Feed pipes

Circular Plastic Project

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How do fish farmers feed their fish?

An important step in fish farming is feeding. The average fish farmer spends about 50% of their budget on fish feed. Therefore, the farmers focus a lot on feeding exactly the right amount. Today they have an automatic feeding system that sends the feed through plastic pipes with air pressure.

The Process:

1. Feed pellets are stored in a silo, generally on a barge by the fish pens.
2. The feed is portioned out by something called a Doser, which is mounted at the bottom of the silos.
3. Portioned feed ends up in the feed pipe and is transported by air pressure created by a Blower.
4. Before the feed ends up in the pens, it is sent through a Selector Valve that chooses the right feed pipe for the right fish pen.
5. The feed is transported with great speed and gets distributed evenly by a Spreader when it arrives at the target fish pen.

Problems with airborne feeding

High plastic waste generation

- Feed pipes wear down quickly due to air pressure and hardness of feed pellets.
- Pipes are typically replaced every 18 months (same as smolt growth cycle).
- Around 28% of feed pipes are discarded each year by an average fish farmer (2022).

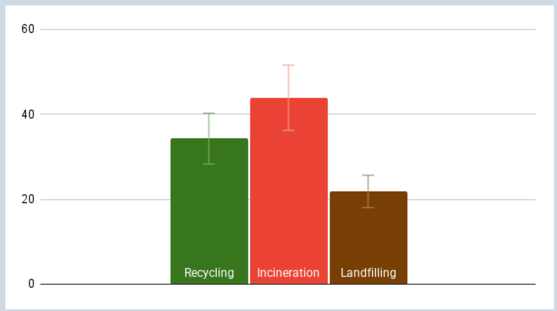
Microplastic pollution

- Fragments knocked off pipes during feeding enter the ocean.
- Estimated 10–100 tons of microplastics released annually from feed pipes

Problems with the handling of discarded pipes

Waste handling issues

- ~44% incinerated, ~34% recycled, and ~22% landfilled (2022 data).
- Significant portion still ends up in incineration or landfill.



Annual % feed pipe waste handling

Recycling

Incineration

Landfilling

Recycling limitations

- Recycled plastic from feed pipes is used for other purposes, not for making new feed pipes.
- Virgin plastic is always required for replacement pipes due to lack of recycled material meeting quality standards.
- Even 100% recycling wouldn't eliminate virgin plastic use.

Waterborne Feeding – A possible solution

A waterborne feeding system works just like an airborne system, but you use water pressure instead of air pressure. Instead of a blower, there is a pump that takes in seawater and pumps it with the feed to fish pens. This comes with a lot of benefits:

- A lot less wear on the pipes because of lower pressure and speed. Resulting in a longer lifespan and less plastic waste.
- Greatly reduces the amount of microplastics entering the ocean.
- Not as high standards for the plastics material. This means that you can use *recycled plastics* to make new pipes for waterborne feeding.
- Because the pump takes less power, you get 50-70% less energy consumption compared to airborne systems.

Why are waterborne feeding systems not widely adopted on all fish farms?

- It is a high upfront cost of new equipment. You will also then be replacing already working equipment.
- Less proven technology with limited long-term data. Fish farmers don't want to be the first movers. They would rather wait until someone else proves it is a better that airborne feeding.

Waterborne feeding systems are available to buy for fish farmers today, time will tell if it becomes the new standard solution for feeding. There also exists hybrid solutions on the market where you keep some of the existing equipment when switching from airborne to waterborne. This lowers the initial costs.

Operations at the aquaculture site as potential sources of microplastics

Circular Plastic Project

Matylda Koryl

Background

Circular plastic is a project by NTNU financed by Handelens Miljøfond. The goal of the project is to find ideas and solutions that reduce plastic waste, limit usage, and increase recycling. The focus area of this project is extended producer responsibility of plastic equipment in aquaculture.

My team was based in Mo i Rana. To expand my own knowledge and to understand what the different stakeholders in this industry are doing, we visited companies around the area.

