

Product category rules

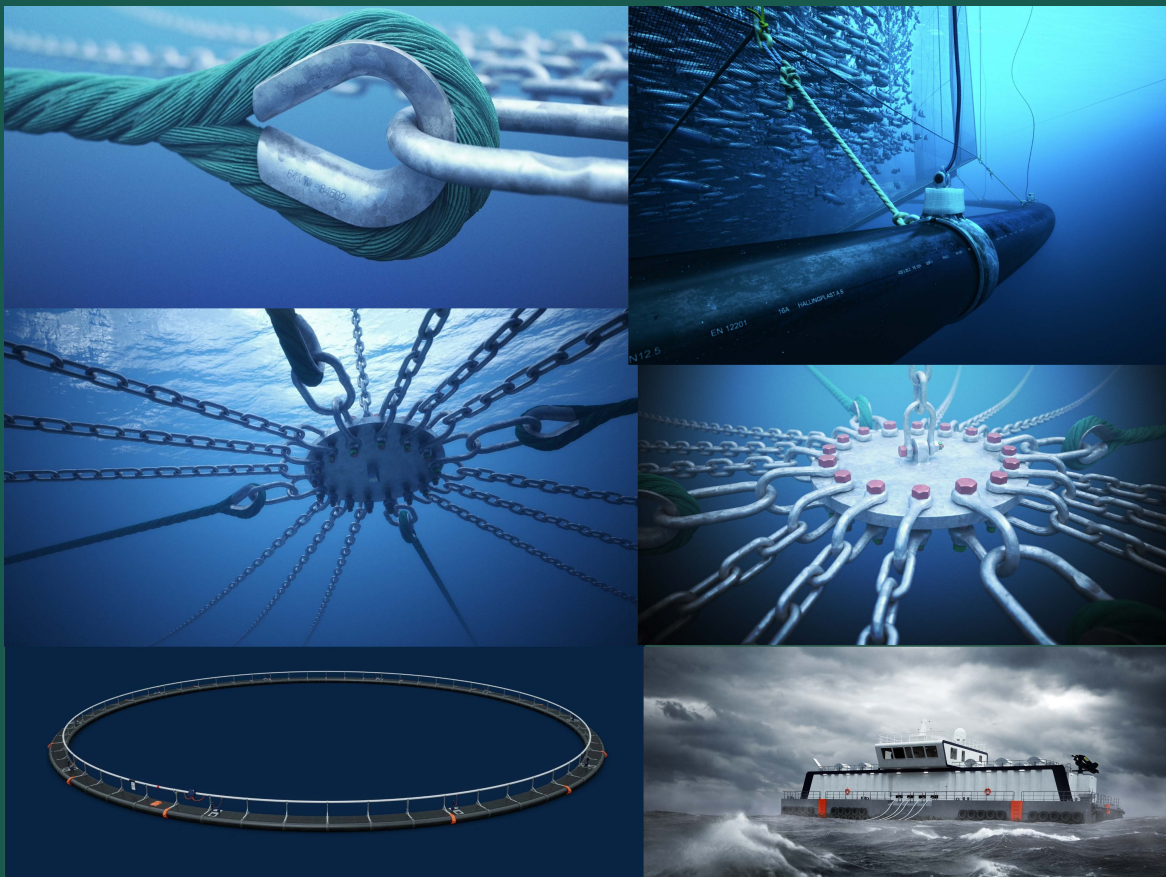
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NPCR 031

Part B for for sea-based aquaculture
infrastructure and components

version 1.0

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REVISION LOG

This is an overview of the changes made to this PCR. Typology of changes:

- Editorial (ed): Text or layout edited, with no change in content.
- Technical (te): Existing content has been changed.
- Addendum (ad): New content has been added.

Naming convention: Version x.y, where x is a major revision and y is a minor revision.

Date (2022-xx-xx)	Type	Description of change
<i>Version 1.0</i>		
Original version, issued 2023-04-26.		

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Introduction

This Product Category Rules (PCR) is intended for companies preparing an environmental product declaration (EPD) for sea-based aquaculture infrastructure and components. This PCR builds upon PCR part A providing all the requirements for construction products and services. Specific rules for sea-based aquaculture infrastructure and components are provided in this PCR part B. When preparing an EPD for sea-based aquaculture infrastructures/components, all requirements outlined in the PCRs part A and part B must be followed. In PCR part B, the requirements for PCR part A are referred to in each section where they occur. The purpose of this document is to define clear guidelines for performing the underlying Life Cycle Assessment (LCA) to ensure comparability between EPDs.

