

# CLOSED CONTAINMENT

*The Future of Salmon Aquaculture is Here*



Land-based salmon farm. Photo: Corey Peet

**Aquaculture has become an important means of satisfying seafood demand, but can come with its own ecological costs.**

**Closed containment technology is the most sustainable way to meet the demand for farmed salmon.**

Worldwide, aquaculture has grown exponentially in the last two decades and now makes up about one-third of all seafood production.

However, not all aquaculture is equal. Open net-cage salmon farming poses environmental threats in all regions it is practiced, including the spread of sea lice and disease, pollution of the marine environment with waste and chemicals, and risks to the survival of wild salmon populations and other marine life.

Closed containment uses barrier technologies that ensure no contact between wild and farmed fish, thus eliminating the most harmful impacts of net-cage operations and significantly reducing others. It is the way to achieve financially viable salmon aquaculture while reducing the risks to local marine ecosystems.

## TYPES OF CLOSED CONTAINMENT SYSTEMS FOR SALMON

Many kinds of closed containment technologies are used to grow a wide variety of seafood around the world. Two distinct technologies have emerged as the most effective for growing salmon at a commercial scale:

### Recirculation Aquaculture Systems (RAS)

Fish are grown in tanks, primarily on land, with up to 98% of the water being filtered, cleaned and reused. Water treatments include oxygenation, removal of solid waste, biological filtration to remove waste ammonia and nitrite, and stabilizing of water pH levels. Optimizing water quality allows for increased density and faster growth rates.



Land-based salmon farm. Photo: Corey Peet

### Flow-Through – Ocean Based

Fish are grown in large floating tanks. Ocean water is drawn from a depth determined to eliminate disease and pathogen transfer, oxygenated, then pumped into the tank where it can be treated and filtered to ensure high quality rearing water and that discharge water is returned to the ocean clean. The solid waste (fish feces and uneaten feed) is collected, treated and available for use as compost.



AgriMarine marine-based salmon farm.

# BENEFITS OF CLOSED CONTAINMENT FOR SALMON AQUACULTURE

## Environmental Benefits

Closed containment systems can:

- › eliminate or greatly reduce the risk of disease and parasite transfer to wild salmon;
- › eliminate solid waste dispersal and resulting contamination of the marine environment;
- › eliminate escapes;
- › eliminate deaths of sea lions, dolphins and other marine mammals entangled in fish farm nets;
- › significantly reduce water column pollution, feed use and the need for antibiotics and chemical treatments to raise fish.



Spawning wild salmon. Photo: O'Vasik

## Economic and Social Benefits

The transition to a more sustainable aquaculture industry in Canada will provide long-term employment in coastal communities and place Canada at the forefront of green technology development in this sector.

Closed containment also provides new opportunities for fertilizer production, waste recovery for biofuels and aquaponics (fish waste nutrients are used to grow other edible plant crops) for additional revenue streams.

Our marine ecosystem and the jobs that are dependent on a healthy ocean will be protected for future generations.

## Operational Benefits to Industry

- › Protection from unpredictable ocean conditions that can lead to catastrophic losses
- › Conditions can be optimized to achieve faster growth rates and better quality fish
- › No loss from predators
- › Greatly reduced cost of managing parasites and diseases
- › Ability to take advantage of secondary industry development such as aquaponics, waste recovery, waste biofuels and fertilizer production
- › Public approval and support for a more sustainable industry
- › Market advantage for sustainably produced seafood



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## THE WAVE OF THE FUTURE

Closed containment uses barrier technologies that ensure no contact between wild and farmed fish, thus eliminating the most harmful impacts of net-cage operations, and significantly reducing others. The technology also enables the control of inputs to reduce disease, optimize growth and minimize mortality, and outputs to limit external impacts on the environment.

As closed containment technology matures, it is being increasingly adopted around the world as the rearing method of choice. A small but growing portion of farmed salmon on the market is now being raised in closed systems in Canada, China and the US.

Using closed containment technology to grow salmon offers tremendous economic opportunity. This sector has a vibrant research and development component and exciting value-added opportunities. The increasing global demand for seafood products coupled with the increasing evidence of aquaculture's impacts on natural ecologies is encouraging investment in this technology.

The Coastal Alliance for Aquaculture Reform works with government and industry to promote closed containment and for the past decade, has been advocating for a shift to closed containment technology for all salmon aquaculture in BC.



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*Caring for our coastal waters*

