork were captured in greater numbers later in the season while dace were trapped in early September.

INTRODUCTION

The only native char in Idaho and Nevada is the bull trout (*Salvelinus confluentus*). Bull trout were historically found primarily in anadromous waters of Idaho and Nevada but construction of dams, water diversions and habitat degradation have eliminated or severely reduced known populations in southern Idaho. The Jarbidge River drainage, which flows north from Nevada into Idaho, has the only remaining population of bull trout south of the Snake River in Idaho and the only remaining population in Nevada. This bull trout population is the southern most population in the United States. This population is isolated from northern populations by warmer waters in the Snake River plains and modern dams in the Snake River drainage. Due to limited population sizes of resident and fluvial populations in the Jarbidge drainage and ongoing concerns about habitat conditions in the West Fork Jarbidge River (West Fork), the U.S. Fish and Wildlife Service listed the Jarbidge River bull trout as a threatened species in 1998. Prior to this listing, legal harvest by anglers of bull trout in Idaho was discontinued in 1994 and in Nevada in 1998.

Recent surveys and observations by Nevada Division of Wildlife, Idaho Department of Fish and Game, and Bureau of Land Management personnel confirmed migratory bull trout were still present in the Jarbidge drainage. Seasonal use was documented in segments of the Jarbidge River, East Fork Jarbidge River (East Fork) and West Fork (Johnson 1990, Partridge and Warren 1998, and Zoellick et al. 1996). A culvert on Jack Creek (tributary to the West Fork) was discovered to be a fish migration barrier and was identified by the Jarbidge River Bull Trout Task Force as the greatest problem to maintaining bull trout in the drainage. The culvert was replaced with a bridge in late 1997.

Population monitoring will be valuable for determining the benefits of removing the fish passage barrier and for evaluating trends in bull trout numbers. The goal of this and future monitoring will be to determine if the population is stable or increasing or if further management actions are needed.

The purpose of this project is to document both adult and juvenile bull trout migrating downstream in late summer and early fall to winter habitat, to develop an index of the size of the population of fluvial bull trout in the East and West Forks of the Jarbidge River, and to obtain information on other migratory native fish in the drainage. Previously this was to be a two year project in 1997 and 1998, however a temporary emergency listing of bull trout as an endangered species due to road construction in the stream above the town of Jarbidge resulted in the postponement until 1999.

METHODS

Downstream movements of bull and rainbow/redband trout (*Oncorhynchus mykiss*) and other fish species were monitored in the East and West Forks of the Jarbidge River,

Idaho during September-November, 1999. Temporary fish weirs were placed in each stream near their confluence (see Fig. 1). In the East Fork, weir location was approximately 100 m upstream of the confluence and in the West Fork, the weir was 10 m above the confluence and approximately 1.7 km downstream of the 1997 trap site. Weirs consisted of angle iron frames with holes drilled 12.5 mm apart for 19 mm conduit. This vertical conduit covered the entire stream width. A tube placed at one opening in each weir funneled downstream moving fish into a trap box. Boxes were checked daily when in operation during the week. Prior to mid-October, intakes to the boxes were closed on the weekends, although the weirs prevented fish from moving past the traps. The traps were also inoperable for four days in late November due to anchor ice, however fish could pass through the weirs. An additional sample of trout was taken immediately above the East Fork weir on November 30 by electrofishing about 250 m of stream. Twenty-one rainbow/redband trout were collected for whirling disease (*Myxobolus cerebralis*) analysis.

Total lengths and weights were taken on bull trout. Rainbow/redband trout were measured and a subsample weighed. All other species were counted and a sample of lengths taken. Longnose dace (*Rhinichthys cataractae*), speckled dace (*R. osculus*), and possibly leopard dace (*R. falcatus*) and redside shiner (*Richardsonius balteatus*) were combined as dace due to trap tender inexperience at nongame fish identification. There may have also been a few mountain sucker (*Catostomus platyrhynchus*) included with the bridgelip sucker (*C. columbianus*). Fish were released immediately downstream of the weir. Bull trout were tagged with internal passive integrated transponders (PIT tags) and a small portion of the caudal fin was taken for future DNA analysis.

Daily means, maximum and minimum water temperatures were determined from HOBO thermographs placed at each trap site.

RESULTS AND DISCUSSION

Fish weirs were placed in the East Fork on September 7, 1999 and in the West Fork on September 8, 1999 and removed on November 30, 1999. Although the trap boxes were closed on the weekends until mid-October, the weirs prevent downstream movement of fish without their being captured, except during cold weather in late November. A total of five bull trout were captured during the trapping period, with three being caught in the West Fork and two in the East Fork (Table 1). The trap tender made additional observations of two unmarked bull trout being caught and released by anglers below the weirs in the first part of September.

Table 1. Bull trout trapped in the East and West Forks Jarbidge River in 1999.

Date	Location	Total length (mm)	Total weight (g)	Condition (K)	PITTAG
09/29/99	West Fork	260	180	1.024	420B28713F
09/30/99	West Fork	250	139	0.890	420B032E40
10/24/99	East Fork	280	170	0.774	420B2A4963
10/31/99	East Fork	315	305	0.976	42036B7004
11/17/99	West Fork	355	335	0.749	420B076750

Although still of limited numbers, four more bull trout were captured in 1999 than in 1997 (Partridge and Warren, 1998). Three of the bull trout captures in 1999 occurred after the date the trap was removed in 1997 (October 17) and the one fish caught in 1997 was caught at an earlier date than the trap installation in 1999. Smaller bull trout (<300 mm) are likely to be immature fluvial fish and may spend most of the summer in the lower elevation waters near the trap sites. Larger fish, which were captured later, are more likely to be mature fish returning from headwater streams after spawning.

The one bull trout trapped on August 28, 1997 in the West Fork was smaller (140 mm, 13 g) than the five fish seen in 1999. Insufficient bull trout were sampled to determine if water temperature or time of year was influencing movement (see Figure 2).