Comparison between the environmental performance of sea-based aquaculture infrastructures/components using information in the EPD shall take into consideration the use phase scenarios at the farm/facility level, including all phases of the products life cycle (A1-A5, B1-B7, C1-C4, and D).

This PCR was developed from January 2022 to December 2022, by a Norwegian PCR Working Group (WG) with representatives from the aquaculture infrastructure/component industry as well as fish farmers, academia, and consulting firms. The Norwegian EPD Foundation (EPD programme operator) led the process. This PCR has been developed in accordance with the requirements outlined in the general programme of instructions from the Norwegian EPD programme (EPD-Norway, 2022).

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NOTE: ISSUES UNDER DEVELOPMENT

The PCR group is aware of the process of the work done by the European Commission on Product Environmental Footprints (PEF) and the accompanying PEFCR for Marine Fish Products. A revision of NPCR 031 should be considered with scope of aligning to this document when it is published. The same applies for "PCR for Yachts, small crafts, vessels and parts thereof" with regards to feed barge. The Norwegian aquaculture industry is currently developing a software to answer to the forthcoming EPR scheme for aquaculture components. When this is ready, the scenarios for module C3 and C4 should be revised.

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1 Scope

This document complements the core product category rules for construction products and services as defined in EN 15804:2012+A2:2019 and NPCR part A and is intended to be used in conjunction with those standards.

The intended application of this product category rule (PCR) is to give guidelines for the development of environmental product declarations (EPDs) for sea-based aquaculture infrastructures/components and to further specify the underlying requirements of the life cycle assessment (LCA). The core rules valid for all construction products are given in the EN 15804 standard, NPCR Part A and relevant published complementary PCR (c-PCR) and are expected to be known by those preparing the EPD. Additionally, the standard NS 9415:2021 on *Floating aquaculture farms Site survey, design, execution, and use* is expected to be known by those preparing the EPD as this standard sets the scope and technical foundations of NPCR 031.

2 Normative references

NPCR Part A: Construction products and services. Oslo: EPD-Norge.

NS9415:2021: Floating aquaculture farms Site survey, design, execution, and use

3 Terms and Definitions

As in PCR part A, NS9415 and relevant c-PCR.

4. Abbreviations

c-PCR	Complementary product category rules
EPD	Environmental Product Declaration
DU	Declared Unit
FU	Functional Unit
PCR	Product Category Rules
LCA	Life Cycle Assessment
LCI	Life Cycle Inventory
LCIA	Life Cycle Impact Assessment
RSL	Reference Service Life
ESL	Estimated Service Life

5. General Aspects

5.1 Objective of PCR Part A and B

As in PCR part A and relevant c-PCR.

5.2 Types of EPD in respect to life cycle stages covered

As in PCR part A and relevant c-PCR, including the following further clarification:

This PCR gives specification for EPD for sea-based aquaculture infrastructure/components on the scope of declared unit with options including life cycle modules A1-A3, A4, C1-C4 and D.

5.3 Comparability of EPD of construction products

As in PCR part A and relevant c-PCR.

5.4 Additional information

As in PCR part A and relevant c-PCR.

5.5 Ownership, responsibility, and liability for the EPD

As in PCR part A and relevant c-PCR.

5.6 Communication format

As in PCR part A and relevant c-PCR.

6. Product Category Rules for LCA

As in PCR part A and relevant c-PCR.

6.1 Product Category

As in PCR part A and relevant c-PCR, including the following further clarification:

The product group comprise of all kinds of sea-based aquaculture infrastructure and components prepared for trade and are made of different materials as long as technical and safety requirements of NS9415:2021 are met. The products that shall follow this PCR are listed here in Table 1. The tables are non-exhaustive and other sea-based aquaculture components than the ones listed may also be declared based on this PCR as long as component's/product's relevance is justified to the EPD verifier. EPDs for both assembled, semi-assembled, and single parts are allowed, but it shall be clearly stated what is included and not included in the EPD under product description.

