



State of Utah

DEPARTMENT OF NATURAL RESOURCES

Division of Wildlife Resources - Native Aquatic Species

LEAST CHUB
(Iotichthys phlegethontis)

MONITORING SUMMARY

Snake Valley, 1999

Publication Number 99-37
Utah Division of Wildlife Resources
1594 W. North Temple
Salt Lake City, Utah
John F. Kimball, Director

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Final Report
October 1999

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ACKNOWLEDGMENTS

We are grateful to K.M. Comella, C.J. Davis, D.L. Harstad, A.M. McLuckie, W.T. Richards, C.B. Schade, G.S. Streater, M.A. Webb, and K.K. Wheeler for their efforts in completing this project. We also appreciate the efforts of D. Hepworth and M.A. Webb for providing comments and technical review. This project was funded by the Utah Division of Wildlife Resources.

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INTRODUCTION:

Least chub historically occupied a variety of habitats including rivers, clear streams, springs, ponds, and marshes (Sigler and Miller 1963). However, large populations are currently restricted to isolated springs and associated marshes. Least chub habitat usually consists of small springs or ponds with cool stable temperatures, relatively low, stable dissolved oxygen values, and low conductivities (Perkins et al. 1998). Least chub are typically found in habitats consisting of moderate to dense emergent, floating, and submergent vegetation. Wetland vegetation most commonly associated with least chub habitat include: olney threesquare (*Scirpus americanus*), common threesquare (*S. pungens*), softstem bulrush (*S. validus*), wiregrass (*Juncus balticus*), clustered field sedge (*Carex praegracilis*), common cattail (*Typha domingensis*), common spikerush (*Eleocharis palustris*), duckweed (*Lemna sp.*), cutleaf water parsnip (*Berula erecta*), and waterfern (*Azolla mexicana*).

Least chub, which are endemic to the Bonneville Basin of Utah, have been declining since the 1940's (Holden et al. 1974), and studies over the last 20 years indicate a continued decline in their distribution and abundance (Perkins et al. 1998). Collections within the Bonneville Basin indicate that the approximate range of least chub once included Big Cottonwood Creek, the Provo River, Utah Lake, Beaver River, Parowan Creek, and Snake Valley (Sigler and Miller 1963, Crist 1990). However, Workman et al. (1979) surveyed historically occupied areas in Millard, Juab, Weber, Salt Lake, and Tooele counties, and concluded that least chub have been extirpated from a majority of their original range. Specifically, Workman and his colleagues showed that least chub distribution is limited to areas within Snake Valley including the Gandy Salt Marsh complex, Leland Harris Spring complex, Callao Spring complex, Twin Springs (Bishop Springs), and Redden Springs. Surveys conducted by Utah Division of Wildlife Resources in the mid 1990's found two previously unknown small populations of least chub in the Sevier River drainage within Mills Valley, and in Juab County near the town of Mona (Perkins et al. 1998).

The first recorded collection of least chub in Snake Valley is believed to be by C.L. Hubbs in 1942 at the Gandy Salt Marsh complex in Millard County (Sigler and Miller 1963). In 1970, R.R. Miller collected least chub from the Leland Harris spring complex in Juab County (Sigler and Sigler 1996). These findings prompted the West Desert survey conducted by Workman et al. (1979), which revealed the limited distribution of least chub to Snake Valley. Osmundson (1985) found that least chub were most abundant in the Gandy Salt Marsh complex and Leland Harris spring complex within Snake Valley. He noted that least chub were least abundant in Miller's Spring (near Leland) and Bishop Springs (Twin and Central Springs). Further research has indicated that least chub have been extirpated from the Callao and Redden Spring complexes. Thus, within Snake Valley, least chub are limited to the Gandy Salt Marsh complex, Leland Harris spring complex, and Bishop Springs complex (Perkins et al. 1998).

Due to their declining distribution and abundance, least chub are currently classified as a conservation species by the State of Utah (Perkins et al. 1998). In 1998, the Conservation Agreement and Strategy for Least Chub (*Iotichthys phlegethontis*) in the State of Utah (Perkins et al. 1998) was implemented in an effort to expand least chub populations and enhance their habitat. Conservation actions identified in the Conservation Agreement include: Wetland revegetation, water quality improvements, grazing enclosure construction, surveys of suitable least chub habitat, control of nonnatives, genetic analysis, and monitoring of least chub populations. Long-term population monitoring is necessary to determine least chub trends and their response to implementation of conservation actions.

The objective of this ongoing effort is to monitor least chub populations and their habitat trends in Snake Valley within the West Desert Geographic Management Unit. In August 1999, the Utah Division of Wildlife Resources conducted the seventh consecutive year of least chub monitoring in Snake Valley, Utah.

METHODS:

In Snake Valley, least chub were sampled at three spring complexes: Leland Harris, Gandy Salt Marsh, and Bishop Springs (Figures 1-3). A total of 76 sites were sampled within these complexes (Leland Harris = 12, Gandy = 51, Bishop Springs = 13). Each of the 76 sites have been designated as an annual monitoring site and have been individually marked with permanent stakes. To determine the presence/absence of least chub, a minimum of one wire minnow trap (17.5" long, 9" diameter, .25" mesh) was placed at each site. All traps were set at a minimum depth of 5" and were left for 2-4 hours before being removed. Trap location, trap depth, and total trapping time was recorded at each site. All captured fish were positively identified and respective lengths were measured and recorded. Least chub size distribution was examined for each spring complex by plotting length frequency histograms in 1 mm increments. In addition, mean length for least chub was calculated for each spring complex.