A total of 1,347 fish were trapped in the East Fork trap in 1999 and 570 in the West Fork trap which along with bull trout included rainbow/redband trout, mountain whitefish (*Prosopium williamsoni*), bridgelip sucker, shorthead sculpin (*Cottus confusus*), longnose dace and speckled dace (Tables 2-3). Numbers of fish by species were comparable except for mountain whitefish where nearly ten times as many were captured in the East Fork as the West Fork. In 1997, the traps were operated from August 27 through October 17 and roughly similar numbers of fish were captured (Tables 4-5). Although overall numbers of fish trapped in 1999 were similar to numbers trapped in 1997, there were some obvious differences for the same sampling period (9/9 through 10/17). In the East Fork, numbers of rainbow/redband trout (32 vs. 203), mountain whitefish (72 vs. 189), and bridgelip sucker (8 vs. 62) were down in 1999 compared to 1997, respectively, however numbers of dace increased (379 vs. 254). In the West Fork, mountain whitefish numbers were down (8 vs. 115) and dace were up (345 vs. 19). Possible causes for differences include change in trap location on the West Fork, seasonal timing due to warmer water temperatures in 1999, normal species variation and trapping efficiency.

Rainbow/redband trout movement was scattered through the sampling period, although there was a slight increase in numbers of fish moving downstream after water temperatures cooled (see Figure 3). Mountain whitefish numbers increased significantly in the East Fork after mid-October when stream temperatures were cooler (see Figure 4). Movement of dace declined as water temperatures dropped (see Figure 5).

Table 2. Number of fish sampled at the East Fork Jarbidge River trap by date in 1999.

Date	Bull trout	Rainbow trout	Mountain whitefish	Dace species	Sculpin species	Sucker species	Total
09/08/99				13			13
09/09/99		1		13			14
09/10/99		1		21			22
09/11/99		----------Trap closed----------					
09/12/99		----------Trap closed----------					
09/13/99			1	1			2
09/14/99				8			8
09/15/99			1	23		1	25
09/16/99		1		8			9
09/17/99				3			3
09/18/99		----------Trap closed----------					
09/19/99		----------Trap closed----------					
09/20/99		----------Trap closed----------					
09/21/99		2	1	4			7
09/22/99		1		8			9
09/23/99			2	2			4
09/24/99			1	3			4
09/25/99		----------Trap closed----------					
09/26/99		----------Trap closed----------					
09/27/99		----------Trap closed----------					
09/28/99		1		32		1	34
09/29/99				54			54
09/30/99		1	4	23		2	30
10/01/99		5	7	36		2	50
10/02/99		----------Trap closed----------					
10/03/99		----------Trap closed----------					
10/04/99		----------Trap closed----------					
10/05/99		2	1	35		1	39
10/06/99				23		1	24
10/07/99		2		24			26
10/08/99		1		17			18
10/09/99		----------Trap closed----------					
10/10/99		----------Trap closed----------					
10/11/99		----------Trap closed----------					
10/12/99		1	10	11			22
10/13/99				3			3
10/14/99		1	9	3			13
10/15/99		3	5	10			18
10/16/99		6	24	1			31
10/17/99		3	6				9
10/18/99		4	3	5			12
10/19/99		3	14	12			29
10/20/99			7	4	1		12
10/21/99		2	38	11			51
10/22/99		3	67	3		1	74
10/23/99		5	11	1			17
10/24/99	1	2	55	1			59
10/25/99		1	25			1	27
10/26/99			36				36
10/27/99		4	66				70
10/28/99		2	53	2			57
10/29/99		15	30	4		1	50
10/30/99		1	43	2			46
10/31/99	1	1	22	1			25

Table 2. Continued.

Date	Bull trout	Rainbow trout	Mountain whitefish	Dace species	Sculpin species	Sucker species	Total
11/01/99			48				48
11/02/99		1	19				20
11/03/99			14	3			17
11/04/99			9	5			14
11/05/99		1	31	3			35
11/06/99			45	2			47
11/07/99		2	5	3	1	1	12
11/08/99			14	4			18
11/09/99				1			1
11/10/99		1	2	3		1	7
11/11/99		1	4	4			9
11/12/99		1	1				2
11/13/99							0
11/14/99		2		1		1	4
11/15/99			1				1
11/16/99				2			2
11/17/99		1					1
11/18/99			4	1			5
11/19/99			8				8
11/20/99				1			1
11/21/99		1	6	1			8
11/22/99		1	1				2
11/23/99		- - -

Table 3. Number of fish sampled at the West Fork Jarbidge River trap by date in 1999.

Date	Bull trout	Rainbow trout	Mountain whitefish	Dace species	Sculpin species	Sucker species	Total
09/09/99				9			9
09/10/99				15			15
09/11/99		----------Trap closed----------					
09/12/99		----------Trap closed----------					
09/13/99		1					1
09/14/99				11			11
09/15/99		1		9			10
09/16/99				11		1	12
09/17/99				6			6
09/18/99		----------Trap closed----------					
09/19/99		----------Trap closed----------					
09/20/99		----------Trap closed----------					
09/21/99		2	1	6			9
09/22/99		1		7			8
09/23/99				11			11
09/24/99				5			5
09/25/99		----------Trap closed----------					
09/26/99		----------Trap closed----------					
09/27/99		----------Trap closed----------					
09/28/99		1	3	49			53
09/29/99	1	2	1	37			41
09/30/99	1	4	1	45			51
10/01/99		1	1	41		3	46
10/02/99		----------Trap closed----------					
10/03/99		----------Trap closed----------					
10/04/99		----------Trap closed----------					
10/05/99		6		15			21
10/06/99		1		12			13
10/07/99		4		9			13
10/08/99		4		6			10
10/09/99		----------Trap closed----------					
10/10/99		----------Trap closed----------					
10/11/99		----------Trap closed----------					
10/12/99		1		9			10
10/13/99				14		3	17
10/14/99		1		14			15
10/15/99		2		2			4
10/16/99			1	1			2
10/17/99		1		1			2
10/18/99		10	2	3			15
10/19/99		4					4
10/20/99		1	1				2
10/21/99			1	2			3
10/22/99		2	2	2			6
10/23/99		1		1			2
10/24/99			3				3
10/25/99				2	1		3
10/26/99				3			3
10/27/99			1				1
10/28/99		2	1	2		2	7
10/29/99		6	1	3			10
10/30/99		3	3	1			7
10/31/99		5	1		1	1	8
11/01/99		5		1	1		7
11/02/99			1				1
11/03/99		2	10				12
11/04/99			11	2		1	14
11/05/99			2				2

Table 3. Continued.