Table 1: List of infrastructure/component categories

Category	Ref. NS 9415 chp.	Description
Enclosures	10	Enclosures include canvas and net/netting material or combination of materials; both closed and partially closed. Load-bearing elements, joints, couplings, fastenings should be included. See NS9415:2021 figure 1 for description of a complete enclosure.
Flotation Collar	11	Both, steel- and polymer based, Load-bearing elements, joints, couplings, fastenings should be included.
Feed barge ¹	12	Includes both the hull and superstructure of the feed barge with accompanying permanently fixed equipment and infrastructure.
Anchoring and mooring	13	Includes ropes, lines, straps, chain, joints, couplings, bolts, and anchors. Both individually and as systems,
Additional equipment	14	Comprise of components divided into two categories: <ul style="list-style-type: none"> - Permanent extra equipment connected to a main component. E.g., Dead fish / feed collector, lice barriers, feed distribution equipment, bird net systems, sensors, pipes for fish/feces transport. - Temporary extra equipment which may be used due to special circumstances. - Sinker tube

6.2 Life cycle stages and their information modules to be declared

6.2.1 General

As in PCR part A and relevant c-PCR, including the following further clarification:

Transport in all life cycle modules shall include the following:

- Direct emissions during transport (exhaust, tires, etc.)
- Upstream emissions from fuel extraction, processing, and distribution
- Life cycle emissions of vehicles (raw materials, manufacturing, maintenance, and disposal)
- Life cycle emissions of infrastructure (raw materials, manufacturing, maintenance, and disposal)

6.2.2 A1-A3, Product stage, information modules

As in PCR part A and relevant c-PCR

6.2.3 A4-A5, Construction process stage, information modules

As in PCR part A and relevant c-PCR, including the following further clarification:

Module A5 is expected to be considered on the complete fish farm level and not for single parts, semi-assembled, and assembled components.

¹ When PCR for "Yachts, small crafts, vessels and parts thereof (main PCR)" is ready – the PCR group should consider if it is possible to rather use that PCR (see <https://www.environdec.com/pcr-library> to check the publication status).

6.2.4 B1-B7, Use stage, information modules

As in PCR part A and relevant c-PCR, including the following further clarification:

Module B is expected to be considered on the complete fish farm level and not for single parts, semi-assembled, and assembled components.

6.2.5 C1-C4 End-of-life stage, information modules

As in PCR part A and relevant c-PCR.

6.2.6 D Benefits and loads beyond the system boundary, information module

As in PCR part A and relevant c-PCR.

6.3 Calculation rules for the LCA

As in PCR part A and relevant c-PCR, including the following further clarification.

For declaring sea-based aquaculture infrastructure/components, specific declared units shall be used for each product groups. The scope and variations of products must be declared according to EPD-Norway guidelines.

6.3.1 Functional unit

As in PCR part A and relevant c-PCR.

6.3.2 Declared unit

As in PCR part A and relevant c-PCR, including the following further clarification:

For all products, the declared unit shall be applied (cradle-to-gate with options) with modules A1-A3, A4, C1-C4 and D. The proposed units for the different product groups are given in Table 2. Note that the list is not exhaustive. A conversion factor to mass should be included such that in any case the weight-based material composition per declared unit is provided in the EPD.

Table 2: List of units for the product categories

Product groups	Declared unit
Nets (both submerged and open air), shielding skirts, gangways	1 piece of product or: 1 kg of product
Ropes, lines, chain, bird-net suspension rods, cables, feeding pipes	1 piece of product or: 1 kg of product
Floating collar, buoys, anchors, joints, fasteners, feed dispensing units, mooring system	1 piece of product or: 1 kg of product
Feed barge	1 piece of product

6.3.3 Reference service life (RSL)

As in PCR part A, relevant c-PCR including the following further clarification:

The estimated service life of the product shall be stated and should be based on manufacturer information and shall refer to compliance to safety and use requirements given by NS9415:2021 or other referred standards therein.

6.3.4 System boundaries

As in PCR part A and relevant c-PCR.

6.3.5 Criteria for the exclusion of inputs and outputs (cut-off)

As in PCR part A and relevant c-PCR, including the following further clarification:

The cut-off criteria in EPD-Norway's general program of instruction (GPI) shall also be followed.

The scope of materials included in the product and packaging in the declared unit shall be the same as for the traded products described in the EPD.

