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MEMORANDUM FOR THE MINISTER

FACTORS AFFECTING THE 2009 FRASER SOCKEYE RETURN

(Information Only)

SUMMARY

- Sockeye salmon returns to the Fraser River in 2009 are significantly below the pre-season forecast. While the explanation for the poor 2009 Fraser return is not known, a number of factors could be important.
- Viral disease, toxic algal blooms and/or low food availability in Queen Charlotte Sound could have led to sockeye mortality at the level observed.
- Sea lice from fish farms, Humboldt squid predation and U.S. fisheries could have contributed to the sockeye mortality but are likely insufficient in themselves to explain the poor return.
- Staff continue to assemble data and analyze the key hypotheses which could inform a post-season review.

Background

- Sockeye salmon returns to the Fraser River in 2009 are significantly below the pre-season forecast. The actual return is now estimated to be on the order of 1.4 million fish, whereas more than 6 million fish¹ were expected. One exception is Harrison sockeye, which returned to the Fraser system significantly above expectation.
- Unlike other recent years when returns to the Fraser were poor, sockeye returns to Barkley Sound and the Columbia system were above expectations. However, returns to the Skeena were also poor.

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¹ Fisheries and Oceans Canada provided a range of forecasts for the abundance of Fraser River sockeye in 2009, from 3.6 million to 37.6 million fish. The most commonly reported forecast is the 50% probability estimate at 10.6 million; i.e. there was a 50% probability that the return would have been greater than 10.6 million sockeye. The 75% probability estimate referenced above was 6.0 million.

- While the explanation for the poor 2009 Fraser return is not known, staff have now considered factors which could have impacted sockeye at different stages of their life cycle as they migrated from their lake-rearing habitats to the Strait of Georgia (spring/early summer 2007), on to the Gulf of Alaska and the Bering Sea and back again to spawn.

Analysis / DFO Comment

- The following factors are unlikely to have contributed to the poor 2009 return:
 1. **Pollution in the Fraser River.** There is no record of any Fraser Basin wide environmental incident that could have impacted the fish.
 2. **Capture by Canadian fisheries.** In 2009, the Canadian fishery was minimal and did not contribute to the poor return.
 3. **Predation on juvenile salmon in Strait of Georgia.** There are no known shifts in predator abundance that could explain increased predation in 2007.
 4. **Low food abundance in the Strait of Georgia.** Juvenile sockeye feed on krill. A krill fishery takes place in Jervis Inlet, but it removes a small amount of krill relative to the total krill biomass. Staff will review survey data for any evidence that juvenile sockeye were food deprived.
- The following factors may have contributed to sockeye mortality, but not at a magnitude sufficient to explain the poor return in 2009:
 1. **Predation by Humboldt squid.** Humboldt squid is a voracious predator that has increased dramatically in abundance in Canadian waters since 2007. Salmon have not been identified in their diet. Surveys in 2009 will be analyzed to assess any possible link to salmon.
 2. **Capture by U.S. fisheries.** Fraser sockeye are intercepted in U.S. Gulf of Alaska fisheries and Bering Sea fisheries. The level is not well documented but appears to be very low.
 3. **Mortality attributed to sea lice from fish farms in Discovery Passage.** While sea lice from farms could have contributed some mortality of juvenile sockeye, sea lice from natural sources could also be a factor. Staff are assessing the lice loads on farms at the time of the 2007 migration.
- The following factors could possibly have led to sockeye mortality at the scale observed:
 1. **Toxic algal blooms in the Strait of Georgia.** Extensive blooms of toxic marine algae were identified in the Strait of Georgia during 2007 when juvenile sockeye were present. Staff are working with Vancouver Island University and the aquaculture industry to assess any possible link.
 2. **Low food abundance in Queen Charlotte Sound.** Poor food supply may have impacted the survival of juvenile sockeye in Queen Charlotte Sound in the spring of 2007.

3. **Viral disease.** Preliminary evidence suggests that Fraser sockeye may be infected with a virus that could lead to mortality throughout the salmon life cycle. Staff are conducting further tests to confirm whether or not a virus could be present.

Next Steps

- Staff are continuing to assemble data and analyze the key hypotheses which could inform a post season review.
- Studies on the link to a potential viral disease are proceeding and more information is expected within the next month.


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