C-survey at Laugardalur, 2022

Arnarlax ehf

Akvaplan-niva AS Report: 2022 64189.01

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Arnarlax ehf. C-Survey at Laugardalur (post fallow), July 2022.

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Customer

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Summary

The results from the monitoring at the farming site Laugardalur in July 2022 showed that the sediment was somewhat loaded with organic carbon and the copper concentrations were within reported natural levels for bottom sediment around Iceland (Egilsson *et al.*, 1999).

No load effect was recorded in the fauna and the faunal index nEQR showed good conditions and no impact at any of the stations (nEQR > 0.6). The diversity index H ' was above 3 at all stations and ranged from 3.23 (C4) to 4.28 (C5). The NS 9410:2016-assessment of the community in the local impact zone (C1) showed environmental condition 1 (Very good). One pollution indicator species was recorded among the top-10 at C1, but not at any of the other stations.

The redox measurements (pH/Eh) gave point 0 acc. Appendix D in NS 9410:2016 for all the sampling stations. The oxygen saturation in July was good in the whole water column with 71 % in the bottom water.

Approval

Project leader

Digitally signed by Roger Velvin
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Quality control

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Preface

Akvaplan-niva carried out a type C (NS 9410:2016) environmental survey at the Laugardalur site. It includes pH/redox measurements (Eh), hydrography, geochemical analyses, and analyses of the bottom fauna from six stations at the fish farming site. The following personnel contributed:

Snorri Gunnarsson	Akvaplan-niva	Field work, report, project leader.
Hans-Petter Mannvik	Akvaplan-niva	Identification of bottom fauna (Echinodermata). Report, professional assessments, and interpretations.
Roger Velvin	Akvaplan-niva	Identification of bottom fauna (Various taxa). QA report.
Rune Palerud	Akvaplan-niva	Identification of bottom fauna (Crustaceans). Statistics.
Thomas Hansen	Akvaplan-niva	Identification of bottom fauna (Polychaeta).
Jesper Hansen	Akvaplan-niva	Identification of bottom fauna (Mollusca).
Vegard Holen	Akvaplan-niva	Hydrographical vertical profiles
Kristine H Sperre	Akvaplan-niva	Coordination of sorting of bottom fauna.
Ingar H. Wasbotten	Akvaplan-niva	Coordination of geo-chemical analyses.

Akvaplan-niva would like to thank Arnarlax ehf and Silja Baldvinsdóttir for good cooperation

Accreditation information:

The survey was carried out by Akvaplan-niva AS with ALS Laboratory Group (Czech Republic) as a sub-contractor.

NORSK AKKREDITERING TEST 079

Akvaplan-niva AS is accredited under NS-EN ISO/IEC 17025 by Norwegian Accreditation for field sampling of sediments and fauna, analyses of TOC, TOM, TN, particle size and macrofauna, and for professional evaluations and interpretations. Our Accreditation number is TEST 079.

Czech Accreditation Institute (Lab nr 1163)

ALS Laboratory Group is accredited by the Czech Accreditation Institute (Lab nr 1163) for copper analyses.

Non-accredited services: Hydrographical measurements and mapping of bottom topography (Olex).

Kópavogur, 10.10 2022

Snorri Gunnarsson (Project Manager)

1 Data Summary

Client information			
Report title:	C-Survey at Laugardalur (post fallow), July 2022.		
Report nr.	2022 64189.01	Site:	Laugardalur
Municipality:	Tálknafjörður	Map Coordinates (construction):	65°39,170 N 23°55,813 V
MTB permitted:	6.414 ton	Operations manager:	Silja Baldvinsdóttir
Client:	Arnarlax ehf		

Biomass/production status at time of survey (06.07.2022)			
Fish group:	Salmon	Biomass on examination:	0
Feed input:	0	Produced amount of fish:	0
Type/time of survey			
Maximum biomass:		Follow up study:	
Fallow (resting period):	X	New location:	

Results from the C study /NS 9410 (2016) – Main results from soft bottom fauna			
Faunal index nEQR (Veileder 02:2018)		**Diversity index H' (Shannon-Wiener)**	
Fauna C1 (impact zone)	0.613	Fauna C1 (impact zone)	4.08
Fauna C2	0.659	Fauna C2	3.48
Fauna C3	0.628	Fauna C3	3.96
Fauna C4 (deep area)	0.643	Fauna C4 (deep area)	3.23
Fauna C5	0.640	Fauna C5	4.28
Fauna C6	0.690	Fauna C6	4.14
Date fieldwork:	(06.07.2022)	**Date of report:**	06.10 2022
Notes to other results (sediment, pH/Eh, oxygen)			nTOC from 26.7 to 38.0 mg/g TS. Copper 42.3 at C1 Eh positive at all stations O_2-conditions were good throughout the water column.
Responsible for field work:	Signature: 	Project manager Snorri Gunnarsson	Signature 

2 Introduction

2.1 Background and aim of the study

On behalf of Arnarlax ehf, Akvaplan-niva completed a survey (type C) for the fish farming site at Laugardalur (Figure 1).

The survey fulfils the requirements of the Icelandic authorities for bottom surveys according to ISO 12878 and the requirements for environmental bottom surveys (according to Vöktunaráætlun). An environmental study was simultaneously undertaken, with reference to Chapter 5.0 in NS 9410:2016 which follows the methodology for C- study. A survey of type C is aimed at studying the environmental conditions of the bottom sediments along a transect sector from the fish farm that extends from the local, to the intermediate and to the regional impact zones. The main emphasis is on the study of the soft bottom fauna which is conducted according to standards ISO 5567-19:2004 and ISO 16665:2014. The obligatory parameters that are included in the survey are described in NS 9410:2016.

A classification or threshold values for this type of survey have not been developed by Icelandic officials so it is not possible to strictly apply the classification based on Norwegian threshold values to Icelandic conditions. We do however report the results with these same indexes with reference to Norwegian threshold values but it should be emphasized that some of these (such as NSI) are developed according to Norwegian conditions. For further descriptions of these indexes see details in Appendix 1 and Miljødirektoratets Veileder 02:2018.

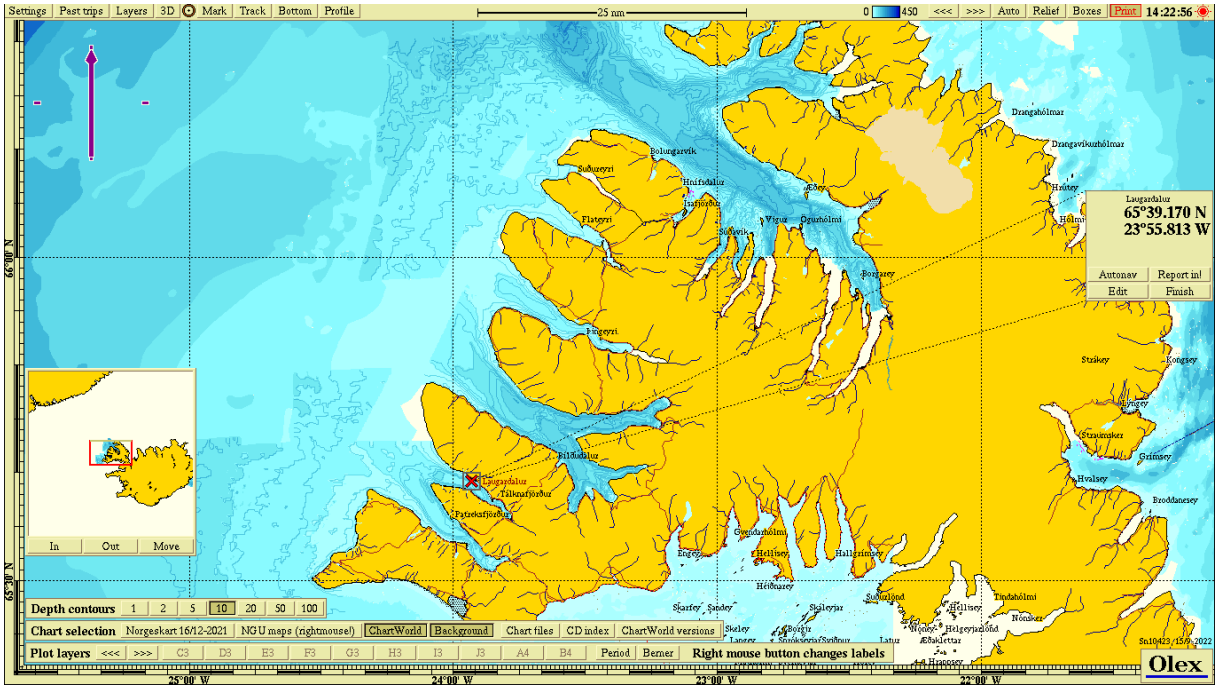

Figure 1 Overview of Westfjords in Iceland with the farming site Laugardalur (red cross) in Tálknafjörður. The map coordinates for the midpoint of the farming site are given to the right.

2.2 Site operation and feed use

The plant is a frame mooring with a total of fourteen 160 metre circumference cages in a 2 x 7 configuration. Laugardalur has been fallowed since early December 2021. Four previous

generations of fish have been reared at site and the production volume increased with each production cycle.

In Iceland, the MTB (maximum allowed biomass) limit is not given a site level as in Norway. The MTB limit determines how much live fish the holder of the permit can have standing in the sea at any one time. In Iceland the allowed production is regulated at two levels, site level and company level. For this site the estimated maximal standing biomass for the next generation is 6.414 tonnes, used as MTB here (Baldvinsdóttir, pers reference).

2.3 Previous surveys

Akvaplan-niva AS has carried out three previous C-surveys for the present fish farming site at Laugardalur. The first one on 1st of November 2017 at maximum biomass for the second generation at the site (Velvin & Gunnarsson, 2018), the second survey during the fallow period prior to putting previous generation into sea (Mannvik & Gunnarsson, 2019) and the third survey at max biomass for the previous generation farmed at the site (Mannvik & Gunnarsson, 2021). In addition, the fish farmer has provided a soft bottom fauna survey for the old Laugardalur site (placed further into the fjord) with results from sampling before the first generation was put into sea (June 2013) and also at maximum biomass on 3rd of September 2014 (Þórisson, Gallo and Jóhannsdóttir, 2015).

An overview of previous APN surveys carried out at Laugardalur is shown in Table 1.

Table 1: Previous surveys at Laugardalur.