Date	Bull trout	Rainbow trout	Mountain whitefish	Dace species	Sculpin species	Sucker species	Total
11/06/99		1	6	1			8
11/07/99				1	2		3
11/08/99		1	2	2		2	7
11/09/99			1				1
11/10/99				1			1
11/11/99			3	1			4
11/12/99		1	3	1			5
11/13/99						2	2
11/14/99			3	1		1	5
11/15/99			6				6
11/16/99		1				1	2
11/17/99	1		2			2	5
11/18/99			4	1			5
11/19/99		1		1	1		3
11/20/99							0
11/21/99				1			1
11/22/99				1	1		2
11/23/99		- - -

Table 4. Number of fish sampled at the East Fork Jarbidge River trap by date in 1997.

Date	Rainbow trout	Mountain whitefish	Dace species	Redside shiners	Sucker species	Total
08/27/97			30		1	31
08/28/97			113		4	117
08/29/97	1		108	2	2	113
08/30/97			92	2	2	96
08/31/97	1		68		3	72
09/01/97			56		2	58
09/02/97			39		2	41
09/03/97	1		74		4	79
09/04/97	2		42			44
09/05/97	1		69			70
09/06/97	2		29			31
09/07/97		3	29			32
09/08/97	3	1	48	1	2	55
09/09/97		2	27		3	32
09/10/97	1		36		1	38
09/11/97			3			3
09/12/97	3		6		4	13
09/13/97	1		1			2
09/14/97			7			7
09/15/97			4			4
09/16/97						0
09/17/97						0
09/18/97	1		9			10
09/19/97		2	5		2	9
09/20/97	10	5	1		4	20
09/21/97	6	1			1	8
09/22/97	10	4	13		7	34
09/23/97	3	2	5		3	13
09/24/97	2	10	4		4	20
09/25/97	6	6	7		3	22
09/26/97	3	19	4		4	30
09/27/97	1	9	5		5	20
09/28/97	6	1	3		1	11
09/29/97	12		2		1	15
09/30/97	9	31		1	7	48
10/01/97	3				1	4
10/02/97	1	1	16			18
10/03/97	2		8			10
10/04/97	6	4	15	1	2	28
10/05/97	24	20	9			53
10/06/97	6	5	3		1	15
10/07/97	7	6		1	1	15
10/08/97	4		3		1	8
10/09/97	6		2			8
10/10/97	24	31				55
10/11/97	29	3	3			35
10/12/97	6	1	1	1		9
10/13/97	1	1				2
10/14/97	2					2
10/15/97	2	17	2		3	24
10/16/97		4	2			6
10/17/97	3	3			1	7
Total:	211	192	1,003	9	82	1,497

Table 5. Number of fish sampled at the West Fork Jarbidge River trap by date in 1997.

Date	Bull trout	Rainbow trout	Mountain whitefish	Dace species	Redside shiners	Sculpin species	Sucker species	Total
08/28/97	1	2		3			3	9
08/29/97		2		11				13
08/30/97				9				9
08/31/97		2		8			3	13
09/01/97		5	4	29	2		4	44
09/02/97		4		13	1		1	19
09/03/97		2		23				25
09/04/97			1					1
09/05/97			1	1				2
09/06/97				3				3
09/07/97			2	2				4
09/08/97		1	1	3			1	6
09/09/97		1		5			1	7
09/10/97			2					2
09/11/97			1					1
09/12/97		1		1				2
09/13/97		1						1
09/14/97			1				1	2
09/15/97								0
09/16/97			3				1	4
09/17/97		1					1	2
09/18/97			5					5
09/19/97			15				2	17
09/20/97		1	15					16
09/21/97		1	15	1				17
09/22/97		1	12				2	15
09/23/97		3	4	1			1	9
09/24/97			9				3	12
09/25/97							1	1
09/26/97							1	1
09/27/97			1	5			1	7
09/28/97			7					7
09/29/97							1	1
09/30/97							1	1
10/01/97								0
10/02/97			4	4				8
10/03/97				1				1
10/04/97								0
10/05/97								0
10/06/97								0
10/07/97		3						3
10/08/97			1					1
10/09/97								0
10/10/97		5	9					14
10/11/97		4	1				1	6
10/12/97		4						4
10/13/97		1						1
10/14/97								0
10/15/97			2					2
10/16/97		3	8					11
10/17/97				2		3		5
Total:	1	48	124	124	3	3	30	333

In the East Fork, rainbow/redband trout ranged from 40 to 320 mm with an average of 158 mm (Table 6). Mountain whitefish ranged from 170 to 400 mm and averaged 255 mm. In the West Fork, rainbow/redband trout ranged from 40 to 270 mm and averaged 112 mm (Table 7). Mountain whitefish ranged from 185 to 355 and averaged 227 mm.

Testing results of rainbow/redband trout from the East Fork for whirling disease were negative although spores from the native *Myxobolus neurobius* or *M. kisutchi* were found in low densities in the samples (Douglas Burton, Idaho Department of Fish and Game, personal communication)

As in 1997, daily mean water temperatures averaged one degree Celsius higher in the East Fork than in the West Fork (Table 8).

ACKNOWLEDGEMENTS

The U.S. Fish and Wildlife Service provided additional funding to extend the sampling season until the end of November. Bio-aide Mike Hillesland operated the traps for the sampling season and Fisheries Technician Karen Frank assisted with trapping and data analysis.

LITERATURE CITED

Johnson, G.L. 1990. The status of bull trout in Nevada. Nevada Department of Conservation and Natural Resources. Reno, Nevada. 17 pp.

Partridge, F.E. and C.D. Warren. 1998. Monitoring of migrating bull trout in the Jarbidge River. Technical Bulletin No. 98-9. Lower Snake River District Office, Bureau of Land Management. Boise, Idaho. 15 pp.

Zoellick, B.W., R. Armstrong, and J. Klott. 1996. Status of the migratory bull trout population in the Jarbidge River drainage. Technical Bulletin No. 96-5. Lower Snake River District Office, Bureau of Land Management. Boise, Idaho. 21 pp.

Table 6. Total length, weight and number of fish sampled at the East Fork Jarbidge River trap in 1999.

