Fisheries Evaluation of Lake Eleanor and Eleanor and Cherry Creeks

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I. Habitat Evaluation, Streams

Methods

The availability of suitable habitats for rainbow trout and Sacramento sucker under different flows was evaluated using the incremental methodology of the USFWS Instream Flow Group (IFG). Three study reaches were established: one on Eleanor Creek about 1 km below the dam on Lake Eleanor, one on upper Cherry Creek about 2 km below the dam on Lake Lloyd, and one on lower Cherry Creek below its confluence with Eleanor Creek (immediately below the bridge on Cherry Valley road). We had originally planned to set up two study reaches on Eleanor Creek but concluded that it would not be worthwhile because most of the stream is a series of waterfalls and deep pools, a habitat type that cannot be adequately modelled using the IFG methodology. The reach we chose to model possessed a variety of good trout habitats (deep pools, boulder dominated runs,etc.). In place of the second reach on Eleanor Creek, we set up the reach on upper Cherry Creek because the creek appeared similar to Eleanor Creek, yet had significantly different fish populations (no suckers, more small trout). The major difference between the two streams seemed to be temperature. Upper Cherry Creek between June 17 and July 17 had minimum temperatures of 8 to 11 C, and maximum temperatures of 12 to 19 C, while Eleanor Creek had minimum temperatures of 14 to 17 C and maximum temperatures of 18 to 19 C.

The three study reaches are described in Table 1. In each reach 5 to 7 transects were established, for which substrates, depths, and mean water column velocities were determined at 0.25 to 1.00 m intervals, the width of the interval depending on the width of the transect. At least 10 measurements were made on each transect. Depth and water column velocities were measured at each point on each transect for three flows in each study reach (Table 1). Water column velocities were measured using a Marsh-McBirney electronic flow meter mounted on a top-setting wading rod, while substrates were measured using the Winford scale.

Determination of the habitat available for rainbow trout at various flows was made using the "standard" habitat utilization curves developed by the IFG. However, because there are no such curves available for the Sacramento sucker, an endemic species, and because we have reservations about the applicability of the "standard" curves to streams of different sizes, gradients, and temperature regimes, we made microhabitat measurements on fish in each creek. To make these measurements, fish were observed by biologists using diving masks and snorkels. Once a fish was observed to be behaving in a normal fashion (feeding, holding in current, etc.), its standard length was estimated. Then, at the spot at which it was observed the following information was gathered: maximum depth, depth of fish, velocity at fish, mean water column velocity, velocity at surface, substrate composition, percent imbeddedness, habitat type

(run, riffle, pool), and activity of fish (feeding, holding, etc.). This information was recorded on a standard form (Figure 1). Table 2 gives the number of observations of each species and size class observed in each stream, at each flow. For this report, only data for mean water column velocity, maximum depth, and substrate composition will be analyzed.

Results

Calibration of the stream simulation portion of the incremental methodology is complete. Several of the transects have velocity adjustment factors (VAF) which are outside the desired range of 0.9 to 1.1 (Tables 3, 4 and 5). These VAFs are a measure of the reliability of the ultimate simulation. Since small rocky streams do not simulate well, we are satisfied that the VAFs we have obtained are adequate. The usable habitat area available to rainbow trout based on our simulation using the IFG curves is provided in Tables 6, 7 and 8.

Eleanor Creek

The available habitat area for rainbow trout in Eleanor Creek responds dramatically to the variation in stream flow (Table 6). There was no suitable spawning habitat in the study reach and only small pockets of suitable substrate were observed in all the stream sections examined. The suitable holding area for adult rainbow trout generally

increases with discharge, but there is a marked drop between 2.5 and 5.0 CFS. At 10 CFS adult habitat area increases by 25% over that available at 5 CFS . At 15 CFS, the suitable area is more than twice that at 5 CFS. The suitable habitat area for juvenile rainbow trout also increases with discharge and has a minimum at 5 CFS. Habitat area for juveniles reaches a maximum at 45 CFS. The habitat area for young-of-year trout follows the same pattern as that of the juveniles, with a minimum at 5 CFS and local maxima at 25 and 40 CFS.

Suitable habitat area for the rainbow trout population in Eleanor Creek increases appreciably above 15 CFS, so discharges below 10 CFS probably limit the population. However, this methodology does not take into account the effects of temperature and the warm temperatures encountered in Eleanor Creek maybe the most important limiting factor for trout, especially late in the summer or at low flows. The warm temperatures probably have a positive effect on the sucker population, however.

Upper Cherry Creek, 2 km below Lake Lloyd

The available habitat area for adult rainbow trout increases with flow in Upper Cherry Creek (Table 7). Juvenile habitat area peaks at a flow of 15 CFS and young-of-year habitat area peaks at 10 CFS. The simulation indicates some spawning area at high flows; however, spawning area in upper Cherry Creek was underestimated in

the reach modeled and was more extensive than in either of the two other study areas.

Lower Cherry Creek, below confluence

Suitable habitat area for adult rainbow trout increases steadily with discharge, to a maximum at 90 CFS (Table 8). Suitable area also increases steadily for juvenile and young-of-year trout, to reach maxima at 45 and 35 CFS, respectively. As in Eleanor Creek, we found only small patches of suitable spawning substrate and none appeared in our study reach. Although the incremental methodology indicates that suitable habitat area is available under a variety of flows in Cherry Creek, high temperatures could eliminate trout from habitat which would otherwise be suitable. Therefore, temperature should be a prime consideration when discharges from Lloyd and Eleanor lakes are mixed to meet discharge requirements.

Stream temperature studies

Thermograph recordings in three reaches in Cherry and Eleanor creeks are plotted in Figure 2 as daily minimum and maximum temperatures. Although some data are missing, the temperature regimes in Eleanor Creek and lower Cherry Creek appear to vary in concert and have similar daily amplitudes. However, Eleanor Creek remains two to four degrees Celcius warmer than does lower Cherry Creek. This is apparently due to the discharge of cooler waters from Lloyd Lake. Daily

temperature variation in upper Cherry Creek is considerably greater than in the other two reaches. Our data suggest that maximum daily temperatures did not reach critical levels for trout during Summer 1981. However, we have an indication that temperatures approached 25 C in Eleanor Creek between July 15 and August 20 when the thermograph tape had stopped (but the thermograph itself was still operating, as the max. and min. temperatures for the period were recorded). The potential exists for a summer kill of trout if warm days are combined with low flows, especially in Eleanor and lower Cherry creeks. The substantial faunal differences between upper Cherry and Eleanor creeks is probably attributable to the differences in the temperature regimes between the streams.

Microhabitat Studies

Figures 3 through 15 show the utilization of depth, velocity, and substrate by different size classes of both suckers and trout, in all three study reaches. Differences between the reaches can be noted, indicating that different temperature and flow regimes affect the nature of the utilizable habitat.

Stream Management Recommendations

The abrupt reduction of flow in Eleanor Creek in June to 5 CFS following the end of spillover stranded many fish.

Two options are available to avoid or minimize such kills. First, the flow might be maintined at 15 CFS if spillover ends in late June with little affect on the stored water. Or following the end of spillover the flow could be gradually reduced to 5CFS over an interval of several days to allow fish to return to the low water channel.

Based on our habitat simulation results, higher flows will generally increase suitable habitat area for all trout life history stages. Higher flows also reduce daily temperature variation and daily maximum temperatures in Eleanor and Cherry creeks. Therefore, higher flows will also enhance trout populations by improving the temperature regimes. In contrast, lower flows will allow stream temperatures to approach critical levels for trout, but will probably enhance the sucker population. The maintenance of at least 15 CFS in Eleanor Creek during the summer months is crucial to maintaining a viable trout population, and higher flows would enhance the population.

II. Population Studies, Streams

The three study streams present formidable challenges to anyone attempting to sample their fish populations quantitatively. Their conductivity is extremely low (less than 9 micromhos), they have many deep pools, and they have fast high flows. Our original plans were to electrofish blocked sections of stream and obtain population estimates using a three-pass depletion method. This proved to be

possible only in Eleanor Creek, after flows were reduced to 5 CFS and after 20-25 kg of salt were added to the water while the electrofishing was in progress. Population estimates in two reaches in Cherry Creek were made using snorkeling surveys. For both techniques the population estimates should be regarded as "ballpark" estimates of the minimum populations. A good representation of the size structure of the fish populations in each creek, however, is provided by the length-frequency analyses of the fish observed in the microhabitat studies.

Methods

Electrofishing

Sampling was accomplished with a Smith-Root Type VII electrofisher. Conductivity of the stream was raised to make electrofishing possible by placing salt blocks and salt pellets upstream of the sampling area. The protocol followed and the form used (Figure 16) were those developed by Donald Price of PG&E. Basically, the upper and lower ends of a 33 m section of stream were blocked with nets and the section was then electrofished three times. After each pass all fish collected were weighed and measured and then released outside the study section. When the sampling was completed, the physical characteristics of the section were determined. For one of the two sections in Eleanor Creek, a population estimate was made using the method of Seber and LeCren. For the other section, catches on the second and third passes

were higher than that of the first pass, so an estimate using depletion was not possible. Therefore, the total fish taken in all three passes was used as a minimum estimate.

Snorkeling Surveys

For these surveys, three persons swam or crawled upstream, parallel with each other, counting all fish observed in a measured section. Each person was assigned a certain portion of the stream in which to count fish. Fish observed were recorded by species and, for trout, size class. The three counts were added, as a minimum population estimate. After the survey was completed, the length and average width of the section were measured.

Results

Table 9 presents the results of the population surveys. Densities of trout longer than 50 mm SL were about the same in all three streams, although the densities of young-of-year trout (less than 50 mm) were quite low in Eleanor Creek when compared to those in Cherry Creek. Sucker densities were highest in Eleanor Creek and they were absent from upper Cherry Creek. The sucker:trout ratio in Eleanor Creek was 1.3:1, in lower Cherry Creek it was 0.2:1, and in upper Cherry Creek it was 0:1.

The length frequency diagrams for trout (Figure 17) indicate that all three creeks support "healthy" trout

populations, with (probably) 4 to 5 age classes present, including trout of catchable size (180+ mm SL). Lower Cherry Creek contained the most large trout, while upper Cherry Creek contained the most young-of-year trout. The latter situation is presumably due to a combination of the fishery for the large trout and the presence of extensive habitat for spawning and rearing. The growth rate of rainbow trout in Eleanor Creek is among the poorest recorded for the species in any Sierra stream (Snider and Linden 1981, Trout growth in California. Inland Fish Admin. Rpt. 81-1:1-11). Such poor growth is no doubt due to excesively warm, but not critical, stream temperatures during much of the summer. Length-frequency graphs for Sacramento suckers indicate balanced populations in both Eleanor and lower Cherry creeks (Figure 18).

III. Lake Eleanor Studies

During our early summer study period (June 29-July 14) Lake Eleanor was full or nearly so. It was highly transparent (Secchi disc depth, 10-15 m), with warm surface waters (22-24 C) and a thermocline between 8 and 16 m (Figure 19). By late summer the temperature stratification was very well developed and the surface waters had warmed to 25 C on 18 August. The Secchi disc depth was reduced to 9.5 meters by a high standing crop of phytoplankton. The water surface elevation was two meters below the top of the dam, and low flows in Frog Creek did not reach the lake. In

early fall, 16 October, the thermal stratification was breaking up and surface temperatures had dropped to 12 C. The water surface elevation appeared to be near the level of the natural lake. We noted that Frog and Cherry creeks were flowing into the lake following the rains of the previous week. We also noted that flows in Frog Creek had recently been adequate to cut a channel to Eleanor Lake and that fish migration between the creek and lake was possible.

Methods

Monofilament experimental gill nets, with mesh sizes ranging from 20 to 160 mm stretch, were set a various depths and locations. A total of 39 sets were made, with 310 hours of "soak time."

Results

A total of 691 green sunfish (Lepomis cyanellus), 336 Sacramento suckers, and 37 rainbow trout were caught (Table 10). The length frequency diagrams (Figures 20-22) indicate that all species have self-reproducing populations, with many age classes represented. The green sunfish population is probably stunted, while the rainbow trout population probably has recruitment problems (perhaps due to competition or predation on the young by green sunfish). Examination of the stomach contents of the large trout indicates that green sunfish are their main prey. Recruitment problems for trout might be reduced by stocking

enough large rainbow trout to reduce the green sunfish population, and thereby reduce competition and predation on young-of-year trout. The gill net survey indicated that most trout are found below the thermocline but that they do move into shallow water to forage in the evening and early morning. The green sunfish are found mainly close to shore, but a pronounced offshore movement was observed each evening. However, green sunfish were rarely caught more than 150 m offshore or in water deeper than 10 m. Suckers were widely distributed in the lake and caught in nets set at all times and places, including nets set just below the surface at night. Schools of suckers were commonly observed near the dam during the day, feeding on surface debris.

