Comparison of the growth *of Saccharina latissima* at a cultivated natural area and an aquaculture site in Sørvágsfjørður, Faroe Islands.

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Abstract

The aim of this thesis was to assess the growth difference of the seaweed species *Saccharina latissima* at an Integrated Multi-Trophic-Aquaculture (IMTA) site compared to a reference site without fish cultivation in Sørvágsfjørður, Faroe Islands. Therefore, one growth season of *S. latissima*, CTD data and nutrient parameter (nitrate, ammonium, phosphate, silicate) were analysed. The seasonal temperature and salinity data showed similar conditions between both sites. Currents were modelled differently between the IMTA site and the reference site. Significant differences in nitrate, phosphate were observed ($P < 0.05$). Ammonium at the IMTA site was measured higher in a four-meter depth (max. 5.34 µM) compared to the reference site (max. 2.9 µM). However, these environmental parameters seem to had no influence on the actual growth of *S. latissima*. Due to the appearance of the snail species *Lacuna vincta*, the growth of *S. latissima* changed at the IMTA site in August and September 2020.

These results showed that *S. latissima* developed at both locations after deployment into the fjord. It should be determined to investigate the cause of the occurrence of the snail to further cultivate *S. latissima* in Sørvágsfjørður. Also, if the appearance of *L. vincta* was a coincidence or if these strong influences occur annually in similar exposures. However, the environmental parameters of the fjord provided good growth conditions for *S. latissima* at both sites.

List of abbreviations

A83	*IMTA site at Sørvágsfjørður*
FAO	*Food and Agriculture Organization of the United Nations*
GR	*Growth rate*
IMTA	*Integrated-Multi-Trophic-Aquaculture*
PSU	*Practical Salinity Unit*
SO06	*Reference site at Sørvágsfjørður*
UN	*United Nations*

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1. Introduction

From 1961 to 2015, the average demand for global fish consumption has more than doubled within the last 60 year. From 9.0 kilogram (1961) fish per person to 20.2 kilogram (2015) fish per person (FAO, 2020). To meet the ever growing demand for fish products, the development and intensification of various aquacultures has become a prominent option for enhancing fish production (FAO, 2020). In 2016 the global aquaculture production covers 47 percent of the total output of global fish industry (FAO, 2020). To prevent overexploitation of the oceans capacities, fish industry became one of the constipated UN Sustainable Development Goals. Integrated Multi-Trophic Aquaculture (IMTA) has been implemented as a sustainable ecological approach to limit aquacultural impacts on aquatic environments (Marinho *et al.*, 2015). This method uses an integration of low trophic species, including various seaweed species, fish and shellfish, to reduce degradation and emissions of aquaculture activities due to increased pollution of cultivated fish in aquaculture cages (FAO, 2020). The integration of macroalgae into IMTA can lead to bioremediation by taking nutrients from the seawater, mainly nitrate and phosphate and using it as a basis for biomass growth (Möller *et al.*, 2015).

Saccharina latissima (Figure 1), is a species of brown algae that grows across cool temperate rocky coasts of Europe, Asia, and America (Peteiro and Freire, 2013; Hasselström *et al.*, 2018). The seaweed grows between one to four meters long and has often a short stripe and a long, undulated blade (Wegeberg, Mols-Mortensen and Engell-Sørensen, 2013). Ideal conditions for the growth of *S. latissima* are around 10°C – 15°C (Fortes and Lüning, 1980). Over the last few years, *S. latissima* is cultivated for many different purposes for example human consumption, animal feed, fertilizers and more (Peteiro and Freire, 2013). Studies showed that *S. latissima* is capable to uptake dissolved nutrients (e.g., nitrate and phosphate). It can be cultivated in conventional aquaculture to reduce emitted emissions by fish (Hasselström *et al.*, 2018; Kang *et al.*, 2021). The seaweed was one of the first cultivated species in Europe (Bak, Mortensen and Gregersen, 2018) and since then the cultivation of *S. latissima* became more commercial, also in the Faroe Islands (Mols-Mortensen *et al.*, 2017).

In the Faroe Islands, aquaculture represents a significant and growing component of its economic activity. Around 90 percent of the country's total exports are fishery and aquaculture products (Rosten *et al.*, 2013). As aquaculture activities increased in the Faroe Islands, so did the potential for environmental impacts increase in those ecosystems (Möller *et al.*, 2015). A fundamental problem of traditionally used net cage aquacultures as an environmentally open system is the input of nutrients into natural ecosystems.

The excessive enrichment of waters with nutrients, mostly results in form of nitrate and phosphate from fish productions. One solution could be the use of IMTA to compensate emitted nutrients by bioremediation capabilities of multi-tropic species (Marinho *et al.*, 2015). This eutrophication and enrichments of nutrients could cause a change in species composition, as well as it could increase the biomass production in aquatic ecosystems (Möller *et al.*, 2015).