Total length (mm)		Bull trout	Rainbow trout	Mountain whitefish	Dace species	Sculpin species	Sucker species
30	Number				3		1
	Mean weight (g)						
40	Number		1		3		1
	Mean weight (g)						
50	Number		7		4		
	Mean weight (g)						
60	Number		13		32		
	Mean weight (g)						
70	Number		9		45	1	1
	Mean weight (g)						
80	Number		3		47		
	Mean weight (g)						
90	Number				20		
	Mean weight (g)						
100	Number				7		
	Mean weight (g)						
110	Number		1		12		1
	Mean weight (g)		14				
120	Number				5	1	
	Mean weight (g)						
130	Number		2		1		
	Mean weight (g)		19				
140	Number		3				
	Mean weight (g)		24				
150	Number		3				3
	Mean weight (g)		27				
160	Number		5				3
	Mean weight (g)		36				
170	Number		4	1			2
	Mean weight (g)		42				
180	Number		3	2			1
	Mean weight (g)		52				
190	Number		5	22			1
	Mean weight (g)		66				
200	Number		4	37			
	Mean weight (g)		74				
210	Number		5	58			
	Mean weight (g)		81				
220	Number			41			
	Mean weight (g)						
230	Number		8	13			
	Mean weight (g)		106				
240	Number		5	14			
	Mean weight (g)		129				
250	Number		6	49			
	Mean weight (g)		138				
260	Number		2	50			
	Mean weight (g)		159				
270	Number		1	38			
	Mean weight (g)		154				
280	Number	1	2	35			
	Mean weight (g)	170	198				
290	Number			25			
	Mean weight (g)						

Table 6. Continued.

Total length (mm)		Bull trout	Rainbow trout	Mountain whitefish	Dace species	Sculpin species	Sucker species
300	Number		1	26			
	Mean weight (g)		200				
310	Number	1		15			
	Mean weight (g)	305					
320	Number		1	11			
	Mean weight (g)		256				
330	Number			8			
	Mean weight (g)						
340	Number			8			
	Mean weight (g)						
350	Number			3			
	Mean weight (g)						
360	Number			4			
	Mean weight (g)						
370	Number			1			
	Mean weight (g)						
380	Number			1			
	Mean weight (g)						
400	Number			1			
	Mean weight (g)						
Total number measured:		2	94	463	179	2	14
Total number not measured:		0	1	292	300	0	0
Total sampled:		2	95	755	479	2	14

Table 7. Total length, weight and number of fish sampled at the West Fork Jarbidge River trap in 1999.

Total length (mm)		Bull trout	Rainbow trout	Mountain whitefish	Dace species	Sculpin species	Sucker species
40	Number		6				
	Mean weight (g)						
50	Number		22		3		
	Mean weight (g)						
60	Number		6		6	1	
	Mean weight (g)						
70	Number		1		23	3	
	Mean weight (g)						
80	Number		1		22	2	
	Mean weight (g)						
90	Number		3		22	1	
	Mean weight (g)						
100	Number		5		32		1
	Mean weight (g)		10				
110	Number		2		8		
	Mean weight (g)		12				
120	Number		5		10		
	Mean weight (g)		16				
140	Number		4				3
	Mean weight (g)		25				
150	Number		4				5
	Mean weight (g)		30				
160	Number		3				8
	Mean weight (g)		35				
170	Number		3				1
	Mean weight (g)		43				
180	Number		1	2			3
	Mean weight (g)		50				
190	Number		4	12			1
	Mean weight (g)		65				
200	Number		1	11			
	Mean weight (g)		78				
210	Number		3	13			
	Mean weight (g)		74				
230	Number		1	2			
	Mean weight (g)		120				
240	Number		1	4			
	Mean weight (g)		98				
250	Number	1	1	8			
	Mean weight (g)	139	180				
260	Number	1	1	2			
	Mean weight (g)	180	125				
270	Number		1	5			
	Mean weight (g)		155				
280	Number			2			
	Mean weight (g)						
330	Number			1			
	Mean weight (g)						
350	Number	1		1			
	Mean weight (g)	335					
Total number measured:		3	79	63	126	7	22
Total number not measured:		0	1	15	254	0	0
Total sampled:		3	80	78	380	7	22

Table 8. Daily temperature (°C) summaries for temperatures taken with continuously recording thermographs on the East and West Fork Jarbidge Rivers at the fish trapping sites in 1999.

Date	East Fork Jarbidge River			West Fork Jarbidge River		
	Daily mean temperature	Daily maximum temperature	Daily minimum temperature	Daily mean temperature	Daily maximum temperature	Daily minimum temperature
09/08/99	12.8	18.0	7.8			
09/09/99	13.9	17.6	10.4	13.0	16.0	10.5
09/10/99	13.8	17.2	10.6	13.3	16.1	10.8
09/11/99	13.4	17.5	9.4	12.6	16.1	9.6
09/12/99	12.6	17.2	8.3	11.7	15.7	8.2
09/13/99	12.8	17.5	8.3	11.9	16.1	8.4
09/14/99	13.4	17.8	9.0	12.5	16.5	9.1
09/15/99	13.5	17.3	9.4	12.6	15.8	9.4
09/16/99	13.9	17.3	10.4	13.0	16.5	10.2
09/17/99	13.8	17.3	10.3	13.0	15.7	10.5
09/18/99	13.7	17.3	10.0	12.9	16.1	9.7
09/19/99	13.8	17.5	10.3	12.9	16.1	10.2
09/20/99	13.3	17.2	9.4	12.4	15.3	9.4
09/21/99	13.8	16.5	10.9	12.6	14.7	10.4
09/22/99	14.2	17.5	10.8	13.4	16.6	10.7
09/23/99	14.2	16.8	11.4	13.3	15.5	11.3
09/24/99	14.2	17.5	12.0	13.6	16.6	11.6
09/25/99	13.1	16.7	10.4	12.8	16.0	10.7
09/26/99	10.1	12.6	7.3	9.6	11.8	7.4
09/27/99	8.0	11.4	5.0	7.2	10.1	4.8
09/28/99	7.6	11.2	3.9	6.5	9.9	3.4
09/29/99	8.5	12.8	4.4	7.2	11.1	4.0
09/30/99	9.8	14.0	5.8	8.8	12.9	5.6
10/01/99	10.5	13.2	7.8	9.6	12.2	7.6
10/02/99	8.7	12.0	5.2	7.8	11.0	5.1
10/03/99	8.9	12.6	5.2	7.9	11.5	4.9
10/04/99	9.3	13.1	5.3	8.3	12.1	5.2
10/05/99	10.4	13.8	6.9	9.6	13.0	7.0
10/06/99	9.8	11.5	8.6	9.2	10.2	8.5
10/07/99	9.5	12.0	7.2	8.6	11.1	6.5
10/08/99	9.9	13.4	6.4	9.1	12.5	6.5
10/09/99	10.8	13.8	7.8	10.0	13.0	7.7
10/10/99	10.6	13.7	7.2	9.6	12.7	6.8
10/11/99	10.6	13.2	7.8	9.9	12.4	7.9
10/12/99	10.3	13.1	7.5	9.7	12.5	7.4
10/13/99	10.0	12.9	6.9	9.3	12.4	6.8
10/14/99	9.7	12.3	6.9	9.0	11.6	6.8
10/15/99	7.3	10.3	4.9	6.6	9.0	4.6
10/16/99	4.8	7.0	2.2	3.9	6.0	1.6
10/17/99	4.5	7.3	1.2	3.3	6.5	0.5
10/18/99	5.7	8.4	2.8	4.7	7.7	2.4
10/19/99	5.6	8.3	2.3	4.6	7.4	2.1
10/20/99	6.0	9.2	2.8	5.1	8.5	2.6
10/21/99	7.1	10.1	3.9	6.3	9.4	4.0
10/22/99	7.4	10.1	4.2	6.6	9.6	4.3
10/23/99	7.5	10.4	4.4	6.5	9.3	4.1
10/24/99	7.5	10.0	4.5	6.6	8.8	4.6
10/25/99	6.9	9.7	3.9	5.9	8.8	3.5
10/26/99	7.2	9.5	4.2	6.4	9.1	4.3
10/27/99	8.4	10.1	5.9	7.3	9.0	5.4
10/28/99	8.6	9.5	6.9	7.7	8.7	6.3
10/29/99	5.9	7.2	4.2	5.3	6.8	3.7