Table 1. Characteristics of reaches selected for habitat evaluation in Eleanor and Cherry creeks.

Location	Section length(m)	Section width(m)	Number of transects	Flows (m^3 sec^{-1})		
Eleanor Ck.	47	19	7	.18	.57	.68
Cherry Ck. below dam	70	12	6	.12	.38	.85
Cherry Ck. below confluence	73	18	6	.52	.68	1.15

Table 2. Number of microhabitat measurements made on different size classes of trout and suckers in Eleanor and Cherry creeks at various flows ($m^3 sec^{-1}$).

Location and flow	Rainbow trout (mm SL)			Sacramento sucker (mm SL)	
	< 50	50-100	> 100	< 50	> 50
Eleanor Ck.					
0.57	30	23	121	20	194
0.68	0	0	7	6	20
Total	30	23	128	26	214
Cherry Ck. (dam)					
0.38	143	55	59	0	0
Cherry C. (confl.)					
0.68	96	31	125	3	42
1.15	31	31	59	0	26
Total	127	62	184	3	68
Grand total	300	100	371	29	282

Table 3. Velocity adjustment factors for Eleanor Creek.

Cross section	Flows ($m^3 sec^{-1}$) 0.18	0.57	0.68
50	0.99	1.02	1.01
100	0.99	0.99	1.00
200	1.07	1.03	1.01
300	1.07	0.99	0.93
400	1.02	0.97	0.94
500[1]	1.18	1.11	1.02
600	0.95	1.02	0.90

[1]Velocity adjustment factors for cross section 500 are not adequate.

Table 4. Velocity adjustment factors for Cherry Creek, below its confluence with Eleanor Creek.

Cross section	Flows ($m^3 sec^{-1}$) 0.52	0.68	1.15
50	1.09	1.05	0.92
100	1.01	0.97	0.84
200	1.32	1.11	0.86
300	1.07	0.98	0.78
400	1.12	1.07	0.98
500	0.95	0.94	0.88

Table 5. Velocity adjustment factors for upper Cherry Creek, circa 2 km below Lake Lloyd.

	Flows($m^3 sec^{-1}$)		
Cross section	0.12	0.38	0.72
50	0.93	1.06	1.06
100	0.94	0.92	0.97
200	1.08	1.07	0.89
300	1.03	1.04	1.08
400	1.05	1.00	0.92
500	0.94	1.00	1.01

Table 6. Available habitat area (sq. ft.) for rainbow trout, per 1000 feet of stream in Eleanor Creek, at different flows, as calculated using the IFG data base. Figures in parentheses are percentages of total area available.

Flow(CFS)	Total	Spawning	Adult	Juvenile	Young-of-year
2.46	18330	0.0	1282 (7)	63 (0.3)	117 (0.6)
4.92	20232	0.0	1261 (6)	51 (0.3)	97 (0.5)
9.84	23394	0.0	1756 (8)	87 (0.4)	135 (0.6)
14.75	25096	0.0	2446 (10)	127 (0.5)	216 (0.9)
20.02	27141	0.0	2972 (11)	230 (0.9)	340 (1.3)
24.94	28189	0.0	3322 (12)	334 (1.2)	365 (1.3)
29.86	29174	0.0	3717 (13)	388 (1.3)	353 (1.2)
34.77	29855	0.0	3969 (13)	414 (1.4)	364 (1.2)
39.69	30466	0.0	4104 (13)	415 (1.4)	365 (1.2)
44.61	31080	0.0	4221 (14)	427 (1.4)	333 (1.1)
49.88	31678	0.0	4424 (14)	417 (1.3)	310 (1.0)

Table 7. Available habitat area (sq. ft.) for rainbow trout, per 1000 feet of stream in upper Cherry Creek, at different flows, as calculated using the IFG data base. Figures in parentheses are percentages of total area available.

Flow(CFS)	Total	Spawning	Adult	Juvenile	Young-of-year
2.46	18062	0.0	591.87 (3)	212.47 (1)	518.67 (3)
4.92	19905	0.0	1053.43 (5)	423.09 (2)	636.31 (3)
9.84	21247	0.0	1898.78 (9)	541.38 (3)	599.06 (3)
14.75	21981	0.0	2513.19(11)	564.25 (3)	488.03 (2)
20.02	22731	0.0	2918.36(13)	514.82 (2)	391.62 (2)
24.94	23706	0.0	3187.63(13)	463.66 (2)	327.48 (1)
29.86	24080	0.0	3314.25(14)	396.41 (2)	276.22 (1)
34.77	24531	0.0	3430.93(14)	360.01 (1)	241.02 (1)
39.69	25041	0.0	3550.27(14)	334.44 (1)	221.19 (1)
44.61	25326	0.05	3570.89(14)	312.27 (1)	204.76 (1)
49.88	25597	0.37	3599.64(14)	290.03 (1)	194.49 (1)

Table 8. Available habitat area (sq. ft.) for rainbow trout, per 1000 feet of stream in lower Cherry Creek below its confluence with Eleanor Creek, at different flows, as calculated using the IFG data base. Figures in parentheses are percentages of total area available. All figures for spawning area were "0", so are not included in table.

Flow(CFS)	Adult	Juvenile	Young-of-year	Total
7.38	2205 (7.6)	183 (0.6)	253 (0.8)	28998
9.84	2981 (9.8)	198 (0.7)	335 (1.1)	30467
12.29	3438(10.8)	313 (1.0)	408 (1.3)	31812
14.75	3814(11.4)	409 (1.2)	525 (1.6)	33520
17.56	4313(12.5)	547 (1.6)	581 (1.7)	34591
20.02	4793(13.5)	648 (1.2)	588 (1.7)	35632
22.48	5215(14.3)	705 (1.9)	606 (1.7)	36567
24.94	5613(15.0)	783 (2.1)	635 (1.7)	37425
27.40	6118(16.9)	820 (2.2)	666 (1.7)	38190
29.86	6567(16.9)	867 (2.2)	666 (1.7)	38976
34.77	7420(18.4)	956 (2.4)	707 (1.8)	40321
39.69	8190(19.9)	1023 (2.5)	676 (1.6)	41229
44.61	8938(21.4)	1063 (2.5)	630 (1.5)	41847
49.88	9897(23.3)	1063 (2.5)	579 (1.4)	42402
54.80	10716(25.1)	1018 (2.4)	559 (1.3)	42787
59.71	11326(26.3)	989 (2.3)	535 (1.2)	43093
64.63	11640(26.8)	962 (2.2)	513 (1.2)	43365
69.55	11895(27.2)	947 (2.2)	476 (1.1)	43687
74.47	12100(27.4)	918 (2.1)	450 (1.0)	44100
79.74	12280(27.7)	884 (2.0)	438 (1.0)	44399
85.00	12346(27.7)	842 (1.9)	400 (0.9)	44612
89.57	12283(27.4)	818 (1.8)	368 (0.8)	44788
94.49	12160(27.0)	779 (1.7)	340 (0.8)	44971
99.41	12097(26.8)	734 (1.6)	317 (0.7)	45148

Table 9. Minimum population estimates for trout and suckers in sections of Eleanor and Cherry creeks. Density is number of fish per square meter of stream surface.

Location	Method	Sect. length	Mean width	Suckers all lengths no.	Suckers all lengths density	Rainbow trout < 50 mm no.	Rainbow trout < 50 mm density	Rainbow trout 50+ mm no.	Rainbow trout 50+ mm density
Eleanor	Electro-fish, Delury	37m	12m	38	0.09	--	--	50	0.11
Eleanor	Electro-fish, total	31	15	56	0.12	1	0.02	39	0.09
Cherry, below dam	snorkel	70	7	0	0.0	115	0.24	47	0.10
Cherry, below confluence	snorkel	25	20	12	0.02	28	0.06	62	0.12

Table 10. Summary of gill net catch data from Eleanor Lake, July 1981.

Time	Position Water col.	No. sets	No. hrs.	Green sunfish	Sacto. sucker	Rainbow trout	Total
Day	bottom	6	46	0.00	0.89	0.87	1.76
Day	midwater	8	53	0.08	0.44	0.15	0.67
Night	bottom	8	81	4.43	1.80	0.09	6.31
Night	midwater	8	95	2.34	1.04	0.19	3.57
Eve	bottom	5	25	1.96	0.45	0.00	2.41
Eve	midwater	1	4	21.30	2.00	0.00	23.30
Eve	surface	3	9	0.00	0.44	0.00	0.44
All	8+ m	13	135	0.00	0.83	0.16	0.99
All	all	39	310	2.07	1.09	0.11	3.27

FISH MICROHABITAT DATA (metric)

eam _____ Date _____ S ction _____

). _____ Method _____ Observers _____ Time: begin _____ end _____

trates: 1) detritus; 2) mud; 3) silt; 4) sand (>.1) 5) gravel (0.1-2.5); 6) rubble (2.5-10); 7) boulder (10+); 8) bedrc

No.	Sl(mm)	Depth Max.	Depth @fish	Velocity @fish	Velocity 0.8	Velocity 0.6	Velocity 0.2	Velocity surf.	Substrate 1	2	3	4	5	6	7	8	Imbed. %	Imbed. substr	Run Riff. Pool	Activity	Near Fis sp.	Dis

Fig 1

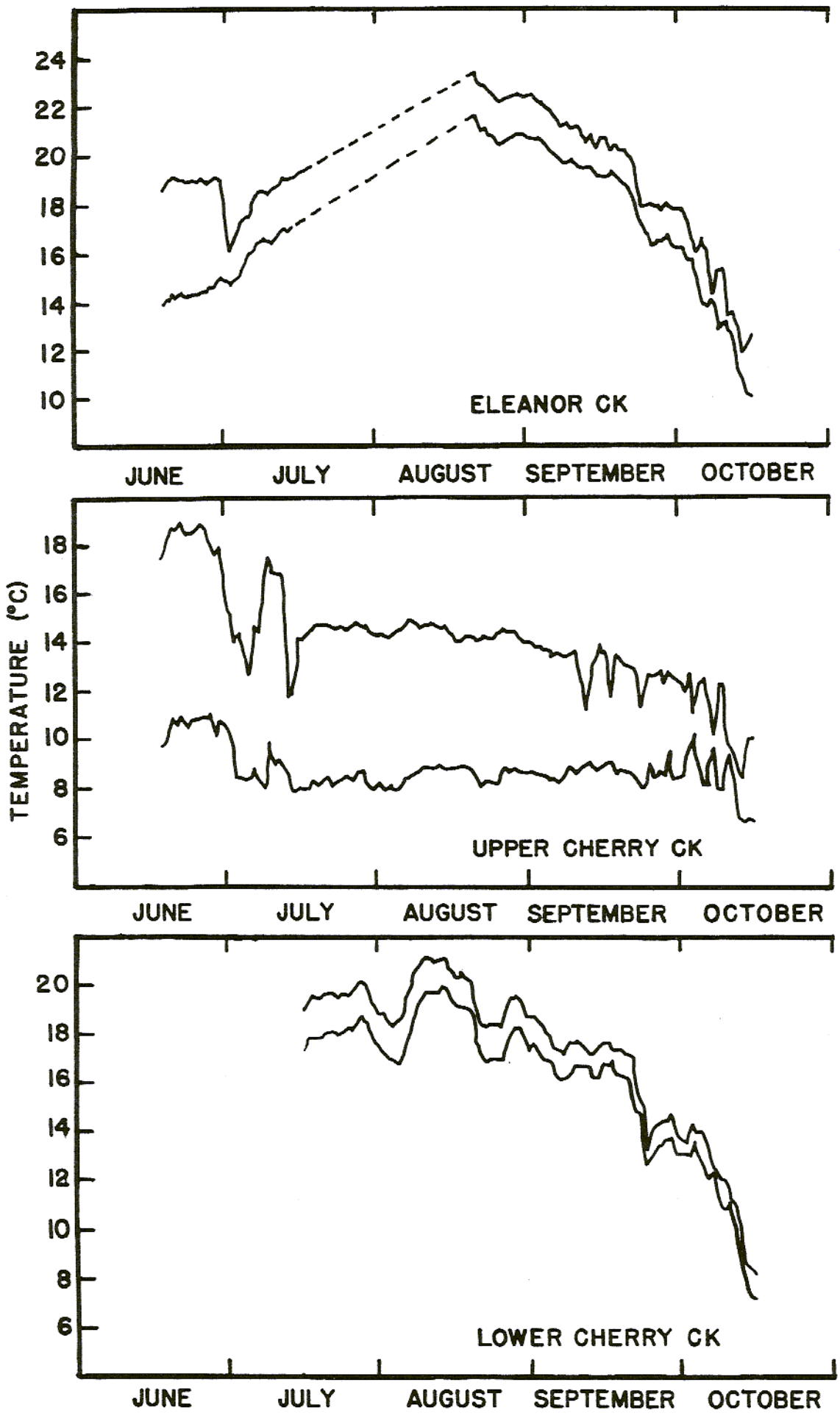


Figure 2. Daily minimum and maximum temperatures in Cherry and Eleanor creeks.