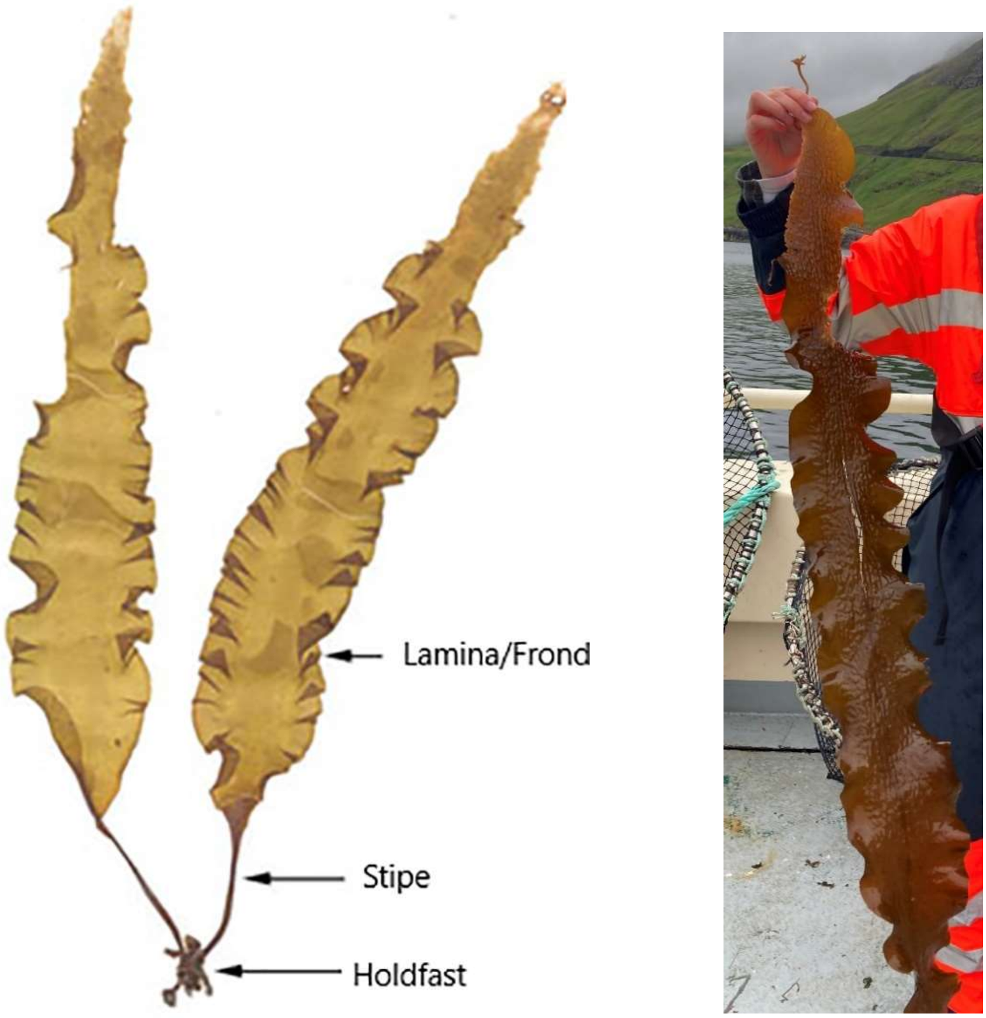

Figure 1: Left: Structure of Saccharina latissima (Aldridge et al.*, 2021). Right: Image of Saccharina latissima at the reference site (SO06) in Sørvágsfjørður on August 23rd, 2021. Source: M. Schlund, 2021.*

The general environmental conditions of the fjords in the Faroe Islands form good initial conditions for growing macroalgae such as *S. latissima* (Mols-Mortensen *et al.*, 2017). Researches had already been conducted on a successful growth of *S. latissima* and integration in IMTA (Marinho *et al.*, 2015; Mols-Mortensen *et al.*, 2017; Zheng *et al.*, 2019). However, it remains to be seen whether the use of *S. latissima* in IMTA makes sense or whether the seaweeds grow better in a pristine environment. Therefore, the focus in the following thesis is on how the growth of *S. latissima* change in direct proximity to aquaculture or in natural environment at two sites in Sørvágsfjørður [ˈsøːrvɔksˌfjøːrʊr], in the Faroe Islands. Sørvágsfjørður is well suited for consideration, as aquacultures already exist and can be expanded with the seaweed species *S. latissima* to operate an IMTA.

Six months of *S. latissima* growth were monitored in a commercial IMTA site (A83) and the reference site (SO06) in Sørvágsfjørður (Figure 2). The environmental conditions for growth at the two sites, such as nutrient availability, water velocity and seawater renewal were compared as well. This study is about looking at the growth of *Saccharina latissima* at both sites and if the macroalgae differ under the usage of IMTA and whether a reorientation and integration of other seaweeds into IMTA must take place.

2. Methodology

All data in this thesis were provided by Fiskaaling. The trials and collection of environmental data were conducted in 2020 and data were provided as CSV files containing raw results such as location, depth and further parameter.

2.1. The study site: Sørvágsfjørður

Two cultivation structures, an IMTA site (A83) and a reference site (SO06), for the seaweed species *Saccharina latissima* were deployed in Sørvágsfjørður (Figure 2), located in the north-western fjord of Vágar in the Faroe Islands (62°N |-7°W) (FaroeseSeafood.com, 2018). Sørvágsfjørður is around 5 kilometre (km) long, approximately 1.5 km narrow and has a maximum depth of 55 meters. The catchment area of the fjord is estimated to be 31 square kilometre (Danielsen and á Norði, 2021).

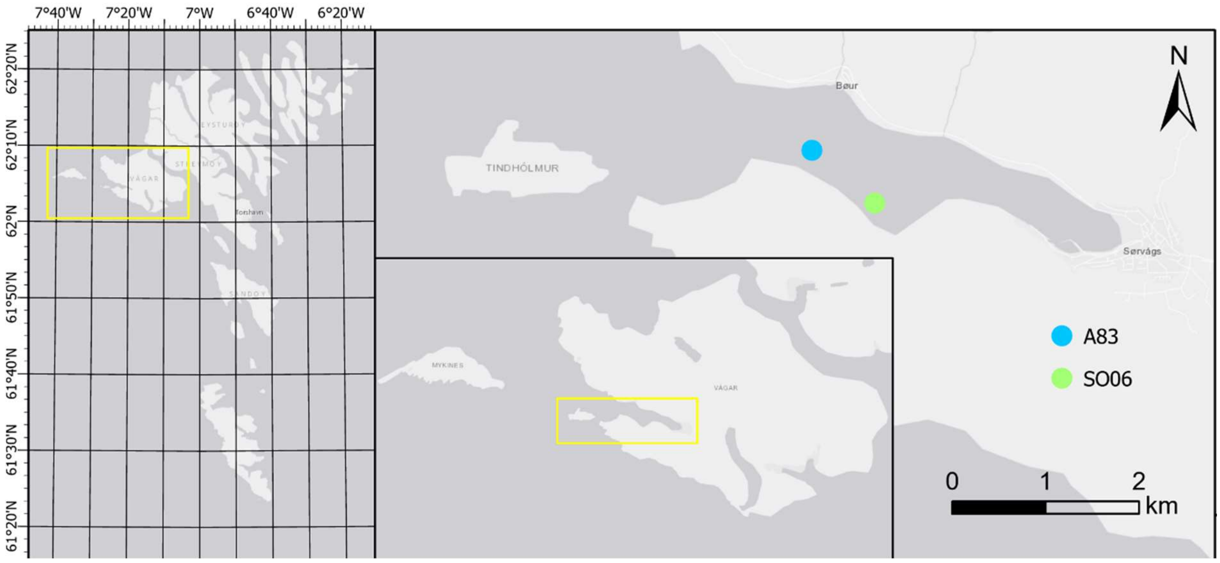

Figure 2: Cultivation location of the IMTA site (A83) and the reference site (SO06) in Sørvágsfjørður, Faroe Islands. Source: Fiskaaling (2020). Created with ArcGIS Pro (2.7.26828) Esri Deutschland GmbH (2021). Coordinate system: ETRS 1989 Faroe TM.

The fjord's environmental condition is shaped by general circulation systems. Such as the gulf stream and small scale estuarine circulation, providing relatively stable seawater temperatures during the year (6°C to 11°C) (Bak, Mortensen and Gregersen, 2018). The gulf stream transports warm water to the southwest of the Faroe Islands and Arctic cold currents flow from north to south (Figure 3). These currents create oceanic water circulations, known as a thermohaline pump, whereby nutrients and temperatures are mixed up between the different water layers, creating a highly dynamic and productive marine ecosystem (FaroeseSeafood.com, 2018).