Table 8. Continued.

Date	East Fork Jarbidge River			West Fork Jarbidge River		
	Daily mean temperature	Daily maximum temperature	Daily minimum temperature	Daily mean temperature	Daily maximum temperature	Daily minimum temperature
10/30/99	5.4	8.0	2.6	4.4	7.1	2.3
10/31/99	6.4	8.4	4.1	5.4	7.7	3.7
11/01/99	4.8	6.7	2.5	3.9	5.6	1.9
11/02/99	4.1	6.7	1.2	3.1	5.9	0.8
11/03/99	5.2	8.1	2.5	4.2	7.0	1.9
11/04/99	6.1	8.3	3.6	5.1	7.6	3.4
11/05/99	6.2	8.4	3.8	5.3	7.7	3.5
11/06/99	6.1	8.1	3.6	5.1	7.0	3.4
11/07/99	7.8	10.3	5.8	6.8	9.7	4.9
11/08/99	7.5	8.7	6.3	6.8	7.9	5.9
11/09/99	5.2	7.0	3.0	4.3	5.9	2.6
11/10/99	6.3	8.0	4.9	5.2	6.8	3.7
11/11/99	7.5	9.7	5.5	6.5	8.2	4.9
11/12/99	6.5	8.4	4.2	5.8	7.9	4.0
11/13/99	5.5	7.3	3.3	4.9	6.8	3.2
11/14/99	4.7	6.9	2.3	4.1	6.3	2.3
11/15/99	5.0	7.0	2.6	4.1	6.5	2.1
11/16/99	5.2	7.8	3.0	4.4	6.7	2.4
11/17/99	5.1	6.6	3.9	4.4	5.2	3.2
11/18/99	2.9	4.2	1.2	2.1	3.2	0.5
11/19/99	3.1	5.3	1.2	1.9	3.8	0.3
11/20/99	4.9	5.6	3.9	3.6	4.3	3.2
11/21/99	3.2	4.4	2.0	2.1	3.1	0.8
11/22/99	1.6	3.0	0.6	0.6	1.9	0.0
11/23/99	0.0	0.9	-0.1	0.1	0.5	0.0
11/24/99	0.8	3.0	-0.1	0.0	0.0	0.0
11/25/99	4.2	5.6	2.8	2.3	4.0	0.0
11/26/99	5.4	6.6	4.1	4.0	5.1	3.1
11/27/99	6.1	7.5	5.2	4.9	6.0	4.5
11/28/99	4.0	5.3	2.3	3.1	4.3	1.9
11/29/99	4.2	5.9	3.0	3.4	4.8	2.3
Mean 9/09-11/29						
	8.1			7.2		