Survey date	Report reference (author, year)	Production (tonnes)	Type of survey
25.03 2021	APN 62334.01 (Mannvik and Gunnarsson, 2021)	9.410	C – max biomass
27.05 2019	APN 60938.01 (Mannvik and Gunnarsson, 2019)	9.090	C - fallow period
01.11 2017	APN 9207.01 (Velvin and Gunnarsson, 2018)	2.836	C – max biomass

3 Materials and methods

3.1 Survey program

The choice of study parameters, placement of sampling stations and other criteria for the study is based on descriptions in NS 9410 (C-surveys). An overview of the planned professional program is given in Table 2.

Akvaplan-niva is accredited for field work, analyses of samples and for the professional evaluation of results in accordance with applicable standards and guidelines ("Veiledere"). For implementation and follow through, the following standards and quality assurance systems were used:

- ISO 5667-19:2004: *Guidance on sampling of marine sediments.*
- ISO 16665:2014. *Water quality – Guidelines for quantitative sampling and sample processing of marine soft-bottom macro fauna.*
- NS 9410:2016. *Miljøovervåking av bunnpåvirkning fra marine oppdrettsanlegg.*
- Internal procedures. *Quality Manual for Akvaplan-niva.*
- Veileder 02:2018. *Klassifisering av miljøtilstand i vann*. Norsk klassifiseringssystem for vann i henhold til Vannforskriften. Veileder fra Direktoratgruppen.

Table 2: Survey program for the C-survey at Laugardalur, 2022. TOC = total organic carbon. GSA = grain size analysis sediment. TOM = total organic material. TN = total nitrogen. Cu = Copper. pH/Eh = acidity and redox potential.

Station	Type analyses/parameters
C1 (local impact zone)	Quantitative analyses of bottom fauna. TOC. GSA, TOM. TN. Cu. pH/Eh.
C2 (transect zone outer)	Quantitative analyses of bottom fauna. TOC. GSA, TOM. TN. pH/Eh.
C3 (transect zone)	Quantitative analyses of bottom fauna. TOC. GSA, TOM. TN. pH/Eh.
C4 (transect zone, deep area)	Quantitative analyses of bottom fauna. TOC. GSA, TOM. TN. Hydrography/O_2. pH/Eh.
C5 (transect zone)	Quantitative analyses of bottom fauna. TOC. GSA, TOM. TN. pH/Eh.
C6 (local impact zone, upstream)	Quantitative analyses of bottom fauna. TOC. GSA, TOM. TN. pH/Eh.

Field work was completed on 06.07.2022.

Placement of stations and local conditions

The number of stations was calculated with reference to the sites estimated maximal standing biomass for the next generation which is 6.414 tonnes (used as MTB here). According to the standard six sampling stations should be examined. Depth and position of the stations are given in Table 3 and shown in Figure 2. Five stations were placed in the direction of the main oceanic current direction at 42 m depth (Heggem, 2019) and one station was placed upstream (C6).

Table 3: Depth, distance between the nearest frame of the fish farm and sampling stations and coordinates for C-stations at Laugardalur, 2022.

Station	Depth, m	Distance from frame, m	Position	
			N	W
C1	51	25	65°39.248	23°56.298
C2	42	500	65°39.384	23°56.820
C3	45	75	65°39.252	23°56.347
C4	53	75	65°39.165	23°56.394
C5	44	125	65°39.264	23°56.417
C6	34	35	65°39.053	23°55.396

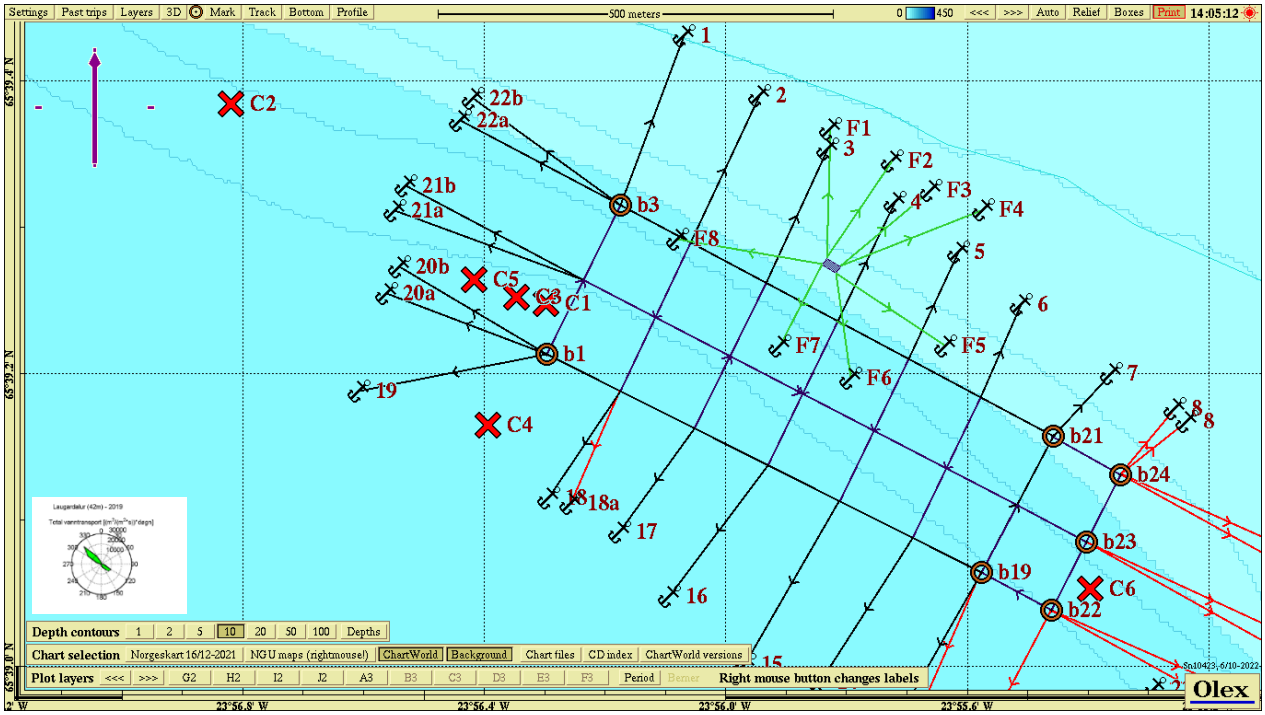

Figure 2. Map showing the sampling stations for the C-survey at Laugardalur, 2022. Current measurements used were from 42 m depth (Heggem, 2019).

3.2 Hydrography and oxygen

At station C4, hydrographic measurements, salinity, temperature, density, and oxygen saturation were taken for vertical surface to bottom profiles using a Sensordata CTDO 204 probe.

3.3 Soft bottom sampling and analyses

3.3.1 Fieldwork

Sediment samples were collected with a 0.1 m^2 bottom grab (van Veen). The sample material was collected through inspection openings. Samples for TOC, TN and Cu were taken from the top 1 cm layer of the sediment and for TOM and grain size analyses from the top 5 cm using a hollow pipe. At

stations C1 – C3 samples with an undisturbed surface were used but at stations C4 – C6 surface was a little disturbed as the crab was completely full despite efforts to slow it down during the last 10 m descent. The samples were frozen prior to further processing in the laboratory.

3.3.2 Total organic material (TOM)

The amount of TOM in sediment was determined by weight loss after combustion at 495 °C. The percent weight loss was calculated. The reproducibility of the TOM analyses is checked during the analyses by using a standard sediment that contains TOM with a known level. Standard calcium carbonate was burned together with the samples as a control of the amount of carbonate that was not burned in the analyses process.

3.3.3 Total nitrogen (TN)

After drying the samples at 40°C, the amount of total nitrogen (TN) was quantified by electrochemical determination using Akvaplan niva internal method that is based on NS-EN 12260:2003 (Vannundersøkelse – Bestemmelse av bundet nitrogen (TNb) etter oksidasjon til nitrogenoksider).

3.3.4 Total organic carbon (TOC) and grain size

The proportion of fine material, the fraction less than 63 µm, was determined gravimetrically after wet sieving of the samples. The results are presented as proportion of fine material on a dry weight basis.

After drying the samples at 40 °C, the content of total organic carbon (TOC) was determined by NDIR-detection in accordance with DIN19539:2016 (Investigation of solids – Temperature-dependent differentiation of total carbon (TOC_{400}, ROC, TIC_{900})). To classify the environmental conditions based on the content of TOC, the measured concentrations are normalized for the proportion of fine substance (nTOC) using the equation: nTOC = TOC + 18 (1 – F), where TOC and F represent a measured TOC value and the proportion of fine substance (%) in the sample (Aure *et al.,* 1993).

3.3.5 Metal analysis - copper (Cu)

The samples for metal analysis were freeze-dried before being placed in a microwave oven in a sealed Teflon container with concentrated ultrapure nitric acid and hydrogen peroxide. The concentration of copper (Cu) was determined by means of ICP-SFMS.

3.3.6 Redox- and pH measurements

At all the stations, a quantitative chemical examination of the sediment was carried out. Acidity (pH) and redox potential (Eh) were measured using electrodes and the YSI Professional Plus instrument. In accordance with the manual of the instrument, 200 mV was added to the measured ORP (the Oxidation Reduction Potential) value.

3.4 Soft bottom fauna investigation

3.4.1 About effect of organic material on bottom fauna

The emission of organic material from fish farms can contribute to the deterioration of conditions for many of the organisms living in the bottom sediment. Negative effects in the bottom fauna can best be assessed through quantitative bottom fauna analyses. Many soft bottom species have low mobility, the fauna composition will largely reflect the local environmental conditions. Changes in the bottom fauna communities are a good indication of unwanted organic loads. Under natural conditions, the communities typically consist of many species. High number of species (diversity) is, amongst other things, that is dependent on favourable conditions for the fauna. However, moderate increases in organic load can stimulate the fauna and result in an increased number of species found. Larger organic loads can result in less favourable conditions where opportunistic species increase their individual numbers, while the species not suited are knocked out resulting in a reduced diversity of species. Changes in species diversity near emission points of feed and faecal matter can, to a large degree, be attributed to changes in organic content (from the feed and faecal matter) in the sediment.

3.4.2 Sampling and fixation

All the bottom fauna samples were taken with a 0.1 m^2 van Veen grab. Only grab samples where the grab was completely closed and the surface undisturbed were approved. The contents were washed through a 1 mm sieve and the remaining material fixed with 4 % formalin with Bengal Rose dye added and then neutralized with borax. In the laboratory, the animals were sorted from the remaining sediment.