Figure 3. Mean water column velocities associated with adult trout (100+ mm SL) in Eleanor and Cherry Creeks.

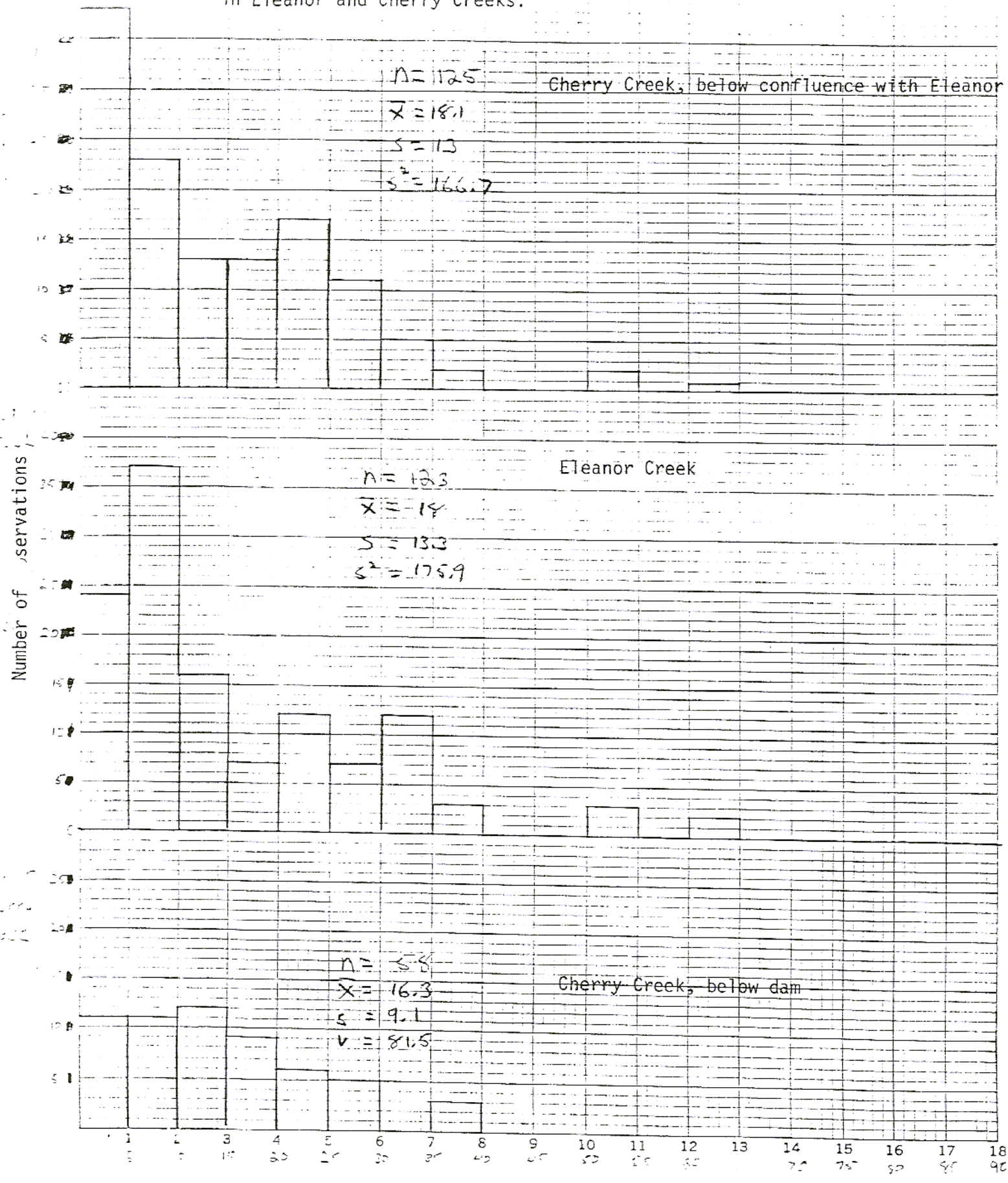


Figure 4. Mean water column velocities associated with yearling rainbow trout (50-100 mm SL) in Eleanor and Cherry Creeks.

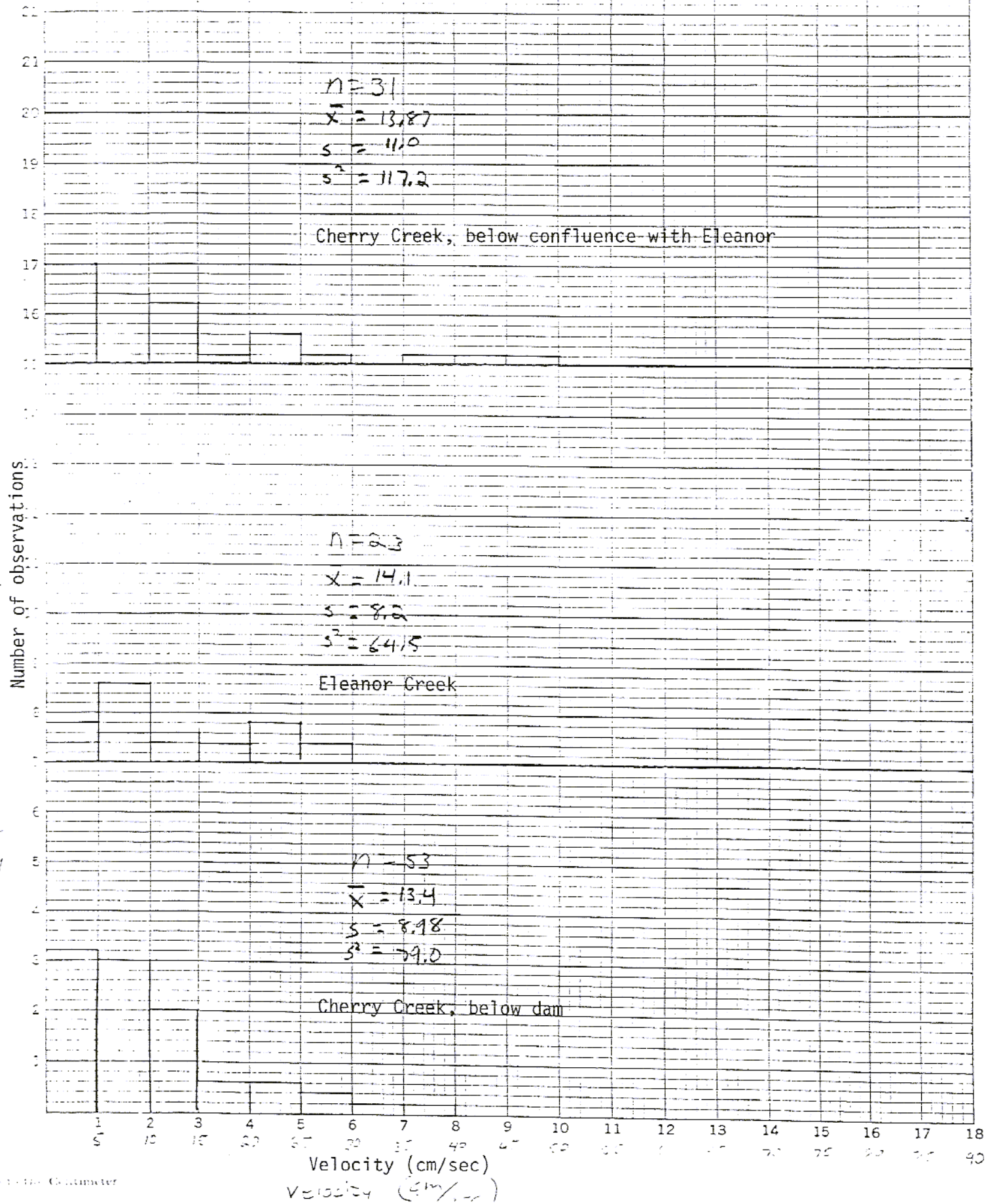
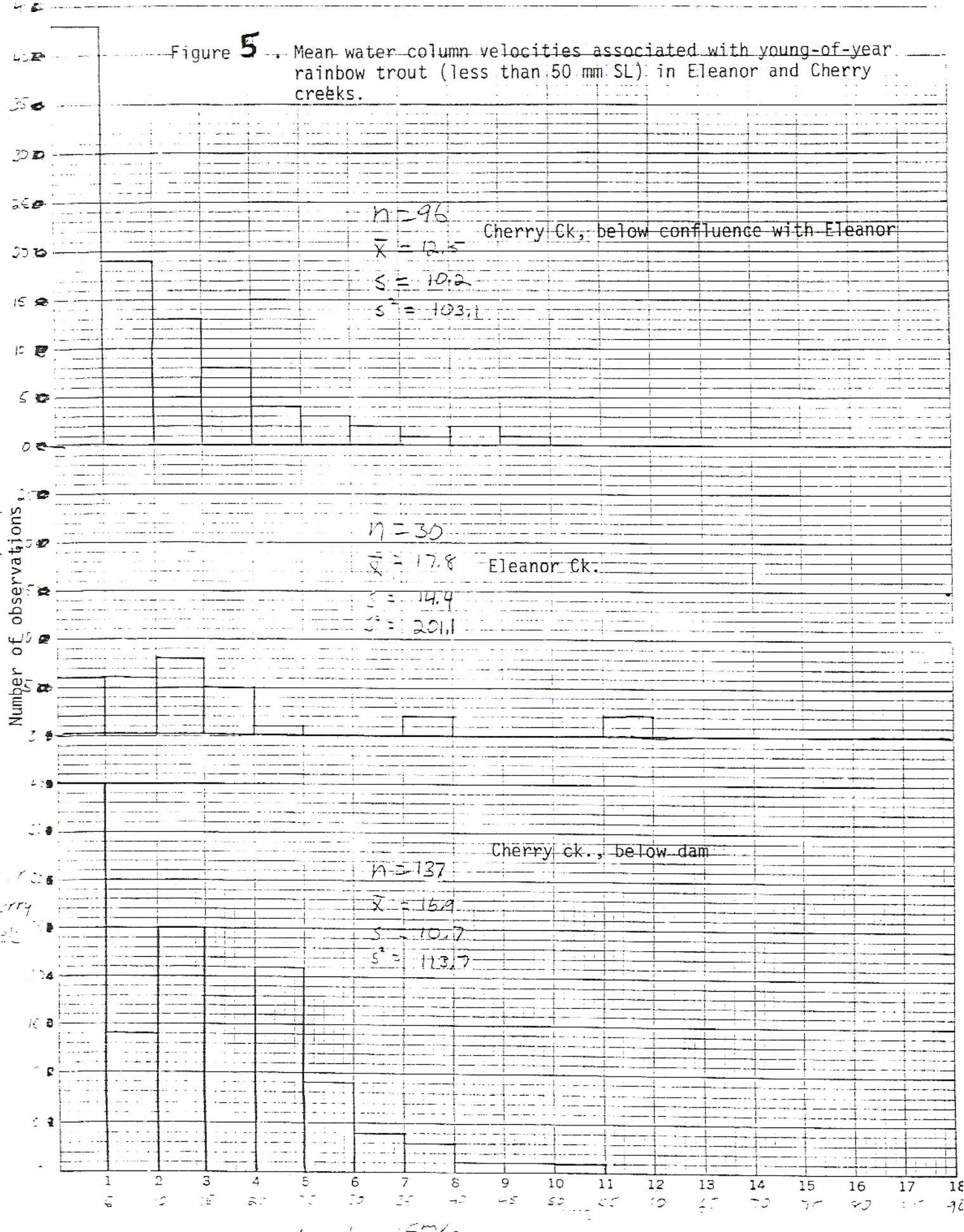


Figure 5. Mean water column velocities associated with young-of-year rainbow trout (less than 50 mm SL) in Eleanor and Cherry creeks.