6.3.6 Selection of data

As in PCR part A and relevant c-PCR.

6.3.7 Data quality requirements

As in PCR part A and relevant c-PCR.

6.3.8 Scenarios at the product level

As in PCR part A and relevant c-PCR.

6.3.8.1 A4 Transport to the building site

As in PCR part A and relevant c-PCR, including the following additions:

"The building site" for sea-based aquaculture infrastructure correspond to the production location at sea.

Transport from the manufacturing site to the production location is estimated based on information from the manufacturer and the the intended market. Default values can also be used for more standardized scenarios after the product leaves the factory gate (after A3):

- Floating collar and feed barge
 - For domestic production, the default travel distance for work boats from the manufacturing site to the production location at sea is 200 Nm sea freight if not specified to a specific customer/order.
- Other components
 - For domestic production, the default travel distance from the manufacturing site to the dock at the production location at sea is 300 km road freight if not specified to a specific customer/order plus 1 Nm sea freight from the producers dock and out to the location.

See 6.3.8.4 for details on work/service boat operation profiles.

6.3.8.2 A5 Installation

As in PCR part A and relevant c-PCR, including the following further clarification:

Not mandatory for aquaculture components. A5 starts before mooring the component to sea. The installation phase includes installing the given component as a part of the fish farm and should be considered on the complete fish farm level and not for single parts, semi-assembled, and assembled components.

6.3.8.3 B1-B7 Use phase

As in PCR part A and relevant c-PCR, including the following additions:

Module B1: Not mandatory for aquaculture components. The release of substances to water should be included in the LCA for the whole aquaculture farm or location and not for single parts, semi-assembled, and assembled components. This is because emissions are dependent on how the fish farmer chooses to operate (e.g., cleaning regime of the net pens). Emissions/leaching during the use phase are especially linked to the application of chemical impregnation and anti-fouling coatings. The latest risk and knowledge-based assessments conducted in Norwegian salmon farms with updated scenarios are available in the publication by Grefserud et al., (2022a) and Grefserud et al., (2022b). Although not included in the LCA – any substances with risk of leaching should be declared according to requirements provided in chapter 7.4 of this PCR.

Modules B2-B5 are not mandatory for aquaculture components. maintenance, repair, replacement and refurbishment scenarios are not mandatory according to this PCR, but if included it should be supported by relevant data/information provided by the manufacturer. It should also be relevant for the intended market and intended area of application. Attempts on evaluating the use stage in EPDs for single parts, semi-assembled, and assembled components should relate to recommended service intervals for safe use and operability according to NS9415:2021. The recommended service intervals are product-specific and will affect energy and material use for maintenance, repair and replacement.

Manual labor required for maintenance and cleaning activities on site during the operation stage are typically below cut-off. However, if hazardous or toxic materials are used during maintenance and cleaning activities, then this activity shall be included in the analysis. Maintenance and cleaning activities involving transportation of the component to the shore for processing should also be included. For all cases where the use of work boat capacity is needed in addition to redundant day-to-day activities this should also be included in the analysis.

Module B6-B7, Not mandatory for aquaculture components. Considerations should be done at the complete farm level.

6.3.8.4 C1-C4 End-of-life

As in PCR part A and relevant c-PCR, including the following additions:

C1: disassembly (including transport from location to nearest dock)

Depending on the product category considered, the following activities should be considered in C1:

- Work boat operations, using cranes, with idling and/or moving engine regimes
- Work boat transport of components to shore
- Sorting/storing on shore near docks
- Further disassembly on shore (manual labour)

The prime factor to consider within these activities is the consumption and combustion of marine fuels. This PCR provides conservative fuel consumption values for standard work boat running on diesel engines:

Work boat, 14x7.5 metres:

Typically operated 4,200 hours per year

o 1,400 hours sailing / towing

o 2,800 hours of operation at site (estimates 20 l/h from propulsion machinery)

• Generator consumption approx. 6 l / h both during sailing and operation at locality.

Service boat, 24 metres:

Typically operated 5,800 hours per year

o 2,600 hours sailing / Towing

o 3,300 hours of operation at location (estimates 35 l/h from propulsion machinery)

• Generator consumption approx. 70 l / h during sailing and operation at locality.