3.4.3 Quantitative bottom fauna analysis

At all stations, two samples (replicates) were collected in accordance with guidelines in NS 9410 (2016). After sorting the sample material was processed quantitatively. The bottom fauna was identified to the lowest taxonomic level possible and quantified by specialists (taxonomists). The quantitative lists of species were statistically analysed. See Appendix 1 for description of analysis methods. The following statistical methods were used to describe community structure and to assess the similarity between different communities:

- Shannon-Wiener diversity index (H')
- Hurlberts diversity index (ES_{100}) – expected number of species pr. 100 individuals
- Pielou's evenness index (J)
- Sensitivities index (Ømfintlighet) (ISI_{2012}), unsuitable at low individual/species number
- Sensitivity index (NSI)
- Composite index for diversity of species and sensitivity (NQI1)
- Sensitivities index which is included in NQI1 (AMBI)
- Normalized EQR (nEQR)
- Number of species plotted against the number of individuals in geometric arts classes
- Cluster analyses
- The ten most dominant taxa per station (top-ten)

4 Results

4.1 Hydrography and oxygen

The hydrographical profile for the deep station C4 in July 2022 is presented in Figure 3.

Temperature was between 13 °C and 5 °C from top to bottom, with oxygen saturation 99 % in the upper layer and 71 % in the bottom layer.

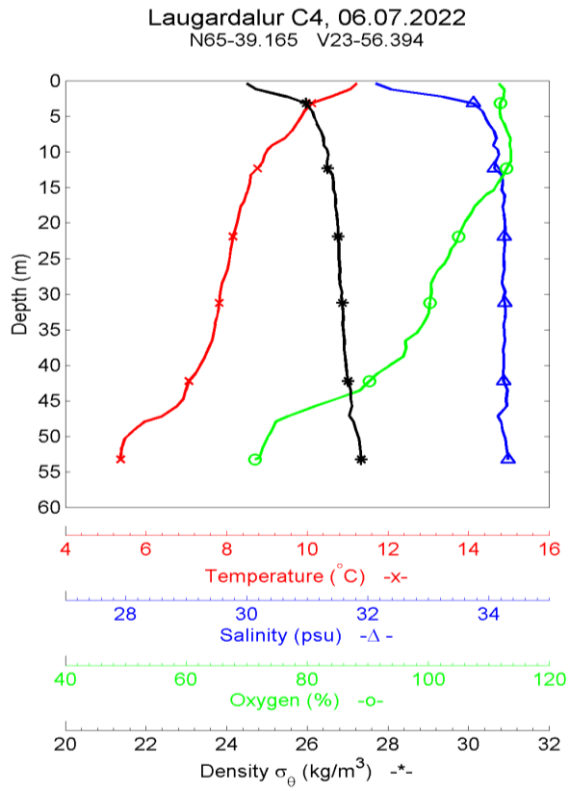

Figure 3. Vertical profiles. Temperature, salinity, density, and oxygen at C4 at Laugardalur, 2022.

4.2 Sediment

4.2.1 TOC, TOM, TN, C/N, grain size and pH/Eh

Levels of total organic material (TOM), total organic carbon (TOC), total nitrogen (TN), C/N-relationship, grain size distribution in sediment (pelite) and pH/Eh in the sediment are presented in Table 4.

TOM-levels varied from 5.6 to 13.9 %. TN-levels were relatively low (3.8 – 6.2 mg/g) as was the C/N-ratio. TOC was rather high at all stations and nTOC varied from 26.7 to 38.0 mg/g TS. The bottom sediments grain size was moderately coarse to moderately fine with a pelite ratio ranging from 33.7 to 57.2 %.

Redox measurements (pH/Eh) gave a point of 0 for all the sampling stations according to Appendix D in NS 9410:2016.

Table 4. Sediment description, TOM (%), TOC (mg/g), TN (mg/g), C/N, grain size distribution (pelite ratio % <0,063 mm) and pH/Eh. Laugardalur, 2022.

St.	Sediment description	TOM	TOC	nTOC	TN	C/N	Pelite	pH/Eh
C1	Olive green mud and silt, some dead shells and black algae.	10.3	30	38.0	6.2*	4.9	57.2	7.7/ 308
C2	Olive green mud and silt, some dead shells and black algae.	5.6	18	29.8	4.6	3.9	33.7	7.6/ 296
C3	Olive green mud and silt, some dead shells and black algae. Some sea cucumbers	10.4	25	34.2	5.3*	4.7	49.0	7.4/ 129
C4	Olive green mud and silt, some dead shells and black algae.	10.9	27	31.2	5.9*	4.5	74.1	7.9/ 303
C5	Olive green mud and silt, some dead shells and black algae. Some sea cucumbers	10.1	25	35.0	5.6*	4.5	46.6	7.6/ 243
C6	Olive green mud and silt, some dead shells.	6.0	16	26.7	3.8	4.1	37.6	7.5/ 310

*Not accredited result.

4.2.2 Copper

Level of copper in bottom sediment at C1 is shown in Table 5. The level was 42.3 mg/kg.

Table 5. Copper (Cu), mg/kg DS. Laugardalur, 2022.

St.	Cu
C1	42.3

4.3 Soft-bottom fauna

4.3.1 Faunal indices

Results from the quantitative soft bottom faunal analyses at the C-stations are presented in Table 6.

The number of individuals varied from 303 (C3) to 3862 (C2) and number of species from 35 (C1 and C3) to 64 (C2 and C6). The diversity H' varied from 3.23 to 4.28. At all stations, the overall index of nEQR was higher than 0.6. This indicates good conditions and no disturbance of the communities.

J (Pielous evenness index) is a measure of how equally individuals are divided between species and will vary between 0 and 1. A station with low value has a "crooked" individual distribution between the species, indicating a disturbed bottom fauna community. The index varied from 0.61 to 0.86 which indicates an even distribution at some of the stations.

Table 6. Number of species and individuals pr. 0,2 m2. H´ = Shannon-Wiener's diversity index. ES100 = Hurlberts diversity index. NQI1 = overall index (diversity and sensitivity). ISI2012 = sensitivity index. NSI = sensitivity index. J = Pielous evenness index. AMBI = AZTI marine biotic index (part of NQI1). nEQR = normalized EQR (excl. DI). C-stations at Laugardalur, 2022.

St.	No. of individuals	No. of species	H´	ES_{100}	NQI1	ISI_{2012}	NSI	nEQR	AMBI	J
C1	389	35	4.08	22.7	0.689	6.67	18.63	0.613	2.375	0.86
C2	3862	64	3.48	20.5	0.731	8.09	20.99	0.659	1.760	0.62
C3	303	35	3.96	23.4	0.721	6.57	20.18	0.628	2.031	0.83
C4	3060	46	3.23	16.9	0.719	7.86	21.69	0.643	1.733	0.61
C5	382	40	4.28	26.2	0.729	6.81	18.81	0.640	2.076	0.86
C6	1252	64	4.14	26.0	0.745	7.98	21.23	0.690	1.947	0.74

4.3.2 NS 9410 Evaluation of the bottom fauna at station C1 (local impact zone).

According to NS 9410 the classification of the environmental status in the local impact zone can also be evaluated based on the number of species and their dominance in the bottom faunal community (see Chapter 8.6.2 in NS 9410:2016).

The soft bottom communities were classified to environmental condition 1 "Very good". The criteria for condition 1 are that there are at least 20 species/0.2 m^2 and that none of these are in numbers exceeding 65 % of the individuals (Table 7).

Table 7. Classification of the environmental status of the soft bottom fauna at station C1 at the Laugardalur site 2022.

Station	Site name	Num. species	Dominating taxa	Environmental condition-NS 9410
C1	Laugardalur	35	Galathowenia oculata – 14 %	1 – Very good

Geometric classes

Figure 4 shows the number of species plotted against the number of individuals, where the number of individuals is divided into geometric classes. For an explanation of the concept of geometric classes is given in Appendix 1.

All curves started relatively low (≤ 10 species) at four of the stations and stretched out in varying degrees towards higher classes. At C2 and C6 the curves started higher and stretched out towards higher classes. None of these give any clear indications of fauna condition.

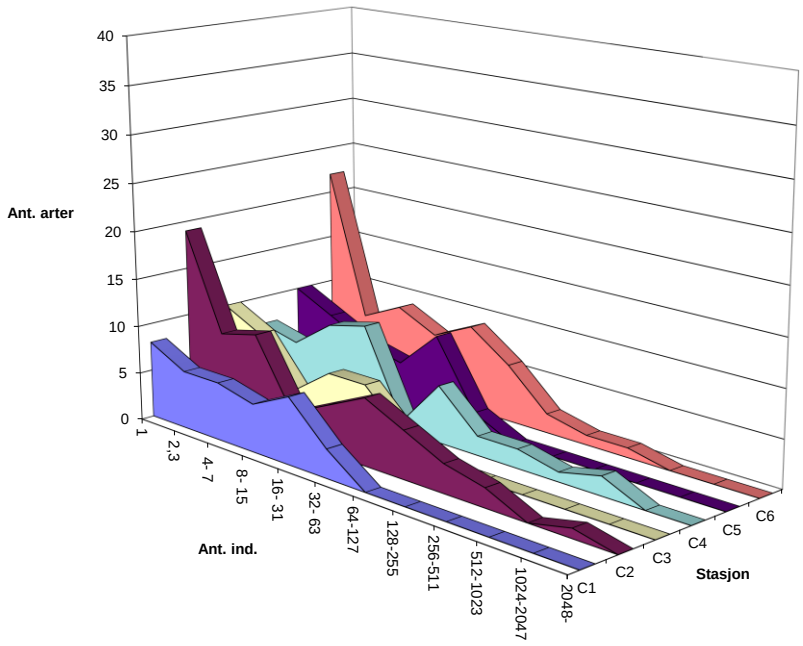

Figure 4. The soft bottom fauna shown as number of species against number of individuals pr. species in geometric classes. Laugardalur, 2022.

4.3.3 Cluster analyses

To investigate the similarity of the faunal composition between the sampling stations, the multivariate technique cluster analysis was used. The results of this are presented in dendrogram in Figure 5.