3 Squares to the Centimeter

Velocities (cm/sec)

Figure 6. Mean water column velocities associated with Sacramento suckers in Eleanor and Cherry Creeks.

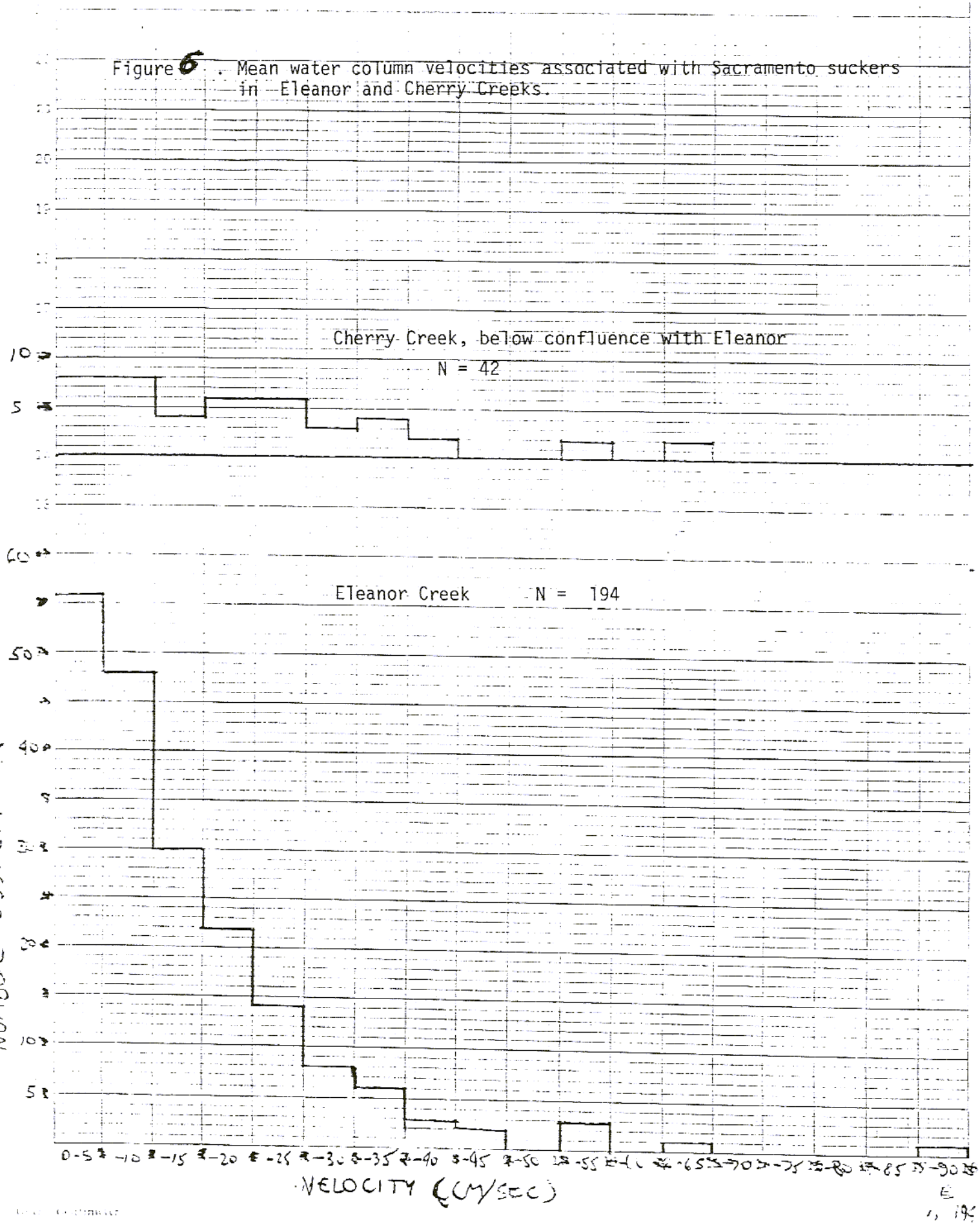
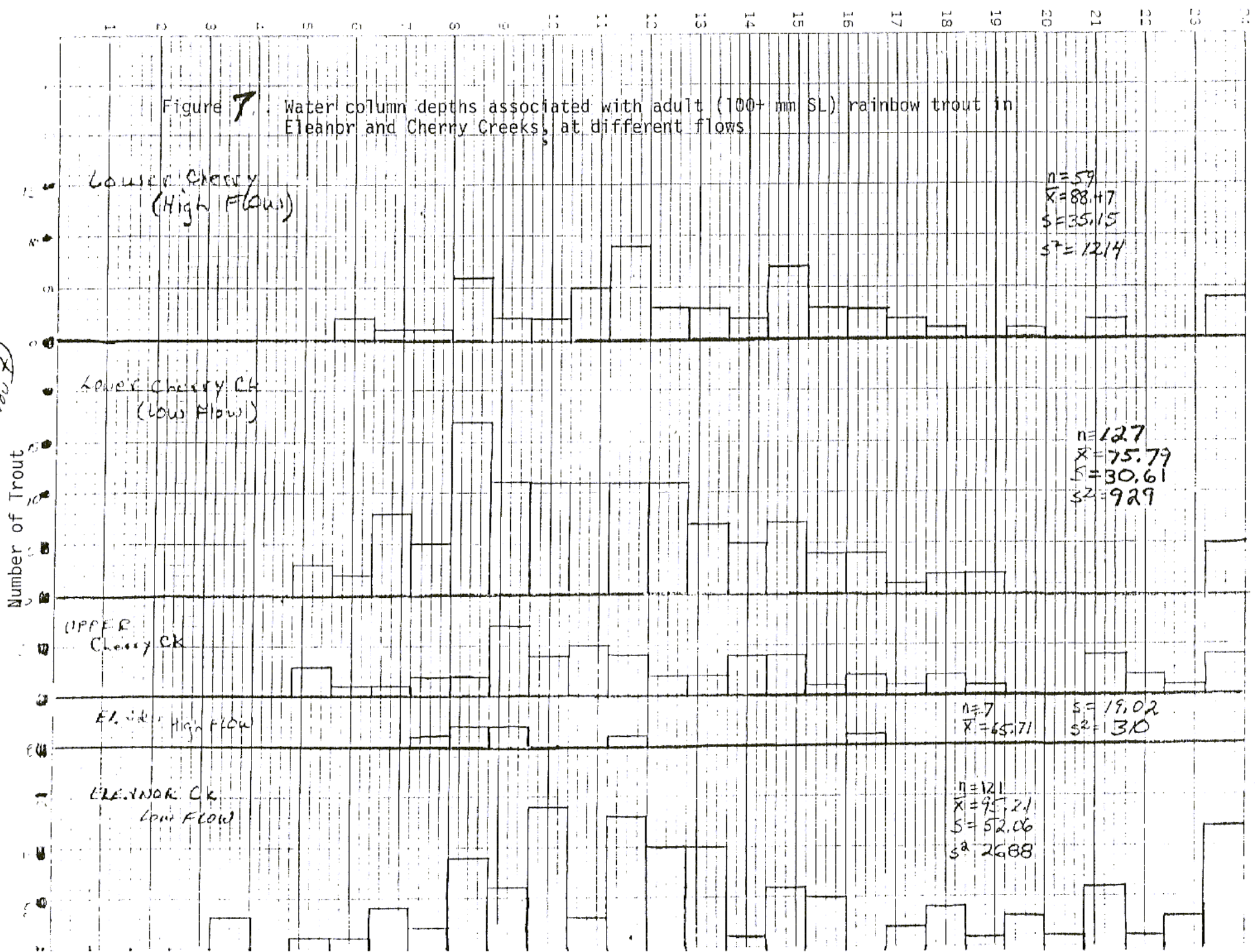


Figure 7. Water column depths associated with adult (100+ mm SL) rainbow trout in Eleanor and Cherry Creeks, at different flows



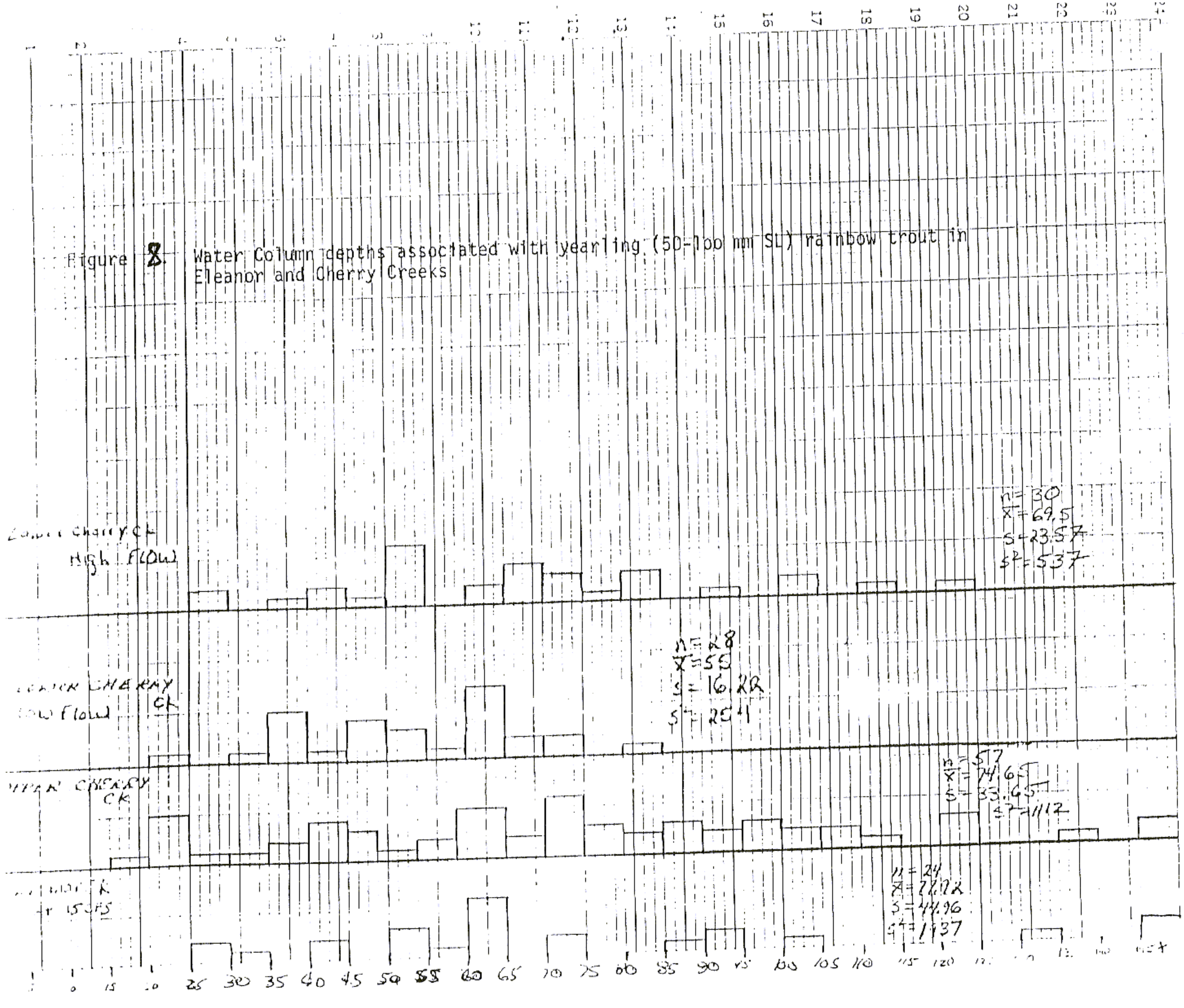


Figure 8. Water Column depths associated with yearling (50-100 mm SL) rainbow trout in Eleanor and Cherry Creeks

