

Recapture and spread of escaped farmed Atlantic salmon depends on the life stage at escape and farm location

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Extended abstract: To improve assessments of the environmental risks of aquaculture, we performed a series of simulated escapes of farmed Atlantic salmon from cages in seawater. From 2005 to 2010 almost 78 000 individually tagged smolts, post-smolts and adult salmon have been released from different locations at different times of the year. Smolts and post-smolts that escaped during their first summer were capable of rapid migration towards open sea. Some returned to spawn and were recaptured after 1-3 years at sea in nearby, but also in remote rivers hundred of kilometers away from the release site (Fig 1). Their mean recapture rate was 0.35 % (Table 1), but the recapture varied from 0.0 to 1.1 % between release groups. 12 % of the post-smolts that escaped during autumn were targeted in nearby fisheries the following months, partly because they had grown large enough to be caught in the gill-nets used, but more importantly because the migratory behavior declined with time. The mean recapture rates of adult salmon were high after releases in fjords (~ 30 %), lower after coastal releases (4 – 7 %) and zero at the outer coast (Table 2). Behavioral studies showed that escaped adults tended to stay within the fjord for several weeks and even months. This behavior increases their catchability in fjords where the fishing effort may be high. However, the majority of these recaptures were immature fish those were recaptured in sea relatively close to the release site during the first month's post-releases (only 0.2 % were recaptured in rivers), and adult escapees very rarely survived one year in the wild (Table 1). The risk that an escaped salmon reach maturity and enter a river to spawn appears to be highest if it escapes as a smolt or post-smolt during the first summer in sea, or if it has already started maturation at the time it escapes as an adult.

Table 1. Overview of the results. Numbers, mean size at release and time of recapture given by the numbers of years post-releases of fish released as smolts, postsmolts or adults.

Released	Size	Type	Recapture rate % (n)				
			0+	1SW	2SW	3SW	1-3SW
N	(kg)						
64172	< 0.23	Smolt	0.03 (22)	0.18 (114)	0.11 (68)	0.06 (41)	0.35 %
5529	~ 0.5	Postsmolt	11.68 (646)	0.02 (1)	0.07 (4)	0.11 (6)	0.20 %
8022	> 0.9	Adult	22.95 (1841)	0.07 (6)	0.01 (1)	0 (0)	0.08 %

Table 2. Numbers of adults released at 8 locations at the outer coast, coast or in fjords, and the percentages (n) of fish recaptured during the flowing months in sea or in rivers.

Site no	Locality type	Released N	0+ recapture rate % (n)		
			Sea	River	Total
2	Outer coast	502	0	0	0
3	Outer coast	302	0	0	0
4	Coast	300	5.00 (15)	0.67 (2)	5.67
5	Coast	350	3.71 (13)	0.29 (1)	4.00
8	Coast	280	5.00 (14)	1.79 (5)	5.79
1	Fjord	850	6.24 (53)	0.47 (4)	6.71
6	Fjord	1659	32.54 (504)	0	32.54
7	Fjord	3780	30.20 (1230)	0.18 (1)	32.38
Total		8023	20.3 (1629)	0.16 (13)	20.47

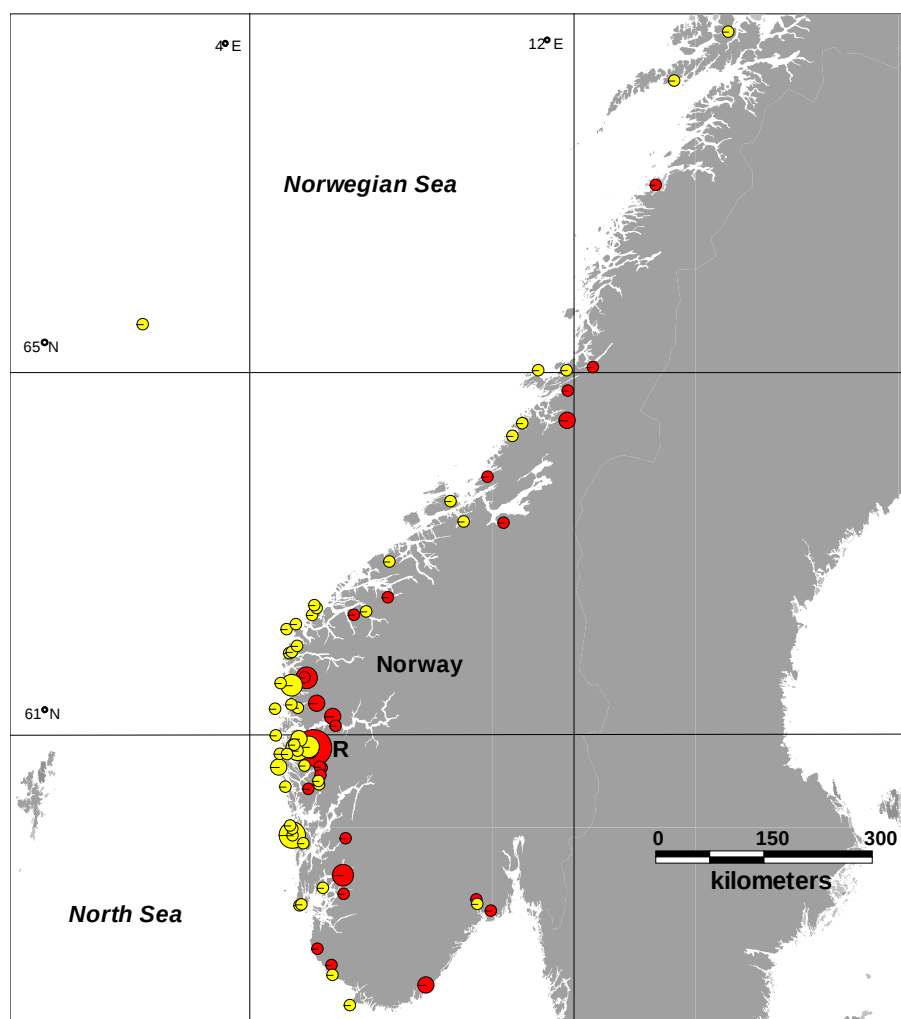


Figure 1. Recaptures of 1-3SW salmon after releases of smolts and postsmolts at site 6 (R) from 2005 – 2010 in sea (light grey) and in rivers (dark grey). Sizes of circles vary according to the number of fish from 1 to 8. Fish captured in sea <1 km from release site is not shown (40 % of catch).