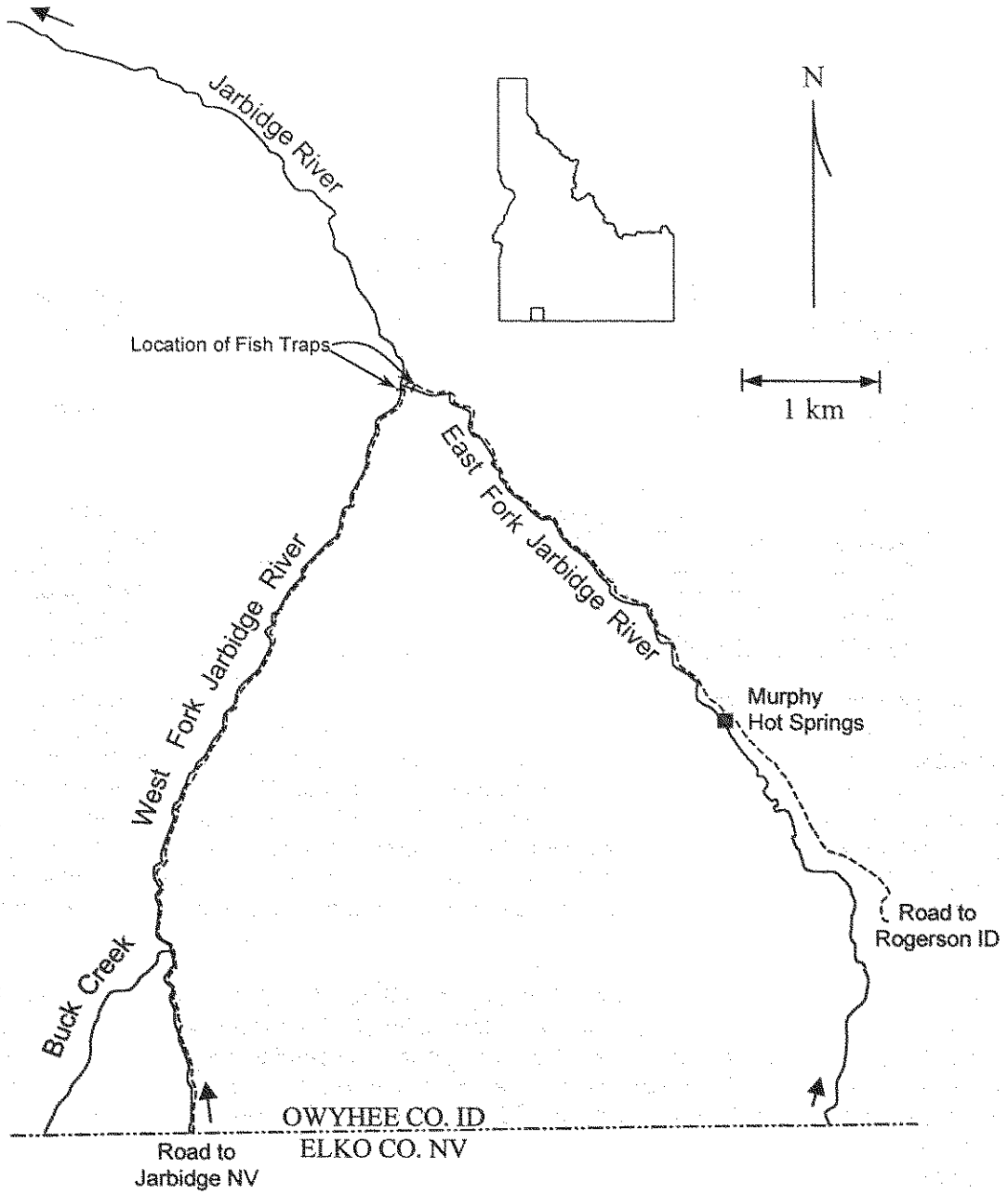
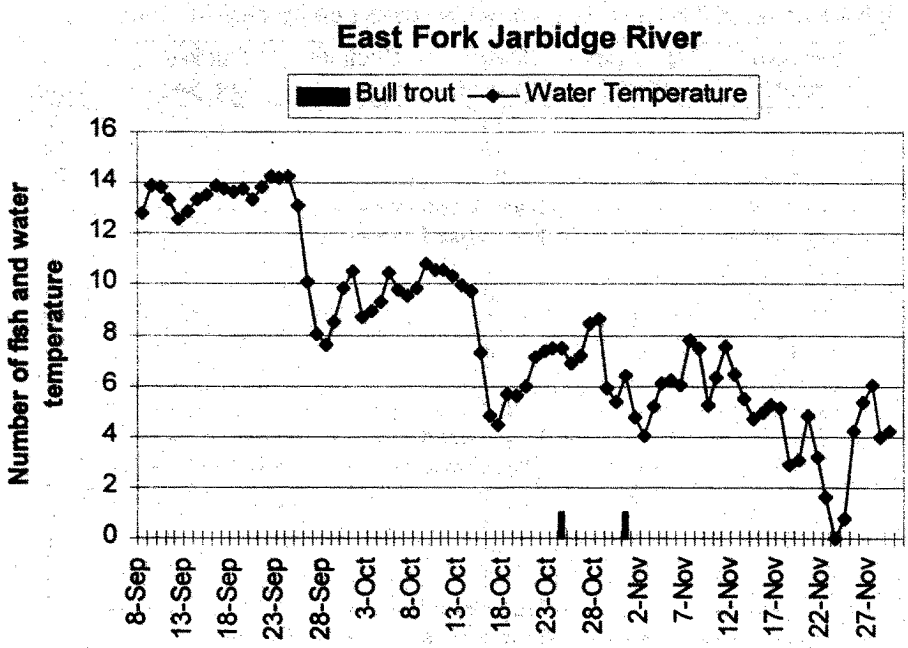


Figure 1. Location of downstream migrant traps on East and West Forks of the Jarbidge River, 1999.



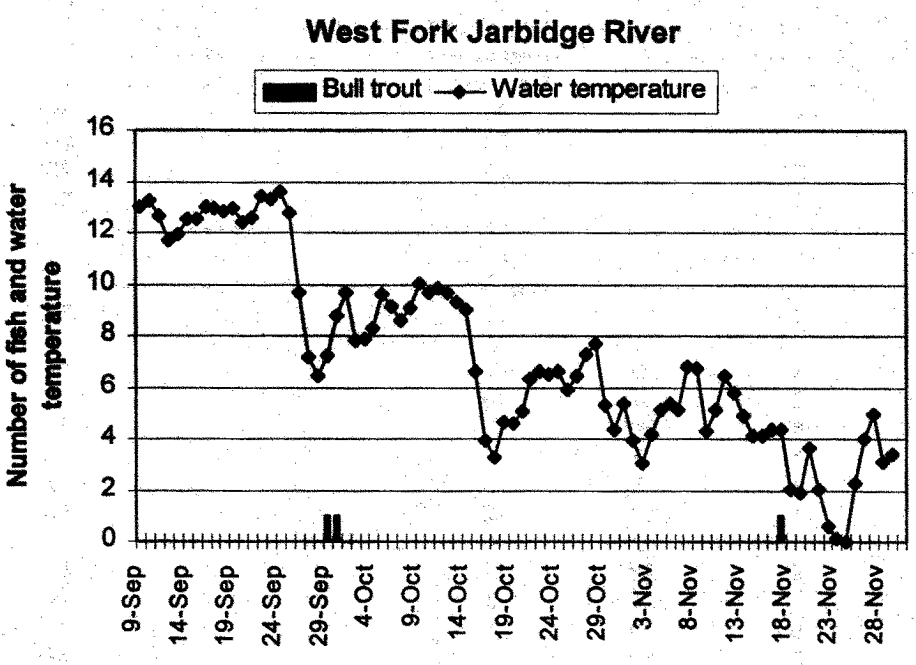
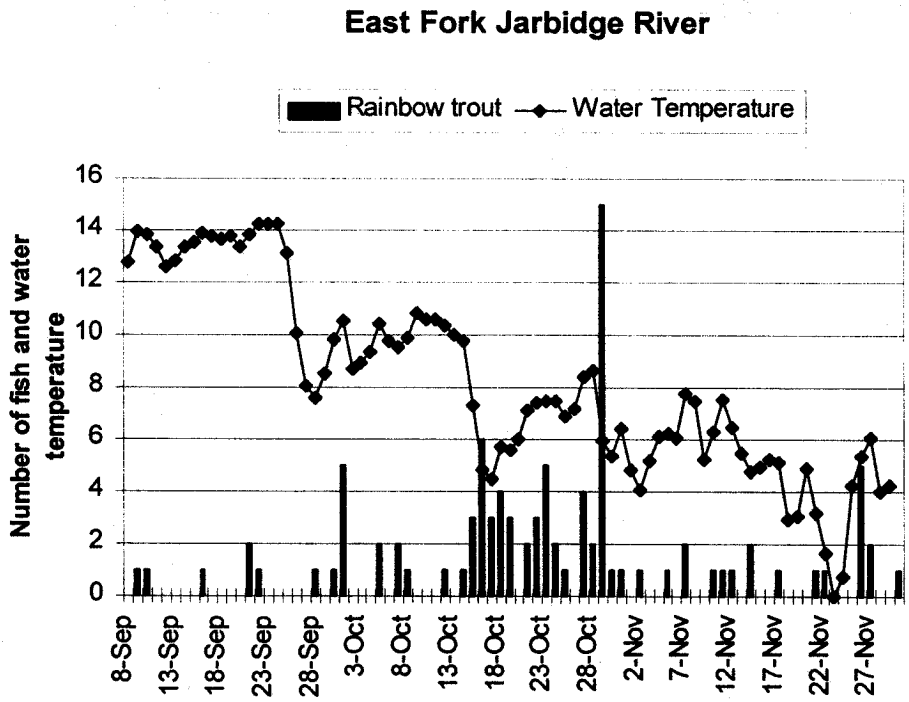