The stations were separated into two main groups. The fauna composition at C1, C3 and C5 was more than 74 % similar and at C2, C4 and C6 more than 65 % similar. The two station groups were 47 % similar.

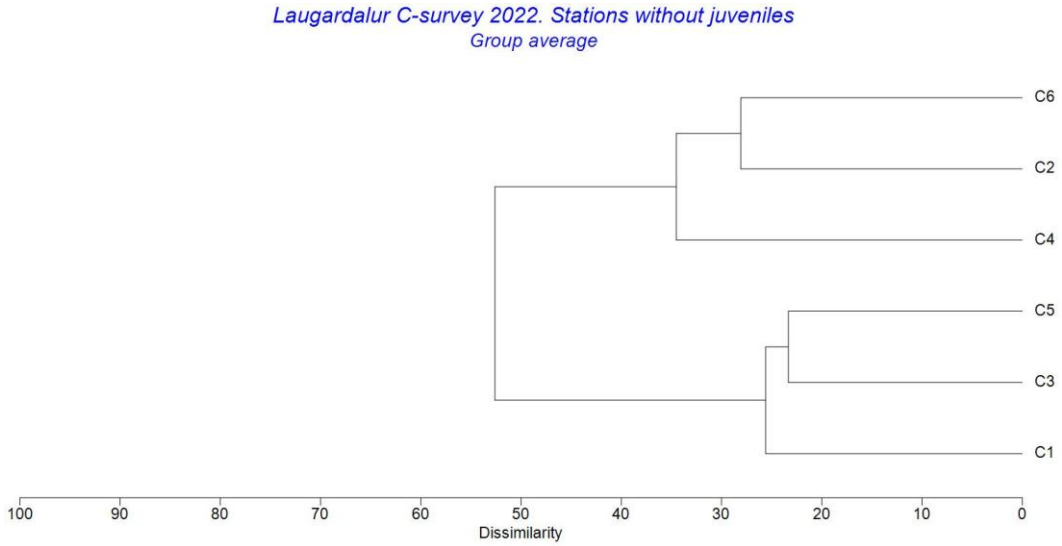

Figure 5. Cluster diagram for the soft bottom fauna at the C- sampling stations at Laugardalur, 2022.

4.3.4 Species composition

The main features of the species composition are shown in the form of a top ten species list from each station in Table 8.

In Rygg and Norling (2013) the species are divided into five ecological groups (EG) based on the value of the sensitivity index. These groups run from sensitive species (EG I) to pollution indicators (EG V).

The fauna at stations C1, C2, C3 and C4 were dominated by the tolerant polychaete *Galathowenia oculata* with between 12 and 39 % of the individuals. The other most dominant species at the stations were mainly a mixture of neutral, tolerant, and opportunistic species. At C1, however, the pollution indicator species *Capitella capitata* (polychaete) also occur among the most dominant species.

At C5, the opportunistic polychaete *Mediomastus fragilis* dominated the fauna with 11 % of the individuals. The other most dominant species, with known EG, at this station were a mixture of neutral, tolerant, and opportunistic species.

At C6, the neutral bivalve *Ennucula tenuis* dominated the fauna with 26 % of the individuals. The other most dominant species, with known EG, at this station were a mixture of neutral, tolerant, and opportunistic species.

Table 8. Number of individuals, cumulative percentage, and ecological group for the ten most dominant species at the C stations. Laugardalur, 2022.*

C1	EG	Numb.	Cum.	C2	EG	Numb.	Cum.
Galathowenia oculata	III	56	14 %	Galathowenia oculata	III	1529	39 %
Polynoidae indet.	II	54	28 %	Ennucula tenuis	II	478	51 %
Capitella capitata	V	36	37 %	Owenia sp.	II	263	58 %
Scalibregma inflatum	III	25	44 %	Thyasira sarsii	IV	233	64 %
Macoma calcarea	IV	20	49 %	Scoloplos armiger	III	184	69 %
Mediomastus fragilis	IV	20	54 %	Maldane sarsi	IV	149	73 %
Echiurus echiurus	Ik	19	59 %	Abra nitida	III	125	76 %
Leucon sp.	Ik	19	63 %	Yoldia hyperborea	Ik	109	79 %
Eteone flava/longa	Ik	18	68 %	Praxillella praetermissa	II	89	81 %
Thyasira sarsii	IV	17	72 %	Lagis koreni	IV	74	83 %
C3	**EG**	**Numb.**	**Cum.**	**C4**	**EG**	**Numb.**	**Cum.**
Galathowenia oculata	III	37	12 %	Galathowenia oculata	III	967	31 %
Scalibregma inflatum	III	35	23 %	Owenia sp.	II	649	53 %
Leucon sp.	Ik	31	34 %	Ennucula tenuis	II	414	66 %
Mediomastus fragilis	IV	22	41 %	Thyasira sarsii	IV	201	72 %
Echiurus echiurus	Ik	21	48 %	Myriochele malmgreni/olgae	Ik	163	78 %
Ennucula tenuis	II	19	54 %	Yoldia hyperborea	Ik	110	81 %
Polynoidae indet.	II	19	60 %	Sternaspis scutata	Ik	88	84 %
Gattyana amondseni	Ik	17	65 %	Prionospio steenstrupi	II	58	86 %
Macoma calcarea	IV	12	69 %	Leucon sp.	Ik	53	88 %
Lagis koreni	IV	10	73 %	Abra nitida	III	41	89 %
C5	**EG**	**Numb.**	**Cum.**	**C6**	**EG**	**Numb.**	**Cum.**
Mediomastus fragilis	IV	42	11 %	Ennucula tenuis	II	332	26 %
Caprellidae indet.	Ik	40	21 %	Scoloplos armiger	III	131	37 %
Leucon sp.	Ik	29	29 %	Abra nitida	III	78	43 %
Thyasira sarsii	IV	26	36 %	Yoldia hyperborea	Ik	73	49 %
Polynoidae indet.	II	23	42 %	Galathowenia oculata	III	60	53 %
Scalibregma inflatum	III	21	47 %	Thyasira sarsii	IV	57	58 %
Echiurus echiurus	Ik	19	52 %	Echiurus echiurus	Ik	51	62 %
Galathowenia oculata	III	18	57 %	Leucon sp.	Ik	37	65 %
Gattyana amondseni	Ik	18	62 %	Gattyana amondseni	Ik	36	68 %
Pholoe baltica	III	18	66 %	Praxillella praetermissa	II	34	70 %

*Ecological groups: EG I = sensitive species. EG II = neutral species. EG III = tolerant species. EG IV = opportunistic species. EG V = pollution indicator species. From Rygg and Norling, 2013. Ik = unidentified group.

5 Summary and Conclusions

5.1 Summary

The results from the environmental monitoring (type C) at Laugardalur, 2022, can be summarised as follows:

- The hydrography measurements showed good oxygen conditions throughout the water column with 71 % saturation in the bottom layer in July 2022.
- TOC was rather high at all stations and nTOC varied from 26.7 to 38.0 mg/g TS. TOM-levels varied from 5.6 to 10.9 %. TN-levels were relatively low (3.8 – 6.2 mg/g) as was the C/N-ratio. The copper level in the sediment at C1 was elevated (42.3 mg/kg) according to Norwegian standards, but within reported natural levels of 55 mg/kg in Icelandic coastal areas (Egilsson *et al.* 1999). The sediment was moderately coarse to moderately fine grained with a pelite share between 33.7 and 57.2 %. The redox measurements (pH/Eh) gave point 0 acc. Appendix D in NS 9410:2016 for all the stations.
- The number of individuals varied from 303 to 3862 and number of species from 35 to 64. The diversity H' varied from 3.23 to 4.28. At all stations, the overall index of nEQR was higher than 0.6. The nEQR values indicates good conditions and no disturbance of the communities.

5.2 Conclusions

The results from the monitoring at the farming site Laugardalur in July 2022 showed that the sediment was somewhat loaded with organic carbon and the copper concentrations were within reported natural levels for bottom sediment around Iceland (Egilsson *et al.*, 1999).

No load effect was recorded in the fauna and the faunal index nEQR showed good conditions and no impact at any of the stations (nEQR > 0.6). The diversity index H ' was above 3 at all stations and ranged from 3.23 (C4) to 4.28 (C5). The NS 9410:2016-assessment of the community in the local impact zone (C1) showed environmental condition 1 (Very good). One pollution indicator species was recorded among the top-10 at C1, but not at any of the other stations.

The redox measurements (pH/Eh) gave point 0 acc. Appendix D in NS 9410:2016 for all the sampling stations. The oxygen saturation in July was good in the whole water column with 71 % in the bottom water.

5.3 Environmental trend since the last C-survey

A C-survey was carried out Laugardalur during max biomass in March 2021 (Mannvik and Gunnarsson, 2021). The conclusion from that survey was: " *The results from the monitoring at the farming site Laugardalur in March 2021 showed that the fauna at C1 may be disturbed (nEQR below 0.4) while it was more or less undisturbed at the other stations (nEQR above 0.6). The NS 9410:2016-assessment of the community in the local impact zone (C1) showed environmental condition 2 (Good). The pollution indicator species Capitella capitata was the most abundant species at C1, but not present among the top 10 taxa at other stations. TOC was highest at C1 and lower at the other stations and nTOC varied between 21.4 (C6) to 46.7 mg/g (C1). The level of copper at C1 was 41.7 mg/kg which is within natural levels reported for bottom sediments*

around Iceland (Egilsson et al., 1999). The redox measurements (pH/Eh) gave points 0 acc., Appendix D in NS 9410:2016, for all the stations. The oxygen saturation in March was good throughout the water column with 90 % in the bottom water."

The faunal index (nEQR) increased at C1 station since previous survey (from 0.303 to 0.613) and is trending in similar range or higher at most of the other stations. The diversity index H´ which is higher than 3.0 at all station in current survey, has also increased since previous survey at stations C1 – C5 and is similar at C6 between surveys. The pollution indicator species *Capitella capitata*, which was the most dominant species at C1 in 2021, is again registered among the top-10 species at C1 but now ranking in third place. In both surveys no pollution indicators were registered at other stations. The results at Laugardalur in July 2022 showed that the sediment was somewhat loaded with organic carbon but nTOC is lower at C1, C2 and C4 than in previous survey, at similar level at C3 slightly higher at C5 and C6. Overall the environmental status has improved significantly between the two surveys.