Habitat inventories were conducted at all springs to assess physical parameters of the site and to determine species occurrence and abundance of aquatic flora. Pool size, maximum water depth, substrate depth, bank condition, ungulate damage, and similar habitat indices were recorded on standardized data sheets. Limited water quality parameters, including pH and dissolved oxygen, were also recorded at each station.

RESULTS:

From August 16, 1999 to August 20, 1999, 3 field crews totaling 11 individuals surveyed 76 pre-established sites within the Leland Harris, Gandy Salt Marsh, and Bishop Springs complexes. Least chub comprised 63.3% (least chub = 1,368; Utah chub = 785; and speckled dace = 7) of all fish caught at Snake Valley (Tables 4, 6, and 8). Of the 76 springs sampled, least chub occurred in 32 (41.2%), Utah chub (*Gila atraria*) in 19 (25.0%), and speckled dace (*Rhinichthys osculus*) in 5 (6.7%) (Tables 1 - 3). A brief synopsis of the spring complexes follows:

Leland Harris (Sample # 99-001 - 99-012)

Least chub were captured in 10 (83.3%) of 12 springs sampled at Leland Harris (Table 1 & Figure 1). Least chub comprised 49.1% (least chub = 596, Utah chub = 618) of all fish captured (Table 4). All springs were classified as having low ungulate damage consisting of minimal bank disturbance. Springs 9 and 10 were classified as having moderate to high ungulate damage consisting of cropped vegetation around spring heads and unstable banks resulting from trampling. Among sites containing least chub, average water depth ranged from .2 to >8 ft., surface water temperature ranged from 14.6 to 19.6 °C (mean = 16.4 °C), dissolved oxygen ranged from 1.23 to 6.2 mg/L (mean = 3.6 mg/L), and pH ranged from 7.5 to 8.9 (mean = 7.8). Substrate of all sites in Leland Harris was either organic or silt.

Length frequency distributions of least chub at Leland Harris Spring Complex (Figure 4) show that the greatest number of fish caught were between the lengths of 31 and 48 mm. Mean length of least chub captured at Leland Harris was 40 mm.

Gandy Salt Marsh (Sample # 99-013 - 99-063)

Fish species present throughout the Gandy Salt Marsh complex (Figure 2) included least chub, speckled dace, and Utah chub (Table 6). Fifteen (29.4%) of 51 sites sampled contained least chub (Table 1). Least Chub comprised 98.5% (least chub = 733 , Utah chub = 8, and speckled dace = 3) of all fish captured (Table 6). Ungulate damage was concentrated at sites outside of exclosures. Eighteen of 51 sites were completely covered with dense *Berula erecta*, *Lemna* sp., or *Nasturtium officinale*. Of these eighteen sites, fish were captured at only 3 springs (4, 5, and 6) and one site (7) was filled with vegetation making sampling impossible. Among sites containing least chub, average water depth ranged from 0.1 ft. to 6.6 ft. (mean = 1.38 ft.) and surface water temperatures ranged from 13.4 to 21.5 °C (mean = 17.4 °C). Dissolved oxygen ranged from 1.5 to 9.8 mg/L (mean = 4.3 mg/L), and pH ranged from 7.4 to 8.8 (mean = 7.9). Substrate at all sites in the Gandy Salt Marsh complex was either organic or silt.

Purple loosestrife (*Lythrum salicaria*) was observed and pulled up at sites 46 and 47.

Length frequency distribution of least chub at Gandy Salt Marsh (Figure 5) showed that the majority of fish collected were between 35 and 48 mm in length. Mean length of least chub captured at Gandy Salt Marsh was 41 mm.

Bishop Springs (Sample # 99-064 - 99-076)

Least chub were found in 7 (53.8%) of the 13 sites sampled at Bishop Springs (Table 1 & Figure 3). Species present in this complex included least chub, Utah chub, and speckled dace (Table 8). Least chub comprised 19.3% (least chub = 39, Utah chub = 159, and speckled dace = 4) of all trapped fish (Table 9). Black spot cysts (*Uvulifer ambloplitis*) appeared on many least chub and Utah chub captured throughout Bishop Springs. Sites 1 and 2 were dry, so no traps were set due to the diversion of flows from Foote Reservoir. Ungulate damage was low at all sites, with the exception of South Twin where damage was moderate. Among sites containing least chub, water depth ranged from 0.4 ft. to >8 ft., with surface water temperatures ranging from 18.4 to 29°C (mean = 21.1°C). Dissolved oxygen ranged from 0.1 to 7.9 mg/L (mean = 4.3 mg/L), and pH ranged from 7.3 to 8.5 (mean = 7.8). Substrate of all sites at Bishop Springs was either organic or silt.

Least chub length frequency distribution for Bishop Springs show that most fish collected were between 35 and 50 mm in length (Figure 6). Mean length of least chub captured at Bishop Springs was 41 mm.