Figure 2. Number of bull trout sampled and daily mean water temperature (^{0}C) on the East Fork and West Fork, Jarbidge River in 1999.



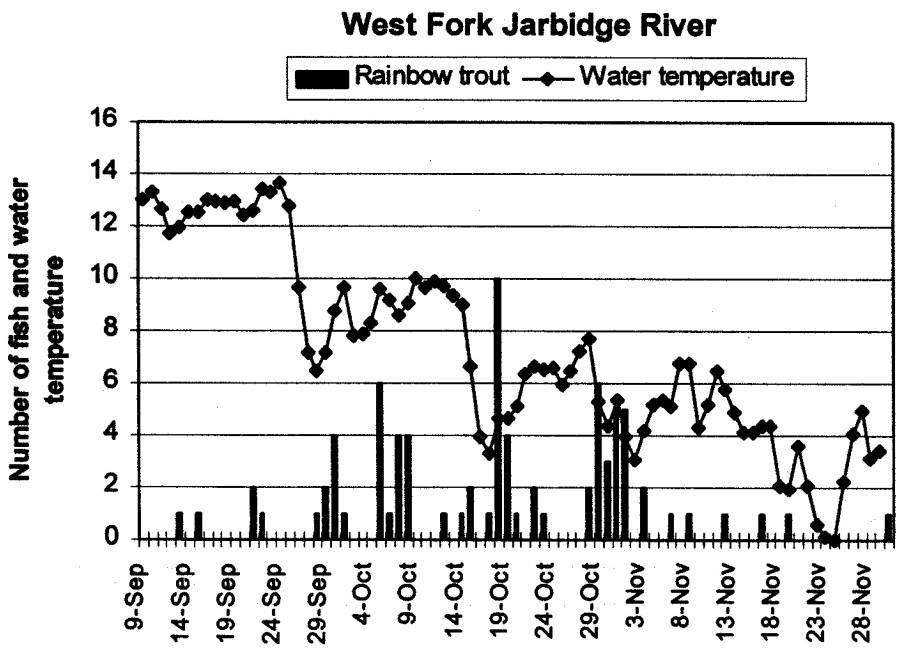
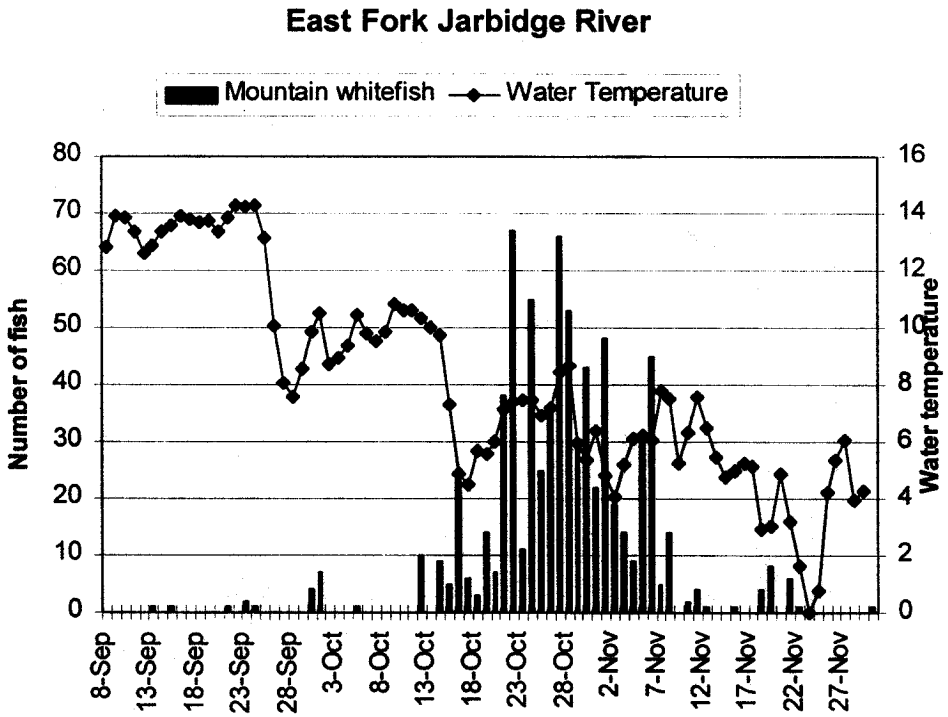


Figure 3. Number of rainbow/redband trout sampled and daily mean water temperature (^{o}C) on the East Fork and West Fork, Jarbidge River in 1999.



