A-Y-K Region
Norton Sound Escapement
Report # 36

1984 Unalakleet River Sonar Feasibility Study

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Introduction

The Unalakleet River empties into Norton Sound approximately 130 miles southeast of Nome, is approximately 130 miles in length and drains an area of 1087 square miles. The Unalakleet River flows from the Nulato hills westward to the town of Unalakleet on the Bering Sea coast. Five major tributaries comprise the river all of which support spawning salmon.

The Unalakleet subdistrict contains the most important commercial salmon fishery in Norton Sound. Because the Unalakleet is the principal river in the subdistrict a reliable escapement index of the river has been a fisheries management priority. Counting towers have tested on both the North and Chirosky Rivers, tributaries to Unalakleet. A test net has operated in the lower river. Two side scanning sonar were tested recently in the lower Unalakleet River. This report is the conclusion of the sonar feasibility study.

Methods and Results

The Unalakleet sonar project began in 1982 and continued through

the summer of 1983 attempting to count all specie of salmon. The methods and results of the 1982 and 1983 seasons can be found in the Unalakleet Project Salmon Escapement Reports, #3Ø and 32#. Only the methods and results of the 1984 season will be considered in this report.

In the two previous years, the project had been plagued by fish milling in the vicinity of the sonar and problems apportioning the count between the specie moving past the counters. In an attempt to minimize these problems in early June a site selection effort was launched to find a site that had a hard bottom, not conducive to spawning, and a fast current to drive away weak or resting fish. The site that was selected is twelve miles upstream from the river mouth at the base of a bluff (Figure 1). At this point the river is cutting bed rock on the north side of the river and depositing a gravel bar on the south side. A recording fathometer was used to profile the river bottom. The placement of the north bank transducer was fairly good with the sonar beam running parallel the bottom. The south bank transducer was placed on a shelf so that the beam was only parallel the bottom for a short distance and it then sampled a mid-water section of the river. Fluctuating high water levels caused the south bank sonar to be moved nearly every day making

it difficult to sample the same part of the river. The Bendix substrates were not used at this site because the pressure wave they create encourages fish to mill and the land owner did not want the associated cables and buoys there.

The sonar project was scheduled to operate during the month of August. Weather and high water delayed the start of the project to August 7. Rising water caused the removal of the sonar again on August 18. Water levels remained high dropping slowly for the remainder of the month. The south bank counts had been questionable due to the irregular bottom so it was decided the feasibility study would continue on the north bank only from August 22 to August 30. The daily counts are presented in Table 1.

When the north bank counter was again set-up on August 22 three days were required to recalibrate the counter. Slow fish passage only allowed calibration for a few hours before dark. The north bank counter was then operated for the remainder of the month.

Apportioning the counts to indicate the specie counted was more difficult at the new site. The narrow river and faster current made set nets impractical. Drift netting was also ruled out

because of snags and boat traffic. Beach seining was attempted but different sites had to be used as water levels changed. Over an eight day period six hauls were made 7 coho, 7 pink and 2 chum salmon were captured compared to 83 char and 2 grayling. Beach seine catches are presented in Table 2.

Coho salmon are much less frequently caught in beach seines than by hook and line by subsistence fishermen. As the counts and seine catches dropped over the season coho were still easy prey on sport tackle. Considering the time the counts were made it seems unlikely that there would be as many pink as coho salmon. The chum salmon counts also seems low in comparison to the pink salmon count. Personal experience would indicate that coho and chum salmon are not easily caught in beach seines and may be able to avoid seine nets with more success than pink salmon and char. Even with these reservations the beach seine catches are the best indication of species composition of the sonar counts. Using the beach seine catches to apportion the combined counts of both counters the following counts were derived.