SUMMARY:

Leland Harris

- Least chub were trapped at 10 of the 12 sites (83.3%).
- Site 9 has not yielded least chub since annual monitoring began in 1993.

- Since annual monitoring began in 1993, Leland Harris has continued to yield a high percentage of springs containing least chub (Table 1).

Gandy Salt Marsh

- Presence of least chub was confirmed at 15 (29.4%) of the 51 sites.
- Only eight Utah chub were trapped in four sites this year, and only three speckled dace were trapped at three sites. These numbers are the lowest recorded totals since annual monitoring began in 1993 (Tables 2 and 3).
- For the first time in six years, no fish were confirmed present at sites 55 and 56 (Table 7).
- Least chub were recorded for the first time since 1993 at site 15, and for the first time since 1994 at site 16 (Table 7).
- The percentage of springs containing least chub has remained stable in the Gandy Salt Marsh complex since 1995 (Table 1).

Bishop Springs

- Least chub were confirmed present at 7 of the 13 sites (53.8%). However, traps were not set at sites 1 and 2 because they were dry due to the diversion of flows at Foote Reservoir (Table 9).
- No fish were captured at site 4 for the first time since annual monitoring began in 1993 (excluding 1995 and 1997 when site 4 was dry due to the diversion of Foote Reservoir).
- This is the third year (1995, 1997, and 1999) that portions of Bishop Springs have been dewatered due to the diversion of flow from Foote Reservoir.
- Since annual monitoring began in 1993, Bishop Springs has continued to support a high number of sites containing least chub (Table 9).

Table 1. Percentage of springs sampled containing Least chub for Leland Harris, Bishop Springs, and Gandy Salt Marsh spring complexes, 1993 to 1999.

Site Name	Leland Harris		Gandy		Bishop Springs		Total	
1993	07/11	63.6%	21/50	42.0%	10/13	76.9%	38/74	51.4%
1994	07/11	63.6%	18/50	36.0%	07/12	58.3%	32/73	43.8%
1995	10/12	83.3%	15/51	29.4%	05/11	45.5%	30/74	40.5%
1996	08/12	66.7%	14/50	28.0%	08/13	61.5%	30/75	40.0%
1997	10/12	83.3%	13/50	26.0%	05/11	45.4%	28/73	38.4%
1998	09/12	75.0%	14/49	28.5%	08/11	72.7%	31/72	43.1%
1999	10/12	83.3%	15/51	29.4%	07/13	53.8%	32/76	42.1%

Table 2. Percentage of springs sampled containing Utah chub for Leland Harris, Bishop Springs, and Gandy Salt Marsh spring complexes, 1993 to 1999.

Site Name	Leland Harris		Gandy		Bishop Springs		Total	
1993	09/11	81.8%	07/50	14.0%	10/13	76.9%	26/74	35.1%
1994	06/11	54.5%	08/50	16.0%	08/12	66.7%	22/73	30.1%
1995	08/12	66.7%	14/51	27.5%	09/11	81.8%	31/74	41.9%
1996	08/12	66.7%	14/51	27.5%	09/13	69.2%	27/75	36.0%
1997	10/12	83.3%	14/50	28.0%	05/11	45.4%	29/73	39.7%
1998	08/12	66.7%	08/49	16.3%	09/11	81.8%	25/72	34.7%
1999	09/12	75.0%	04/51	7.8%	06/13	46.2%	19/76	25.0%

Table 3. Percentage of springs sampled containing speckled dace for Leland Harris, Bishop Springs, and Gandy Salt Marsh spring complexes, 1993 to 1999.

Site Name	Leland Harris		Gandy		Bishop Springs		Total	
1993	00/11	0.0%	24/50	48.0%	04/13	30.8%	28/74	37.8%
1994	00/11	0.0%	13/50	26.0%	02/12	16.7%	15/73	20.5%
1995	00/12	0.0%	15/51	29.4%	04/11	36.4%	19/74	25.7%
1996	00/12	0.0%	21/50	42.0%	00/13	0.0%	21/75	28.0%
1997	00/12	0.0%	14/50	28.0%	00/11	0.0%	14/73	19.2%
1998	00/12	0.0%	07/49	13.2%	02/11	18.1%	09/72	12.5%
1999	00/12	0.0%	03/51	5.9%	02/13	15.4%	05/76	6.7%

Table 4. Species present and number of fish captured in springs of the Leland Harris Spring complex, Snake Valley, Utah, August 1999.

Site	Species Present	# Captured
1	LC, UC	19, 31
2a	LC, UC	81, 28
2b	LC, UC	84, 36
3	LC, UC	121, 2
4	LC	15
5	LC	210
6	LC	2
7	LC, UC	42, 165
8	LC, UC	6, 17
9	UC	182
10	UC	34
11	LC, UC	16, 123
Total		1214

LC - Least Chub, SD - Speckled Dace, UC - Utah Chub

Table 5. Fish species present from 1993 to 1999 in springs of the Leland Harris complex, Snake Valley, Utah.