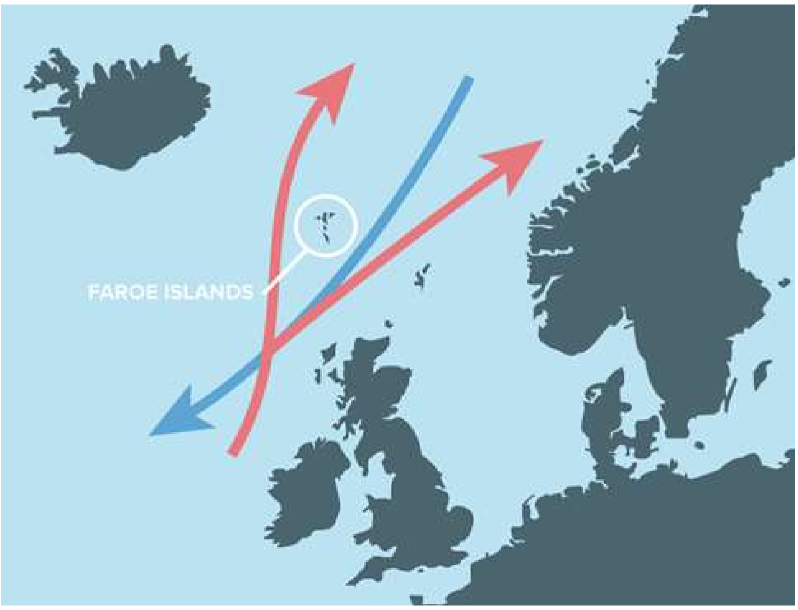

Figure 3: The Gulf Stream in the Northwest Atlantic Ocean. Warm water from the Gulf Stream shown in red and cold currents from the Arctic shown in blue. Source: The Pristine Waters of the North Atlantic, 2018.

The estuarine circulation at the inner part of the fjord is caused by freshwater runoff (precipitation) into the fjord. As a consequence of density differences, the lighter freshwater and heavier Atlantic saltwater interact with each other and, as the freshwater mixes with saltwater, a low saline upper layer that flows out of the fjord is created (Figure 4). The freshwater is replaced by denser saltwater from deeper layers, causing a constant upwelling in fjords and contributing to a nutrient rich environment (Gaard, Nordi and Simonsen, 2011).

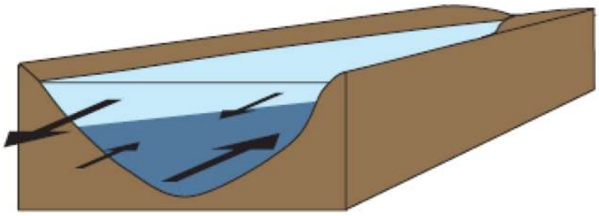

Figure 4: Flow pattern of estuarine circulation from Danielsen & á Norði, 2021.

The fjord's water stratification is weak, and nutrients are easily mixed into the euphotic zone, which is defined by the occurrence of sufficient light for photosynthesis. As cited in Gaard et al. (2011), areas of shallow pycnocline and short-term changes in weather conditions are temporally frequent in hydrographic properties and contribute to a highly dynamic ecosystem on the fjords in the Faroe Islands.

The fjords ecosystem is largely dominated by natural factors. The only anthropogenic influences on the fjord system originate from two villages, Sørvágur and Bøur. These villages have a total population of 1.200 inhabitants and the company Hiddenfjord which conducts fish farming activities is located in Sørvágsfjørður.

Highly productive environments benefiting from stable seawater temperatures constitute an ideal habitat for several marine species (The Government of the Faroe Islands., 2019). Sheltered inlets around the Faroe Islands provide a barrier against the harsh climate of the North Atlantic and are perfect for aquaculture activities (FaroeseSeafood.com, 2018), which often occur in the Faroe Islands. Salmon farming is an especially popular aquaculture activity there.

The fish industry company Hiddenfjord is based in the Faroe Islands. They exclusively produce and process salmon for the local market and international selling as well. The company provided data from the IMTA site (A83) and the reference site (SO06) for comparison.

2.2. A83 – Integrated Multitrophic Aquaculture site

The IMTA site A83 is located at 62.08 north latitude and -7.38 west longitude. At this location, Atlantic salmon (*Salmo salar*) is cultivated by the company Hiddenfjord. Figure 5 shows the various cages of the company Hiddenfjord in Sørvágsfjørður.

One rope containing the seaweed species *Saccharina Latissima* was deployed within the cage on April 20th, 2020. The procedure of how *S. latissima* was seeded and deployed is presented in chapter 2.5. The IMTA site A83 was used for analysis to see if the cultivation of salmon in the cage impacted the growth of *S. latissima*.

Figure 5: IMTA site (A83) of the company Hiddenfjord in Sørvágsfjørður, producing salmon (Salmon salar). Source: M. Schlund, 2021.

2.3. SO06 – The reference site

The reference site SO06, located at the 62.07 north latitude and -7.36 west longitude, was used for comparison. Figure 6 shows the reference site SO06 in the Sørvágsfjørður. At this site, one rope with seeded *S. latissima* grew in a fish cage, but without the presence of farmed fish at the site. The two sites are about 800 meters apart in the same fjord. Both stations, the reference site SO06 and the IMTA site A83 were nearly equally observed and documented. Variables of the environmental data, as well as differences in growth data of *S. latissima* were used for comparison.

Figure 6: The reference site (SO06) in Sørvágsfjørður. The cage is owned by the company Hiddenfjord. Source: M. Schlund, 2021.

2.4. Environmental variables

The characteristics of the environment determine the growth of a species. Environmental properties, especially the water properties in Sørvágsfjørður, form the basis for the growth and development of seaweeds (Connan and Stengel, 2011). For the determination of the conditions at both study sites, the environmental parameters of temperature, salinity, currents, nutrients in the water (nitrate, silicate, phosphate, ammonium) were considered and analysed.

2.4.1. Temperature and salinity

Water temperatures and salinity impact ecosystem activities and depend individual cell growth (Went, 1953; Connan and Stengel, 2011). Seaweed species are adapted to the local environment (Eggert, 2012). Temperatures and salinity are important parameters that strongly influence the growth of *S. latissima* as well. For the reasons mentioned above, both parameters were taken into consideration in this work.

Data of temperature and salinity from 2020 were provided by Fiskaaling. At the IMTA site (A83) and the reference site (SO06), temperature and salinity measurements were performed with a Seabird SBE-25 plus CTD device according to Seabird guidelines. From June 4th, 2020 and September 23rd, 2020, recordings of the vertical profile from both sites were taken approximately every ten days.

The temperature data were measured in degrees Celsius (°C), salinity in Practical Salinity Unit (PSU), the water pressure in decibar (dbar) and depths in meter (m). After the data had been digitized and recorded in a CSV document, they were subsequently further processed in Microsoft Excel. Furthermore, the data were transformed, sorted, and graphically processed for each sampled day. The temperature and salinity of the two sites were plotted vertically, with the depth being approximately equivalent to the pressure levels. A seasonal average (June to September) was calculated and displayed. All data were tested in Microsoft Excel on equality of variances and significant differences due to statistical f-tests and one tailed t-tests. F-tests were used to determine the variances and whether there were equal or unequal (Högel, 2020). To test significant differences, t-tests were performed ($\alpha = 0.05$) to calculate how much the two groups differ from each other, weighted on their variances.

2.4.2. Current measurements

Water currents are an important factor of choice for a cultivation site and the development of a seaweed production (Peteiro and Freire, 2013; Mols-Mortensen *et al.*, 2017). For instance, water movement has a positive effect on the uptake of nutrients from macroalgae (Mols-Mortensen *et al.*, 2017).