If the specifics of the combustion process are unknown, the following generic ecoinvent process or equivalent shall be applied: "diesel, burned in fishing vessel | diesel, burned in fishing vessel | Cutoff, U"

Liters of diesel can be converted per kg and further in MJ using the following factors:

- 1 liter of diesel has a mass of 0.85 kg
- 1 kg of diesel contains 42.7 MJ

Note that these average fuel consumption values are conservative, based on the use of work boat/service boat running on diesel engines. Manufacturers are encouraged to gather specific data representative of the disassembly effort and the engine types equipped on the vessels used. A standard distance of 1 Nm between production location at sea and nearest working dock could be used if no specific data is available.

C2: transport

Transport from the sorting/storing facility near the dock to the waste treatment/recycling facility is estimated based on information from the manufacturer and its relevance for the intended market. If specific data is unavailable, this distance is 300 km for Norwegian conditions. For other markets, default values should be derived from recent statistics.

C3-C4: Waste treatments

For scenarios C3 and C4 apply the scenarios and the default rates provided in table 3. The scenarios are based upon the assumption that all material is collected at the end-of-life phase. Alternatives to table 3 can be utilized if documented. For the Norwegian aquaculture industry see Hognes & Skaar (2017), Sundt et. al (2018) or relevant annual update of the study for representative scenarios and statistics of life cycle modules C3 and C4 for the main material categories. For feed barge, see PCR for "Yachts, small crafts, vessels and parts thereof."

Table 3: Generic, conservative scenarios for life cycle modules C3 and C4 modified from Hognes & Skaar (2017) and Sundt et. Al (2018)

Category	C3: Waste treatment	C4: landfilling
Metal from mooring, connectors, joints	Central sorting of metals. Metals to recycling. Default rates for steel and other relevant metals. 90%**	Landfilling of metals. Default rates for steel and other relevant metals. 10% Landfilling of ashes from incineration
Rope and lines	Central sorting and cleaning of ropes and lines. Plastics to recycling. Default rates for PE, PP, Nylon 6, etc. 70%** Plastics to incineration with energy recovery and fly ash extraction. Default rates for PE, PP, Nylon 6, etc. 15%** Landfill: 15%**	Landfilling of ashes from incineration (15%) and direct landfilling (15%).
Enclosure	100% of enclosures are collected from the washing and rehabilitation facilities. Washing and disinfection should be included. Residue organic material from the washing process is extracted and goes to energy recovery. 70%** are sorted for further processing and the other 30%** go to energy recovery. Of the 70% sorted for recycling – 80% go to recycling using chemical depolymerization. The remaining 20% go energy recovery.	Residue from washing: Landfilling of ashes from incineration. Energy recovery of enclosures: Landfilling of ashes from incineration.

Feed pipes	Central sorting, cleaning, and shredding of feed pipes. Plastics to recycling 45%* Plastics to incineration with energy recovery and fly ash extraction 55%*	Landfilling of ashes from incineration
Floating collars, gangways and other large components of uniform plastic or metal material	Plastic: Central sorting, cleaning, and shredding of large plastic components. Plastics to recycling 95%* Plastics to incineration with energy recovery and fly ash extraction 5%* Metal: Central sorting of metals. Metals to recycling. Default rates for steel and other relevant metals. 90%**	Plastic: Landfilling of ashes from incineration Metal: Landfilling of ashes from incineration
Shielding skirts, lice skirts and other canvas-based parts	Shielding skirts / lice skirts: 5%* recycled, 5%* reused, 90%* landfilled	Landfilling of plastics. Default rates for mixed plastics.

* Expert judgement from industry actors involved in the PCR process

** Data from Sundt et al. (2018)

6.3.8.5 D Benefits and loads outside the system boundary

As in PCR part A and relevant c-PCR.

6.3.9 Units

As in PCR part A and relevant c-PCR.

6.4 Inventory analysis

As in PCR part A and relevant c-PCR.

6.5 Impact assessment

As in PCR part A and relevant c-PCR.

The PCR development committee is aware that environmental parameters derived from LCA in

accordance with the EN15804 standard do not cover impacts of ocean plastic pollution. See section 7.4.1.2 for guidelines on informative requirements for the EPD in this behalf.

