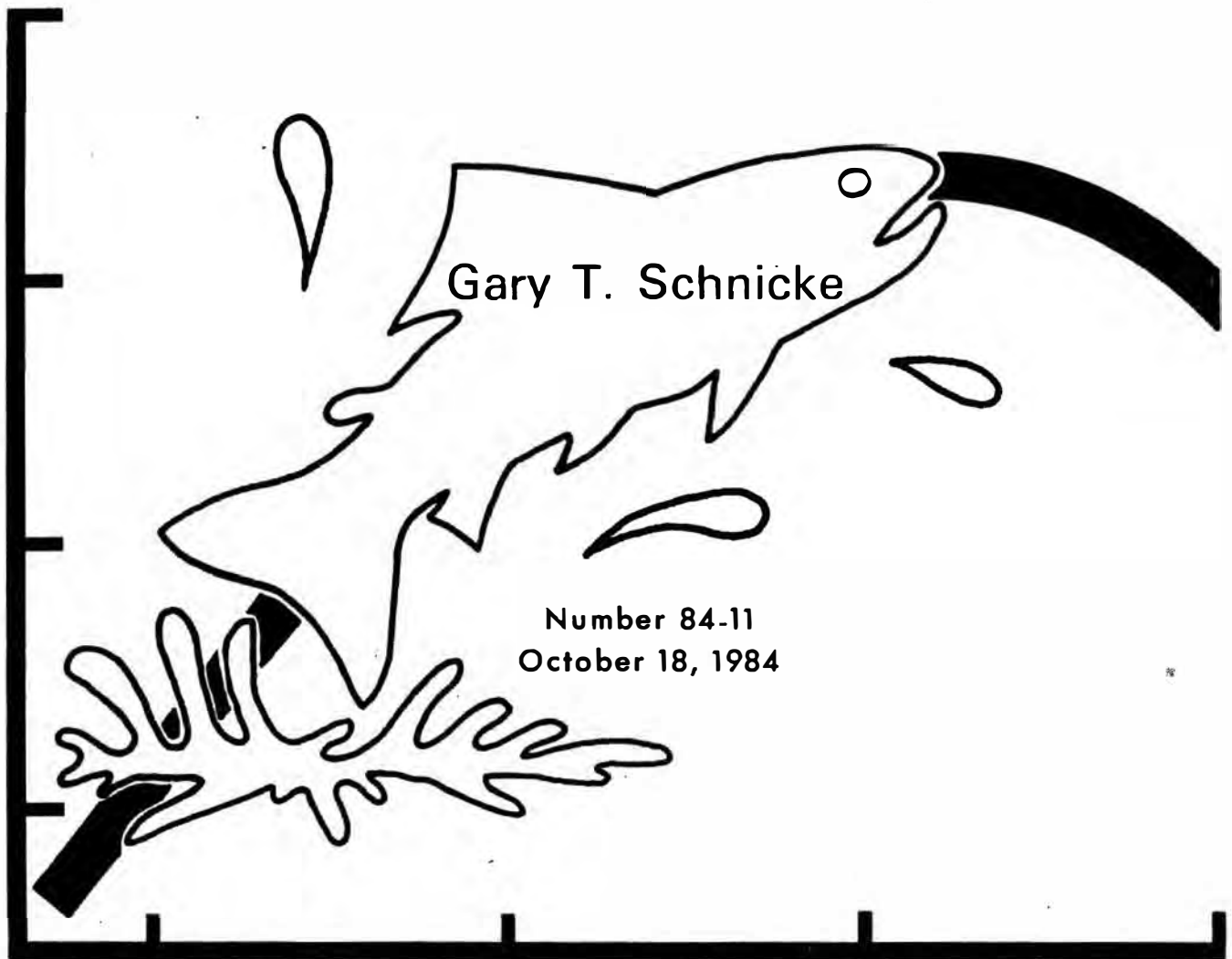


# FISHERIES DIVISION

## TECHNICAL REPORT

### Au Sable Harvest Weir Report, 1983



Michigan Department of  
Natural Resources

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FISHERIES DIVISION

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AU SABLE RIVER HARVEST WEIR REPORT, 1983

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## Introduction

The Au Sable River, which flows into Lake Huron at Oscoda, Iosco County, has been stocked with coho and steelhead since 1968 (Table 1). Steelhead have been planted annually and coho salmon have been planted in 9 of the last 16 years. Fingerling chinook salmon have been planted annually, beginning in 1970. Over the years, returning adult and jack chinook have typically provided a good to excellent open water fishery in Lake Huron near Oscoda. In addition, thousands of mature chinook run the Au Sable River, creating a controversial river fishery that is concentrated below Foote Dam, about 9 miles upstream from the river mouth.

