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Estimate of immediate tagging mortality of adult Atlantic salmon

by

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Introduction

The main aim of the recent International Salmon Tagging Experiment at West Greenland was to estimate (1) the return rate of salmon from Greenland to home waters and (2) the exploitation rate and fishing mortality rate at West Greenland. Any estimates obtained from tagging studies without first of all determining to some degree the immediate tagging mortality would probably result in serious error.

The act of capturing, handling and marking a fish may cause wounds or abrasions in the epidermis which may provide an entrance for infection either through the marking wound or breaks in the epidermis caused by handling. Also, the adult Atlantic salmon taken at West Greenland by drift nets have thinner skin than those in fresh water and are more susceptible to scale loss than fish which are entering home rivers. This scale loss incurred while struggling in the nets and during handling may cause increased osmoregulatory distress and death. The nylon twine of the nets also causes constriction of the salmon which bruises the epoxial muscles and also causes rupture of the blood vessels (Murray, White and Whitaker, 1969). Even in the event of small scale loss, there may be short term mortality after strenuous activity from struggling in the nets and handling. Secondat and Diaz (1942) reported that blood lactate concentrations of tench (*Tinca tinca*) increased following forced activity, but usually subsided by the end of six hours. These investigators also observed that some fish died and the blood lactate levels of these had failed to decrease. Parker and Black (1959) and Parker, Black and Larkin (1959) found a positive association between blood lactate level and death in samples of troll-caught chinook and coho salmon in sea water. While the high blood lactate levels were not shown to be a direct cause of death, they are a significant correlate of death following hyperactivity. The aim of this paper is to provide a first estimate of the immediate mortality caused by handling and tagging adult Atlantic salmon in the West Greenland area.

Methods and materials

Thirty-one adult Atlantic salmon captured during August 26-September 20 (Table 1) by surface drift nets near the West Greenland coast were held in large tanks to determine the immediate mortality due to tagging and handling. Only those salmon which were considered in good or fair condition for tagging (Table 2) and would ordinarily have been released were used in this experiment. Sixteen of these salmon were caught while patrolling the nets in the rubber boat. These were tagged, measured, and a scale sample was obtained and their condition recorded while on board the small boat. They were then placed in a small canvas recovery tank in the rubber boat and carried back to the A. T. Cameron to which they were transferred in a small rubber transfer tank filled with water. The salmon were then placed in two round fibreglass tanks filled with circulating sea water. The tanks were circular with the following dimensions: (1) 4 feet in diameter and 2 2/3 feet high and (2) 4 2/3 feet in diameter and 3 feet high. While the salmon were being held in the tank, sea water was being continuously circulated in the tanks from the sea water supply system on the deck of the A. T. Cameron. Fifteen salmon were tagged while taking the nets back on board the A. T. Cameron and after tagging and sampling for scales and length were placed in either of the two tanks. The maximum number of fish held in the tanks at any one time was eleven - six in one tank and five in the other. The salmon were held in the tanks for periods varying from 5.67 to 54.58 hours (Table 1) before being released provided they were in suitable condition for releasing.

Results and discussion

Thirty-one tagged adult Atlantic salmon were placed in the recovery tank; only two fish (6.5%) died subsequently. The initial condition of both fish which died was 'fair' but it became clear soon after they were placed in the tank that behaviour was erratic. Generally fish classified as 'fair' or better swam actively in the tank but these two specimens lay on their sides and did not engage in swimming activity unless disturbed by the rolling of the ship or by being lifted up manually from the bottom of the tank. After disturbance, the salmon swam for

2-5 minutes before sinking again to the bottom of the tank. Finally, they showed no movement of gills or body musculature and were removed from the tank.

The 29 fish which survived and were subsequently released did not lose condition while in the recovery tank. Condition generally improved. Nine salmon graded as 'fair' when placed initially in the tank were regraded as 'good' at the time of release while a further six fish maintained their 'fair' grading during the experiment, as did 14 fish graded as in 'good' condition. In general, fish were noticeably more active when released after 24 hours confinement in the recovery tank than during the first few hours after capture.

While the tagging mortality under experimental conditions was quite low it must be expected that mortality would be appreciably higher for fish released after tagging without a recovery period, because 6 (40%) of those fish graded as 'fair' did not resume swimming immediately they were placed in the recovery tank but sank to the bottom where they lay for up to one hour before active swimming resumed. Mortality and predator vulnerability of such torpid individuals would be considerable if they were not confined in recovery tanks. If one considers that the 6 fish which remained in a torpid condition for a prolonged period would not have survived if released immediately after tagging, the estimate of immediate post tagging mortality must be revised upwards to 26%. This may be a more realistic estimate of immediate tagging mortality.

