

Book review...Toxic

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In *Toxic: The Rotting Underbelly of the Tasmania Salmon Industry*, Booker Prize winner Richard Flanagan investigates the dubious practices of farming Atlantic salmon in Tasmania. The industry, which markets itself as the world's best practice, has become a vast, largely unregulated industry over the past fifteen years and has caused significant environmental degradation to pristine World Heritage waterways and endangered ecological communities.

Flanagan has spoken to scientists, activists, community members and reviewed evidence from journal articles, international reports, and legislative inquiries to provide a fully referenced review of the Tasmanian salmon industry.

A large body of evidence supports dietary omega-3 polyunsaturated fatty acids as beneficial to human health, including a balanced dietary omega-6/omega-3 ratio. Consequently, fish and seafood consumption, particularly oily fish, is recommended in most national dietary guidelines. However, Flanagan demonstrates how Tasmanian Atlantic salmon, exposed to genetic modification, synthetic dyes, antibiotics, and other petrochemicals, is anything but the healthy, sustainable omega-3 rich food source the industry has led consumers to believe.

Toxic is a confronting read, but for anyone concerned about the environment and the food they eat, it is an essential read.

Highlights

A handful of things to consider before buying and consuming farmed Tasmanian Atlantic salmon:

- **Salmon farming threatens wild fish stocks**

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Atlantic salmon are carnivorous fish largely dependent on wild-caught fish (e.g. sardines, anchovies) manufactured into fishmeal and fish oil. While the amount of wild-caught fish used in feed has been reduced over recent years, it is currently higher than the amount of salmon grown in farms, resulting in an overall burden on wild fish stocks and ocean ecosystems. Australia's most prominent salmon producer, Tassal, uses 1.73 kg of wild-caught fish in feed to produce just 1 kg of farmed salmon.

- **Potentially harmful chemicals are used to preserve salmon feed**

Ethoxyquin (EQ) is widely used in fishmeal to protect it against lipid peroxidation and self-ignition during long-distance transport. Ethoxyquin was developed by Monsanto in the 1950s as a pesticide. Ethoxyquin cannot be used in any food for human consumption except spices (e.g., chilli), but it can pass from feed to farmed fish. Farmed fish is probably the primary source of EQ and its residues for European consumers. EQ toxicity and mutagenicity were observed in vivo and in vitro studies showing its potentially harmful effects. However, data are lacking to assess its human health effects. Some Tasmanian salmon feed contains EQ.

- **Salmon are now fed land-animal based protein**

The commercial diets of farmed salmon have changed over the past 15 years towards a more plant and land-animal based diet due to the limited availability and cost of fish meal and fish oil. Much of the animal protein used in Tasmanian salmon feed is chicken-derived, including poultry oil, poultry meal, and feather meal. Chicken meal is prepared from the carcasses of slaughtered poultry, such as heads, feet, intestines, and frame, and can include foreign matter such as aluminium bag clips and elastic netting/bands.

- **Salmon farming is driving deforestation**

Another way of replacing fishmeal in salmon's diet is to use high-protein vegetable matter such as lupins, wheat, canola, and soy. Much of this comes from Australian farms, excluding soy which is sourced through global supply chains from South America and contributes to Amazon deforestation and Indigenous dispossession.

- **The nutritional profile of farmed salmon has declined**

Replacing the traditional fish meal and fish oil in farmed salmon diets with plant-based alternatives, devoid of omega-3 fatty acids, has altered the fatty acid composition of farmed salmon and compromised its nutritional value. A Scottish study comparing the fatty acid composition of Scottish Atlantic salmon farmed between 2006 and 2015 found a decrease in omega-3 levels of 30-50%. Additionally, the omega-6 content is increasing in farmed salmon, and animal models demonstrated the consumption of farmed salmon raised on vegetable oils resulted in increased tissue inflammation, weight gain and insulin resistance in mice.

- **Synthetic compounds are used to dye salmon**

Farmed salmon are naturally white or grey. Pigmenting compounds are added to feed so that the salmon can achieve the same deep pink colour that wild salmon obtain naturally from carotenoids, which are found in crustaceans, algae and other naturally occurring sources. The Tasmanian salmon industry uses a synthetic version of the red dye called astaxanthin derived from petrochemicals.

- **Use of antibiotics in salmon farming contributes to rising antibiotic resistance**

Antibiotics are used to control fish disease in overcrowded fish pens. Recent reports indicate some Australian salmon producers' antibiotic use is increasing to allow for stocking densities that fail to provide healthy growing environments for salmon. Salmon do not efficiently metabolise antibiotics and excrete about 75% of what they are given. This practice leads to the accumulation of antibiotic residues in the aquatic environment, especially in marine sediments where they can persist for months. Even low levels of antibiotics found in farmed salmon in the United States have been linked to the growth of antibiotic resistance in the human population.

- **Use of genetically altered salmon**

The Tasmanian industry subjects salmon eggs to thermal or pressure shocks to create a sterile creature with three sets of chromosomes known as triploids. The process prevents early sexual maturation, allowing farmers to delay harvest and grow larger fish for market. However, genetically altered salmon are prone to health effects such as skeletal and heart deformities and are more prone to hypoxia. The RSPCA states that the triploidisation process and the farming of triploid salmon should not be permitted.

- **Salmon are kept in overstocked feedlots**

Salmon are reared in feedlots stacked in towers up to 20m high, in which faeces and nutrients accumulate, and oxygen is depleted. Rearing salmon in cages constrains their natural swimming behaviour as it deprives them of swimming the great distances that are normal for wild salmon at sea. That constraint is exacerbated at high densities, and salmon suffer stunted growth, deformity, depression, injury, disease, and increased mortality rates.

- **Freshwater bathing is required to reduce amoebic gill disease**

Atlantic salmon cultured in Tasmanian commercial farms are at risk of contracting and transferring infectious bacterial diseases and other pathogens such as amoebic gill disease (AGD). To avoid salmon stock being killed by amoebic gill disease, the fish also need to be "bathed" in giant freshwater bladders on a monthly, sometimes fortnightly, rotation. The salmon are vacuumed from their nets into bladders and then returned to their saltwater pens. Freshwater bathing requires large volumes of freshwater and takes place on giant factory ships, contributing to excessive noise pollution, generation of significant volumes of contaminated water and industrialisation of waterways.

- **Salmon farming causes significant ecological and environmental damage**

Salmon farming in poorly flushed shallow waterways has led to excessive nutrient accumulation, low dissolved oxygen, excessive growth of toxic algae, remobilisation of heavy metals trapped in sediments, and significant impact to endangered species habitat. For example, on Tasmania's west coast, salmon farming in Macquarie Harbour has contributed to depleting oxygen levels in the harbour to the extent that marine dead zones have formed and endangered species, including the Maugean skate, the world's rarest skate, are now at risk.

In *Toxic*, Flanagan provides a provoking insight into the Tasmanian salmon industry, including the environmental destruction, animal cruelty, lack of effective regulation and government obfuscation. However, he does highlight how tighter regulation in Europe has improved environmental outcomes there and proposes that land-based systems may provide cleaner and more sustainable alternatives to current salmon farming practices in Tasmania.

Toxic highlights important factors that we should consider before buying Tasmanian Atlantic salmon and demonstrates a need to consider our food choices and seek sustainable alternatives.

For sustainable seafood alternatives please refer to the [Sustainable Seafood Guide](#).

References

- 1 Flanagan R. Toxic The Rotting Underbelly of the Tasmanian Salmon Industry 2021. Penguin Random House. Australia.