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7 Appendix (in Norwegian)

7.1 Statistiske metoder

Diversitet

Diversitet er et begrep som uttrykker mangfoldet i dyre- og plantesamfunnet på en lokalitet. Det finnes en rekke ulike mål for diversitet. Noen tar mest hensyn til artsrikheten (mål for artsrikheten), andre legger mer vekt på individfordelingen mellom artene (mål for jevnhet og dominans). Ulike mål uttrykker derved forskjellige sider ved dyresamfunnet. Diversitetsmål er "klassiske" i forurensningsundersøkelser fordi miljøforstyrrelser typisk påvirker samfunnets sammensetning. Svakheten ved diversitetsmålene er at de ikke alltid fanger opp endringer i samfunnsstrukturen. Dersom en art blir erstattet med like mange individer av en ny art, vil ikke det gjøre noe utslag på diversitetsindeksene.

Shannon-Wieners indeks (Shannon & Weaver, 1949) er gitt ved formelen:

$$H' = -\sum_{i=1}^{s} \frac{n_i}{N} \log_2 \left(\frac{n_i}{N} \right)$$

der n_i = antall individer av art i i prøven
N = total antall individer
s = antall arter

Indeksen tar hensyn både til antall arter og mengdefordelingen mellom artene, men det synes som indeksen er mest følsom for individfordelingen. En lav verdi indikerer et artsfattig samfunn og/eller et samfunn som er dominert av en eller få arter. En høy verdi indikerer et artsrikt samfunn.

Pielous mål for jevnhet (Pielou, 1966)

har følgende formel, der symbolene er som i Shannon-Wieners indeks

$$J = \frac{H'}{\log_2 s}$$

Hurlberts diversitetskurver

Grafisk kan diversiteten uttrykkes i form av antall arter som funksjon av antall individer. Med utgangspunkt i total antall arter og individer i en prøve søker man å beregne hvor mange arter man ville vente å finne i delprøver med færre individer. Diversitetsmålet blir derved uavhengig av prøvestørrelsen og gjør at lokaliteter med ulik individtetthet kan sammenlignes direkte. Hurlbert (1971) har gitt en metode for å beregne slike diversitetskurver basert på sannsynlighetsberegning.

ES_n er forventet antall arter i en delprøve på n tilfeldig valgte individer fra en prøve som inneholder total N individer og s arter og har følgende formel:

$$ES_n = \sum_{i=1}^{s} \left[1 - \frac{\binom{N-N_i}{n}}{\binom{N}{n}} \right]$$

der N = total antall individ i prøven
N_i = antall individ av art i

n = antall individ i en gitt delprøve (av de N)
s = total antall arter i prøven

Plott av antall arter i forhold til antall individer

Artene deles inn i grupper/klasser etter hvor mange individer som er registrert i en prøve. Det vanlige er å sette klasse I = 1 individ pr. art, klasse II = 2-3 individer, klasse III = 4-7 individer, klasse IV = 8-15 individer, osv., slik at de nedre klassegrensene danner en følge av ledd på formen 2^x, x=0,1,2, ... En slik følge kalles en geometrisk følge, derfor kalles klassene for geometriske klasser. Hvis antall arter innenfor hver klasse plottes mot klasseverdien på en lineær skala, vil det fremkomme en kurve som uttrykker individfordelingen mellom artene i samfunnet. Det har vist seg at i prøver fra upåvirkede samfunn vil det være mange arter med lavt individantall og få arter med høyt individantall, slik at vi får en entoppet, asymmetrisk kurve med lang "hale" mot høye klasseverdier. Denne kurven vil være godt tilpasset en log-normal fordelingskurve.

Ved moderat forurensing forsvinner en del av de individfattige artene, mens noen som blir begunstiget, øker i antall. Slik flater kurven ut, og strekker seg mot høyere klasser eller den får ekstra topper. Under slike forhold mister kurven enhver likhet med den statistiske log-normalfordelingen. Derfor kan avvik fra log-normalfordelingen tolkes som et resultat av en påvirkning/forurensing. Det har vist seg at denne metoden tidlig gir utslag ved miljøforstyrrelse. Ved sterk forurensning blir det bare noen få, men ofte svært tallrike arter tilbake. Log-normalfordelingskurven vil da ofte gjenoppstå, men med en lavere topp og spredt over flere klasser enn for uforstyrrede samfunn.

Faunaens fordelingsmønster

Variasjoner i faunaens fordelingsmønster over området beskrives ved å sammenligne tettheten av artene på hver stasjon. Til dette brukes multivariate klassifikasjons- og ordinasjons-analyser (Cluster og MDS).

Analysene i denne undersøkelsen ble utført ved hjelp av programpakken PRIMER v5. Inngangsdata er individantall pr. art, pr. prøve. Prøvene kan være replikater eller stasjoner. Det tas ikke hensyn til hvilke arter som opptrer. Forut for klassifikasjons- og ordinasjonsanalysene ble artslistene dobbelt kvadratrot-transformert. Dette ble gjort for å redusere avviket mellom høye og lave tetthetsverdier og dermed redusere eventuelle effekter av tallmessig dominans hos noen få arter i datasettet.

Clusteranalyse

Analysen undersøker faunalikheten mellom prøver. For å sammenligne to prøver ble Bray-Curtis ulikhetsindeks benyttet (Bray & Curtis, 1957):

$$d_{ij} = \frac{\sum_{k=1}^{n} \left| X_{ki} - X_{kj} \right|}{\sum_{k=1}^{n} (X_{ki} + X_{kj})}$$

der n = antall arter sammenlignet
X_{ki} = antall individ av art k i prøve nr. i
X_{kj} = antall individ av art k i prøve nr. j

Indeksen avtar med økende likhet. Vi får verdien 1 hvis prøvene er helt ulike, dvs. ikke har noen felles arter. Identiske arts- og individtall vil gi verdien 0. Prøver blir gruppert sammen etter graden av likhet ved å bruke "group-average linkage". Forholdsvis like prøver danner en gruppe (cluster). Resultatet presenteres i et trediagram (dendrogram).

Ømfintlighet (AMBI, ISI og NSI)

Ømfintligheten bestemmes ved indeksene ISI og AMBI. Beregning av ISI er beskrevet av Rygg (2002). Sensitivitetsindeksen AMBI (Azti Marin Biotic Index) tilordner en ømfintlighetsklasse (økologisk gruppe, EG): EG-1: sensitive arter, EG-II: indifferente arter, EG-III: tolerante arter, EG-IV: opportunistiske arter, EG-V: forurensningsindikerende arter. Sammensetningen av makroevertebratsamfunnet i form av andelen av økologiske grupper indikerer omfanget av en forurensningspåvirkning.

NSI er en sensitivitetsindeks som ligner AMBI, men er utviklet med basis i norske faunadata og ved bruk av en objektiv statistisk metode. En prøves NSI verdi beregnes ved gjennomsnittet av sensitivitetsverdiene av alle individene i prøven.

Sammensatte indekser (NQI1 og NQI2)

Sammensatte indekser NQI1 og NQI2 bestemmes både ut fra artsmangfold og ømfintlighet. NQI1 er brukt i NEAGIG (den nordøst-atlantiske interkalibreringen). De fleste land bruker nå sammensatte indekser av samme type som NQI1 og NQI2.

NQI1 indeksen er beskrevet ved hjelp av formelen:

NQI1 (Norwegian quality status, version 1) = [0.5* (1-AMBI/7) + 0.5*(SN/2.7)* (N/(N+5)]

Diversitetsindeksen SN = lnS/ln(lnN), hvor S er antall arter og N er antall individer i prøven

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7.2 Statistical results Laugardalur, 2022

Number of species and individuals per station

St.	C1	C2	C3	C4	C5	C6
Ant. ind.	389	3862	303	3060	382	1252
Ant. arter	35	64	35	46	40	64

Benthos indices per replicate

st.nr.	tot.	C1_01	C1_02	C2_01	C2_02	C3_01	C3_02	C4_01	C4_02	C5_01	C5_02	C6_01	C6_02
no. ind.	9248	173	216	1787	2075	179	124	1467	1593	176	206	756	496
no. spe.	97	27	27	51	49	29	25	36	45	34	30	57	42
Shannon-Wiener:		4,3	3,9	3,4	3,5	4,1	3,8	3,1	3,4	4,4	4,1	4,2	4,1
Pielou		0,90	0,82	0,60	0,63	0,85	0,81	0,60	0,62	0,87	0,84	0,72	0,76
ES100		24	22	20	21	24	23	16	18	29	23	27	25
SN		2,01	1,96	1,95	1,91	2,05	2,05	1,80	1,91	2,15	2,03	2,14	2,05
ISI-2012		6,87	6,47	8,44	7,74	6,63	6,51	7,65	8,06	6,65	6,97	8,57	7,38
AMBI	*)	2,003	2,747	1,775	1,744	2,027	2,034	1,744	1,721	1,918	2,234	2,039	1,854
NQI1		0,72	0,66	0,73	0,73	0,72	0,72	0,71	0,73	0,75	0,71	0,75	0,74
NSI		19,0	18,3	21,0	21,0	20,4	19,9	21,8	21,6	19,3	18,3	21,2	21,2

Benthos indices, averages per station

st.nr.		C1	C2	C3	C4	C5	C6
Shannon-Wiener:		4,08	3,48	3,96	3,23	4,28	4,14
Pielou		0,86	0,62	0,83	0,61	0,86	0,74
ES100		22,7	20,5	23,4	16,9	26,2	26,0
SN		1,98	1,93	2,05	1,85	2,09	2,09
ISI-2012		6,67	8,09	6,57	7,86	6,81	7,98
AMBI		2,375	1,760	2,031	1,733	2,076	1,947
NQI1		0,69	0,73	0,72	0,72	0,73	0,75
NSI		18,63	20,99	20,18	21,69	18,81	21,23
Tilstandsklasse nEQR *)		0,613	0,659	0,628	0,643	0,640	0,690

*) På stasjon C4 mangler 22% av populasjonen AMBI verdi.