In 1983 as part of an attempt to curtail the legal as well as illegal foul-hooking of salmon in Michigan, the Department of Natural Resources hired Tempotech Industries, Hart, Michigan, to harvest salmon. Tempotech agreed to construct and operate a salmon harvest weir on the Au Sable River at the mouth of Van Etten Creek, about 2 miles upstream from the river mouth (Fig. 1), and to purchase all salmon they collected.

## Installation and Operation of the Weirs

Two weirs were installed to block salmon from Van Etten Creek and to harvest a major portion of the salmon ascending the Au Sable River (Fig. 1). The Van Etten weir was "pipe weir" constructed of materials previously used by the Fisheries Division on other streams. The Au Sable weir was an experimental design provided by Tempotech, which utilized nylon netting for both the blocking lead and the fish trap.

Construction of the weirs began in late August 1983. I made inspection trips on August 23, 26, and 31 to monitor construction progress. On the initial trip workers were struggling with the Van Etten pipe weir and were unfamiliar with its assembly. I made several suggestions to facilitate

assembly but, since I had received no instructions to supervise construction nor provide personnel to assist Tempotech, nothing further was offered. During my second visit, Tempotech personnel were installing the Au Sable weir and by August 31 that installation was complete. Between August 23 and 31, the boat passage facility was moved downstream, away from the trap. The trap was then moved out closer to the current.

On September 13, both weirs were in place but no major runs of salmonids had yet occurred. A few chinook had drifted down on both weirs from upstream. Water temperatures during most of this period were in the mid-to-high 70's--too warm to entice salmon to run the river. However, a few chinook did enter the Au Sable trap during this period and these fish, totaling less than 50, were passed upstream (Table 2).

The first major run of chinook arrived at the Au Sable weir on September 16, apparently triggered by stormy and cooler weather. On that day several thousand salmon congregated below the Au Sable weir but were reluctant to enter the trap because it was located in an area of slack water. Fish congregated 100-150 feet below the trap where the main current contacted the weir. I suggested that a small pump be used to create a flow of water through the trap entrance to attract the fish. This was done and several boxes of fish (355 fish) were harvested that afternoon. However, many fish were not attracted to the trap and continued to fight the blocking lead, especially at the end farthest from the trap where a dogleg had been put in the lead to avoid a deep run.

Fish could be observed jumping over the net all afternoon on September 16 and concentrations of salmon quickly built-up below Van Etten weir and Foote Dam. Snagging activity was high at the Foote Dam access site all through the weekend of September 16, 17, and 18. Therefore,

I instructed weir personnel to pass no more fish above the weir until further notice.

To create more flow through the trap, one of Fish Division's Crisafulli pumps was transported to the site and put in place during the morning of the 17th. Salmon numbers began to build up below the Au Sable weir, but as the day passed those fish disappeared and large numbers of them appeared below the Van Etten weir. It was then discovered that someone (probably a fisherman--there was a large concentration of boats in the 0.5 mile of river below the weir) had untied the lower end of the net and allowed it to swing out in the current. Several thousand salmon must have passed the blocking lead that day, based on the concentrations below Van Etten weir and Foote Dam. Because of strong current and high flow due to operation of the Foote Hydro Dam, the untied end of the net could not be retrieved and retied until late that night when the river level went down.

Digging by salmon below the Van Etten weir soon revealed that neither rock nor fence had been placed on the stream bottom during construction as I had recommended during pre-construction meetings. To relieve pressure on the weir, I gave Tempotech personnel permission to begin harvesting fish below the Van Etten weir by seining. I also advised them that they would have to "armor" the stream bottom under the weir to keep the weir in place and functional.

Salmon harvest was discontinued at the Main Au Sable weir on September 17 and shifted to the Van Etten weir on September 18. The first attempts at seining below the Van Etten weir yielded 195 salmon. Inadequate gear and stumps and snags in the river made the process difficult at first. The salmon also had a tendency to swim around the point at the mouth of the creek and on up the Au Sable, so I suggested a blocking net be deployed.