Site	1993	1994	1995	1996	1997	1998	1999
1	LC, UC	LC, UC	LC, UC	LC, UC	UC	LC, UC	LC, UC
2a	LC, UC	LC, UC	LC, UC	LC, UC	LC, UC	LC, UC	LC, UC
2b	Not sampled	Not Sampled	LC, UC	LC, UC	LC, UC	LC	LC, UC
3	LC	LC	LC, UC	LC, UC	LC, UC	LC, UC	LC, UC
4	LC	LC	LC	LC	LC	LC	LC
5	UC	None Captured	LC	None Captured	LC	LC	LC
6	LC, UC	LC, UC	LC, UC	LC	LC, UC	UC	LC
7	UC	LC, UC	LC, UC	LC, UC	LC, UC	LC, UC	LC, UC
8	LC, UC	No fish present	LC	None Captured	LC, UC	LC	LC, UC
9	UC	UC	UC	UC	UC	UC	UC
10	LC, UC	None Captured	None Captured	UC	LC, UC	UC	UC
11	LC, UC	LC, UC	LC, UC	LC, UC	LC, UC	LC, UC	LC, UC

LC - Least Chub, SD - Speckled Dace, UC - Utah Chub

Table 6. Species present and number of fish captured at Gandy Salt Marsh, Snake Valley, Utah, August 1999.

Site	Species Present	# Captured
1	Did not trap	-
2	Did not trap	-
3	-	0
4	SD	1
5	LC	19
6	LC	1
7	Did not trap	-
8	LC	11
9	-	0
10	-	0
11	-	0
12	-	0
13	-	0
14	LC, UC	164, 1
15	LC	3
16	LC, UC	1, 1
17	LC	13
18	-	0
19	-	0
20	LC	5
21	-	0
22	-	0
23	-	0
24	-	0
25	Did not trap	-
26	LC, UC, SD	2, 4, 1
27	-	0

Table 6. Continued.

Site	Species Present	# Captured
28	LC	335
29	LC	18
38	LC	134
39	SD	1
40	-	0
41	-	0
42	-	0
43	-	0
44	LC, UC	5, 2
45	-	0
46	LC	21
47	-	0
48	-	0
49	-	0
50	-	0
51	-	0
52	-	0
53	-	0
54	-	0
55	-	0
56	-	0
57	LC	1
58	-	0
60	-	0
Total		744

LC - Least Chub, SD - Speckled Dace, UC - Utah Chub

Table 7. Fish species present in Gandy Salt Marsh springs, Snake Valley, Utah, 1993 to 1999.

Site	1993	1994	1995	1996	1997	1998	1999
1	-	-	-	-	-	-	Did not trap
2	-	-	-	-	-	-	Did not trap
3	-	-	-	-	-	-	-
4	SD	-	-	-	-	SD	SD
5	SD	LC	-	LC, SD	-	-	LC
6	LC	LC	LC	LC, SD	SD	LC	LC
7	-	-	-	Did not trap	Did not trap	Did not trap	Did not trap
8	LC, SD	LC	LC, SD	LC	LC	LC	LC
9	-	SD	-	LC, SD, UC	LC	-	-
10	-	-	-	-	-	-	-
11	LC, SD	UC	-	-	-	-	-
12	LC, SD	LC	LC	LC	-	LC, UC	-
13	-	-	-	-	SD	-	-
14	LC, SD	LC, SD	LC, SD, UC	LC, SD, UC	LC, SD	LC	LC, UC
15	LC, SD	-	-	-	-	-	LC
16	LC, UC	LC, UC	UC	SD, UC	SD, UC	UC	LC, UC
17	LC, UC	LC, SD, UC	LC, SD, UC	LC, SD, UC	LC, SD, UC	LC	LC
18	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-
20	SD	SD	UC	UC	-	LC, UC	LC
21	-	-	-	-	-	-	-
22	SD	-	UC	-	-	-	-
23	-	-	-	-	-	-	-
24	LC	LC	-	UC	-	-	-
25	-	-	-	-	-	-	Did not trap
26	LC, SD	LC, SD	UC	LC, UC	UC	UC	LC, UC, SD

LC - Least Chub, SD - Speckled Dace, UC - Utah Chub

Table 7. Continued

Site	1993	1994	1995	1996	1997	1998	1999
27	SD	SD	-	SD	-	-	-
28	LC	LC	UC	LC, SD	LC	LC, SD	LC
29	LC, SD	-	LC, SD	LC, SD	LC, SD	LC, SD	LC
38	LC, SD	LC, SD	LC, SD	LC	LC	LC	LC
39	LC, SD	LC, SD	SD, UC	SD	LC, SD	LC, SD	SD
40	-	-	SD	SD	LC, SD	-	-
41	-	-	-	-	-	-	-
42	LC, SD, UC	LC	LC, SD, UC	SD	-	-	-
43	LC, SD	LC, SD, UC	LC, SD	LC, SD	-	-	-
44	LC, SD, UC	LC, UC	LC, SD, UC	LC, SD, UC	LC	LC, UC	LC, UC
45	SD, UC	LC, SD, UC	SD	LC, SD, UC	-	LC, UC	-
46	LC, SD	LC, SD	LC, SD, UC	LC, SD, UC	LC, SD	LC	LC
47	SD	SD	SD	-	-	-	-
48	SD	-	SD	-	-	-	-
49	-	-	-	-	-	-	-
50	-	-	-	-	-	Did not trap	-
51	-	-	-	-	-	LC, UC*	-
52	-	-	-	SD	SD	-	-
53	LC, SD	-	-	SD	LC, SD	LC, SD	-
54	-	LC, SD	-	UC	-	SD, UC	-
55	SD, UC	SD, UC	LC, SD, UC	LC, UC	SD, UC	UC	-
56	LC, SD	LC, SD	LC, SD	LC, SD	LC, SD	SD	-
57	LC, SD, UC	LC, SD, UC	-	LC	LC	-	LC
58	SD	SD	-	-	SD	-	-
60	-	-	-	-	-	-	-

LC - Least Chub, SD - Speckled Dace, UC - Utah Chub

*- Fish were captured in dipnets

Table 8. Species present and number of fish captured at Bishop Springs Complex, Snake Valley, Utah, August 1999.