Geometrical classes

int.	C1	C2	C3	C4	C5	C6
1	8	19	10	7	10	22
2,3	6	9	8	6	8	7
4- 7	6	10	3	9	6	9
8- 15	5	3	6	10	5	7
16- 31	7	5	6	1	9	9
32- 63	3	7	2	6	2	6
64-127	0	5	0	2	0	2
128-255	0	3	0	2	0	1
256-511	0	2	0	1	0	1
512-1023	0	0	0	2	0	0
1024-2047	0	1	0	0	0	0
2048-	0	0	0	0	0	0

7.3 Species lists

Artsliste pr stasjon

Laugardalur C-survey 2022

Rekke	Klasse	Orden	Art/Taxa	Replikat: 01	02	-	Sum
Stasjonsnr.: C1							
NEMERTINI							
			Nemertea indet.		2	-	2
PRIAPULIDA							
			Priapulus caudatus	2	2	-	4
ECHIURIDA							
			Echiurus echiurus	10	9	-	19
ANNELIDA							
	Polychaeta						
		Orbiniida					
			Scoloplos armiger	5	3	-	8
		Spionida					
			Chaetozone setosa	1		-	1
			Laonice cirrata	1		-	1
			Malacoceros vulgaris		2	-	2
			Spio armata	4	8	-	12
			Spio limicola	2	1	-	3
		Capitellida					
			Capitella capitata	7	29	-	36
			Mediomastus fragilis	11	9	-	20
		Opheliida					
			Ophelina acuminata		6	-	6
			Scalibregma inflatum	13	12	-	25
		Phyllodocida					
			Eteone flava/longa	7	11	-	18
			Gattyana amondseni		1	-	1
			Microphthalmus sczelkowii	1		-	1
			Pholoe baltica	15		-	15
			Polynoidae indet.	18	36	-	54
			Syllis cornuta	4		-	4
		Oweniida					
			Galathowenia oculata	16	40	-	56
		Terebellida					
			Cistenides hyperborea	9	1	-	10
			Lagis koreni	3	1	-	4
CRUSTACEA							
	Malacostraca						
		Cumacea					
			Leucon sp.	8	11	-	19
		Amphipoda					
			Caprellidae indet.		3	-	3
			Dulichiidae indet.		1	-	1
			Isaeidae indet.		1	-	1
			Lysianassidae indet.	1	2	-	3
			Oedicerotidae indet.	2		-	2
		Decapoda					
			Carcinus maenas	1		-	1
			Paguridae indet.	1		-	1
MOLLUSCA							
	Bivalvia						
		Nuculoida					
			Ennucula tenuis	3	1	-	4
			Nuculana sp. juv.		1	-	1
			Yoldia hyperborea	5	6	-	11
		Veneroida					
			Macoma calcarea	13	7	-	20
			Thyasira sarsii	10	7	-	17
		Myoida					
			Mya sp. juv.		1	-	1
ECHINODERMATA							
	Ophiuroidea						

Rekke	Klasse	Orden	Art/Taxa	Replikat:	01	02	-	Sum
		Ophiurida						
			Ophiocten affinis			4	-	4
			Ophiuroidea indet. juv.		1	1	-	2
				Maksverdi:	18	40		56
				Antall arter/taxa:	28	30		38
				Sum antall individ:				393

Stasjonsnr.: C2

CNIDARIA								
	Anthozoa							
			Edwardsia sp.			1	-	1
NEMERTINI								
			Nemertea indet.		1	1	-	2
ECHIURIDA								
			Echiurus echiurus		2	2	-	4
SIPUNCULIDA								
			Phascolion strombus			2	-	2
ANNELIDA								
	Polychaeta							
		Orbiniida						
			Aricidea sp.		1		-	1
			Scoloplos armiger		101	83	-	184
		Cossurida						
			Cossura pygodactylata			2	-	2
		Spionida						
			Chaetozone setosa		2	3	-	5
			Dipolydora sp.		1		-	1
			Laonice cirrata		1		-	1
			Prionospio steenstrupi		10	4	-	14
			Spio armata		1	1	-	2
			Spio limicola		7	23	-	30
		Capitellida						
			Maldane sarsi		72	77	-	149
			Mediomastus fragilis		1	3	-	4
			Praxillella praetermissa		55	34	-	89
		Opheliida						
			Ophelia sp.		1		-	1
			Scalibregma inflatum		3	1	-	4
		Phyllodocida						
			Eteone flava/longa		23	27	-	50
			Gattyana amondseni			1	-	1
			Goniada maculata		1		-	1
			Nephtys ciliata			6	-	6
			Pholoe assimilis		9	14	-	23
			Pholoe baltica		34	21	-	55
			Phyllodoce groenlandica		1		-	1
			Polynoidae indet.		2	6	-	8
			Syllis cornuta		14	14	-	28
		Eunicida						
			Scoletoma sp.		3	1	-	4
		Sternaspida						
			Sternaspis scutata		4	10	-	14
		Oweniida						
			Galathowenia oculata		736	793	-	1529
			Myriochele malmgreni/olgae		2	2	-	4
			Owenia sp.		105	158	-	263
		Terebellida						
			Ampharete borealis		2		-	2
			Ampharete sp.			1	-	1
			Lagis koreni		29	45	-	74
			Lanassa venusta		1		-	1
			Laphania boecki		27	11	-	38
			Pista cristata		2		-	2
			Polycirrus medusa		1		-	1
			Proclea graffii			3	-	3

Rekke	Klasse	Orden	Art/Taxa	Replikat:	01	02	-	Sum
			Zatsepinia rittichae			1	-	1
		Sabellida						
			Euchone incolor		6	24	-	30
CRUSTACEA								
	Malacostraca							
		Cumacea						
			Leucon sp.		16	28	-	44
		Tanaidacea						
			Tanaidacea indet.		1		-	1
		Amphipoda						
			Byblis gaimardii		1		-	1
			Lysianassidae indet.		1	2	-	3
			Paroediceros sp.			6	-	6
			Protomedeia fasciata		6		-	6
		Isopoda						
			Pleurogonium spinosissimum			1	-	1
MOLLUSCA								
	Caudofoveata							
			Caudofoveata indet.			1	-	1
	Opistobranchia							
		Cephalaspidea						
			Retusa obtusa			4	-	4
	Bivalvia							
		Nuculoida						
			Ennucula tenuis		204	274	-	478
			Nuculana pernula		33	41	-	74
			Nuculana sp. juv.		6	12	-	18
			Yoldia hyperborea		37	72	-	109
		Veneroida						
			Abra nitida		54	71	-	125
			Arctica islandica		1		-	1
			Astarte montagui		1		-	1
			Axinopsida orbiculata		20	19	-	39
			Macoma calcarea		10	24	-	34
			Thyasira gouldii		22	16	-	38
			Thyasira sarsii		111	122	-	233
			Thyasiridae indet.			1	-	1
		Myoida						
			Mya sp. juv.		3	1	-	4
ECHINODERMATA								
	Ophiuroidea							
		Ophiurida						
			Ophiocten affinis		7	16	-	23
			Ophiura albida		1	2	-	3
			Ophiuroidea indet. juv.		6	9	-	15
				Maksverdi:	736	793		1529
				Antall arter/taxa:	54	52		67
				Sum antall individ:				3899

Stasjonsnr.: C3

PRIAPULIDA								
			Priapulus caudatus		2		-	2
ECHIURIDA								
			Echiurus echiurus		17	4	-	21
ANNELIDA								
	Polychaeta							
		Orbiniida						
			Scoloplos armiger		4	3	-	7
		Spionida						
			Chaetozone setosa		1	1	-	2
			Dipolydora caulleryi		1	1	-	2
			Laonice cirrata		1		-	1
			Spio armata		3		-	3
			Spio limicola		1	7	-	8
		Capitellida						
			Mediomastus fragilis		20	2	-	22
		Opheliida						

Rekke	Klasse	Orden	Art/Taxa	Replikat:	01	02	-	Sum
			Ophelina acuminata			1	-	1
			Scalibregma inflatum		26	9	-	35
		Phyllodocida						
			Eteone flava/longa		3	2	-	5
			Gattyana amondseni		14	3	-	17
			Nephtys hystricis		1		-	1
			Nephtys paradoxa			1	-	1
			Nereimyra punctata		1		-	1
			Pholoe baltica		6	4	-	10
			Phyllodoce citrina			1	-	1
			Polynoidae indet.		13	6	-	19
			Syllis cornuta		2		-	2
		Oweniida						
			Galathowenia oculata		9	28	-	37
		Terebellida						
			Cistenides hyperborea		1	1	-	2
			Lagis koreni		2	8	-	10
		Sabellida						
			Euchone incolor			1	-	1
CRUSTACEA								
	Malacostraca							
		Cumacea						
			Leucon sp.		6	25	-	31
		Amphipoda						
			Caprellidae indet.		3		-	3
			Dulichiidae indet.		1		-	1
			Lysianassidae indet.		10		-	10
			Oedicerotidae indet.		1		-	1
			Paroediceros sp.			2	-	2
MOLLUSCA								
	Bivalvia							
		Nuculoida						
			Ennucula tenuis		14	5	-	19
			Nuculana sp. juv.			2	-	2
			Yoldia hyperborea		7	1	-	8
		Veneroida						
			Macoma calcarea		8	4	-	12
			Thyasira sarsii		1	3	-	4
ECHINODERMATA								
	Ophiuroidea							
		Ophiurida						
			Ophiocten affinis			1	-	1
			Ophiuroidea indet. juv.		2		-	2
				Maksverdi:	26	28		37
				Antall arter/taxa:	30	26		37
				Sum antall individ:				307

Stasjonsnr.: C4

NEMERTINI								
			Nemertea indet.		1	1	-	2
SIPUNCULIDA								
			Phascolion strombus			2	-	2
ANNELIDA								
	Polychaeta							
		Orbiniida						
			Aricidea sp.		1	3	-	4
			Scoloplos armiger		7	4	-	11
		Cossurida						
			Cossura pygodactylata			6	-	6
		Spionida						
			Chaetozone setosa		3	3	-	6
			Prionospio steenstrupi		25	33	-	58
			Spio limicola		5	3	-	8
		Capitellida						
			Maldane sarsi		9	31	-	40
			Mediomastus fragilis		1	2	-	3
			Praxillella gracilis			1	-	1
			Praxillella praetermissa		5	6	-	11