The seining operation harvested 260 salmon on September 19 and 271 on September 20. On September 20, 1.2 inches of rain triggered a big run of fish (902 harvested on the 21st) followed by extremely high water levels. The blocking nets were inundated, plugged with debris, and washed out for 2 days. The Van Etten weir was also swamped for a least 1 day, allowing a substantial number of salmon to pass upstream. High water levels and turbidity made observation difficult, but I estimate that 1,000-2,000 salmon reached Van Etten Dam. No fish were harvested on September 22 or 23, due to high water. Several thousand fish reached Foote Dam during this period and snagging success there remained high.

When water levels began to recede, Tempotech personnel began to modify and improve their gear and operations to concentrate on the Van Etten site. It was apparent by then that the Au Sable net could not be kept operational and that the preferred migration route was along the eastern bank of the Au Sable (Van Etten side) instead of along the western bank as had been expected.

The lower end of the Au Sable net was repositioned and connected to the blocking net off the point on the west bank of Van Etten Creek as shown in Figure 1. This formed a solid lead which prevented fish from going up the east bank of the Au Sable and directed them into the Van Etten harvest site. A better seine was built and snags were removed from the stream bottom. A trap of chain link fence was installed above the Van Etten pipe weir to harvest upstream salmon. The stream bottom was armored to prevent fish from digging under the weir.

After September 26, when most of the above modifications had been completed, harvest operations became more successful and routine. Escapement up both the Au Sable River and Van Etten Creek diminished as did snagging success at Foote Dam. Numbers of fish at Van Etten Dam dwindled (through trapping, illegal fishing, and fish

dropping back) to an estimated 200-300 fish on September 27, 28, and 29. To facilitate removal of salmon dropping back to the weir, I allowed a piece of large mesh net to be hung on the upstream side of the weir. It acted as a gill net and captured most fish that encountered it. These fish were harvested at frequent intervals.

Although harvest operations were more successful, they were also slow and labor intensive--very similar to some of the very early operations at the Bear Creek Rearing Station in the 1960's. Fish were seined from either the trap above the weir or the creek below the weir, hand-loaded on pick-up trucks, transferred to the Au Sable weir site, then boxed, iced, and loaded on a semi-trailer. Due to the low numbers of fish harvested, truck shipments were made only every 2 or 3 days.

Fish runs were light on September 29 and 30. Fish numbers at Van Etten Dam appeared to remain constant while snagging success at Foote Dam dwindled, indicating minimal escapement up both streams. On October 1, fish runs increased again and remained at relatively high levels through October 11. Harvest with bag seine below the Van Etten weir continued to be effective.

Fish numbers at Van Etten Dam did not change noticeably but illegal fishing (snagging) was becoming common. Fish numbers and fishing success at Foote Dam picked up, indicating that there was still escapement up the Au Sable, although not at earlier levels. On October 5, high water washed out the boat passage section of the Au Sable weir. It was not replaced because that portion of the weir was plugged with debris and was presumed to be off the stream bottom and not blocking fish anyway. After October 11 no major runs of salmon occurred at the weir and angling pressure and success at Foote Dam declined. On October 25 the weirs were removed.

### Chinook salmon

The total chinook run in the Au Sable River in 1983 was estimated to be about 42,000 fish. A total of 16,165 chinook salmon (adults and jacks combined), weighing a total of 209,954 pounds were harvested at the Au Sable River-Van Etten Creek weir complex (Table 2). An additional 50 chinook were captured and released upstream. An estimated 26,000 chinook were not captured due to escapement of about 90% of the early runs and about 50% of the runs occurring after September 25.

Compared with similar-size chinook plants in recent years, the 1983 run was larger than expected, indicating improved survival of planted smolts. The 1983 run contained a high percentage of jacks, indicating that relatively large runs of adults can be expected in 1984 and 1985.

The length, weight, and sex of 100 chinook were recorded in each of 5 weekly samples but no scale samples were taken. The combined length-frequency distribution is shown in Table 3. Males outnumbered females (65% versus 35% for combined samples) especially during September. Males averaged 31.9 inches and 12.0 pounds, females averaged 34.6 inches and 15.3 pounds.

### Other salmonids

Other salmonids passed above the weir in 1983 included 8 steelhead and 22 lake trout. Other salmonids harvested included 2 coho and 1 pink salmon.

### Summary

In 1983, the harvest of returning salmon at the newly installed Au Sable River-Van Etten Creek weir complex got off to a disastrous start with the first large runs of chinook salmon passing the weirs relatively untouched. Tenacity and ingenuity on the part of Tempotech personnel in relocating the nets and improving capture techniques



resulted in the harvest of about half of the salmon running after September 25. The 1983 run of chinook was estimated to be roughly 42,000 fish, of which 16,165 fish (38.5%), weighing 209,954 pounds, were harvested.

