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THE STATUS OF PINK SALMON IN NORTH NORWAY

BY

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Summary

The interest in introducing Pacific salmon species for mariculture and enhancement purposes have been increasing in Western Europe during the recent years. Risks implied are diseases and escape-ments followed by interactions with native species. In North Norway pink salmon have occurred commonly since 1960, as a result of Russian enhancement efforts. The stock have been decreasing during the last years. The catch at the coast of Finnmark in 1979 was less than 30% of the 1977 catch. The migration from the feeding areas to the shore takes place towards West Finnmark, after which the run turns east along the coast of Finnmark. In West Finnmark captures take place most intensely about 25-30 June, and in East Finnmark 5-10 July. Upstream migration reaches the peak during the last half of July. Spawning starts between 15 and 20 August, and goes on to about 15 September. The interactions with Atlantic salmon at the spawning grounds do not seem to be alarming, as the spawning in pink salmon determines before the Atlantic salmon start. If the Russian enhancement program is abandoned, the continued existence of pink salmon in the North East Atlantic will probably depend on some kind of Norwegian effort.

There has been a growing interest in Western Europe during the recent years for introducing pacific salmon species for pen rearing and enhancement (Harache & Novotny, 1976, Munro, 1979, Solomon, 1979). For the moment most effort is devoted to the mariculture of coho, as a cheaper alternative to rearing of atlantic salmon. Some escapes have already occurred from fishfarms in Normandy and Brittany. It still remains to see whether the escapements will result in establishments of selfsustaining populations, competing with native salmonids.

Besides coho, pink and chum are the two pacific salmon species of greatest interest for West-European mariculture and enhancement. These are species leaving freshwater as fry, and therefore lend themselves very well to enhancement- and penrearing programs based on low cost production of sea migrants.

The risks of introductions allways imply escapements, followed by some kind of interaction with native species. The long term effects of such interactions are very uncertain. It will therefore be of interest to study the situation in areas where pacific salmon have been established for some time as a result of large scale enhancement programs (Kossov et al., 1960, Lear, 1975, Berg, 1977, Grinyuk et al., 1978, Bjerknes & Vaag, 1980).

This report accounts for some experiences with pink salmon in the wild state in Finnmark, North Norway, where the species has occurred commonly since 1960, as a result of russian efforts (Berg, 1977).

It has recently been suggested from russian fisheries authorities in Murmansk that the pink salmon enhancement program in the North East Atlantic will be determined due to the low benefit (D. Møller, pers. comm.). Continuing sustainment of a pink salmon population in this area may therefore from now on be dependent on norwegian activity. Norwegian effort will also be desirable to satisfy the requirements of fertilized eggs or fry for experimental purposes elsewhere in Western Europe. Importation of pink salmon from North Norway will have clear advantages compared to transplants from the North Pacific.

#### The capture of wild pink salmon in Norway.

Pink salmon are mainly caught in norwegian waters as bycatch to the atlantic salmon fishery. Driftnets for catching atlantic salmon are legal outside the costal baseline north to Sværholt in Western Finn-

mark (south-east of North Cape). The inshore fishery at the coastline and in the fjords is mainly based on gillnets and bagnets. The season for offshore- and inshore salmon fishery has till now been 1 May to 5 August, while in the rivers fishery continues to 31 August.

The predominant catch of norwegian pink salmon takes place in Finnmark county, while strayfish appear commonly south to Bergen. In years of high abundance spawning migrants have also been registered in other contries around the North Atlantic basin, e.g. Iceland in 1960 (Gudjonsson, 1961) and 1973 (A. Isaksson pers. comm.), and in Scotland in 1960, 1965, 1967 and 1973 (Williamson, 1974).

After the first appearance in Norway in 1960 (Berg, 1961), the size of the pink salmon stock has fluctuated to a great extent, with peaks in 1965 and 1973. During the years after 1973 there has been a continuing decrease in the number of spawners from one generation to the next. In conformity with the mother population in Sakhalin, odd years spawners are most abundant. The per cent of equal years spawners has fluctuated between 1.2 and 9.6 compared to next years run during the 1970's (Grinyuk et al., 1978).

The first attempt to compile catch statistics from the salt water fisheries was made by Varanger Salmon Board in 1975 for the Varangerfjord area (T. Bårdsen, pers. comm.). The same year catch statistics were started for the Tana river (Bjerknes & Rikstad, 1978). Starting in 1977, catch statistics have been compiled for inshore waters in whole Finnmark for the recent years (Bjerknes & Vaag, 1980). Tabs. 1, 2 & 3 give summaries of the catches.