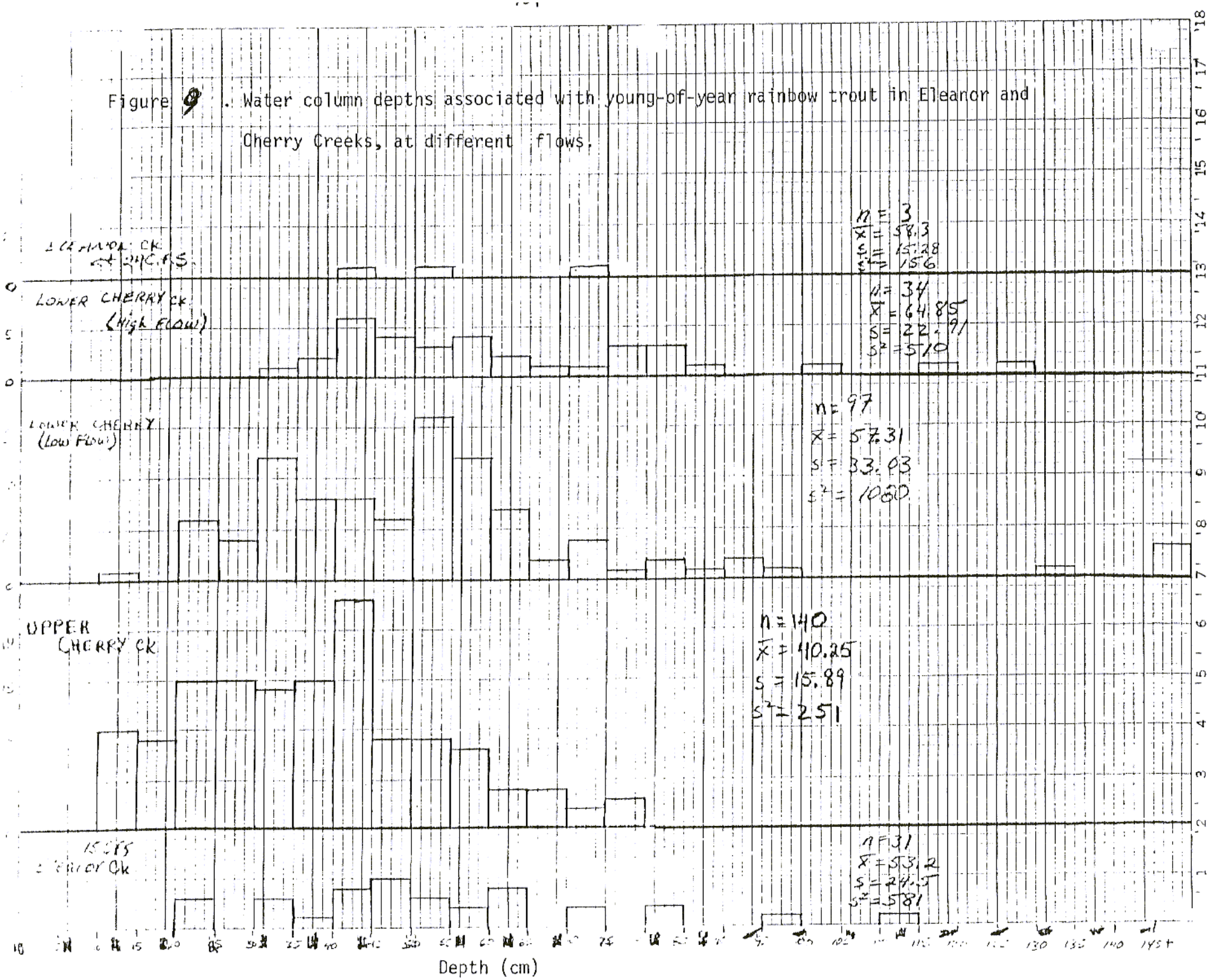


Figure 9. Water column depths associated with young-of-year rainbow trout in Eleanor and Cherry Creeks, at different flows.
ELEANOR CK
~ 24 C.F.S.
LOWER CHERRY CK
(HIGH FLOW)
n = 34
x̄ = 64.85
s = 22.91
s² = 570
LOWER CHERRY
(LOW FLOW)
n = 97
x̄ = 57.31
s = 33.03
s² = 1080
UPPER
CHERRY CK
n = 140
x̄ = 110.25
s = 15.89
s² = 251
15 CFS
ELEANOR CK
n = 31
x̄ = 53.42
s = 24.13
s² = 581
Depth (cm)

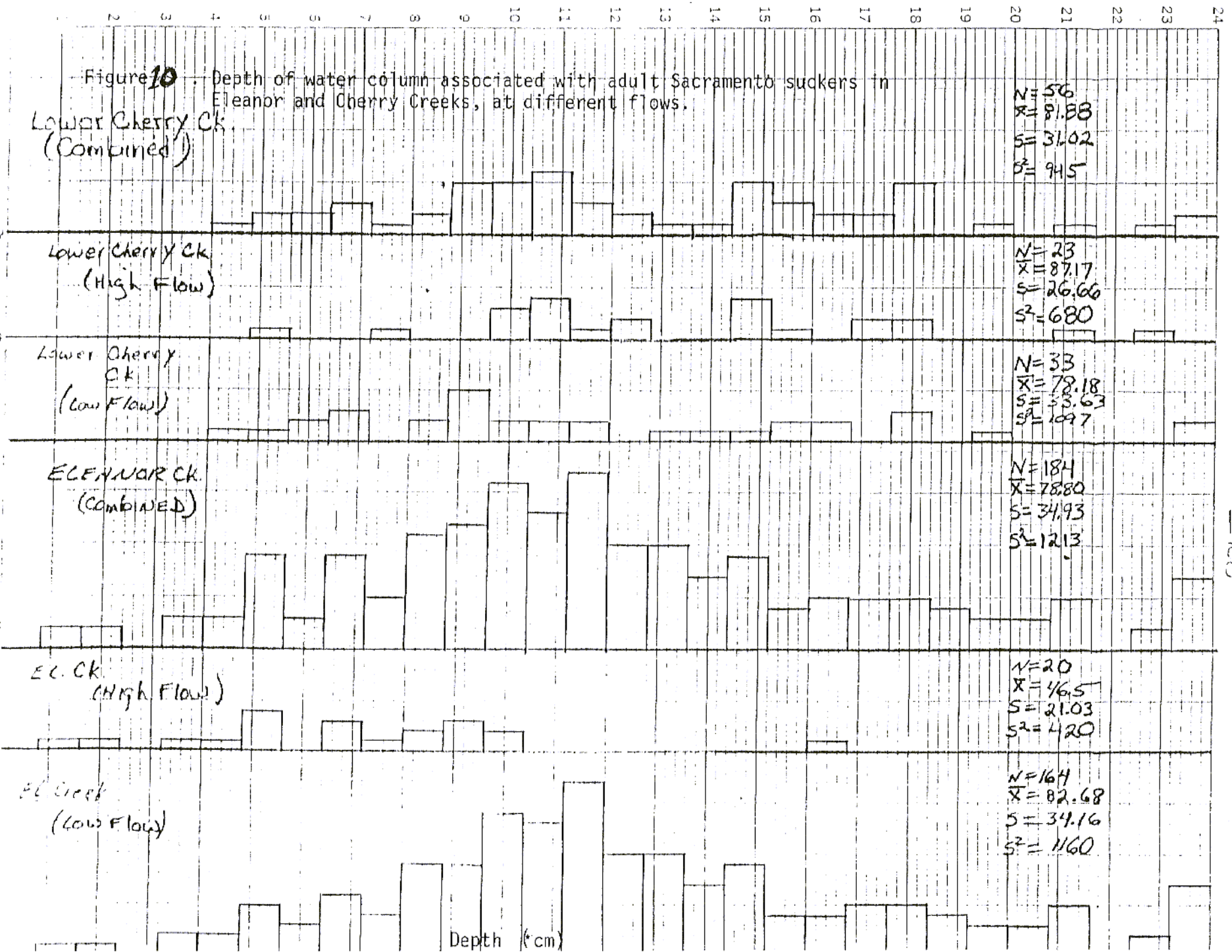


Figure 10. Depth of water column associated with adult Sacramento suckers in Eleanor and Cherry Creeks, at different flows.

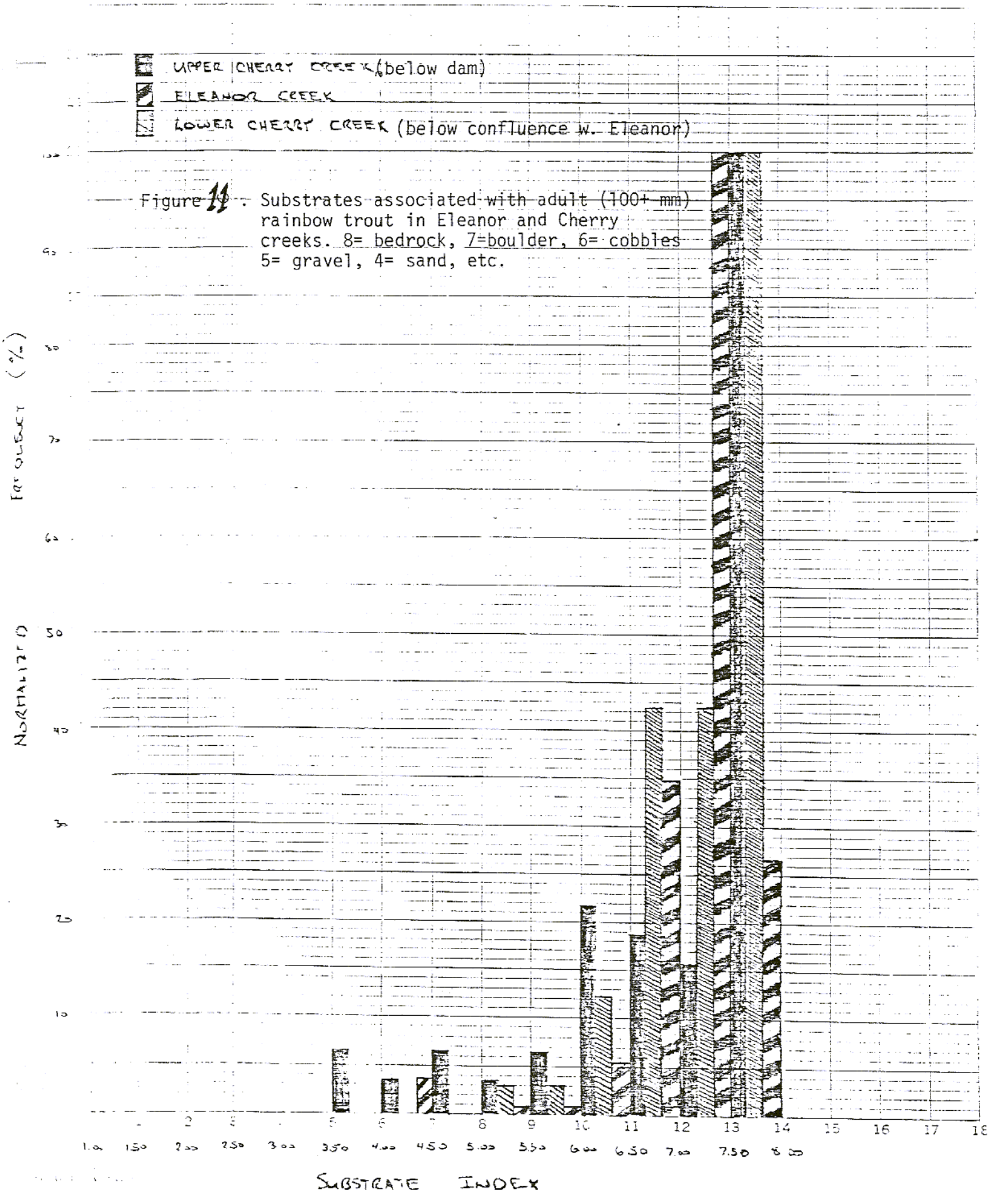


Figure 11. Substrates associated with adult (100+ mm) rainbow trout in Eleanor and Cherry creeks. 8= bedrock, 7=boulder, 6= cobbles 5= gravel, 4= sand, etc.