Modelled results of the currents at the IMTA site and the reference site were plotted by Dr. GPJ Diedericks, University of Stellenbosch. The data were modelled in the hydrodynamic model Delft-3D with local bathymetry, freshwater runoff and wind as input data, and validated against a current measurement at the fish farm site. No data were available for 2020, which is why currents data from 2017, the most recent available dataset, were used. Nevertheless, these variables were considered in this thesis to get an impression of the environment in which *S. latissima* grew. Therefore, comparability of data was assumed.
The hydrodynamics model Delft-3D considered the current magnitudes and current directions at the reference site and the IMTA site in two different depths. Due to depth differences in the fjord, the mid-depth at A83 was plotted at 21 meters compared to 15 meters at SO06. First, surface currents data were considered which map the surface direction in degrees (°) and in magnitudes in meter per second ($m\ s^{-1}$) at both sites. Second, a mid-depth current analysis was considered.

Further processing of the data was done in Microsoft Excel. There, the current strengths of the entire period was displayed graphically. The current magnitudes were processed for the entire period as well as for the weekly average from February 2017 to March 2017 at both sites and both depths. In total, 13 weeks have been recorded and used to determine a weekly average. Boxplot diagrams of the current strengths were generated to get insights about the distribution and abnormalities.

2.4.3. Nutrient analysis

Due to the production process, aquaculture activities generate a considerable amount of biogenic and organic wastes as well as inorganic nutrients (Wang *et al.*, 2012). Cultivated seaweeds such as *S. latissima* remove nutrients from its surrounding environment and use it for biomass production (Bak, Mortensen and Gregersen, 2018). Especially in coastal waters, occurrence and fresh inputs of nitrate and phosphate are important since these factors are limiting the growth rate of seaweeds (Sanderson *et al.*, 2008). Additionally, ammonium concentrations were measured due to their importance and close relation to fish farming. The most important factor for aquaculture activities are fertilizer and feeds (Boyd, 2018).

All nutrient data were provided by Fiskaaling and analysed by Havstovan. A seawater sampling campaign was conducted in 2020 by using a Seabird SBE-25 plus CTD and taking samples at two- and four-meter depths. The mid-depth data at the reference station were sampled at a depth of five instead of four meters after July 2020. Nutrient data from February 24th, 2020 to September 23rd, 2020 were collected at both sites. In total, 18 samples for each station and each depth had been taken in 2020.

All data were statistically tested and plotted in Microsoft Excel. Unpaired two-sample t-tests ($\alpha = 0.05$) were used to evaluate the differences between the two culture sites. Additionally, f-tests were performed before to examine the equality of variances, which is a prerequisite for the t-test choice.

2.4.3.1. Nitrate

Seaweed growth is limited by nutrients in pristine ecosystems. Inorganic nitrate (NO_3^-) forms the most commonly limiting nutrient in waters for seaweed growth (Roleda and Hurd, 2019). During a sample campaign, the nitrate concentrations (NO_3^-) were analysed in the laboratory according to Mols-Mortensen et al. (2017). The nitrate concentration is given in micromole (µm). For comparison, nitrate data from 2019 (16.04.2019 – 05.09.2019) were observed to gain insights on the currents annual course. No data were available for the winter period of 2019/2020.

2.4.3.2. Silicate and phosphate

The presence of phosphate and silicate in the water is essential for the growth of seaweeds, as the concentration of the nutrients support the cell growth. Silicate can increase the biodiversity of algae, such as microalgae, in an aquatic ecosystem (Kamp *et al.*, 2011; Mooij *et al.*, 2016; Li *et al.*, 2017). Silicates are used for protection and strengthening by the seaweeds (Boyd, 2007; Mizuta and Yasui, 2012). These nutrients result from aquaculture activities and can be a growth limiting factor for macroalgae (Ringuet, Sassano and Johnson, 2011). Samples for phosphate (PO_4^{3-}) and silicate (SiO_4^{4-}) were analysed according to standard methods. The parameters are given in micromole.

2.4.3.3. Ammonium

Aquaculture production of salmon (*Salmon salar*) releases mainly dissolved nitrogen in organic nitrate (NO_3^-) and ammonium (NH_4^+) (Dahlen, 2018; Roleda and Hurd, 2019). *S. latissima* uptake of ammonium makes the seaweed interesting for IMTA (Shimoda, Suryati and Ahmad, 2006; Dahlen, 2018).

Ammonium was measured at both sites and analysed by the laboratory Havstovan. The seawater samples were analysed according to standard methods. These results were displayed in micromole. Data from 2020 were available at two- and four-meter depth at the IMTA site and at four-meter depth at the reference site. Due to incomplete data at two-meter depth at SO06, this depth was not considered. The digitized data are graphically processed in Microsoft Excel.

2.5. Saccharina latissima

The seaweed *Saccharina Latissima* has already been introduced in chapter 1. Seeding and cultivation of the seaweed was carried out by the company *Tari Spf.* at their hatchery in Nesvík, Faroe Islands.

2.5.1. Seeding

Fertile individuals of *S. latissima* were collected at Oyragjógv, Faroe Islands on the 12^{th} of November 2019. The spores of the seaweeds were extracted and seeded on 1.5 mm strings. These were coiled around cylinders and further transferred to seawater tanks. To ensure spore attachment, there was no water velocity in the tanks for the first five days. After these initial five days, the flow was turned on. The temperature in the tanks was approximately 9°C, and the light conditions were 16 hours of light and 8 hours of darkness per day. Custom LED technology was used to facilitate these conditions.

2.5.2. Deployment

When the seeded spores developed to new sporophyte, the seeded strings were coiled around 18 mm thick rope. On the January 7^{th}, 2020, two ropes with seeded *S. latissima* were deployed at the reference site SO06 in Sørvágsfjørður. Each rope was 50 meters long, but the seeded seaweed strings were only attached on 30-meter length in the middle of the rope. Both ropes were situated between the surface and approximately four-meter depth. On April 20^{th}, 2020, one of the two ropes was transferred to an active salmon cage, the IMTA site A83 in Sørvágsfjørður.

2.5.3. Seaweed growth, yield, and biomass measurements

The seaweeds were sampled approximately once a month between April 2020 and September 2020. For the growth measurements, three samples of ten seaweed individuals (total of 30 individuals) were taken from the rope at the reference site and the IMTA site. The sampled individuals were cut free from the rope at the holdfast and transported to the laboratory for further analysis. The samples were measured regarding their weight (g), blade length (cm) and width of the blade (cm).

The samples for the yield analysis were conducted by removing the entire biomass from 10 cm of the rope. Figure 7 shows *S. latissima* on the rope at the reference site in 2021. The biomass was weighted (g) and the number of individuals was counted to obtain information about the density of seaweed individuals on each rope. Three samples of 10 cm were taken from the rope at the reference site and the IMTA site at each sampling date. To determine the weight and individual per meter of rope, the numbers for 10 cm were multiplied by ten. This method was used to conserve the ropes to enable representable sampling of the ropes throughout the season. All data were tested on variances and significant differences according to previous described procedures (chapter 2.4.1).

Figure 7: Cultivated Saccharina latissima at the reference site (SO06) in Sørvágsfjørður on 23rd, 2021. Source: M. Schlund, 2021.

2.5.4. Growth rate analysis

Data of average biomass and average individual weights of *S. latissima* at the reference site and IMTA site were used for growth rate analysis. Each sampling day, biomass (g) was sampled at each site according to previous described methods.