#### Recommendations of 1984

The two most serious errors made in 1983 were assuming that salmon would follow the deep channel up the west bank of the Au Sable (when in fact they appeared to prefer the shallow east bank and Van Etten Creek) and attempting to block the entire width of the Au Sable with netting.

It would appear that at least half of the total number of salmon ascending the Au Sable could be harvested with a more efficient harvest system located in Van Etten Creek. A system designed to trap and hold all salmon that entered the creek might capture substantially more than half of the 1984 run if fish could be prevented from dropping back once they reach the pipe weir. A double weir system with a holding pond and harvest facility off to the side would seem most feasible. As in 1983, a wing of netting or fence extending downstream from the western point of the Van Etten Creek mouth would be required to force the fish to enter Van Etten Creek. The only system that would be more effective would be a more substantial barrier completely across both streams, such as a pipe or wooden rack weir.

From the first chinook handled at the beginning of the 1984 run, scale samples should be taken from 50 males and 50 females covering the size range from 28 inches to the largest available. Select fish in good, bright condition to facilitate scale taking and reading. After reading, calculate age-frequency by sex and inch group. Use these percentages to assign ages to subsequent samples of 100 fish per week. For each weekly sample, determine mean length and weight for males and females of each age group. When the

run is over, determine seasonal weighted mean lengths and weights for each age group.

Use the data on age, sex, and weight from each weekly sample to divide the chinook harvest (both numbers and pounds) for that week into estimates by age and sex. When the run is over, add the weekly harvest estimates to determine the total estimates of chinook harvested, by age and sex.

Use the procedure described in the previous paragraph to estimate for each week the number of fish passed and weight of fish passed, by age and sex. Add the weekly estimates of fish harvested and fish passed to estimate the weekly chinook run, by age and sex. Finally, add the weekly totals to estimate the annual chinook run, by age and sex.