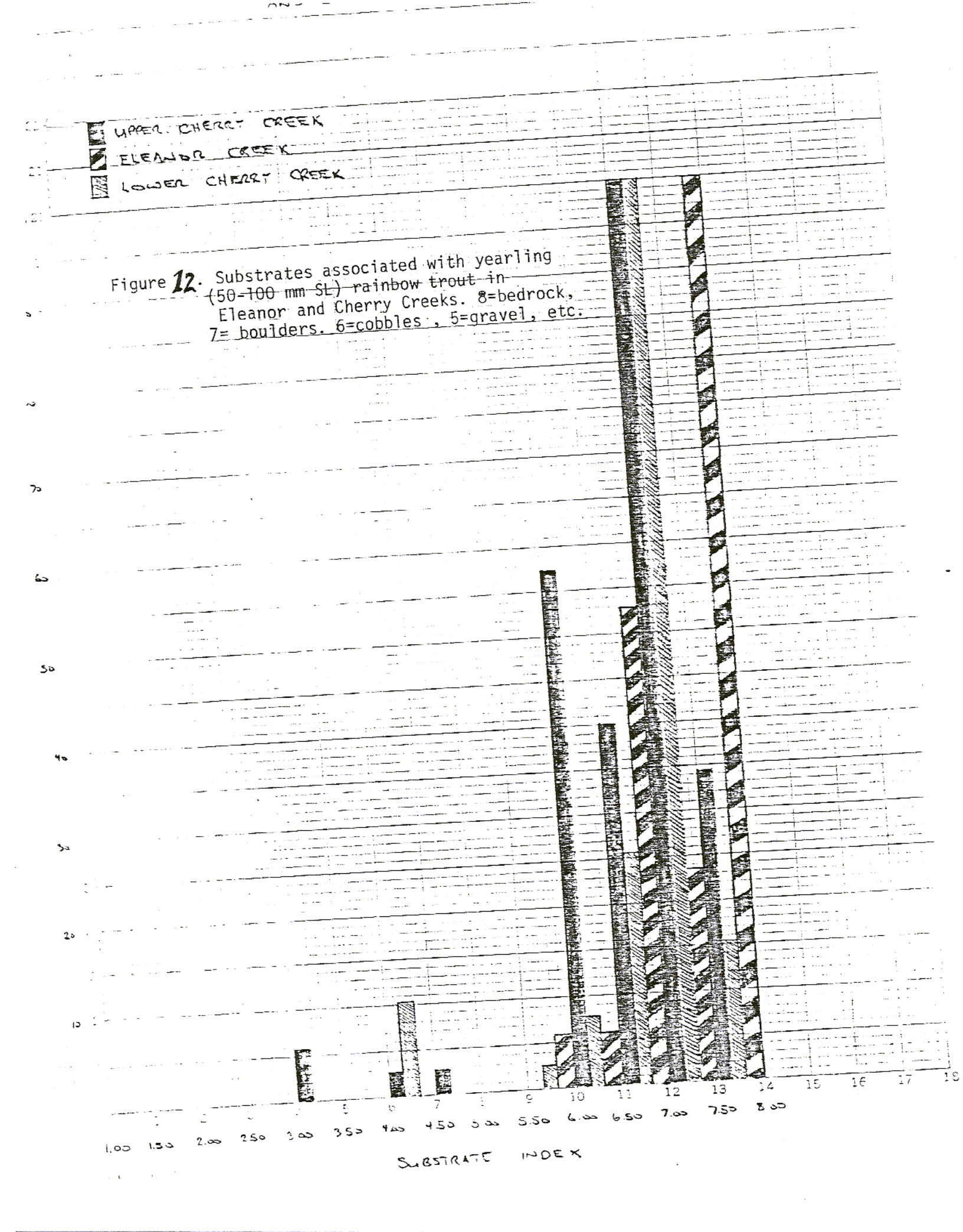
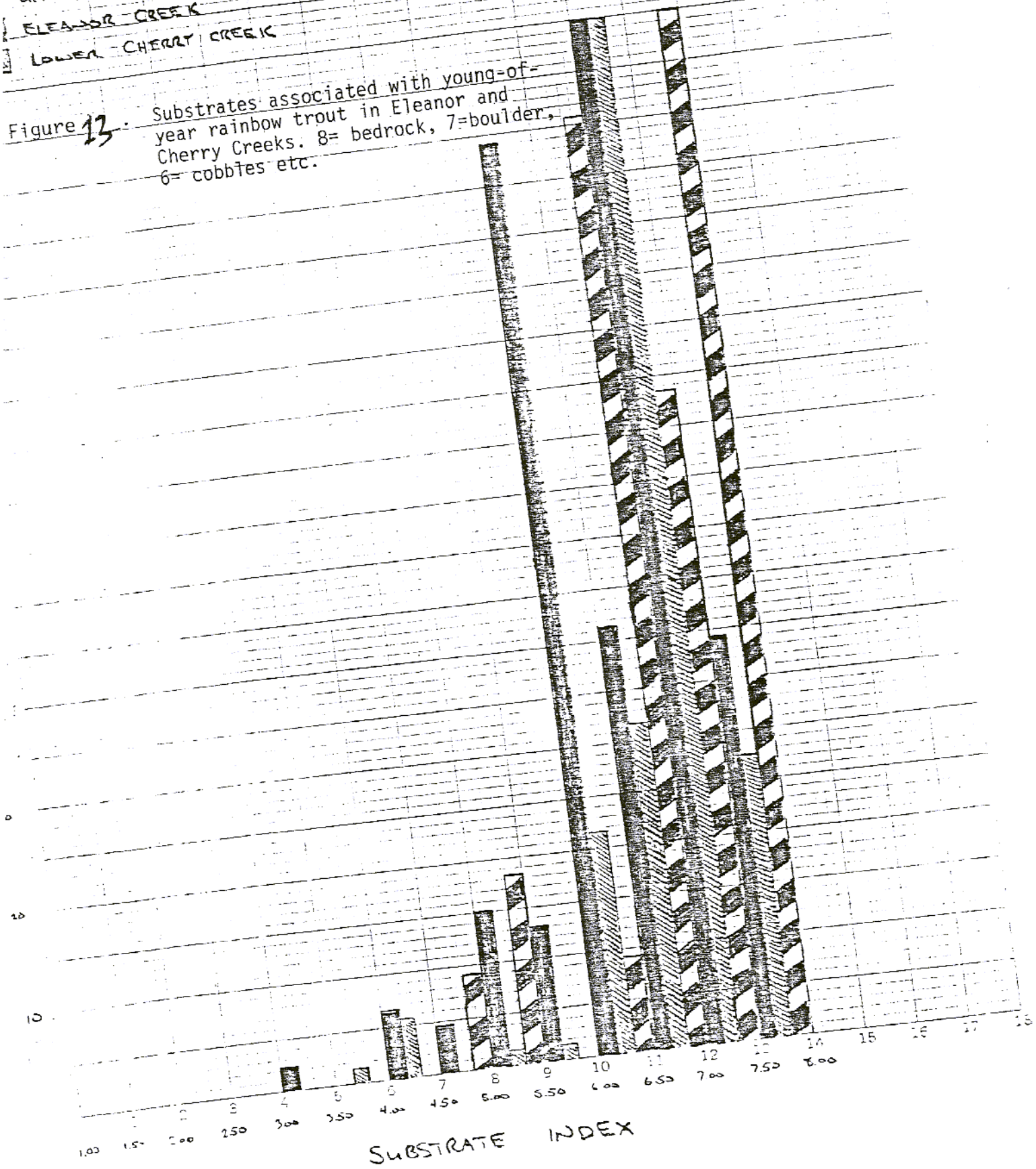


Figure 12. Substrates associated with yearling ~~(50-100 mm SL) rainbow trout~~ in Eleanor and Cherry Creeks. 8=bedrock, 7= boulders, 6=cobbles, 5=gravel, etc.

AND UPPER AND

UPPER CHERRY CREEK
ELEANOR CREEK
LOWER CHERRY CREEK

Figure 13. Substrates associated with young-of-year rainbow trout in Eleanor and Cherry Creeks. 8= bedrock, 7=boulder, 6= cobbles etc.



ELEANOR AND LOWER CHERRY CREEKS

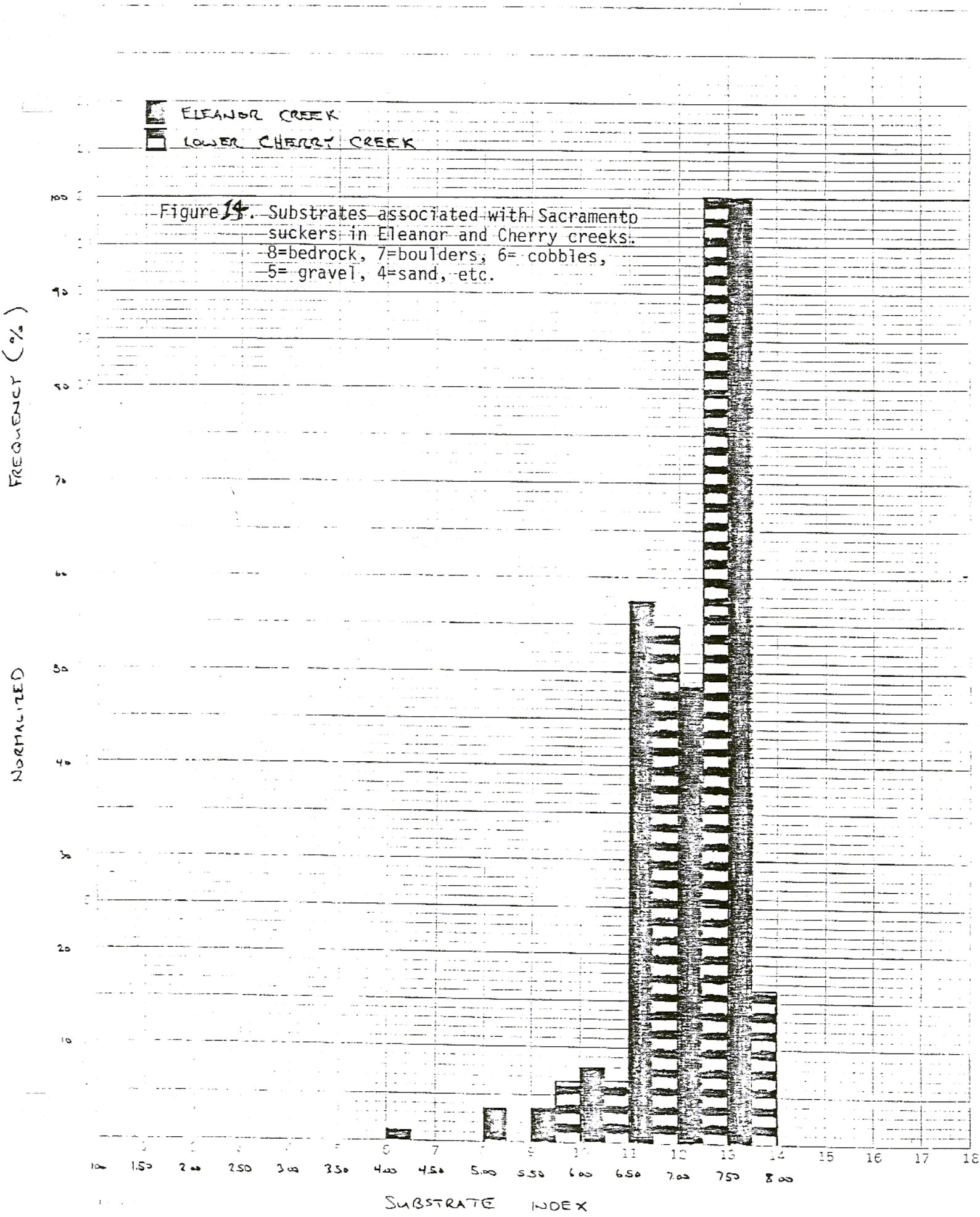
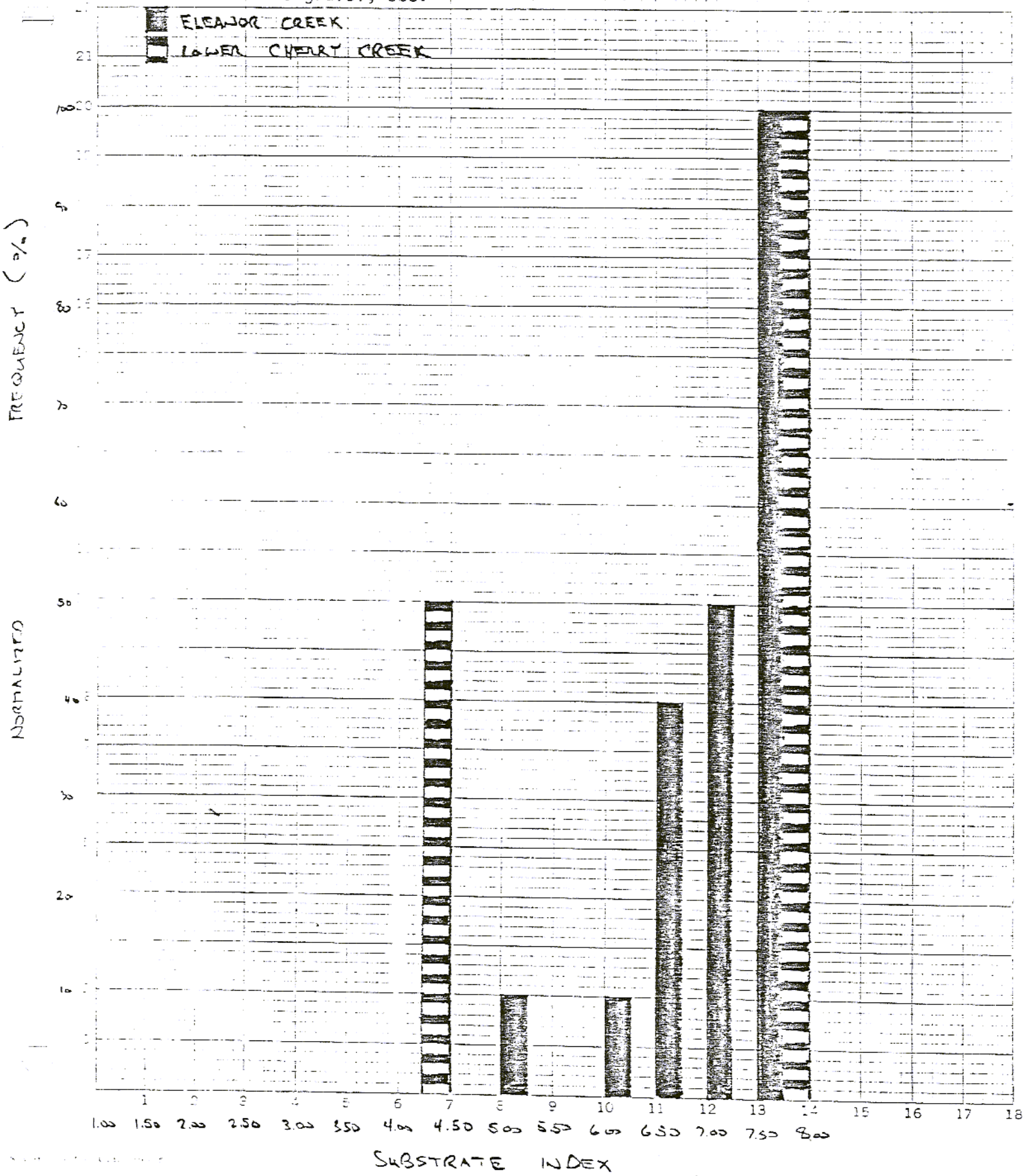