In August, data from the IMTA site provided two samples for biomass and individuals instead of three samples. According to TNeutron, 2021, equation 1 was used to calculate the growth rate in Microsoft Excel. Equation 1 calculates growth differences in relation to time. For the growth rate calculation, the same assumptions were made for both parameters.

$$\text{Growth rate} = \frac{(W_t - W_0)}{\text{t}}$$

Growth rate = [g / day]

W_t = weight/ biomass of seaweed after t days [g]

W_0 = initial weight/ biomass seaweed [g]

t = days

Equation 1: Equation for determining the growth rate of Saccharina latissima.

Monthly changes and the total period were considered for growth rate analysis. For the monthly statistics, the previous month's average was compared with the current month's average and the elapsed time was included. However, results of both parameters from May 2020 to September 2020 were calculated for the growth rates at both sites. The growth data after 107 days (May to August) were included in the calculation for both sites.

2.6. Production data

The Hiddenfjord company provided production data for the IMTA site A83. The number of fish and biomass production in kilogram had been daily recorded from October 2019 to October 2020. All data were graphically processed in Microsoft Excel to generate a descriptive presentation of the data series.

3. Results

3.1. Environmental variables

3.1.1. Temperature and Salinity

Temperature and salinity measurements were obtained in intervals of approximately 4 weeks from June 4th, 2020 to September 23rd, 2020 in Sørvágsfjørður. Data from a CTD is plotted in figure 8, temperature is presented in degrees Celsius (°C) and salinity in Practical Salinity Unit (PSU) in relation to the pressure level in decimal bar (dbar), which is equal to the depth in meter of the fjord.

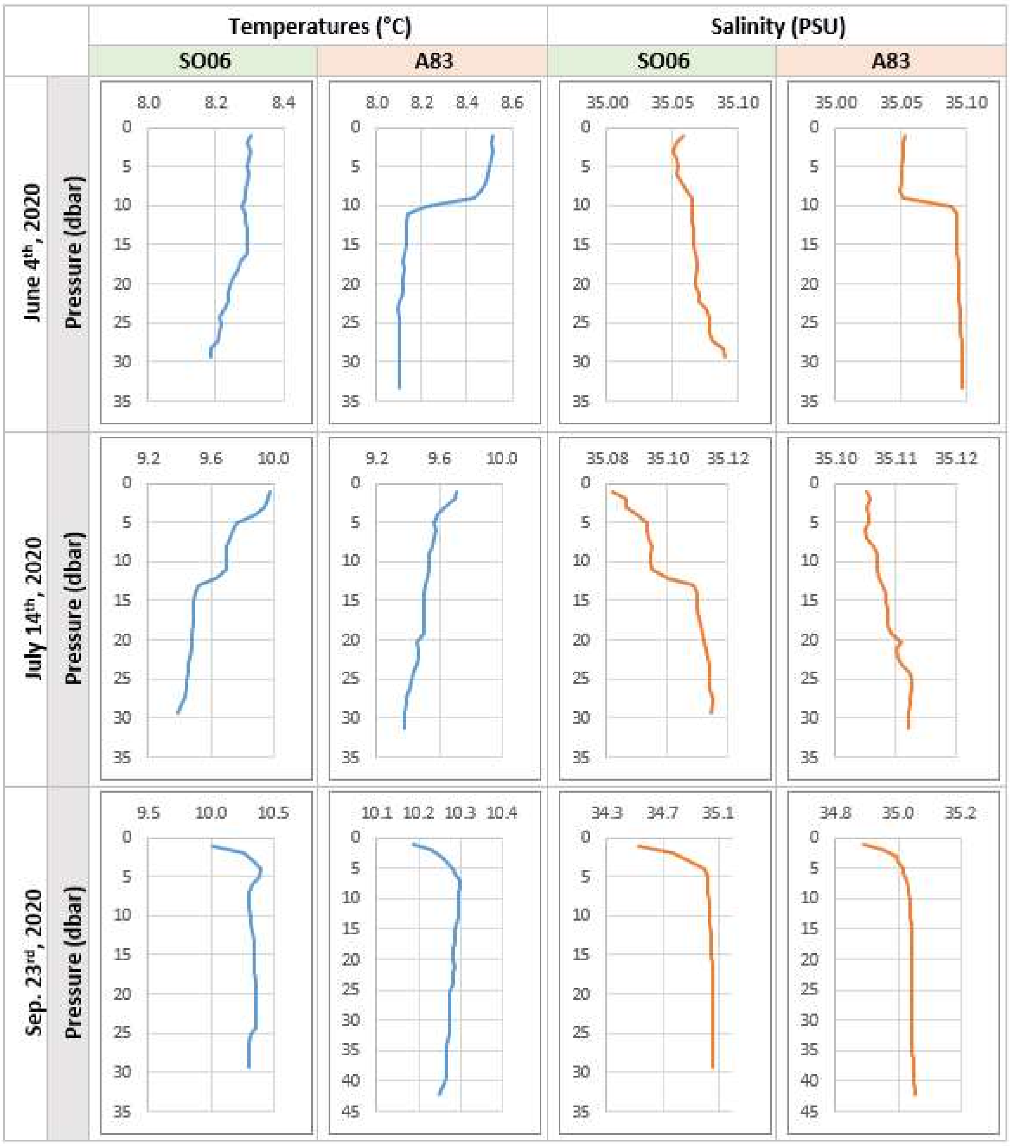

Figure 8: Three monthly comparisons of vertical temperature (°C) and salinity (PSU) of the reference site (SO06) and the IMTA site (A83) in Sørvágsfjørður, 2020. Illustration: M. Schlund, 2021.

Figure 8 shows three measurement samples, taken at the beginning, middle and end of a five-month measurement period in the fjord. This was done to present an overview of the seasonal variability of water properties.

On June 4th, 2020, the first CTD data were collected at both sites in Sørvágsfjørður. Vertical differences occurred at both study sites. At the IMTA site (A83), the vertical temperature gradient ranged from 8.1°C to c. 8.5°C, whereas the temperature at the reference site (SO06) fluctuated between 8.2°C to 8.3°C. The salinity varied from a minimum of 35.05 PSU to a maximum of 35.11 PSU at both sites.

On July 14th, the vertical distribution of salinity again differed between the two sites. Unlike in June, it was site A83 that exhibited a slightly increased in salinity. SO06 documented a relatively steep increase at approximately 12 dbar. Salinity ranged from 35.105 PSU to 35.113 PSU at site A83 and from 35.08 PSU to 35.115 PSU at site SO06. The temperature profiles in July only showed minor fluctuations between both sites, ranging from 9.4°C to 9.7°C and showed a gradual drop in temperatures.

During the last recorded day, September 23rd, all vertical profiles of the CTD measurements showed comparable trends. At both sites, the vertical temperature is reversed compared to previous months, as the upper layers of the water were colder than the deeper layers. SO06 showed a temperature range of 10.0°C to 10.4°C and the IMTA site varied between 10.3°c to 10.2°C. The salinity of the two sites was also reversed and showed the same vertical structure as the temperature. A83 had a slightly smaller range with salinity levels between 34.9 and 35.05 PSU compared to the reference site SO06 where salinity levels ranged from 34.5 and 35.05 PSU.