Site	Species Present	# Captured
South Twin	-	0
North Twin	-	0
1	Did not trap*	-
2	Did not trap*	-
3	LC	4
4	-	0
5	LC, UC, SD	11, 21, 1
6	LC	4
7	LC, UC	5, 91
8	LC, UC	2, 16
9	LC, UC	7, 13
10	UC, SD	17, 3
11	LC, UC	6, 1
Total		202

LC - Least Chub, SD - Speckled Dace, UC - Utah Chub, LMB - Largemouth Bass, GF - Goldfish

*Area dewatered due to diversion of Foote Reservoir

Table 9. Fish species present from 1993 to 1999 in Bishop Springs, Snake Valley, Utah.

Site	1993	1994	1995	1996	1997	1998	1999
South Twin	LC, UC	LMB, UC Observed	LMB, UC	UC& GF Observed	UC& GF Observed	GF& LMB Observed	None captured
North Twin	UC	UC	UC	UC, LMB Observed	UC	UC	None captured
1	LC	Did not trap	Did not trap	LC, UC	Did not trap	Did not trap	Did not trap*
2	LC, SD	None Captured	Did not trap	LC	Did not trap	Did not trap	Did not trap*
3	LC, UC	LC	Did not trap*	LC, UC	Did not trap*	LC, SD, UC	LC
4	LC, UC	LC, SD, UC	Did not trap*	LC, UC	Did not trap*	LC, UC, LMB	None captured
5	LC, SD, UC	LC, UC	LC, SD, UC	LC, UC	Did not trap*	LC, SD, UC	LC, UC, SD
6	LC, UC	LC	LC, SD, UC	None captured	LC	LC	LC
7	LC, SD, UC	LC, UC	LC, SD, UC	LC, UC	LC, UC	LC, UC	LC, UC
8	SD, UC	LC	LC, SD, UC	LC, UC	LC, UC	LC, UC	LC, UC
9	UC	UC	UC	UC	LC, UC	LC, UC	LC, UC
10	LC	LC	SD, UC	UC	UC	LC, UC	UC, SD
11	LC, SD, UC	LC, SD, UC	LC, UC	LC, UC	LC	LC, UC	LC, UC

LC - Least Chub, SD - Speckled Dace, UC - Utah Chub, LMB - Largemouth Bass, GF- Goldfish