Tab.1. Catches of pink salmon in Varangerfjord (Nesseby and Sør-Varanger).

	1975	1976	1977	1978	1979
Numbers	5600	-	4780	73	620
Weight (kg)	-	-	6850	105	1010

Tab.2. Catches of pink salmon in Tana river.

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>
Numbers	2340	290	1370	0	400
Weight (kg)	4770	500	1730	0	430

Tab.3. Inshore and offshore catches of pink salmon in Finnmark.

	<u>1977</u>		<u>1978</u>		<u>1979</u>	
	Number	Weight	Number	Weight	Number	Weight
Gilnets/ Bagnets (Inshore)	10600	15200	320	500	2960	4340
Driftnets (Offshore)	2200	3250	-	-	370	740
<b>Total</b>	<b>12800</b>	<b>18450</b>	<b>-</b>	<b>-</b>	<b>3330</b>	<b>5080</b>

Compared to corresponding coastal areas for instance in western Alaska, these catch numbers are quite insignificant. Along the scarcely populated Varanger fjord, however, pink salmon contribute with a significant part to the total salmon fishery.

Spawning migrations in salt water.

The migrations from feeding grounds to the coast seem to be restricted to the ocean areas outside West Finnmark. Catch statistic data indicate landfall in the areas around Sørøya, which also constitutes the main gate for atlantic salmon on its way to the Finnmark rivers (L.Rosseland, pers.comm.).

The catch statistics in the four northern statistic areas for drift-nets, show a high number of pink salmon for West Finnmark in 1979, compared to the neighbouring area, Troms, situated farther south. Tab.4 gives the catch numbers of the four northern driftnet areas from Helgeland (north of 65°N) to Hammerfest (north of 70.2°N) (Central Bureau of Statistics, pers.comm.).

Tab.4. Pink salmon catches in driftnets outside the costal base line of the northern statistic areas in Norway, 1979.

(South)	Helgeland	Vesterålen and Lofoten	Troms	Hammerfest	(North)
Number	14	50	80	370	
Kg	26	98	162	740	

The high inshore catches in western coastal areas compared to the corresponding fjords is another fact indicating the coastal approach of pink salmon in this area (Tab.5).

Tab.5. Catch distribution in costal- and fjord areas in Finnmark in 1977 and 1979, in per cent of total inshore catch. For a definition of the areas it is referred to Bjerknes & Vaag (1980).

	1977	1979	1979 in % of 1977	
Coastal areas from west to east.	Sørøysund, Kvalsund, Hasvik,			
	Loppa	7.1	19.2	75
	Nordkapp, Måsøy	10.9	28.0	71
	Nordkynn	12.9	17.2	37
	Varangerhalvøya	8.4	3.4	11
Fjords from west to east.	Altafjord	0.7	0.7	25
	Porsangerfjord	1.2	1.0	23
	Laksefjord	7.9	7.4	26
	Tanafjord	6.5	2.0	8
	Varangerfjord	44.4	21.0	13

The migration scedual (Tab.6), showing a significant delay in the catches for eastern areas compared to western areas, indicates a west to east direction of the run (Bjerknes & Vaag, 1980).

Tab.6. Dates by which 50% of the pink salmon inshore catches were made in 1977 and 1979 (from west to east).

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	Nordkapp, Måsøy	Varangerfjord
1977	29 June	6 July
1979	25 June	9 July

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The Varangerfjord catches are quite high both years, which corresponds very well to the general opinion that the rivers draining to this fjord represent the most important reproduction areas of pink salmon in Norway (Bjerknes, 1977a).

#### Upstream migration.

In the Tana river 50% of the pink salmon catch was made about 21 July in 1977. The corresponding date for the Tanafjord was 6 July. There seems to be a similar delay between the Varangerfjord and the Neiden river draining to this fjord.

These are huge rivers, and it is difficult to see any significant relationship between daily river flow and upstream migration of pink salmon, as pointed out by Davidson et al. (1943).

In Neiden pink salmon usually appear between July 10 and 15, ascending most intensely in the end of July. Spawning usually starts between August 15 and 20, as the water temperature falls beneath 10°C (Bjerknes & Rikstad, 1977), and goes on to September 15.