7. Content of the EPD

7.1 Declaration of general information

As in PCR part A and relevant c-PCR, including the following additions:

The material composition of the product shall be listed with specific weights of the main components as it is installed. Usage areas and conditions must be specified in the EPD. The harmonized standard for which the product is produced according to must be specified in the EPD. Key performance characteristics should be included under product information.

The products that are declared shall be referred to by product name, brand name (including product code(s) such as GTIN or similar) that gives an unambiguously link between product and EPD according to EN 15804 7.1.c.

The scope of products declared in an EPD must be specified so that the product range can easily be identified by the customer and user of the aquaculture components.

Enclosures

Are all components according to NS9415:2021 figure 1 included – constituting a complete enclosure? If not – state which of the components which are not included in the EPD.

Floating collar

Which of the major components are included: floating tube, handrail, bracket with rail, support, walkway, mooring bracket? Are any accessories included?

Feed barge

The specification of the feed barge must be given in the EPD. This includes.

- Gross tonnage
- Length x Width
- Hull material
- Superstructure material
- Silo capacity (tons of feed/m³)
- Number of feed lines
- Ensilage capacity (m³)
- Energy data: Diesel tank, Battery size, Shore power availability, etc.
- Other qualities: Living quarters, number of cabins, kitchen, etc.,

The product categories listed above are the three largest elements in sea-based aquaculture components. EPDs for other product categories not listed here shall also include product specifications. The purpose of these product descriptions is to make sure that users of the EPD clearly understand what is included and excluded from the EPD., Transparency to that regard, will enable EPD users to compare sea-based aquaculture components from different manufacturers and perform assessments at the farm level (e.g., LCA analyses and/or GHG scope 3 reporting). The ability of scaling LCIA results for the different environmental impacts to other dimensions must also be specified and tables shall be used to show the product variations.

7.2 Declaration of environmental parameters derived from LCA

As in PCR part A and relevant c-PCR.

7.3 Scenarios and additional technical information

As in PCR part A and relevant c-PCR.

7.4 Additional information

As in PCR part A and relevant c-PCR.

7.4.1 Additional information on release of dangerous substances to indoor air, soil, and water

7.4.1.1 Indoor air

As in PCR part A and relevant c-PCR, including the following clarification:

Not relevant for sea-based aquaculture components.

7.4.1.2 Soil, ambient air, and water

As in PCR part A and relevant c-PCR.

Hazardous materials with the risk of leaching to water in the use phase of the component shall be made aware of in this section of the EPD. Efforts to mitigate the risk of losing equipment at sea and potential impacts should be referenced to raise awareness of ocean plastic pollution since impact categories in LCA do not cover this. In such a case, quantification of normal losses of equipment at sea should be included if relevant.

7.4.2 Additional requirements

As in PCR part A and relevant c-PCR.

7.4.2.1 Greenhouse gas emissions from electricity use in A3 Manufacturing.

As in PCR part A and relevant c-PCR.

7.4.2.2 Dangerous substances and content declaration

As in PCR part A and relevant c-PCR.

7.4.2.3 Emission classification of building materials

As in PCR part A and relevant c-PCR, including the following clarification:

Not relevant for sea-based aquaculture components.

7.4.2.4 Carbon footprint of products

As in PCR part A and relevant c-PCR.

7.5 Aggregation of information modules

As in PCR part A and relevant c-PCR.

8. Project Report

As in PCR part A and relevant c-PCR.

9. Verification and Validity of an EPD

As in PCR part A and relevant c-PCR.

Approved 26.04.2023, valid until 26.04.2028.

Norwegian EPD Foundation, Technical committee



Christofer Skaar
Leader of the Technical committee

10 Bibliography

As in PCR part A, including the following additions:

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Ellen Sofie Grefsrud, Lasse Berg Andersen, Pål Arne Bjørn, Bjørn Einar Grøsvik, Pia Kupka Hansen, Vivian Husa, Ørjan Karlsen, Bjørn Olav Kvamme, Ole Samuelsen, Nina Sandlund, Monica F. Solberg og Lars Helge Stien (HI) Rapport fra havforskningen 2022-12 ISSN: 1893-4536 Risikorapport norsk fiskeoppdrett Publisert: 04.05.2022 Prosjektnr: 14272 Program: Miljøeffekter av akvakultur, Fremtidens havbruk.

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EPD for the best environmental decision



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