*Area dewatered due to diversion of Foote Reservoir

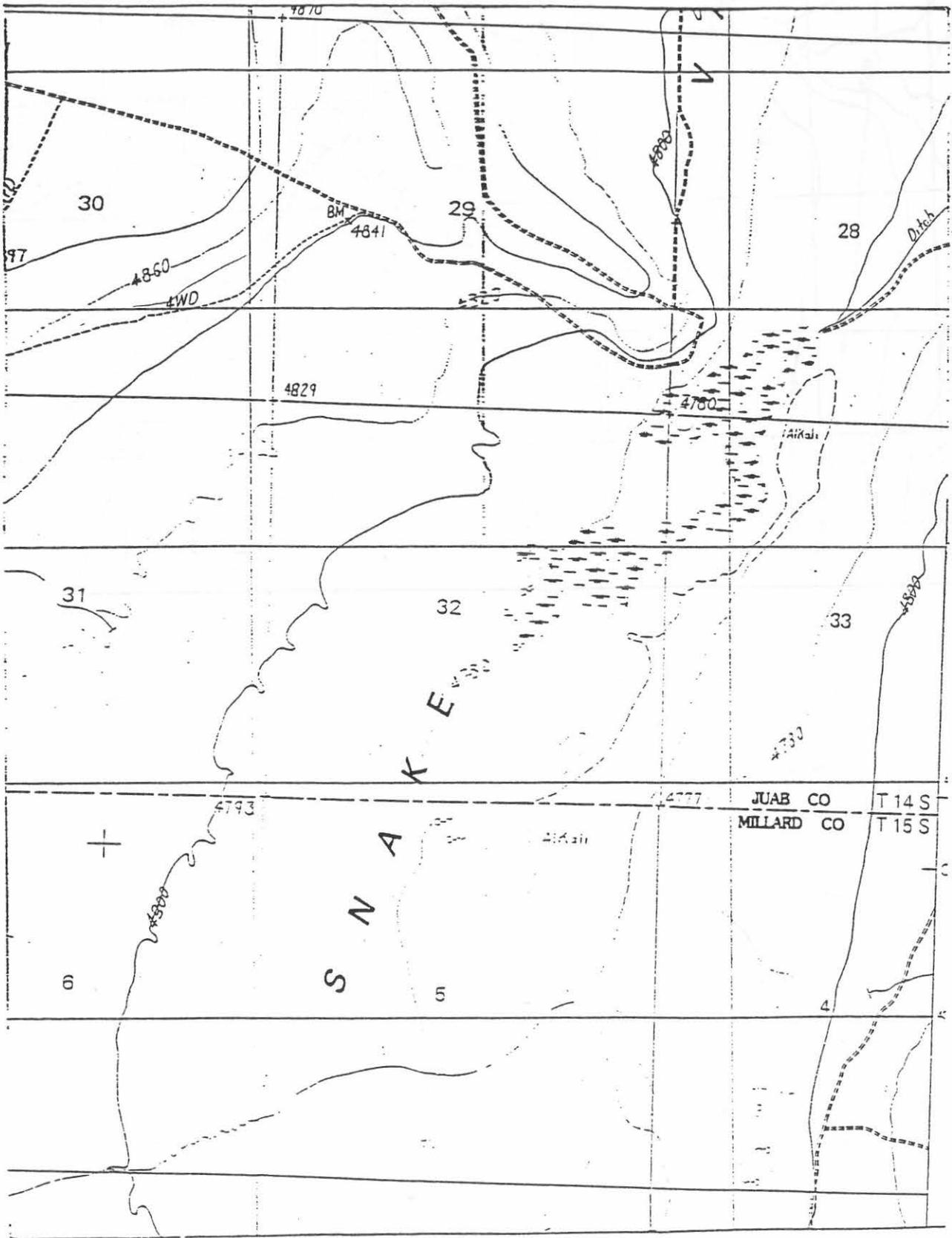


Figure 1. Location of Leland Harris least chub monitoring site. Gandy quadrangle, 7.5 minute series, Juab Co., UT.

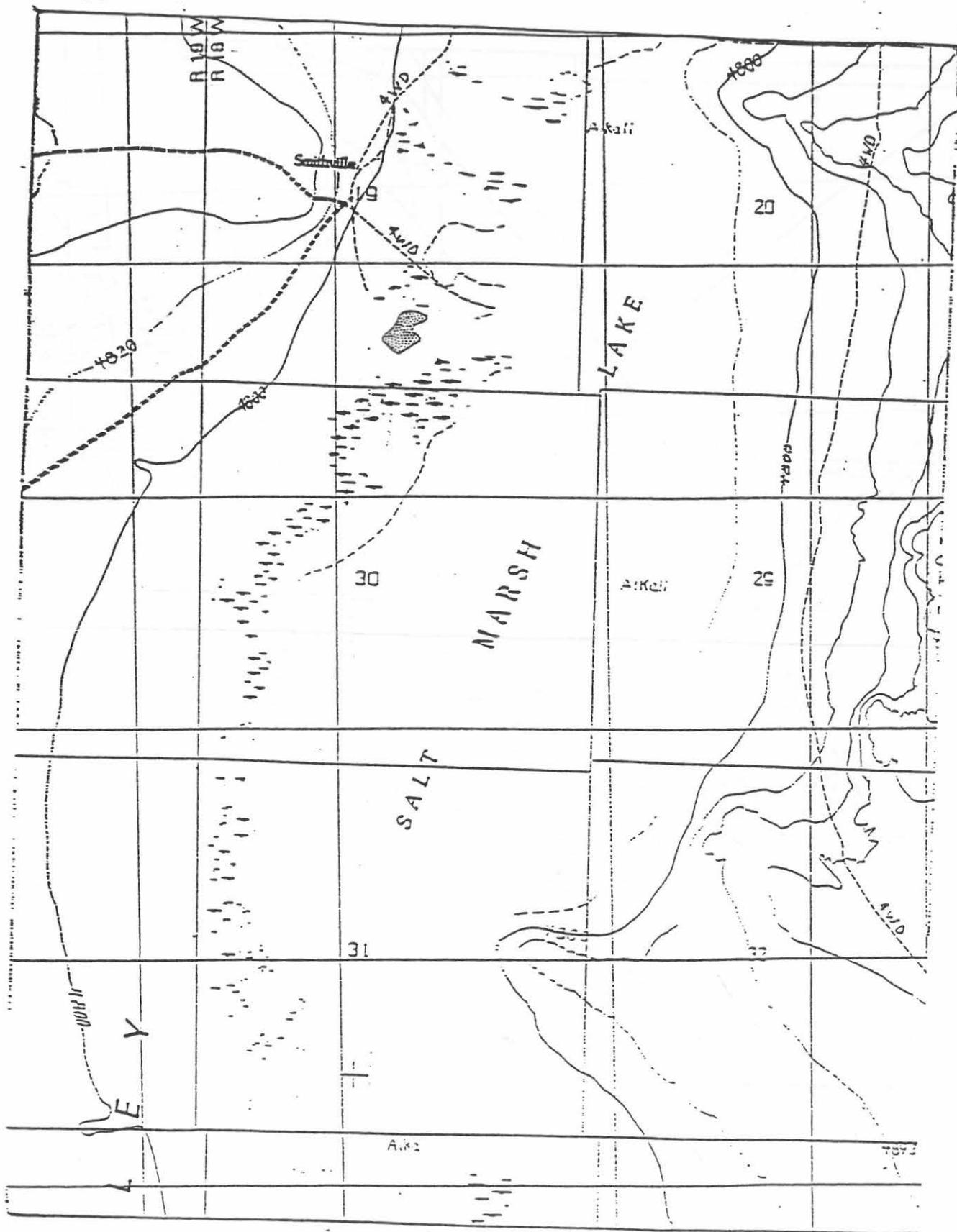


Figure 2. Location of Gandy Salt Marsh least chub monitoring site. Gandy quadrangle, 7.5 minute series, Juab Co., UT.

