APPENDIX 1

Open Net Pen Provincial Score Adjustments

The Seafood Watch (SFW) assessment provides a score for rainbow trout in open net pens and raceways for the whole of Canada. However, practices differ across regions, and there are some differences at the provincial level that justify a higher score for open net pens in both Ontario and British Columbia. Evidence in Ontario indicates a lower concern for chemical use and, in British Columbia, the only location that used open net pens has transitioned to a floating closed-containment system instead.

Under the adjusted scores, Rainbow/Steelhead trout farmed using both open net pens in Ontario and floating closed-containment in British Columbia score above 5.5 and are therefore Ocean Wise recommended.

Note that the assessment was scored according to SFW standard 3.1. This appendix update is scored according to SFW standard 3.2. Instead of sub-criterion 6.2 being scored for Invasiveness, 6.2 is scored for Competitive and genetic interactions. However, the matrix for awarding the overall score for Criterion 6 is identical.

1.1 ONTARIO

Scoring

	Criterion	SFW Assessment	Adjusted ON score
C1	Data	7.5	7.5
C2	Effluent	7	7
C3	Habitat	7.33	7.33
C4	Chemicals	3	5
C5	Feed	6.95	6.95
C6	Escapes	4	4
C7	Disease	5	5
C8x	Source	0	0
C9x	Wildlife mortalities	-3	-3
C10x	Introduced Species escape	-0.5	-0.5
	Total	37.28	39.73
	Final score	**5.326**	**5.676**

1.2 CRITERION 4: CHEMICAL USE

Justification of Score Change

In the assessment, this Criterion 4 scores 3 out of a possible 10. This is largely due to confirmed antibiotic resistance and the unknown effectiveness of the few management regulations in place. Additionally, multiple chemical treatments have been performed on sites in the past. However, since the report was researched, new information specific to Ontario has become known, warranting re-scoring of this criterion.

In particular, new regulations concerning antibiotic use came into force in December 2018 and, in the same month, the Ontario net pen industry achieved Best Aquaculture Practices (BAP) Facility Certification, which has stringent requirements for reporting. Although net pens allow chemical treatments to discharge into the environment, government data indicates that in both 2016 and 2017 no net pen farms used chemical treatments more than twice annually. Additionally, the Ontario Ministry of Food and Rural Affairs (OMAFRA) argue that the study cited in the assessment which indicated confirmation of disease resistance does not apply directly to the Ontario net pen industry.

Chemical use is very low and there are regulations and management in place that help limit the frequency and total use of chemicals, with demonstrated effective enforcement. Although there is some concern of resistance, it has not yet been confirmed. For these reasons, this criterion scores 4/10 for Ontario.

Given consistent declines in antibiotic use over at least the last five years, a trend adjustment of 1 for the province is also added.

The overall score for this criterion, therefore, is 5/10.

Detailed background

Chemical Use

Further to the assessment, since December 2018, Ontario now requires any antimicrobial treatment to be prescribed by a veterinarian (OMAFRA, 2019). This regulation requires that the vet visits the production facility to fully assess the situation and that the prescription must be made to minimize risk to the environment (A. Reid, OMAFRA, 2019). Prior to this, farmers could use oxytetracycline with no oversight (R. Taylor, pers. comm. 2019). Although the Province does not have set limits on antibiotic use, this regulation minimizes use effectively. Environmental factors also limit the practical use of antibiotics; the water temperature is often too low for use, because the reduced fish metabolism below 10°C prolongs clearance. Therefore, net pen fish can only be medicated for approximately 6 months of the year (OMAFRA 2019).

Farmers are required to report all chemical use to the Government, and data from 2016 and 2017 shows that chemical use was minimal (DFO 2019). Only one net pen farm reported any chemical use in each year and both reports were for two treatments of antibiotics (DFO 2019).

Antibiotic Resistance

The assessment indicates that there is evidence of antibiotic resistance in Ontario farmed trout samples. However, more recent information from the Animal Health and Welfare Branch of OMAFRA indicates that although the study cited, conducted by the Ontario Animal Health Network (OAHN), did show some antimicrobial resistance, it cannot be attributed to Ontario net pen farms. The study states that samples came from commercial aquaculture farms and government hatcheries operated by the Ontario Ministry of Natural Resources and Forestry (MNRF) (OAHN, 2018) however, according to OMAFRA, isolates used in the samples actually came from mixed sources, including from outside of Ontario and zoological samples (OMAFRA, 2019). Clearly there is concern of antibiotic resistance, although attribution is currently problematic.

Trend adjustment

Industry data from at least the last five years have shown consistent declines in chemical use. As reported in the assessment, medicated feed use has reduced from 1-4% prior to 2013 to significantly less than 1% currently due to better management practices (S. Naylor, pers. comm. 2018). The companies that reported data to the assessment demonstrated treatments are once or twice per year and for one producer, who also reported a decrease over recent years, medicated feed was just 0.002% of the annual total volume (Anonymous. pers. comm. 2016).