Figure 14. Substrates associated with Sacramento suckers in Eleanor and Cherry creeks. 8=bedrock, 7=boulders, 6= cobbles, 5= gravel, 4=sand, etc.

ELEANOR AND LOWER CHERRY CREEKS

Figure 15. Substrates associated with young-of-year Sacramento suckers in Eleanor and Cherry creeks. 8= bedrock, 7=boulders, 6=rubble, 5=gravel, etc.



PLEASE PRINT CLEARLY

OBSERVER _____ SHEET _____ OF _____

DRAINAGE NAME												STREAM NAME												STA. NO. STM. TP.		DATE MO		DA		YR		TIME START				STOP			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39

CD TP	PERSONNEL SHKS			NET 1			NET 2			CREW NO.	PHOTO INFO. FILM NO.		NO. OF EXP.		ELECTROSHOCKER DATA TYP.	VOLTS		S/N	OUTPUT		B/N		SHOCKING DURATION (seconds) PASS 1			PASS 2			PASS 3		
40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
1																																			

CD TP	STREAM WIDTHS, METERS (ESTIMATE UNDERCUT BANKS TO NEAREST DECIMETER) 3m			6m			9m			12m			15m			18m			21m			24m			27m			30m		
40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70
2																														

CD TP	AIR TEMP. (°C.)			@ TIME				WATER TEMP. (°C.) SURF.			@ TIME				BOT.			@ TIME				COND. (µmhos/cm)				pH			DISS. O_2 (mg/l)			TOTAL AMMONIA (mg/l)				TURB. (NTU)			
40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
3																																							

CD TP	MAP ELEV. (m)				% COVER			EST. FLOW (cfs)			% AREA POOL			RIFFLE			RUN			DROP (m)			STREAM FLOW DATA STREAM WIDTH (cm)			STREAM DEPTH (cm) MID			¼ A			¾ B		
40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74
4																																		

CD TP	% BOTTOM TYPE CLAY (compacted)			SILT			SAND <0.3 cm			GRAVEL 0.3–7.6 cm			RUBBLE 7.6–30.5 cm			BOULDER > 30.5 cm			BEDROCK			% CANOPY				STREAM VELOCITY (m/sec.) MID				¼ A				¾ B			
40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
5																																							

CD TP	SEQ.	CROSS-SECTIONAL STREAM DEPTHS (cm) 3m			6m			9m			12m			15m			18m			21m			24m			27m			30m			
40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	
6	1																															MID
6	2																															¼ A
6	3																															¾ B

CD TP	PASS	SPEC. CODE		SEQ. NO.		NO. COLL.			BIOMASS (grams)					FORK LENGTHS (mm) LENGTH			LENGTH			LENGTH			LENGTH			LENGTH			LENGTH			LENGTH			LENGTH		
40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80

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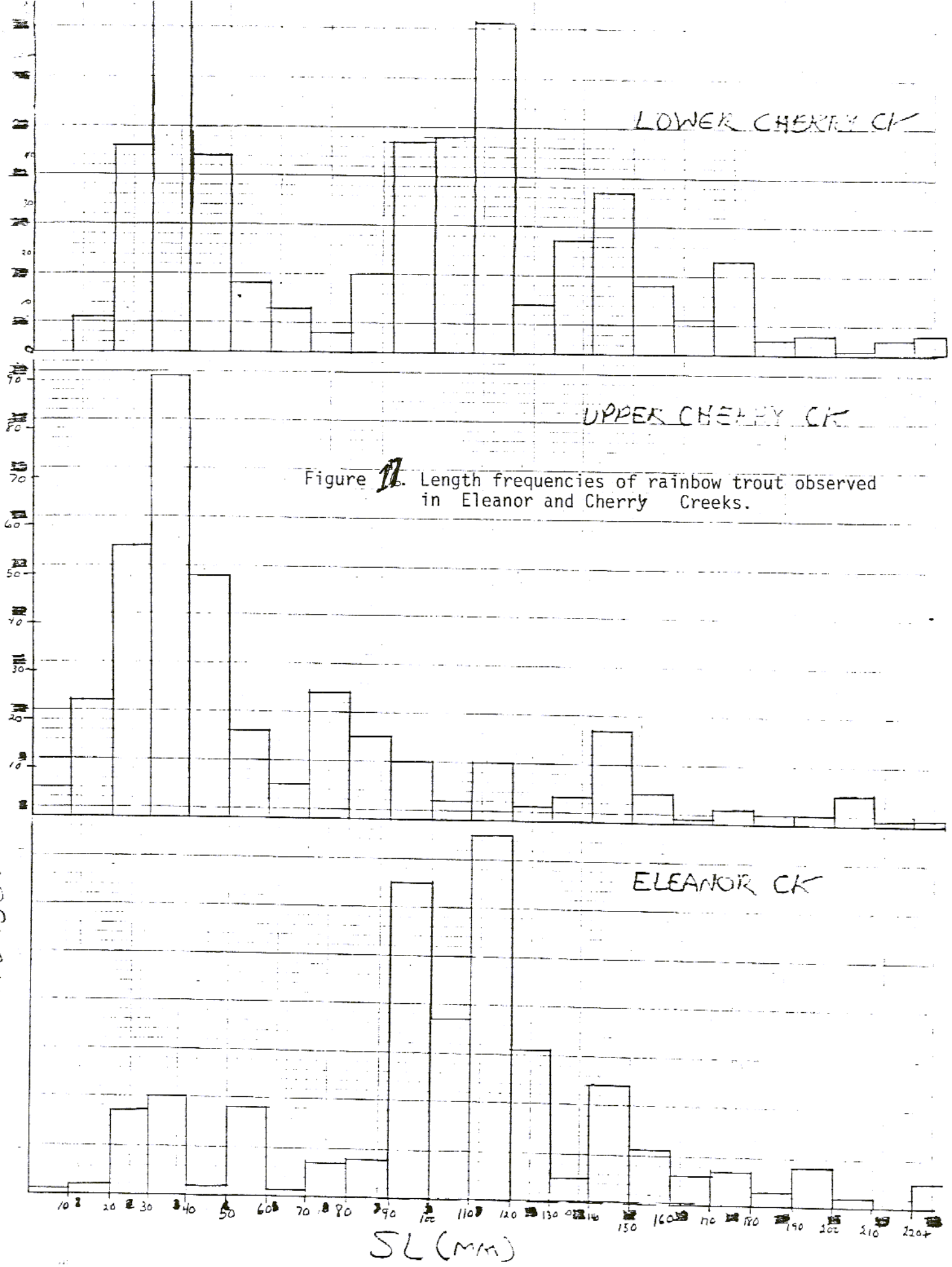
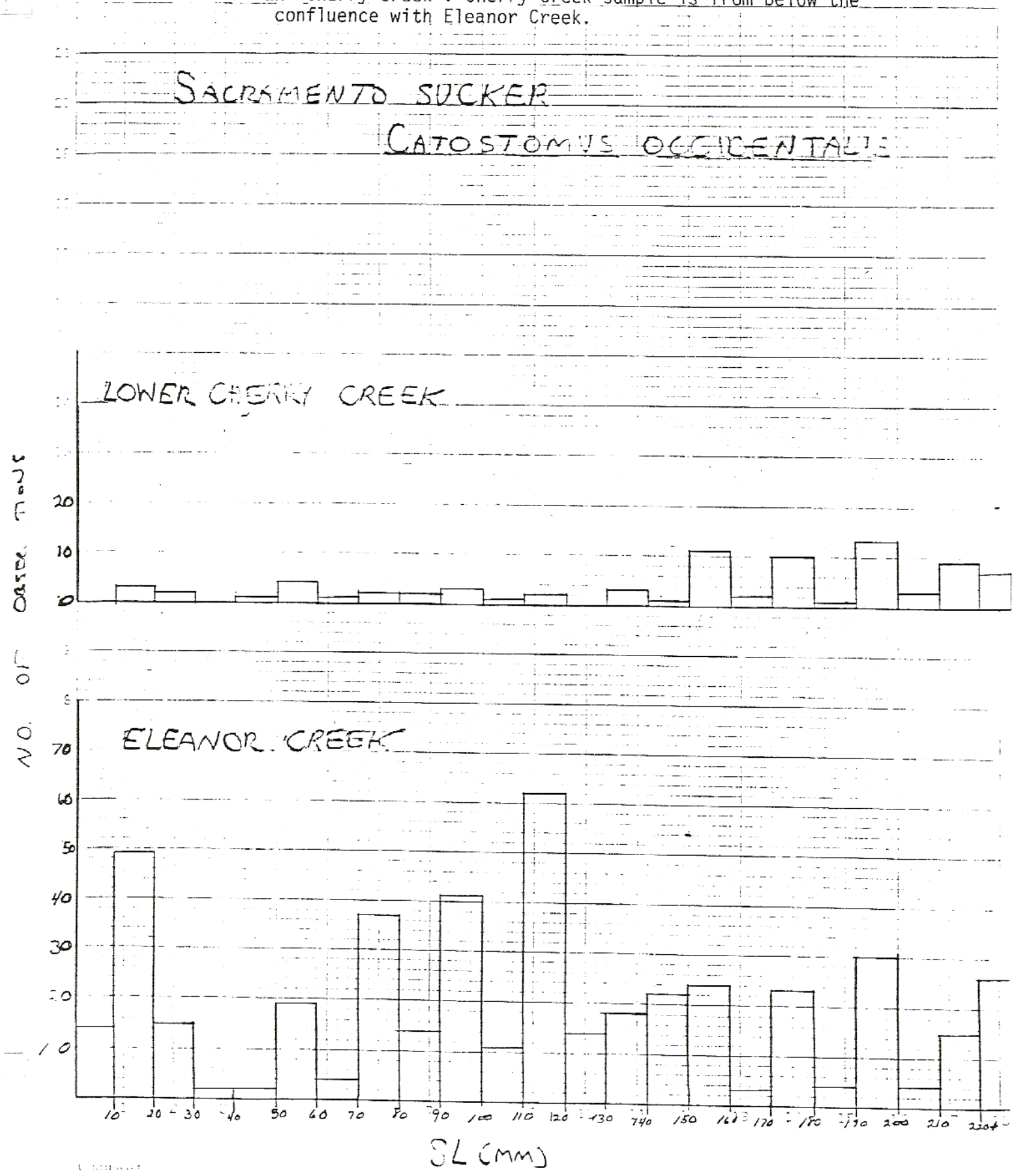


Figure 11. Length frequencies of rainbow trout observed in Eleanor and Cherry Creeks.