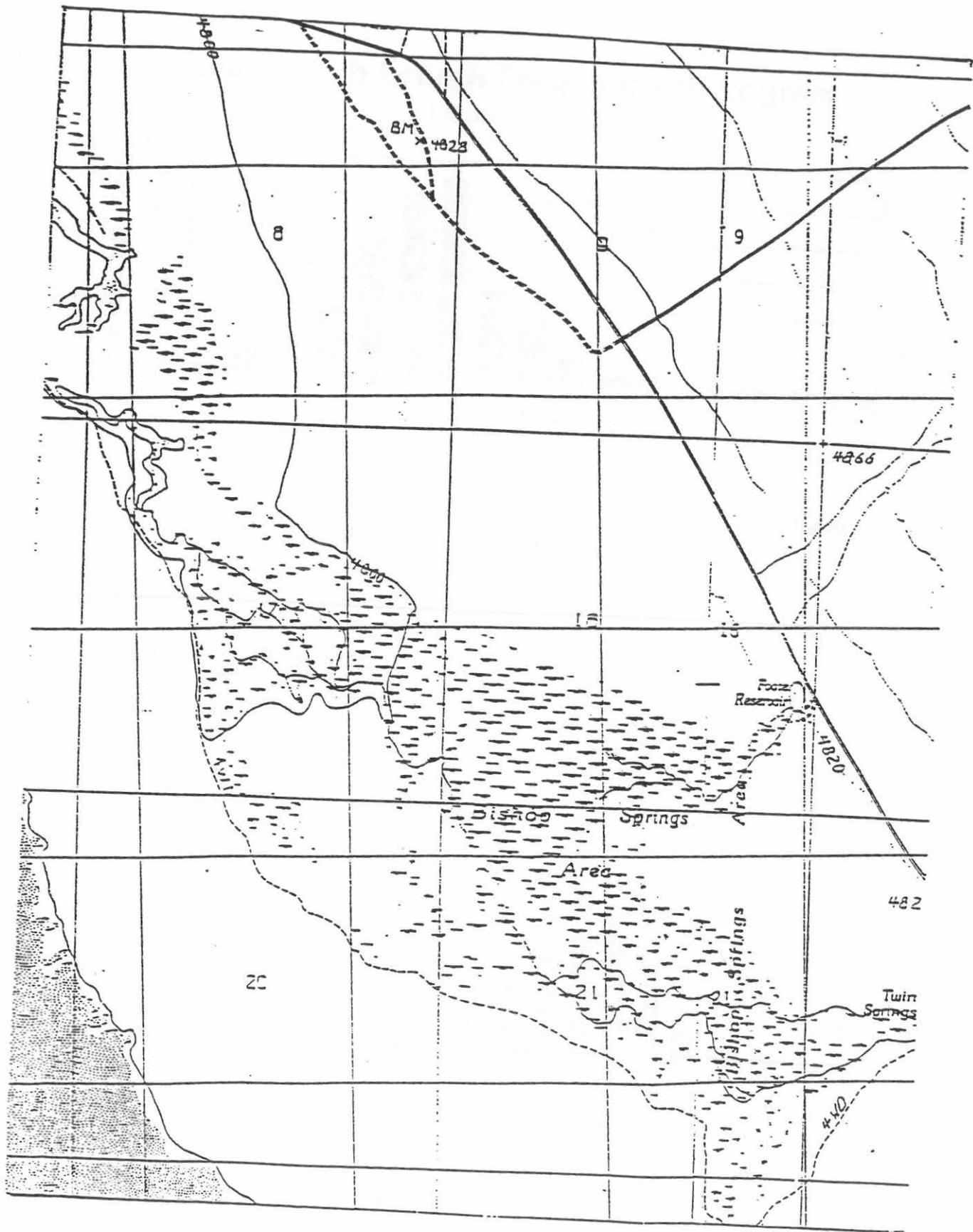


Figure 3. Location of Bishop Springs least chub monitoring site. Gandy quadrangle, 7.5 minute series, Juab Co., UT.