Coho salmon	1593
Pink salmon	1593

Chum salmon	455
Char	18660
Grayling	455
Total	22756

Discussion

The Unalakleet sonar project has encountered several problems that have rendered the projects results unusable. The most serious of these problems and the first to be realized is species apportionment. At any time three species of salmon, char, burbot, several whitefish species and grayling might be passing by the sonar. Only on rare occasions were visual observations of fish passage possible. Set gillnets were the most practical methods of species apportionment but still there were sources of error. A staggered fishing schedule of three meshes was required to evenly sample the fish large enough to be counted by the sonar. "Catch ability" of various species had to be assumed for the net sizes used. A slight error in the percentage apportioned to a less numerous species greatly affected the count of that species. The large pink salmon run created this problem for the chinook and chum salmon counts. Coho salmon apportionment was greatly affected by a simultaneous char run.

Beach seines and drift gillnets were considered as methods of apportionment. Beach seine deployment was highly dependent on water levels or what beaches were exposed. Drift nets could only be used for short distances in the lower river where boat traffic often interfered.

Milling salmon were also a serious problem. The extent of the milling fish problem became apparent as the water cleared during the summer of 1983. The north bank sonar site was moved down river to a site with a swifter current and rocky bottom but the problem continued only slightly diminished. During the 1984 season an attempt to avoid milling salmon by runing the sonar in a still swifter current without a substrate proved inconclusive due to the uneven bottom and rapidly changing water levels at the site. When the fish were milling in the turbulance created by the substrate the overcount could be estimated, however, when the fish were milling over a large section of river it was much more difficult to quantify the extent of the problem.

To operate the counters in a consistent manner from year to year is difficult. Because of counting sites changing each year and the odd-even year pink salmon cycles. Each year the initial

calibration was dependent on the water speed at the new site and when salmon migration built to the point that a reasonable calibration was possible. Because the crew often could not accurately determine the extent of error caused by milling fish the moral of the calibration team suffered. Consistency is possible only with constant attention to the counter and fish behavior. A permanent project site and a few years experience there would have helped.

Finding a site for the counter has been difficult. Most of the land along the Unalakleet River is privately owned by small land owners who are unwilling to commit their summer camp for the whole salmon season year after year. The local native corporation owns the remainder of the land and they would like to produce as much revenue for their share holders as possible. The membership of the corporation does not fully understand the role of the fisheries biologist or the sonar project. A site was reluctantly made available during 1984 only after meeting with corporation officers and some correspondence.

Conclusion

During the three years of the sonar projects operation no

satisfactory counting site has been found. Sites with the proper bottom profile have serious milling fish problems. And sites with minimal milling are susceptible to rapid water level and speed fluctuations that endangers the equipment and makes speciation difficult. Judging from the project results over the past years and the prospective sites left untried, the Bendix sonar counter does not seem applicable to the Unalakleet River.

Literature Cited

Lean, Charles and Don Peterson

1982 Unalakleet River Escapement Project. Alaska Department of Fish and Game, Norton Sound Salmon Escapement Report No. 30. 56pp.

Lean, Charles and Don Peterson

1983 Unalakleet River Escapement Project. Alaska Department of Fish and Game, Norton Sound Salmon Escapement Report No. 32. 74pp.