2.1 BRITISH COLUMBIA

Scoring

	Criterion	SFW Assessment	Adjusted BC score
C1	Data	7.5	7.5
C2	Effluent	7	7
C3	Habitat	7.33	7.33
C4	Chemicals	3	3
C5	Feed	6.95	6.95
C6	Escapes	4	7
C7	Disease	5	5
C8x	Source	0	0
C9x	Wildlife mortalities	-3	-3
C10x	Introduced Species escape	-0.5	-0.5
	Total	37.28	40.73
	Final score	**5.326**	**5.819**

2.2. Criterion 6: Escapes

Justification for Change in Score

The overall score for Canada for this criterion was 4, due to a moderate-high risk of escape (score: 2) and a low-moderate risk of competitive or genetic interactions (7/10). However, in British Columbia there is only one floating pen rainbow trout producer, which operates in a unique situation compared to other open net farms across Canada. Instead of using mesh nets that are open to the water, fish are grown using floating closed-containment pens made of fibreglass. Additionally, farming takes place in a man-made lake formed by a dam several decades ago.

Although there is a very small risk of trickle-loss through stocking, the risk of loss from the pens themselves is minimal, as they are closed-containment and built with certification to high industry standards. There is also minimal risk of fish reaching the natural watershed as all water passes through the turbines of dam, which is known to cause high mortality rates. Although there is some evidence that fish can survive hydro-turbines, there are no reports of escapees having been found in surveys of the Lois River. Therefore, as connection to natural water bodies is severely curtailed, escape risk scores 7/10.

Competition and genetic interaction risk is also minimal, as the lake environment is significantly altered from its natural state. The lake itself was formed from flooding when the dam was built and escaped fish from previous iterations of the farm are already established. Some competitive interactions are possible, but any escapes would occur in an environment significantly altered from its natural state and further risk is minimal. Therefore, this sub-criterion has no change to its score, which is 7/10.

The overall adjusted score for Escapes is 7.

Detailed Background

6.1 Escape Risk

The only farm operating with pens in British Columbia is sited on Lois Lake, near Powell River. Lois Lake is a man-made lake, created by the installation of a dam which flooded three natural lakes. The dam was built in 1941 (Lambert 2015), without a fishway (DFO 1991), and the natural waterway (Lois River) has been cut off since. There has been no history of flooding or bypass of the dam.

Escape risk is scored according to the production practice and location of the farm. The production method is unusual in that, since 2019, adult grow-out is conducted in a state-of-the-art floating closed containment system. This significantly reduces the susceptibility to escapes risk that net pens are subject to as the system is built out of fiberglass and not able to tear or collapse. Although an early prototype of the technology cracked after a storm in 2011, which resulted in the loss of some Chinook salmon (Grydeland, 2012), the current technology has been upgraded and is now certified to Norwegian standard NS9415 (S. Wilton, AgriMarine, pers. comm. 2019). This certification is the industry standard in Norway for floating fish farm installations and contains requirements for design, construction, installation and operational requirements that minimize escape risks, ensuring structures can cope with forces from waves, winds and currents (Norwegian Ministry of Fisheries and Coastal Affairs, 2006; Senate Canada, 2015). This standard has significantly reduced escapes since it became an requirement for all floating pen farms in Norway in 2003 (Jensen et al., 2010). Additionally, the majority of fish transfer is done by pipe directly from the hatchery on shore which

minimizes the possibility of trickle loss during stocking. With the new technology, escape risk has been reduced close to zero.

Additionally, risk to natural waterbodies is minimized as the farm operates in a man-made lake, cut off from the river below by the dam. The ecosystem has been substantially altered from its natural state for over 75 years, such that it can be considered unnatural. As there is no fishway, all water passing from the lake to the Lois River below passes through turbines, which has a very high risk of mortality, or severe injuries that may cause delayed mortality, to fish passing through (Mueller et al., 2017).

6.2 Competitive and genetic Interactions

A 1993 survey of the Lois Lake drainage system noted the presence of native rainbow trout, cutthroat trout and kokanee, the latter likely the remnants of a sockeye run cut off by the dam (SSCA 201). Different iterations of aquaculture in the lake over the last 45 years have altered the natural species composition substantially. A survey of the lake in 1991 captured escaped Chinook and coho from previous iterations of the farm (DFO 1991), and a later survey in 1996 found that 80% of fish sampled were escaped coho and Atlantic salmon from farming on the lake (Lough et al. 1997). No recent survey has been performed, but it can be assumed that there are likely escaped rainbow trout also established in the system. Anecdotally, stocking has also occurred in the lake since the 1950s (FishnBC 2018; S. Wilton, pers. comm. 2019). However, Freshwater Societies of British Columbia has no historical official record of stocking the lake (FSBC, pers. comm. 2019).

Although any occurrence of escapes could result in element of competitive interaction with other fish in the lake (NRC 1997), the lake is already significantly altered ecosystem, having been severed from the natural waterway for over 70 years and there being established populations escapees from previous iterations of the farm over four decades.

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