Rekke	Klasse	Orden	Art/Taxa	Replikat:	01	02	-	Sum
		Phyllodocida						
			Eteone flava/longa		8	2	-	10
			Nephtys ciliata		2	2	-	4
			Pholoe assimilis		2		-	2
			Pholoe baltica		8	4	-	12
			Polynoidae indet.		3	6	-	9
			Syllides sp.			1	-	1
			Syllis cornuta		3	3	-	6
		Eunicida						
			Parougia eliasoni			1	-	1
		Sternaspida						
			Sternaspis scutata		29	59	-	88
		Oweniida						
			Galathowenia oculata		446	521	-	967
			Myriochele malmgreni/olgae		40	123	-	163
			Owenia sp.		382	267	-	649
		Terebellida						
			Lagis koreni		6	8	-	14
			Laphania boecki		3	1	-	4
			Melinna cristata			1	-	1
			Proclea graffii			1	-	1
		Sabellida						
			Euchone incolor		3	15	-	18
			Euchone papillosa		7	30	-	37
CRUSTACEA								
	Malacostraca							
		Cumacea						
			Leucon sp.		21	32	-	53
		Amphipoda						
			Caprellidae indet.		1	1	-	2
			Dulichiidae indet.		2	3	-	5
			Gammaridea indet.			1	-	1
			Lysianassidae indet.			2	-	2
			Oedicerotidae indet.			1	-	1
MOLLUSCA								
	Bivalvia							
		Nuculoida						
			Ennucula tenuis		211	203	-	414
			Nuculana pernula		12	28	-	40
			Nuculana sp. juv.		3	9	-	12
			Yoldia hyperborea		59	51	-	110
		Veneroida						
			Abra nitida		25	16	-	41
			Axinopsida orbiculata		9	5	-	14
			Macoma calcarea		2	11	-	13
			Thyasira gouldii		5	2	-	7
			Thyasira sarsii		112	89	-	201
			Thyasiridae indet.		4	1	-	5
ECHINODERMATA								
	Ophiuroidea							
		Ophiurida						
			Ophiocten affinis		5	7	-	12
			Ophiuroidea indet. juv.		2	4	-	6
				Maksverdi:	446	521		967
				Antall arter/taxa:	38	47		48
				Sum antall individ:				3078

Stasjonsnr.: C5

PRIAPULIDA								
			Priapulus caudatus		2	7	-	9
ECHIURIDA								
			Echiurus echiurus		4	15	-	19
SIPUNCULIDA								
			Golfingiidae indet.		1		-	1
ANNELIDA								
	Polychaeta							

Rekke	Klasse	Orden	Art/Taxa	Replikat:	01	02	-	Sum
		Orbiniida						
			Scoloplos armiger		7	7	-	14
		Spionida						
			Chaetozone setosa		5	5	-	10
			Dipolydora sp.			1	-	1
			Laonice cirrata			1	-	1
			Spio armata		8	3	-	11
			Spio filicornis		1		-	1
			Spio limicola		1	2	-	3
		Capitellida						
			Mediomastus fragilis		10	32	-	42
		Opheliida						
			Scalibregma inflatum		6	15	-	21
		Phyllodocida						
			Bylgides groenlandicus		3		-	3
			Eteone flava/longa		3	1	-	4
			Gattyana amondseni		5	13	-	18
			Microphthalmus sczelkowii		1		-	1
			Nephtys ciliata		1		-	1
			Nephtys hystricis		2		-	2
			Pholoe baltica		3	15	-	18
			Polynoidae indet.		8	15	-	23
			Syllis cornuta		1	1	-	2
		Eunicida						
			Parougia eliasoni		2	1	-	3
			Scoletoma fragilis			2	-	2
		Oweniida						
			Galathowenia oculata		6	12	-	18
		Terebellida						
			Cistenides hyperborea		1	1	-	2
			Lagis koreni		2	2	-	4
CRUSTACEA								
	Malacostraca							
		Cumacea						
			Leucon sp.		12	17	-	29
		Amphipoda						
			Calliopiidae indet.		1		-	1
			Caprellidae indet.		39	1	-	40
			Dulichiidae indet.		4		-	4
			Gammaridea indet.			1	-	1
			Lysianassidae indet.		2		-	2
			Oedicerotidae indet.		6		-	6
			Paroediceros sp.		3	2	-	5
MOLLUSCA								
	Bivalvia							
		Nuculoida						
			Ennucula tenuis		9	8	-	17
			Yoldia hyperborea		4	2	-	6
		Veneroida						
			Macoma calcarea		6	3	-	9
			Thyasira gouldii			1	-	1
			Thyasira sarsii		7	19	-	26
ECHINODERMATA								
	Ophiuroidea							
		Ophiurida						
			Ophiocten affinis			1	-	1
			Ophiuroidea indet. juv.		1		-	1
				Maksverdi:	39	32		42
				Antall arter/taxa:	35	30		41
				Sum antall individ:				383

Stasjonsnr.: C6

ECHIURIDA								
			Echiurus echiurus		20	31	-	51
ANNELIDA								
	Polychaeta							
		Orbiniida						
			Levinsenia gracilis		2		-	2
			Scoloplos armiger		115	16	-	131
		Cossurida						

Rekke	Klasse	Orden	Art/Taxa	Replikat:	01	02	-	Sum
			Cossura pygodactylata			1	-	1
		Spionida						
			Chaetozone setosa		5	4	-	9
			Dipolydora sp.		4	2	-	6
			Laonice cirrata		2	2	-	4
			Prionospio steenstrupi		5	3	-	8
			Spio armata		2	2	-	4
			Spio limicola		5	17	-	22
		Capitellida						
			Capitella capitata		1		-	1
			Maldane sarsi		6		-	6
			Mediomastus fragilis		11	9	-	20
			Praxillella gracilis		2		-	2
			Praxillella praetermissa		31	3	-	34
		Opheliida						
			Ophelina acuminata		1	2	-	3
			Scalibregma inflatum		3	19	-	22
		Phyllodocida						
			Eteone flava/longa		9	2	-	11
			Gattyana amondseni		32	4	-	36
			Goniada maculata		4	2	-	6
			Nephtys ciliata		1		-	1
			Pholoe assimilis		5		-	5
			Pholoe baltica		6	18	-	24
			Phyllodoce citrina		1		-	1
			Phyllodoce groenlandica			1	-	1
			Polynoidae indet.		4	19	-	23
			Syllis cornuta		10	3	-	13
		Eunicida						
			Scoletoma fragilis			1	-	1
		Sternaspida						
			Sternaspis scutata		1		-	1
		Oweniida						
			Galathowenia oculata		56	4	-	60
			Myriochele malmgreni/olgae		1		-	1
			Owenia sp.		2	1	-	3
		Terebellida						
			Ampharete borealis		3	7	-	10
			Cistenides hyperborea		2	1	-	3
			Lagis koreni		9	18	-	27
			Lanassa venusta		1		-	1
		Sabellida						
			Euchone incolor		3	1	-	4
			Sabella pavonina			1	-	1
CRUSTACEA								
	Malacostraca							
		Cumacea						
			Eudorellopsis deformis		1		-	1
			Leptostylis sp.		1		-	1
			Leucon sp.		19	18	-	37
		Tanaidacea						
			Tanaidacea indet.		1		-	1
		Amphipoda						
			Byblis gaimardii		1		-	1
			Dulichiidae indet.			1	-	1
			Gammaridea indet.		1	4	-	5
			Lysianassidae indet.			1	-	1
			Oedicerotidae indet.		1		-	1
			Paroediceros sp.		4	5	-	9
			Protomedeia fasciata		4		-	4
		Decapoda						
			Paguridae indet.		1		-	1
MOLLUSCA								
	Caudofoveata							
			Caudofoveata indet.		1		-	1
	Prosobranchia							
		Neogastropoda						
			Propebela sp.		1		-	1
	Opistobranchia							
		Cephalaspidea						
			Retusa obtusa		2		-	2
	Bivalvia							
		Nuculoida						
			Ennucula tenuis		183	149	-	332
			Nuculana pernula		3		-	3

Rekke	Klasse	Orden	Art/Taxa	Replikat:	01	02	-	Sum
			Nuculana sp. juv.		3	2	-	5
			Yoldia hyperborea		39	34	-	73
		Veneroida						
			Abra nitida		48	30	-	78
			Arctica islandica		1		-	1
			Axinopsida orbiculata		7	2	-	9
			Macoma calcarea		22	9	-	31
			Thyasira gouldii		8	13	-	21
			Thyasira sarsii		30	27	-	57
			Thyasiridae indet.			1	-	1
ECHINODERMATA								
	Ophiuroidea							
		Ophiurida						
			Ophiocten affinis		12	8	-	20
			Ophiuroidea indet. juv.		3	2	-	5
				Maksverdi:	183	149		332
				Antall arter/taxa:	59	44		66
				Sum antall individ:				1262

7.4 Analytical report

ANALYSERAPPORT

Kunde:	Arnarlax	Rapport nr.:	P2200123
Kundemerking:	Laugardalur		
Kontaktperson kunde:		Rapportdato	2022-08-30
Prosjektnr.:	64189	Ankomst dato	2022-07-05

Lab-id. P2200123-01

Objekt	Kundens ID	Beskrivelse	Notering	Mottatt lab
Sediment	C1	64189 - Laugardalur C and B survey at fallow 2022		2022-07-05

Analyseresultat						
Parameter	Resultat	Enhet	Analysedato start	Analysedato slutt	Standard	Måleusikkerhet
TOC	30	mg/g TS	2022-08-08	2022-08-13	DIN 19539:2016	±3.0
TNb	*6.2	mg/g TS	2022-08-08	2022-08-13	NS-EN 16168:2012	±1.8
N TOC	38.0	mg/g TS	2022-08-16	2022-08-16	Veileder 02:2018	
C/N - forhold	4.9		2022-08-15	2022-08-15		
TOM	10.3	% TS	2022-08-11	2022-08-16	Intern metode	±0.0
Vekt % 2 mm	0.8	wt% TS	2022-08-10	2022-08-16	Intern metode	±0.0
Vekt % 1 mm	0.4	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.0
Vekt % 0.500 mm	1.0	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.0
Vekt % 0.250 mm	10.2	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.5
Vekt % 0.125 mm	9.2	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.5
Vekt % 0.063 mm	21.2	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±1.1
Vekt % < 0.063 mm	57.2	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±2.9
Pelitt	57.2	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±2.9
Sand	41.9	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±2.1
Grus	0.8	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.0
Cu (kobber) [a]	42.3	mg/kg TS	2022-08-11	2022-08-11	Intern metode	
P (Fosfor) [a]	1340	mg/kg TS	2022-08-11	2022-08-11	Intern metode	