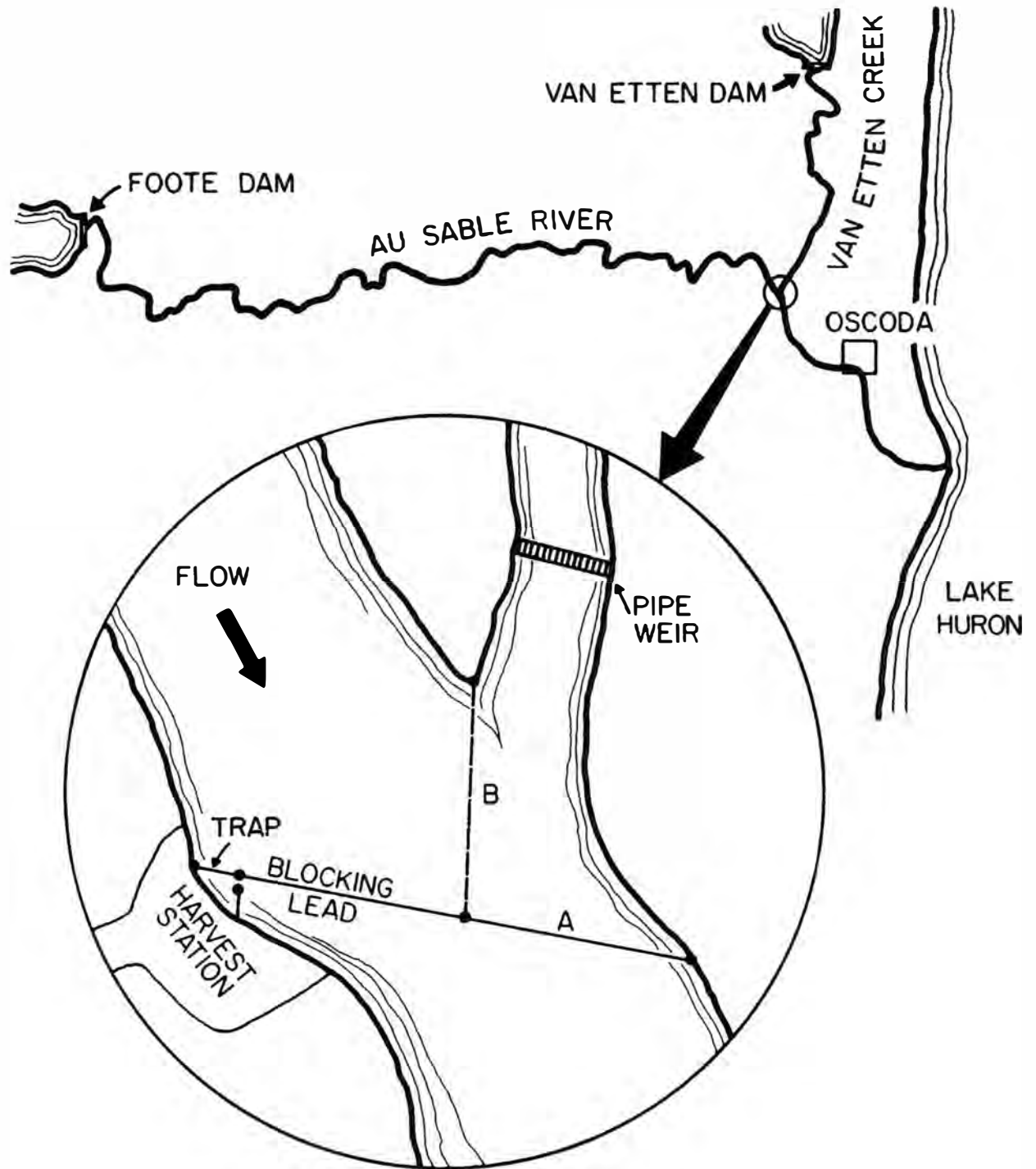


Figure 1. Map of the lower Au Sable River and schematic of the salmon harvest weirs on the Au Sable River and Van Etten Creek. Net section "A" was moved to location "B" in mid-season.

Table 1. Planting history of anadromous salmonids in the Au Sable River since 1968. Age of fish at planting: spring fingerlings (SF), fall fingerlings (FF), and yearlings (Y).

Planting year	Salmon			Trout
	Chinook (SF)	Coho (Y) <sup>1</sup>	Atlantic	Steelhead (Y) <sup>1</sup>
1968	---	74,987	---	25,000
1969	---	183,213	---	15,000
1970	503,144	235,611	---	35,923
1971	204,500	224,900	---	30,000
1972	50,427	---	9,000	122,573
1973	405,745	---	---	120,580
1974	401,292	---	---	84,716
1975	302,500	150,060	---	36,660
1976	251,440	200,068	---	65,613
1977	200,200	100,349	---	20,240
1978	500,925	---	---	50,000
1979	499,922	782,216(SF)	---	100,000
1980	600,105	---	---	50,000
1981	550,000	---	---	88,276 22,967(FY)
1982	625,259	270,769(FF)	---	81,013(FF) 50,035
1983	500,000	---	---	125,000

<sup>1</sup>Unless otherwise noted.

Table 2. Summary of chinook salmon harvested at the Au Sable River--Van Etten Creek weir complex, 1983.

Date	Chinook harvested		Rainfall (inches)
	Number	Weight (pounds)	
September 16	355	4,768	0.65
17	0	0	0.10
18	195	2,619	0.53
19	260	3,692	0.00
20	271	3,848	1.24
21	902	11,275	0.40
22	0	0	0.10
23	0	0	0.10
24	158	2,370	0.00
25	370	5,550	0.17
26	74	1,110	0.18
27	924	13,398	0.00
28	855	12,397	0.00
29	385	5,558	0.00
30	298	4,298	0.00
October 1-2	1,078	15,585	0.00
3	680	9,761	0.00
4	1,120	13,460	0.00
5	960	11,536	0.00
6	2,080	24,991	0.25
7	240	2,883	0.20
8-9	1,880	24,434	0.00
10-11	2,164	24,094	0.00
12-17	766	10,725	0.75
18-24	150	1,602	2.37
Totals	16,165	209,954	7.04

Table 3. Length-frequency distribution (percent) of 323 male and 177 female chinook salmon sampled at the Au Sable weir complex September 16-October 17, 1983.

Inch group <sup>1</sup>	Male	Female
19	0.3	---
20	---	---
21	0.9	---
22	5.0	---
23	6.5	0.6
24	7.5	---
25	2.5	---
26	1.6	0.6
27	1.5	---
28	1.6	---
29	7.7	0.6
30	4.3	4.5
31	6.2	6.2
32	5.3	11.3
33	6.2	11.3
34	4.3	17.5
35	6.5	18.5
36	8.1	12.4
37	9.9	8.5
38	7.4	4.0
39	4.3	3.4
40	1.2	0.6
41	0.6	---
42	---	---
43	0.6	---
Total	100.0	100.0

<sup>1</sup>Inch group 19 = 19.0-19.9; 20 = 20.0-20.9; etc.