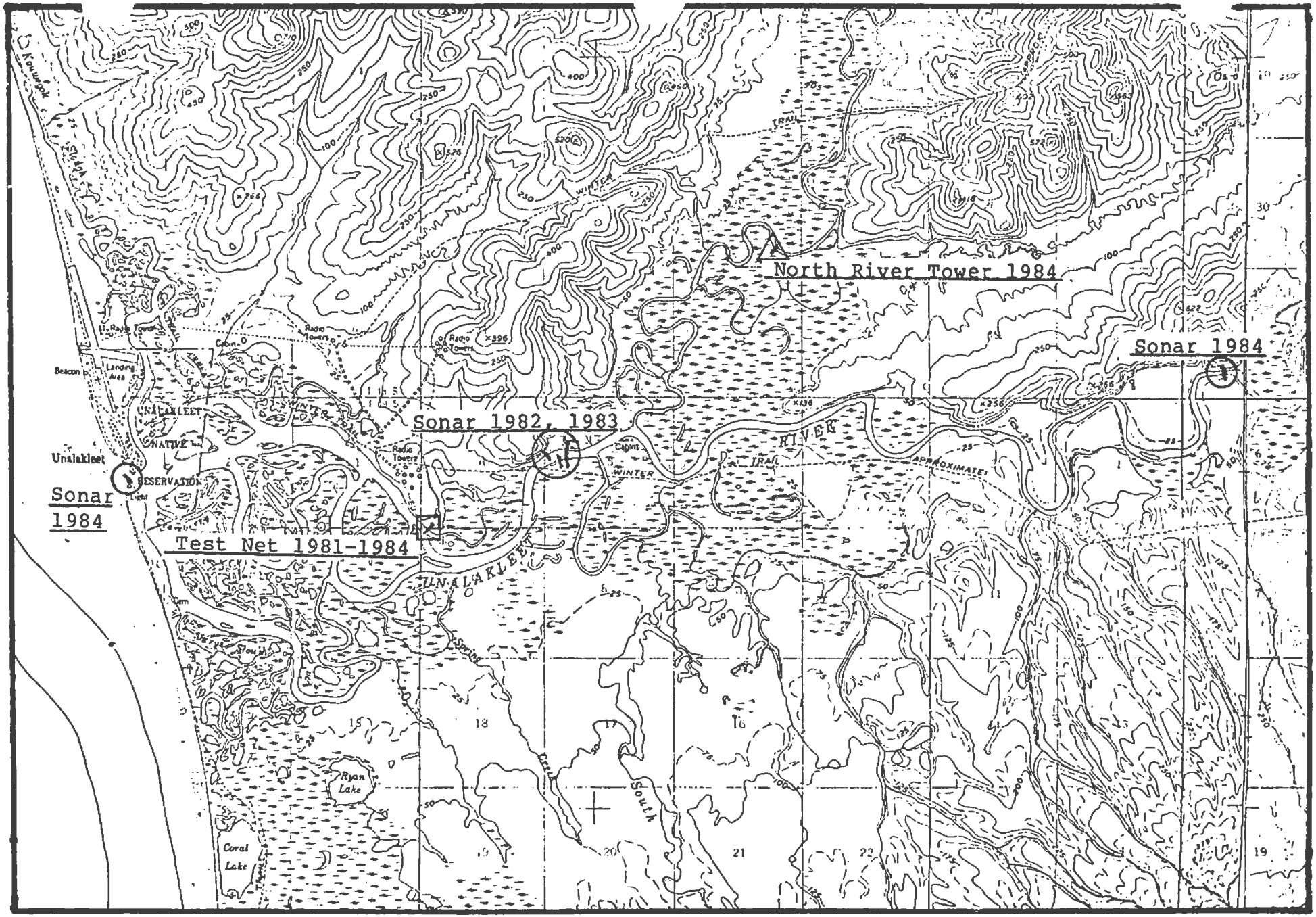

Figure 1. Unalakleet Escapement Project Site Locations.

Table 1. 1984 Unalakleet River Sonar Counts.

	North Bank		South Bank	
Date	Daily Count	Hours Counted	Daily Count	Hours Counted
8/7	101	10		
8/8	106	24		
8/9	437	24	2265 1/	9
8/10	1514	24	1159 1/	23
8/11	1256	24	98	24
8/12	1062	24	152	24
8/13	1486	24	174	24
8/14	943	24	72	24
8/15	824	23	62	24
8/16	1153	24	160	24
8/17	2671	24	542	24
8/18	105	6	44	6
	High Water			
8/22	1293 1/	12		
8/23	1976 1/	22		
8/24	963 1/	24		
8/25	637	24		
8/26	429	24		
8/27	311	22		
8/28	222	23		
8/29	362	18		
8/30	177	9		
Total	18028		4728	

1/ Poor calibration, counts high

Table 2. Beach Seines at Sonar Site, 1984.

25 fathom net 4" mesh

Date	Catch
Site 1 - 13 mile site	
8/9	5 coho
	5 pink
	22 char
	1 grayling
8/13	1 pink
	20 char
8/15	17 char
8/16	1 pink
	4 char
Site 2 - 12 mile site	
8/16	1 coho
	1 chum
	16 char
8/17	1 coho
	1 chum
	4 char
	1 grayling