[a] Prøvingen er utført av eksternt laboratorium, ALS Laboratory Group

* = Ikke akkreditert resultat

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ANALYSERAPPORT

Kunde:	Arnarlax	**Rapport nr.:**	P2200123
Kundemerking:	Laugardalur		
Kontaktperson kunde:		**Rapportdato**	**2022-08-30**
Prosjektnr.:	**64189**	**Ankomst dato**	2022-07-05

Lab-id. P2200123-02

Objekt	Kundens ID	Beskrivelse	Notering	Mottatt lab
Sediment	C2	64189 - Laugardalur C and B survey at fallow 2022		2022-07-05

Analyseresultat						
Parameter	Resultat	Enhet	Analysedato start	Analysedato slutt	Standard	Måleusikkerhet
TOC	18	mg/g TS	2022-08-08	2022-08-13	DIN 19539:2016	±1.8
TNb	4.6	mg/g TS	2022-08-08	2022-08-13	NS-EN 16168:2012	±1.4
N TOC	29.8	mg/g TS	2022-08-16	2022-08-16	Veileder 02:2018	
C/N - forhold	3.9		2022-08-15	2022-08-15		
TOM	5.6	% TS	2022-08-11	2022-08-16	Intern metode	±0.0
Vekt % 2 mm	1.5	wt% TS	2022-08-10	2022-08-16	Intern metode	±0.1
Vekt % 1 mm	0.6	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.0
Vekt % 0.500 mm	0.7	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.0
Vekt % 0.250 mm	2.0	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.1
Vekt % 0.125 mm	8.8	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.4
Vekt % 0.063 mm	52.7	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±2.6
Vekt % < 0.063 mm	33.7	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±1.7
Pelitt	33.7	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±1.7
Sand	64.8	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±3.2
Grus	1.5	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.1
P (Fosfor) [a]	863	mg/kg TS	2022-08-11	2022-08-11	Intern metode	

[a] Prøvingen er utført av eksternt laboratorium, ALS Laboratory Group

* = Ikke akkreditert resultat

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ANALYSERAPPORT

Kunde:	Arnarlax	**Rapport nr.:**	P2200123
Kundemerking:	Laugardalur		
Kontaktperson kunde:		**Rapportdato**	**2022-08-30**
Prosjektnr.:	**64189**	**Ankomst dato**	2022-07-05

Lab-id. P2200123-03

Objekt	Kundens ID	Beskrivelse	Notering	Mottatt lab
Sediment	C3	64189 - Laugardalur C and B survey at fallow 2022		2022-07-05

Analyseresultat						
Parameter	Resultat	Enhet	Analysedato start	Analysedato slutt	Standard	Måleusikkerhet
TOC	25	mg/g TS	2022-08-08	2022-08-13	DIN 19539:2016	±2.5
TNb	*5.3	mg/g TS	2022-08-08	2022-08-13	NS-EN 16168:2012	±1.6
N TOC	34.2	mg/g TS	2022-08-22	2022-08-22	Veileder 02:2018	
C/N - forhold	4.7		2022-08-15	2022-08-15		
TOM	10.4	% TS	2022-08-11	2022-08-16	Intern metode	±0.0
Vekt % 2 mm	0.8	wt% TS	2022-08-10	2022-08-16	Intern metode	±0.0
Vekt % 1 mm	0.5	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.0
Vekt % 0.500 mm	1.0	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.0
Vekt % 0.250 mm	13.0	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.6
Vekt % 0.125 mm	12.0	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.6
Vekt % 0.063 mm	23.8	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±1.2
Vekt % < 0.063 mm	49.0	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±2.4
Pelitt	49.0	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±2.4
Sand	50.2	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±2.5
Grus	0.8	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.0
P (Fosfor) [a]	1160	mg/kg TS	2022-08-11	2022-08-11	Intern metode	

[a] Prøvingen er utført av eksternt laboratorium, ALS Laboratory Group

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Analyserapporten er digitalt undertegnet av:
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ANALYSERAPPORT

Kunde:	Arnarlax	**Rapport nr.:**	P2200123
Kundemerking:	Laugardalur		
Kontaktperson kunde:		**Rapportdato**	**2022-08-30**
Prosjektnr.:	**64189**	**Ankomst dato**	2022-07-05

Lab-id. P2200123-04

Objekt	Kundens ID	Beskrivelse	Notering	Mottatt lab
Sediment	C4	64189 - Laugardalur C and B survey at fallow 2022		2022-07-05

Analyseresultat						
Parameter	Resultat	Enhet	Analysedato start	Analysedato slutt	Standard	Måleusikkerhet
TOC	27	mg/g TS	2022-08-08	2022-08-13	DIN 19539:2016	±2.7
TNb	*5.9	mg/g TS	2022-08-08	2022-08-13	NS-EN 16168:2012	±1.8
N TOC	31.2	mg/g TS	2022-08-22	2022-08-22	Veileder 02:2018	
C/N - forhold	4.5		2022-08-15	2022-08-15		
TOM	10.9	% TS	2022-08-11	2022-08-16	Intern metode	±0.0
Vekt % 2 mm	2.4	wt% TS	2022-08-10	2022-08-16	Intern metode	±0.1
Vekt % 1 mm	2.2	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.1
Vekt % 0.500 mm	2.5	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.1
Vekt % 0.250 mm	2.2	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.1
Vekt % 0.125 mm	3.6	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.2
Vekt % 0.063 mm	13.0	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.6
Vekt % < 0.063 mm	74.1	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±3.7
Pelitt	74.1	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±3.7
Sand	23.5	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±1.2
Grus	2.4	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.1
P (Fosfor) [a]	855	mg/kg TS	2022-08-11	2022-08-11	Intern metode	

[a] Prøvingen er utført av eksternt laboratorium, ALS Laboratory Group

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ANALYSERAPPORT

Kunde:	Arnarlax	**Rapport nr.:**	P2200123
Kundemerking:	Laugardalur		
Kontaktperson kunde:		**Rapportdato**	**2022-08-30**
Prosjektnr.:	**64189**	**Ankomst dato**	2022-07-05

Lab-id. P2200123-05

Objekt	Kundens ID	Beskrivelse	Notering	Mottatt lab
Sediment	C5	64189 - Laugardalur C and B survey at fallow 2022		2022-07-05

Analyseresultat						
Parameter	Resultat	Enhet	Analysedato start	Analysedato slutt	Standard	Måleusikkerhet
TOC	25	mg/g TS	2022-08-08	2022-08-13	DIN 19539:2016	±2.5
TNb	*5.6	mg/g TS	2022-08-08	2022-08-13	NS-EN 16168:2012	±1.7
N TOC	35.0	mg/g TS	2022-08-22	2022-08-22	Veileder 02:2018	
C/N - forhold	4.5		2022-08-15	2022-08-15		
TOM	10.1	% TS	2022-08-11	2022-08-16	Intern metode	±0.0
Vekt % 2 mm	0.6	wt% TS	2022-08-10	2022-08-16	Intern metode	±0.0
Vekt % 1 mm	0.8	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.0
Vekt % 0.500 mm	2.7	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.1
Vekt % 0.250 mm	13.2	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.7
Vekt % 0.125 mm	12.5	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.6
Vekt % 0.063 mm	23.5	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±1.2
Vekt % < 0.063 mm	46.6	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±2.3
Pelitt	46.6	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±2.3
Sand	52.8	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±2.6
Grus	0.6	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.0
P (Fosfor) [a]	1040	mg/kg TS	2022-08-11	2022-08-11	Intern metode	

[a] Prøvingen er utført av eksternt laboratorium, ALS Laboratory Group

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ANALYSERAPPORT

Kunde:	Arnarlax	**Rapport nr.:**	P2200123
Kundemerking:	Laugardalur		
Kontaktperson kunde:		**Rapportdato**	**2022-08-30**
Prosjektnr.:	**64189**	**Ankomst dato**	2022-07-05

Lab-id. P2200123-06

Objekt	Kundens ID	Beskrivelse	Notering	Mottatt lab
Sediment	C6	64189 - Laugardalur C and B survey at fallow 2022		2022-07-05

Analyseresultat						
Parameter	Resultat	Enhet	Analysedato start	Analysedato slutt	Standard	Måleusikkerhet
TOC	16	mg/g TS	2022-08-08	2022-08-13	DIN 19539:2016	±1.6
TNb	3.8	mg/g TS	2022-08-08	2022-08-13	NS-EN 16168:2012	±1.1
N TOC	26.7	mg/g TS	2022-08-22	2022-08-22	Veileder 02:2018	
C/N - forhold	4.1		2022-08-15	2022-08-15		
TOM	6.0	% TS	2022-08-11	2022-08-16	Intern metode	±0.0
Vekt % 2 mm	0.6	wt% TS	2022-08-10	2022-08-16	Intern metode	±0.0
Vekt % 1 mm	0.4	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.0
Vekt % 0.500 mm	0.6	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.0
Vekt % 0.250 mm	3.1	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.2
Vekt % 0.125 mm	10.0	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.5
Vekt % 0.063 mm	47.9	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±2.4
Vekt % < 0.063 mm	37.6	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±1.9
Pelitt	37.6	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±1.9
Sand	61.9	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±3.1
Grus	0.6	wt% TS	2022-08-10	2022-08-16	Intern metode (Bale/Kenny 2005)	±0.0
P (Fosfor) [a]	804	mg/kg TS	2022-08-11	2022-08-11	Intern metode	

[a] Prøvingen er utført av eksternt laboratorium, ALS Laboratory Group

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ANALYSERAPPORT

Kunde:	Arnarlax	**Rapport nr.:**	P2200123
Kundemerking:	Laugardalur		
Kontaktperson kunde:		**Rapportdato**	**2022-08-30**
Prosjektnr.:	**64189**	**Ankomst dato**	2022-07-05

Analyseansvarlig:

Ingar H. Wasbotten

Signatur:

Ingar H. Wasbotten

Katrin Bluhm

Underskriftsberettiget:

Signatur:

Katrin Bluhm

Analysene gjelder bare for de prøver som er testet. De oppgitte analyseresultat omfatter ikke feil som måtte følge av prøvetagningen, inhomogenitet eller andre forhold som kan ha påvirket prøven før den ble mottatt av laboratoriet. Rapporten får kun kopieres i sin helhet og uten noen form for endringer. En eventuell klage skal leveres laboratoriet senest en måned etter mottak av analyseresultat. Nærmere informasjon om analysemetodene (måleusikkerhet, metodeprinsipp etc.) fås ved henvendelse til Akvaplan-Niva AS

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