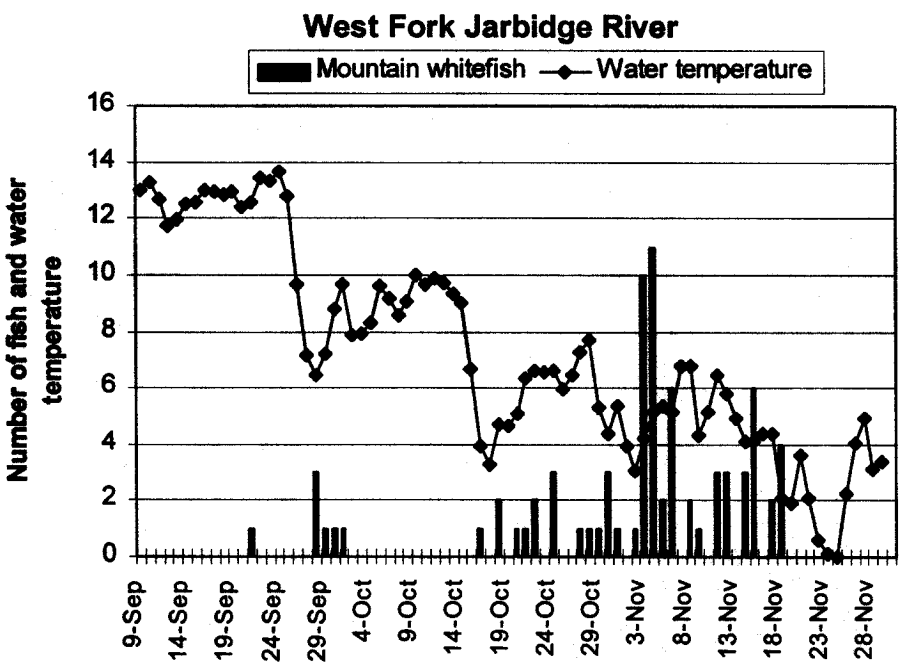
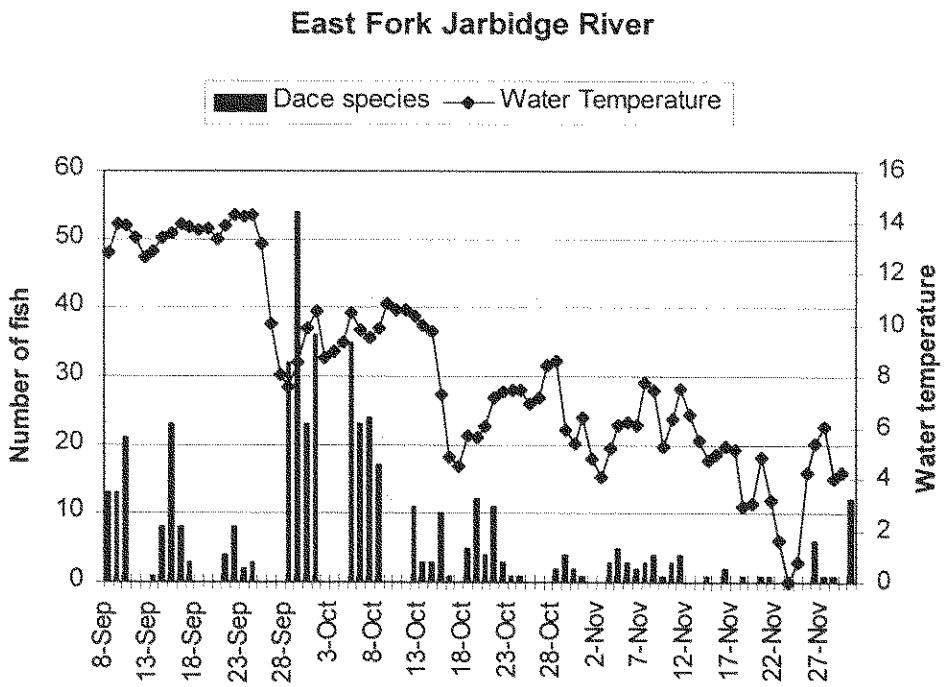


Figure 4. Number of mountain whitefish sampled and daily mean water temperature (^{0}C) on the East Fork and West Fork, Jarbidge River in 1999.



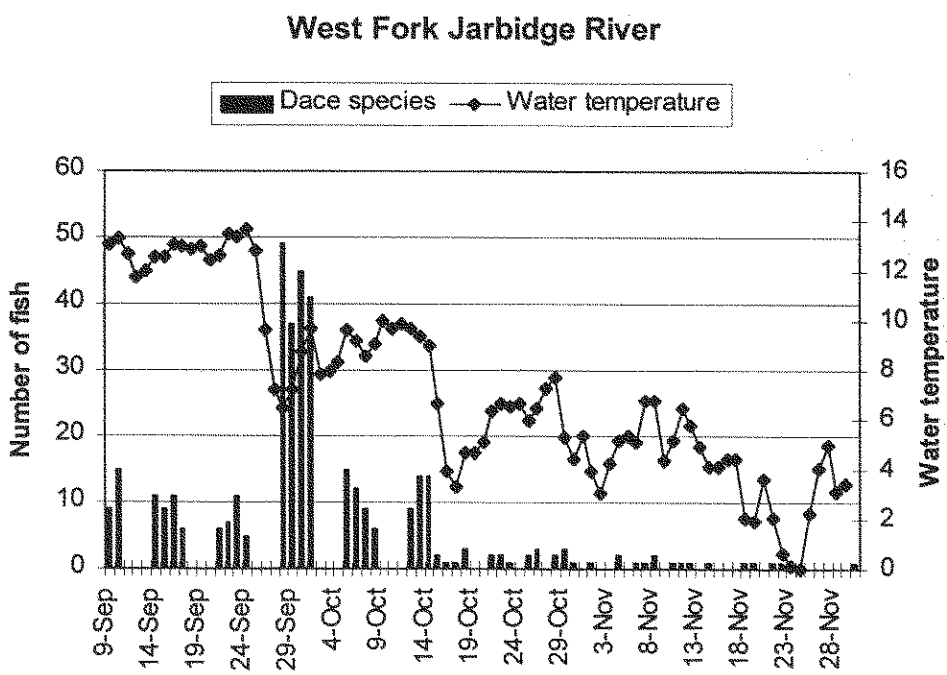


Figure 5. Number of dace sampled and daily mean water temperature (^{0}C) on the East Fork and West Fork, Jarbidge River in 1999.