Figure 18. Length frequencies of Sacramento suckers observed in Eleanor and Cherry Creek. Cherry Creek sample is from below the confluence with Eleanor Creek.



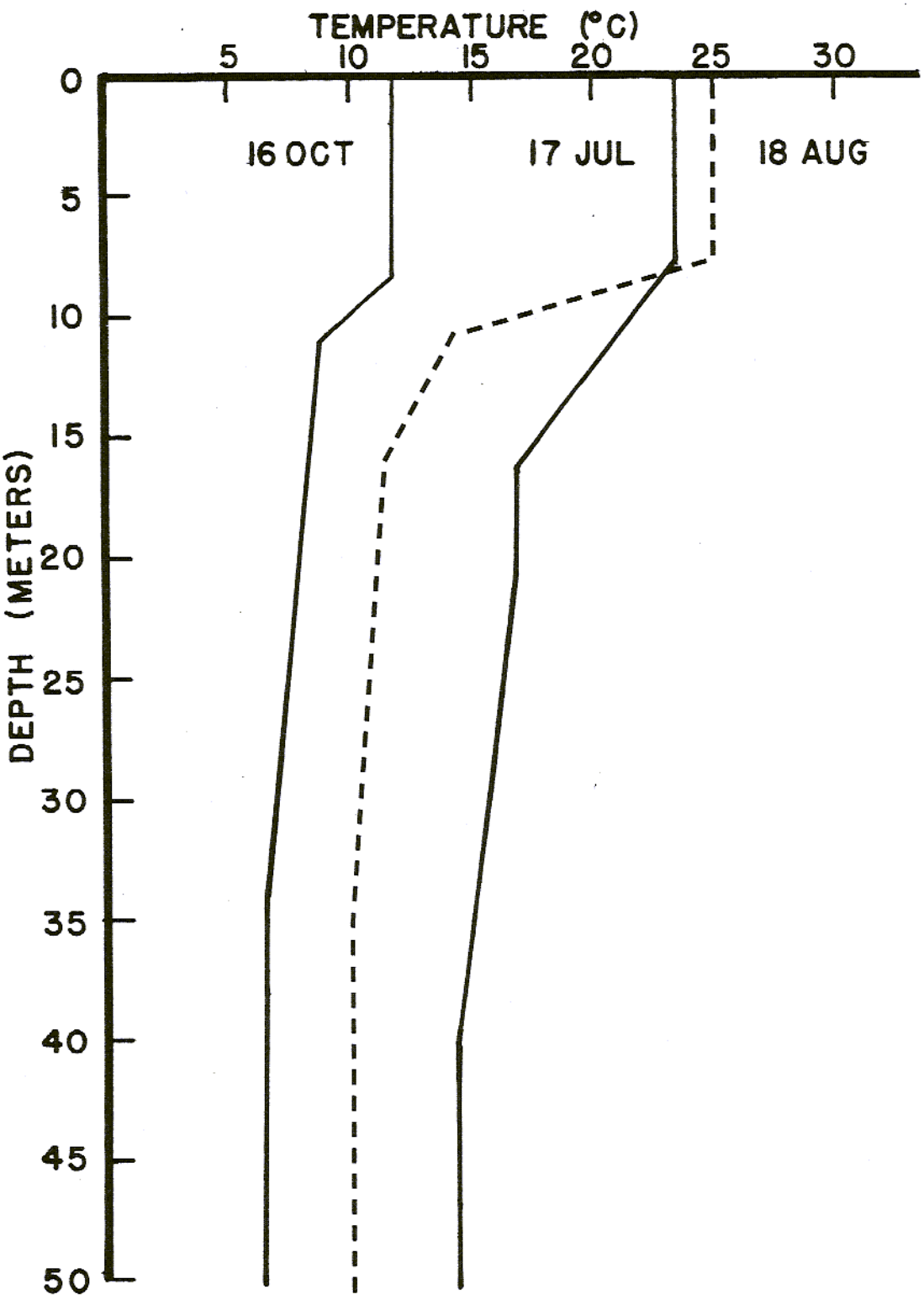


Figure 19. Temperature profiles in Lake Eleanor taken on 17 July, 18 August, and 16 October 1981.

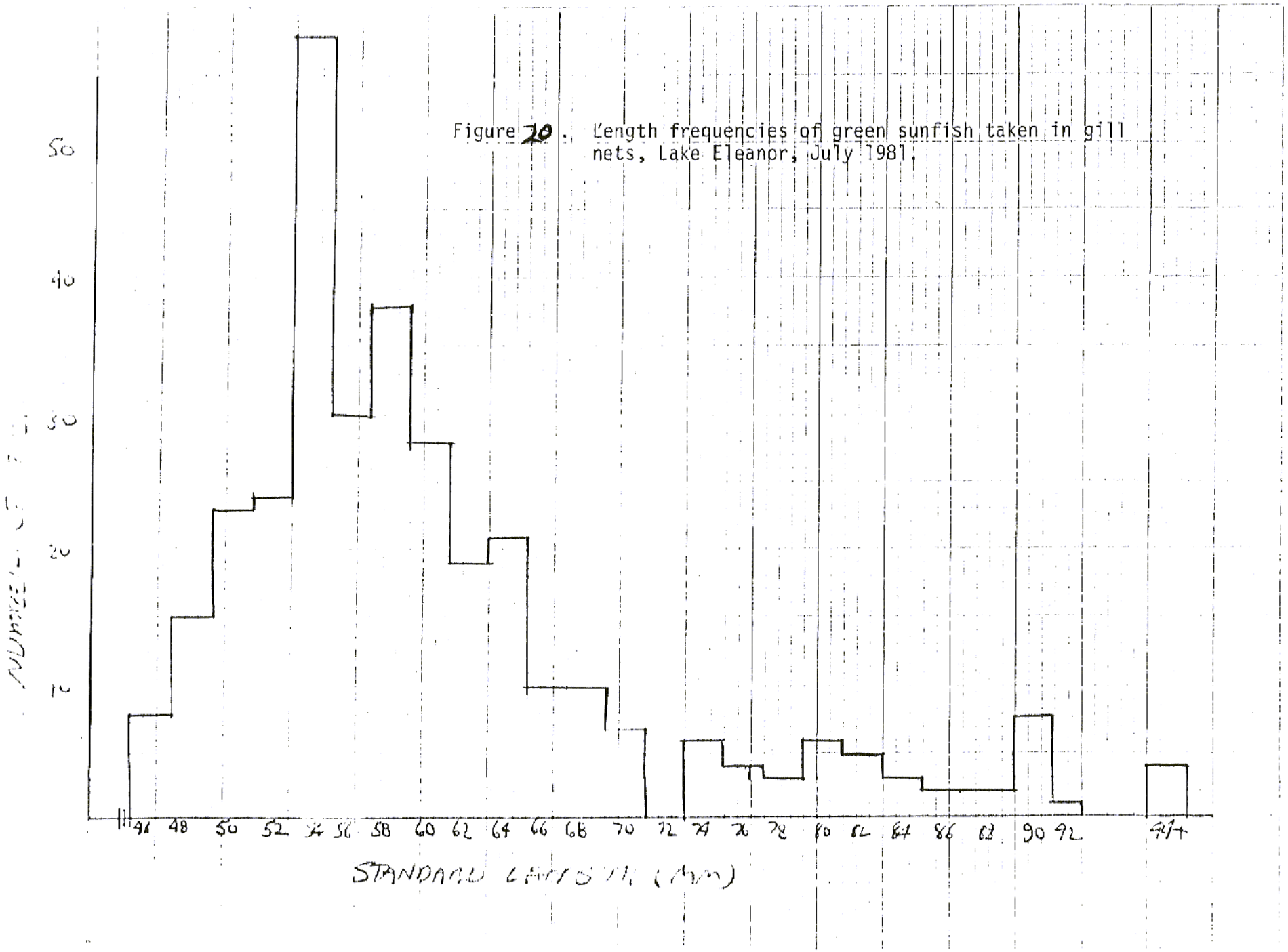


Figure 20. Length frequencies of green sunfish taken in gill nets, Lake Eleanor, July 1981.

Figure 21 . Length frequencies of Sacramento suckers (N = 279) taken in gill nets, Lake Eleanor, July 1981

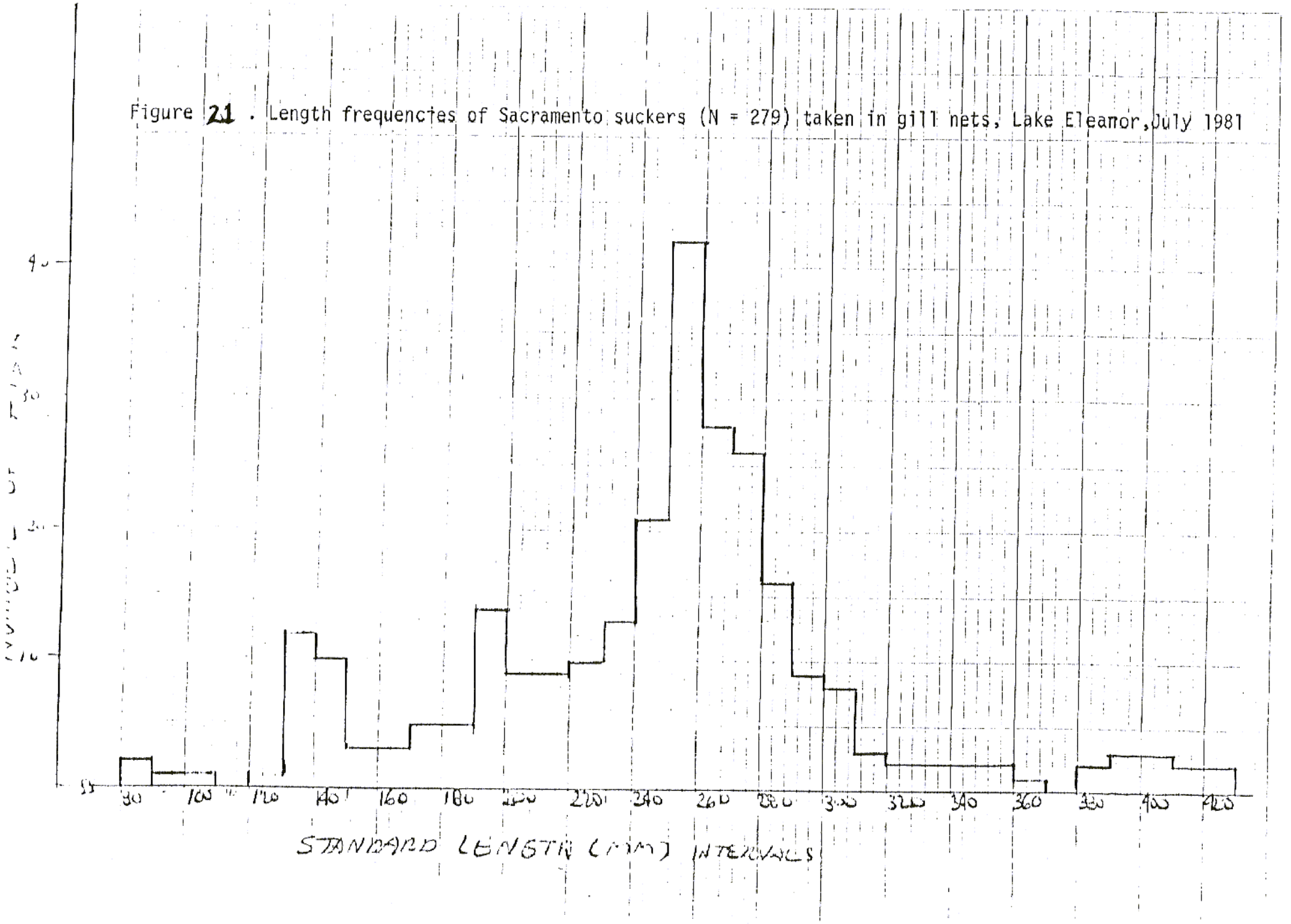


Figure 22. Length frequencies of rainbow trout from the gill net catches in Eleanor Lake