References

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Table 1. Details on tag numbers, condition at time of tagging and release, duration held in recovery tank and position of release of salmon used for the tagging mortality experiment.

Tag No.	Time Hour	Tagged (GT) Day	Tagged (GT) Month	Condition Tagged	Scale Loss %	Survived	Died *	Time Hour	Released (GT) Day	Released (GT) Month	Position Released Lat.	Position Released Long.	Duration in tank (hours)	Condition Released	Scale Loss %	Tagged Deck	Tagged Boat
X10147	1100	26	August	F	10	X		1700	26	August	66°03'N	53°50'W	6.00	G	10	X	
X10148	1110	"	"	F	10	X		1700	"	"	" "	" "	5.83	G	10	X	
X10149	1115	"	"	F	10	X		1700	"	"	" "	" "	5.75	G	10	X	
X10150	1120	"	"	F	20	X		1700	"	"	" "	" "	5.67	F	20	X	
X10167	1430	30	August	F	10	X		1415	31	August	67°47'N	54°04'W	23.75	G	10	X	
X10190	0630	12	Sept.	F	15	X		1250	13	Sept.	67°57'N	54°11'45"W	30.33	G	15		X
X10191	1110	"	"	F	15	X		1250	"	"	" "	" " "	25.67	G	15	X	
X10193	0740	13	Sept.	F	5	X		1113	14	Sept.	67°10'30"N	54°26'00"W	27.55	F	5	X	
X10201	0630	"	"	G	15	X		1113	"	"	" " "	" " "	28.72	G	15		X
X10194	0830	"	"	G	15	X		1113	"	"	" " "	" " "	26.72	G	15		X
X10195	0840	"	"	G	5	X		1113	"	"	" " "	" " "	26.55	G	5		X
X10196	1110	"	"	F	15	X		1113	"	"	" " "	" " "	24.05	G	15	X	
X10197	1230	"	"	F	5	X		1113	"	"	" " "	" " "	22.72	G	5	X	
X10212	0730	16	Sept.	F	30	X		1405	18	Sept.	67°40'30"N	53°34'30"W	54.58	F			X
X10199	1000	"	"	G	20	X		1405	"	"	" " "	" " "	52.08	G			X
X10200	1100	"	"	G	5	X		1405	"	"	" " "	" " "	51.08	G		X	
X10202	1130	"	"	G	5	X		1405	"	"	" " "	" " "	50.58	G		X	
X10203	1240	"	"	G	10	X		1405	"	"	" " "	" " "	49.42	G		X	
X10204	0630	19	Sept.	F	20		X	*1700	*19	Sept.	-	-	10.50*	-	-		X
X10205	0630	"	"	G	5	X		1245	20	Sept.	67°35'00"N	54°10'30"W	30.25	G	5		X
X10206	0645	"	"	F	10		X	*1430	*19	Sept.	-	-	7.75*	-	-		X
X10207	0700	"	"	G	10	X		1245	20	Sept.	67°35'00"N	54°10'30"W	29.75	G	10		X
X10208	0830	"	"	G	10	X		1245	"	"	" " "	" " "	28.25	G	10		X
X10213	0705	"	"	G	10	X		1245	"	"	" " "	" " "	29.67	G	10		X
X10214	0845	"	"	F	10	X		1245	"	"	" " "	" " "	28.00	G	10		X
X10215	0730	"	"	G	10	X		1245	"	"	" " "	" " "	29.25	F	10		X
X10217	0745	"	"	G	20	X		1245	"	"	67°35'00"N	67°10'30"W	29.00	G	20		X
X10218	1300	"	"	G	15	X		1245	"	"	" " "	" " "	23.75	G	15	X	
X10216	1305	"	"	F	10	X		1245	"	"	" " "	" " "	23.67	G	10	X	
X10220	0630	20	Sept.	F	20	X		1210	21	Sept.	67°13'10"N	53°53'30"W	29.67	F	20		X
X10221	1100	"	"	F	15	X		1210	"	"	" " "	" " "	25.17	F	15	X	

Table 2. Criteria for rating the condition of fish for tagging.

Good	- minor scale loss (generally 10% or less but up to 20% if fish is very lively), fish lively and hard to handle, swims away quickly after tagging.
Fair	- moderate scale loss (generally 10% to 20% but to a maximum 30%), fish swims slowly in tagging tank and on release.
*Poor	- moderate to large scale loss (generally 10% to 30%), fish has difficulty maintaining its position in tagging tank; operculum or fins may be injured; if released, fish swims away sluggishly and erratically.

*Fish in poor condition were not tagged though this rating was used to describe condition of a tagged fish if, upon release, the fish was obviously in greater distress than had been anticipated.