Least Chub Length Frequency Histogram

Leland Harris

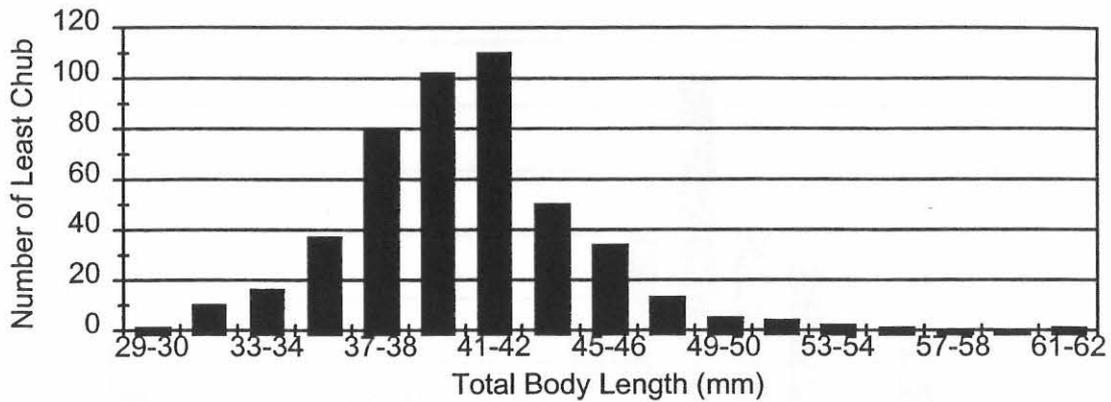


Figure 4. Length frequency distribution of least chub (n=596) sampled at Leland Harris monitoring sites, Snake Valley, Utah, August 1999.

Least Chub Length Frequency Histogram

Gandy Salt Marsh

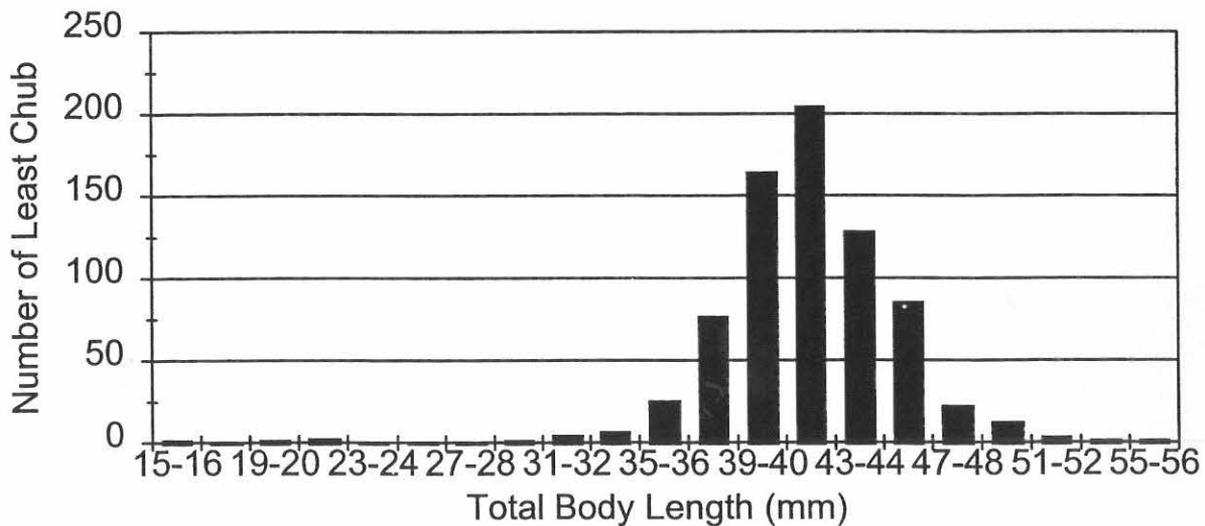


Figure 5. Length frequency distribution of least chub (n=733) sampled at Gandy Salt Marsh monitoring sites, Snake Valley, Utah, August 1999.

Least Chub Length Frequency Histogram Bishop Springs

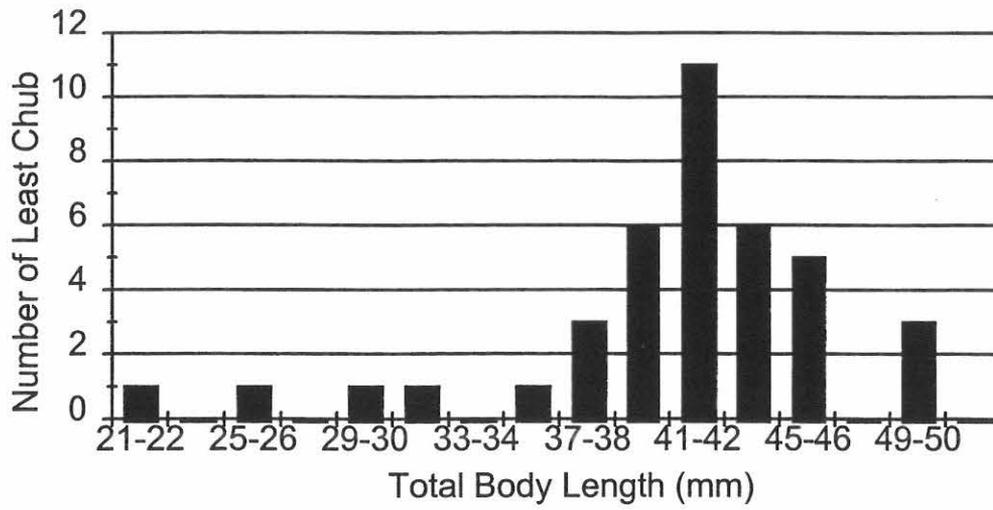


Figure 6. Length frequency distribution of least chub (n=39) sampled at Bishop Springs monitoring sites, Snake Valley, Utah, August 1999.

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