To provide a seasonal overview, figure 9 presents the average vertical profiles over the course of the recorded season of temperature and salinity from both sites. This was used to eliminate monthly fluctuations from the vertical profiles. Since a long-term growth of *S. latissima* was considered, it was suitable to analyse differences over a long period rather than focus on short-term variations.

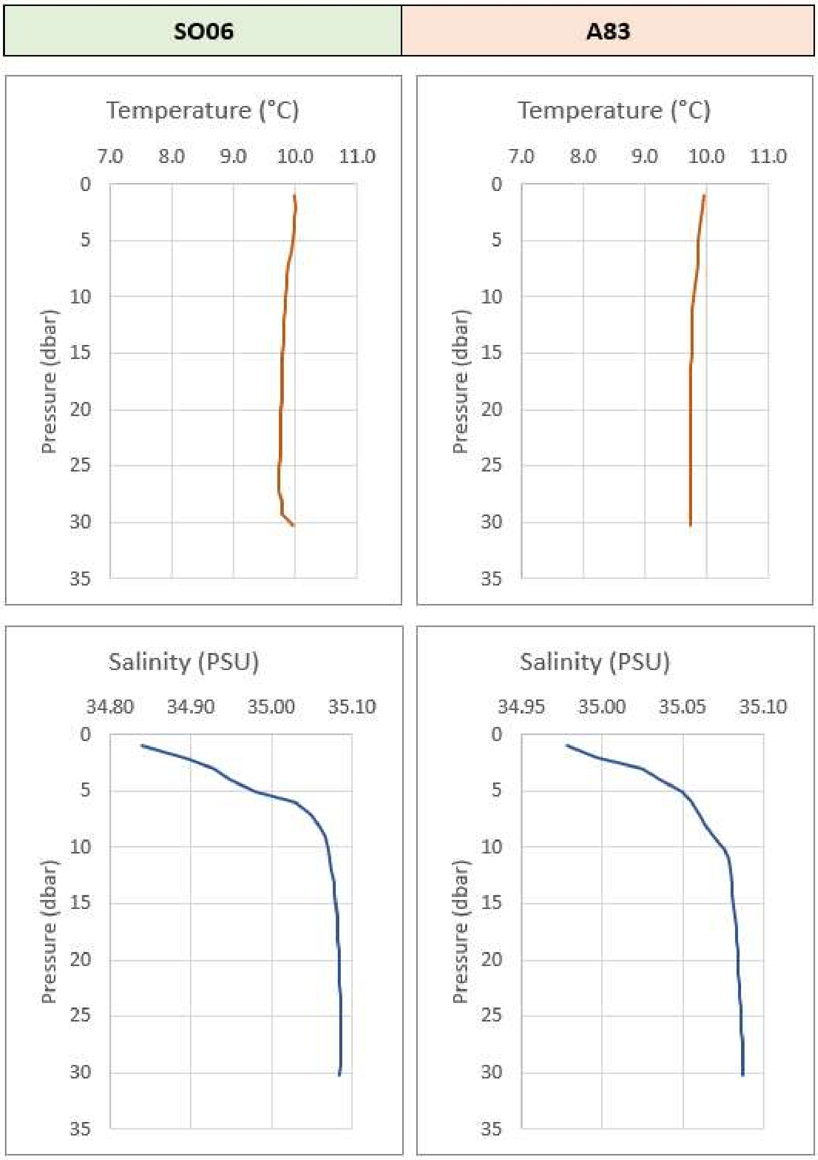

Figure 9: Seasonal comparison (June – September) of vertical salinity (PSU) and temperature (°C) of the IMTA site (A83) and the reference site (SO06) in Sørvágsfjørður, 2020. Illustration: M. Schlund, 2021.

According to figure 9, the vertical profiles of the IMTA site (A83) and the reference site (SO06) were similar throughout the year. The average temperatures ranged from 9.7°C to 9.8°C at both sides. For both study sites, the vertical profiles were almost perfectly perpendicular. The only noticeable deviations were at A83, where the temperature levels sharply increased by 0.5°C at a pressure level of 30 dbar.

At the IMTA site, a slightly larger increase in salinity with depth was observed. Salinity levels were also even in the seasonal vertical profiles, ranging from 35.0 PSU to 35.1 PSU at the IMTA site and between 34.8 PSU and 35.1 PSU at the reference site.

3.1.2. Current measurement

3.1.2.1. Direction of the surface currents

Figure 10 displays the model results of water current directions (°) and speeds (m s^{-1}) on February 2nd, 2017 at 4 p.m.. The IMTA site A83 was located within the main channel, where water flowed out of the fjord into the North Atlantic (current exposed). The sheltered reference site SO06 was located in close proximity to the island Vágar and inside a small bay. The currents at SO06 flowed into the main channel of the fjord.

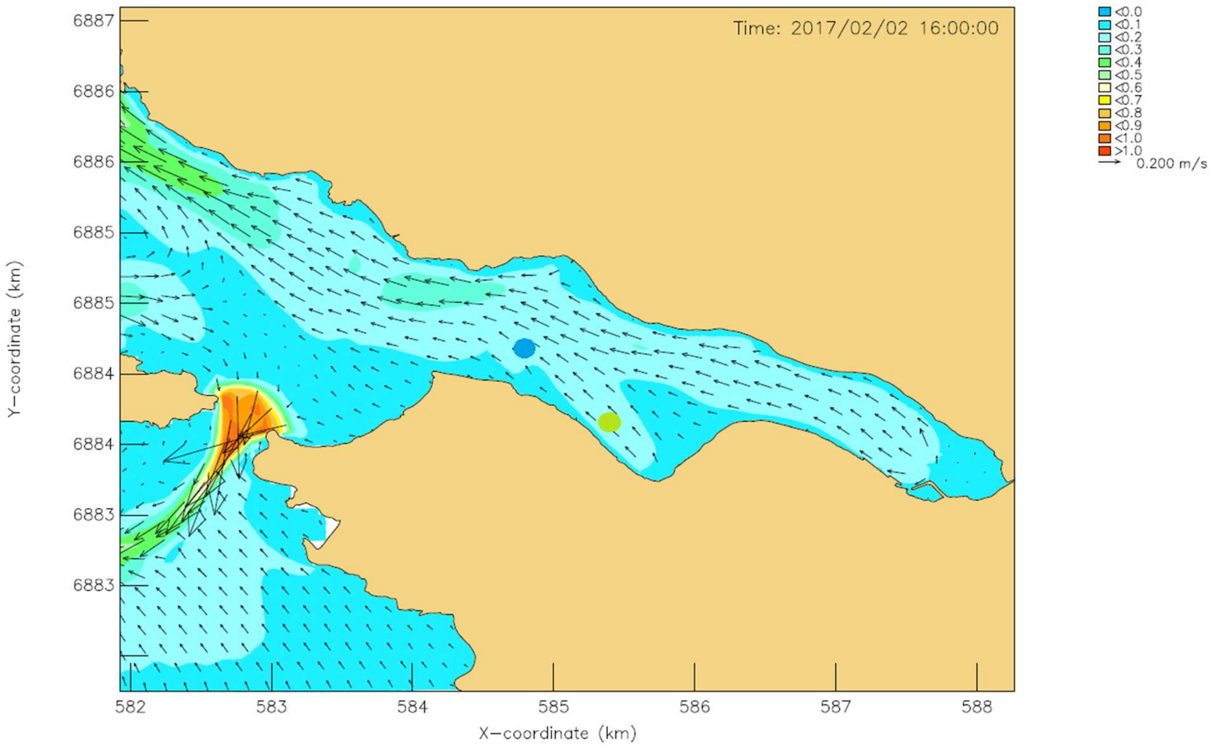

Figure 10: Surface current magnitude in m s^{-1} and direction of the Sørvágsfjørður on 02nd February 2017. The reference site is presented in green and the IMTA site in blue. Source by GPJ Diedericks, University of Stellenbosch. Created with Delft-3D. Coordinate system: Universal Transverse Mercator (UTM).