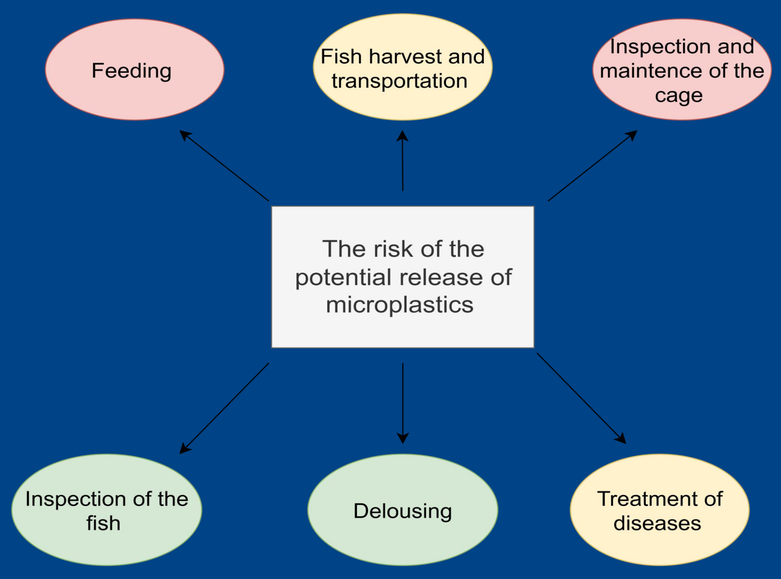
Problem

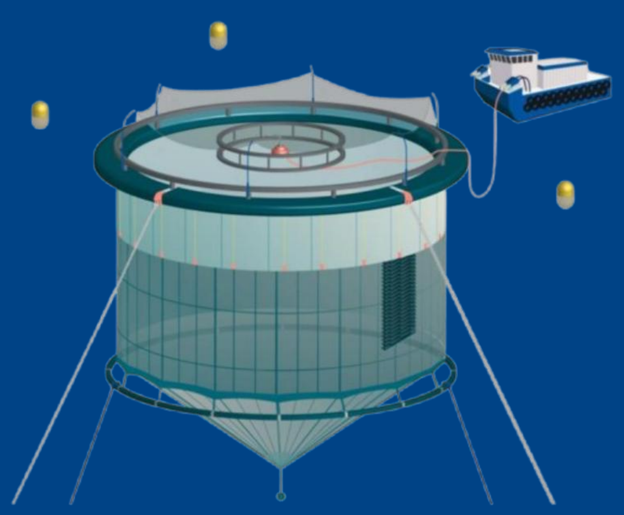
A huge part of the equipment used in the aquaculture industry is made of plastic. In recent years, concerns have been raised about the effect of microplastics on fish and the potential threats that come with it.

Can operations in the aquaculture potentially contribute to the spread of microplastics into the sea?

Methods

- The interviews were done on the field and during company visits.The interviews provided data about fish farming, operations done on the farms, the use of plastic, and the equipment used on an aquaculture site.
- The questionnaires were sent to the companies in the aftermath of the visit.The questionnaires provided data on fish welfare, operations done on an aquaculture site, and pollution data.
- The literature review was done to gather additional information and to get more insight into the industry. . The literature review provided information about fish farming, fish welfare, microplastic spread, and the threats that come with it.





Results

Microplastics can be released into the environment either directly through activities like wearing and tearing of the equipment. Or by loss of the plastic equipment that breaks
down later into microplastics in the sea

The findings suggest that feeding and inspection, and maintenance of the cage pose a higher possible risk of microplastic emission into the sea. Fish harvest and transportation, as well as the treatment of diseases, pose a moderate risk of microplastic emission into the sea. Inspection of the fish and delousing pose a risk of microplastic emission into the sea.

Conclusion

The results of this review indicate that microplastics can potentially enter the sea via operations done on an aquaculture site.

The microplastic loss may vary from farm to farm, depending on waste management, how often the equipment is changed, and the environmental conditions. It` s important to notice that direct comparison among different studies is hard due to the lack of harmonization of the methods. More cohesive methods should be used in the future. The data on microplastics in aquatic environments is very limited, and the methodology is still improving. At the same time, all the assessed studies show a lack of data and knowledge gaps. Microplastics should become a bigger focus in the future, both for the welfare of the fish and for human health.

Handelens Miljøfond

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