According to Canadian authors (e.g. Neave, 1953), pink salmon commonly utilizes the lower ranges of the rivers for spawning. This is certainly also the case in the Neiden river, where spawning were observed below the high water mark in 1975 and 1977. In the Tana river, however, pink salmon are regularly caught at Jergul, 300 km above the river mouth (K. HoImestrand, pers. comm.). In years of high abundance (1960, 1965, 1973), pink salmon were observed schooling in the pool under Jiesjokgorzzi waterfall, 350 km above the river mouth, constituting the end point for salmon in the Tana river (H. Eriksen, pers. comm.). The absence of interaction with other Oncorhynchus species with regard to spawning grounds may be one possible explanation of the extremely long upstream migration in the Tana river. In Neiden the pinks seem to have some difficulties ascending the Skoltefossen waterfall 12 km above the river mouth, resulting in aggregations of fish in the lower part of the river (Bjerknes, 1977a).

The upstream migration of anadromic species in Neiden generally follows the scedual expressed in Tab.7 (Bjerknes & Rikstad, 1977).

Tab.7. Scedual for upmigration of anadromic species in Neiden.

Large atlantic salmon	10 June - 15 July
Atlantic salmon grilse	10 July - 30 August
Pink salmon	15 July - 15 August
Anadromic trout	1 Aug. - 15 September

Spawning.

Observations of spawning made by the autors in 1975 and 1977 can be summerized in the following points:

1. Pink salmon appearently spawn in aggregations, numbers of pairs in the same pool at the same time.
2. Premature couples of atlantic salmon were generally observed in the deeper parts (2-4m) of the same pools during the pink salmon session.
3. Pink salmon spawn, at least partly, in very shallow water (0.2-0.6m), at sites not utilized by the later spawning atlantic salmon.
4. Carcasses of spawned pink salmon appeared from about 1 September.
5. Spawning determined around 15 September.
6. In bouth years the atlantic salmon started spawning around 15 October in the pools utilized by pink salmon 1-2 months earlier.

One conclusion from these observations is that the atlantic salmon spawn definitely later than the pinks. The competition for spawning grounds, therefore seems to be in favor of the atlantic salmon, and possibly to detriment of pink salmon redds. However the spreading of fungus from dead pink salmon eggs may in its turn cause some mortality to atlantic salmon eggs within the same redd.

A reduction in the water level commonly takes place in the Finnmark rivers during the late autumn. This may result in dessiccation of redds situated in shallow water, with subsequent death of the eggs.

Due to the higher water temperature during the early incubation, pink salmon eggs are suggested to hatch during February - March, i.e.

about two months before the atlantic salmon. Seawards migration takes place after the emergence from the gravel in May - June (Bjerknes, 1977a). At this time the atlantic salmon fry are still in the alveline stage.

Concluding remarks.

The presence of pink salmon in Finnmark for the last twenty years has not made any provable harm to the atlantic salmon. The biology of the two species implies a minimum of interspecific competition, an assertion supported by the sparse observation material presented above. The presence of diseases has not been detected in wild pink salmon in North Norway, as has been the case under pen rearing conditions (E.Egidius, pers.comm.).

The straying of pink salmon from the russian transplants has brought some doubt about the homing ability of pink salmon (e.g.Berg, 1961). However, studies carried out in the North Pacific conclude that less than 1% of pink salmon return to other than the natal river (Pritchard, 1939, Sano & Kobayshi, 1953). Bams (1976) suggests that some of this discrepancy between wild and transplanted populations may be explained by a genetic component operating in conjunction with an enviromental inprinting mechanism, so that donor stocks, and to a lesser extent donor-native hybrids, exhibit greater straying than stoks native to a certain river or fjord system.

The clear west-east spawning migration evidenced along the coast of Finnmark for the recent years may thus indicate the establishment of homing to russian and norwegian rivers close to the original introduction areas (Bjerknes & Vaag, 1980).

With its short resident time in freshwater, pink salmon lends itself to large scale enhancement programs, and as a low cost alternative in mariculture. Raising pink salmon fry in limed freshwater in Southern Norway could be considered an alternative in the increasing number of rivers where the atlantic salmon is wiped out due to acidic precipitation (Bjerknes, 1977b).

The possibilities for utilizing norwegian pink salmon for such programs in the future will depend on the delivery of fertilized eggs to fish-farms for the establishment of donor stocks. The definite two year



life cycle with a total mortality for the parent population, makes pink salmon extremely susceptible to the unfavorable climatic conditions of North Norway. Without any kind of enhancement effort, there will be a certain risk that the stock may decrease to an extent where self-sustainment will no longer be possible (Surkov & Surkova, 1971).

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