At A83, the surface current direction showed a directed flow pointing out of the fjord (283.1°) towards the open sea with flow speeds of 0.06 m s^{-1} on February 02nd, 2017, 4 p.m.. In comparison, the reference site was modelled with surface current directions of 17.1° and speeds of 0.08 m s^{-1} at the same time.

3.1.2.2. Magnitudes of currents in Sørvágsfjørður

The modelled current speed was measured for surface currents and mid-depth currents. Due to depth differences in the fjord, the mid-depth currents at the IMTA site were located at a depth of 21 m compared to a mid-depth of 15 m at the reference site SO06.

3.1.2.2.1. Surface currents

Figure 11 depicts the surface currents at the reference site from February to May 2017. The surface currents fluctuated daily and vary between 0.0 m s^{-1} in February to a maximum of 0.21 m s^{-1} in April 2017.

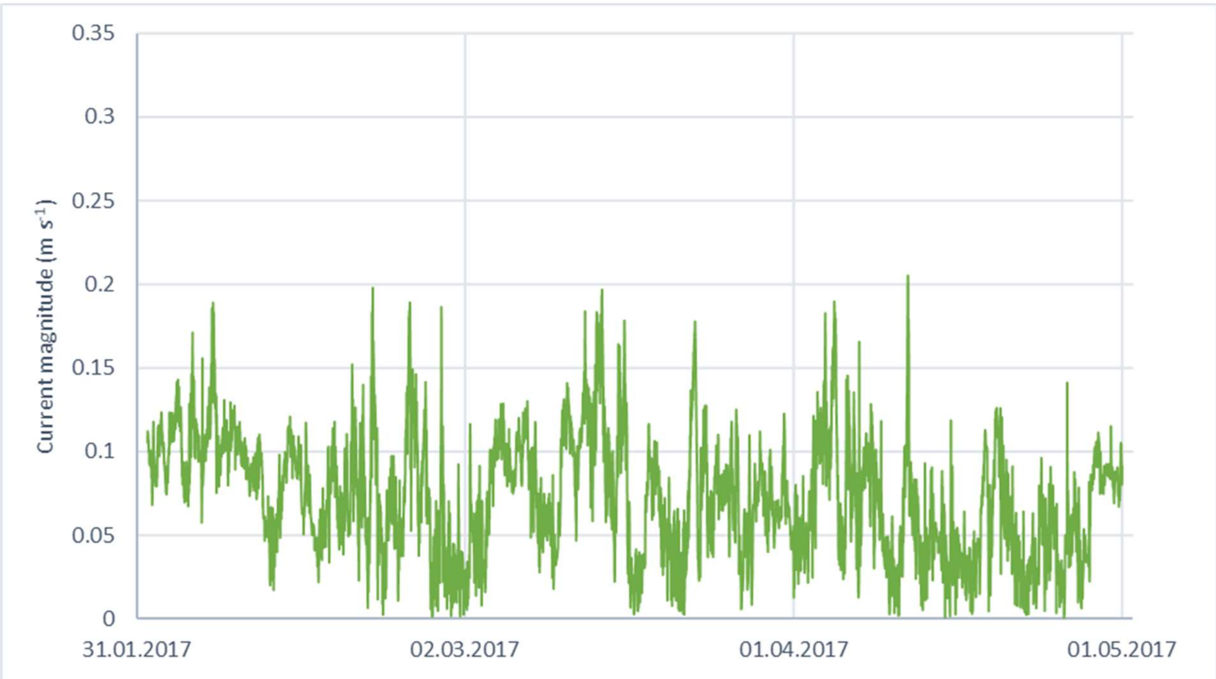

Figure 11: Time period (February – May 2017) of the surface currents (m s^{-1}) at the reference site (SO06) in Sørvágsfjørður. Illustration: M. Schlund, 2021.

Figure 12 highlights the surface currents at the IMTA site in the same period (2017). The minimum was in April (0.0013 m s^{-1}) and the maximum in February (0.336 m s^{-1}). Overall, A83 displayed increased peaks throughout the observed period in 2017 and thus the IMTA site documented generally higher fluctuations compared to the reference site.

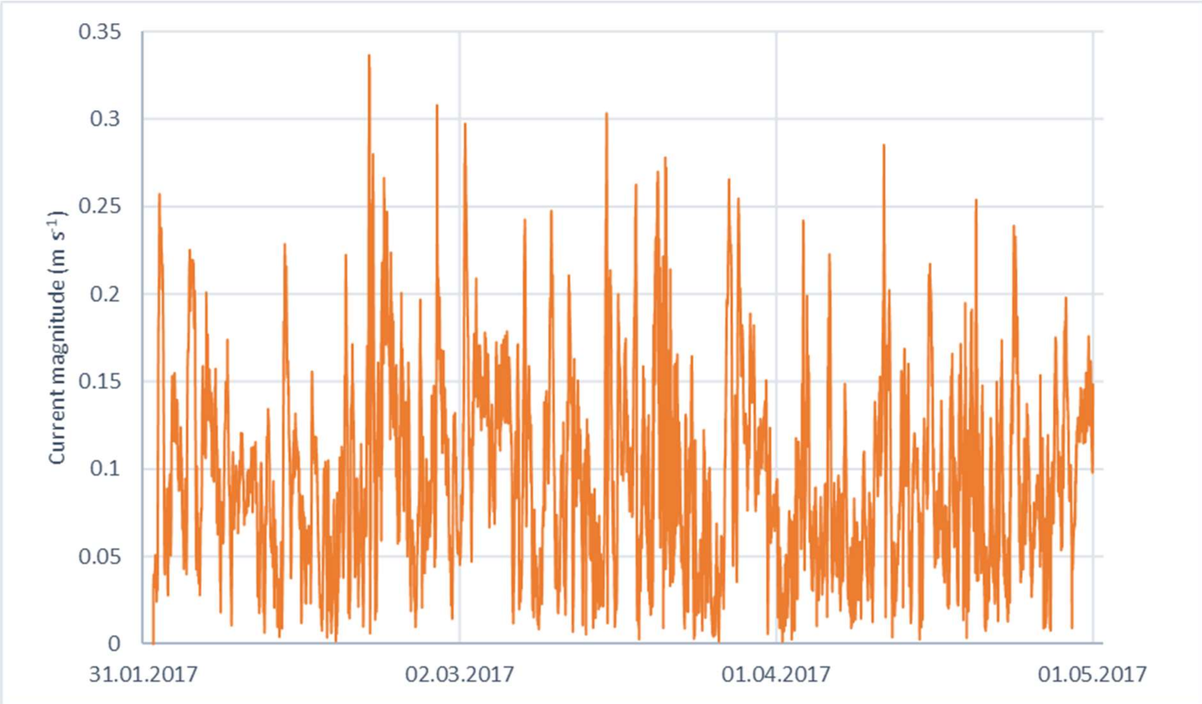

Figure 12: Time period (February – May 2017) of the surface current strengths (m s^{-1}) at the IMTA site (A83) in Sørvágsfjørður. Illustration: M. Schlund, 2021.

3.1.2.2.2. Mid-depth currents

The currents at the different mid-depths were much more attenuated than the surface currents. Mid-depth measurements at reference site SO06 documented daily fluctuations in the current magnitudes ranging from 0.0861 m s^{-1} (February) to 0.0003 m s^{-1} (March). At the end of March, stronger fluctuations in the current magnitudes were recorded (figure 13).

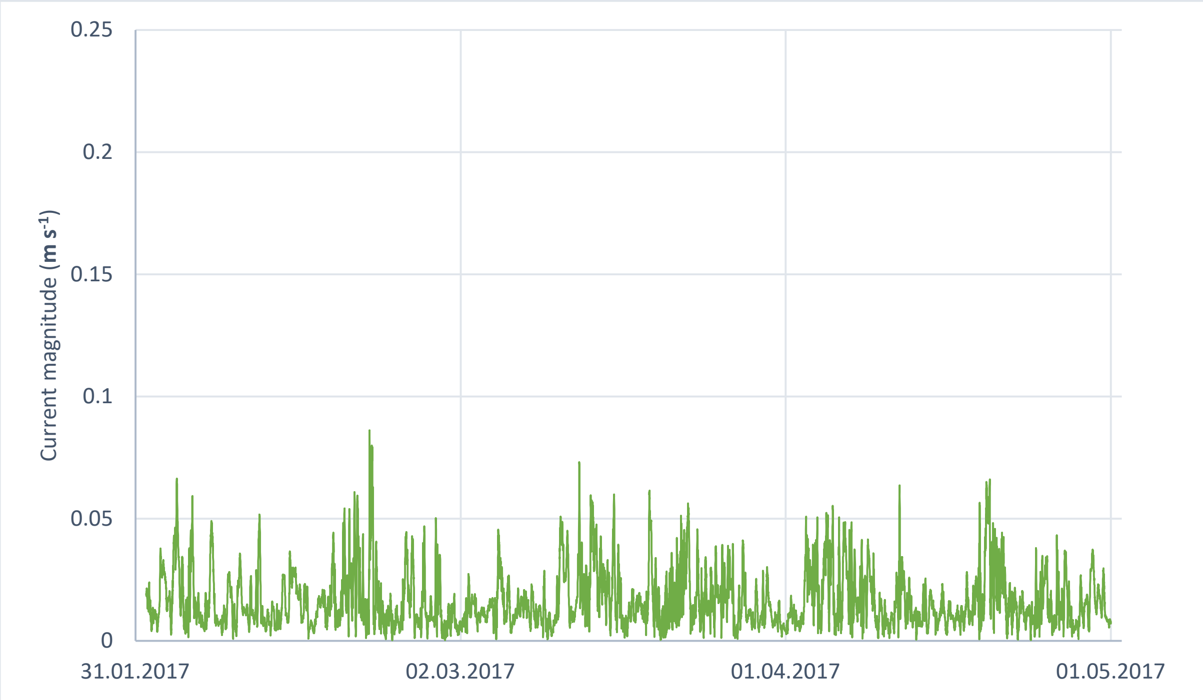

Figure 13: Time period (February – May 2017) of the mid-depth current strengths (m s^{-1}) at the reference site (SO06) in Sørvágsfjørður. Illustration: M. Schlund, 2021.

The currents at the IMTA site presented higher daily fluctuations compared to the reference site (figure 14). The maximum was 0.2246 m s^{-1} in February and the minimum was 0.0003 m s^{-1} in April. At end of March and at the end of April increased fluctuations were recorded.

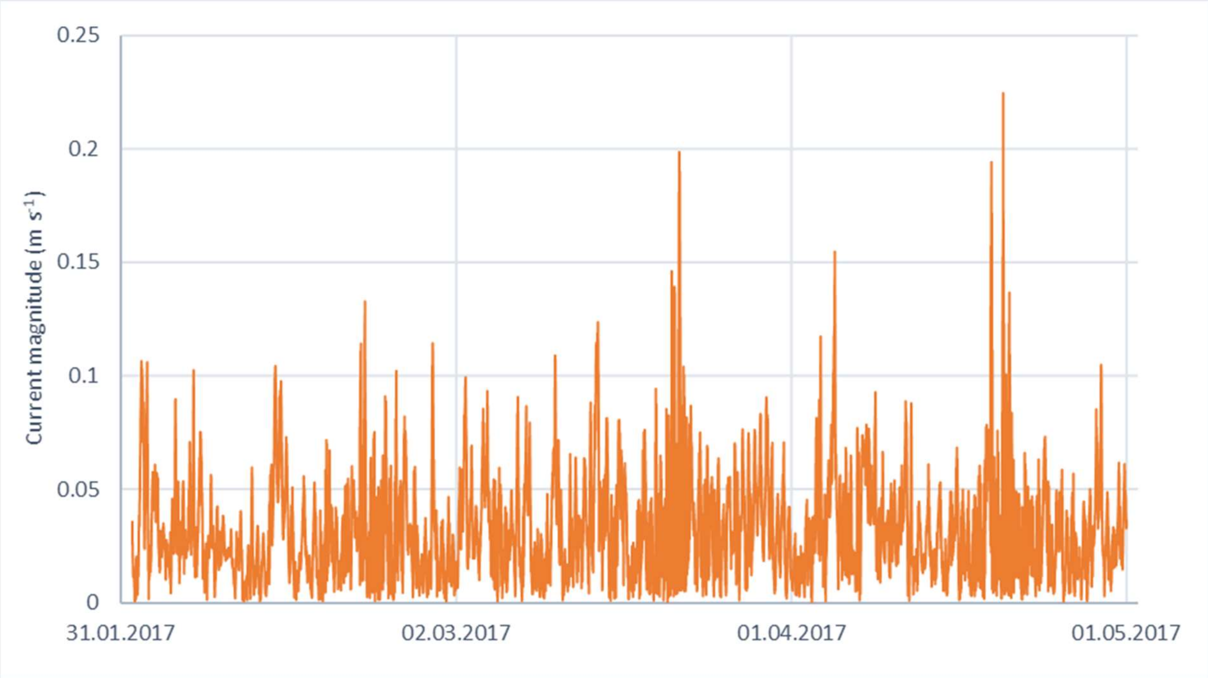

Figure 14: Time period (February – May 2017) of the mid-depth current strengths (m s^{-1}) at IMTA site (A83) in Sørvágsfjørður. Illustration: M. Schlund, 2021.

3.1.2.2.3. Boxplot - current magnitudes

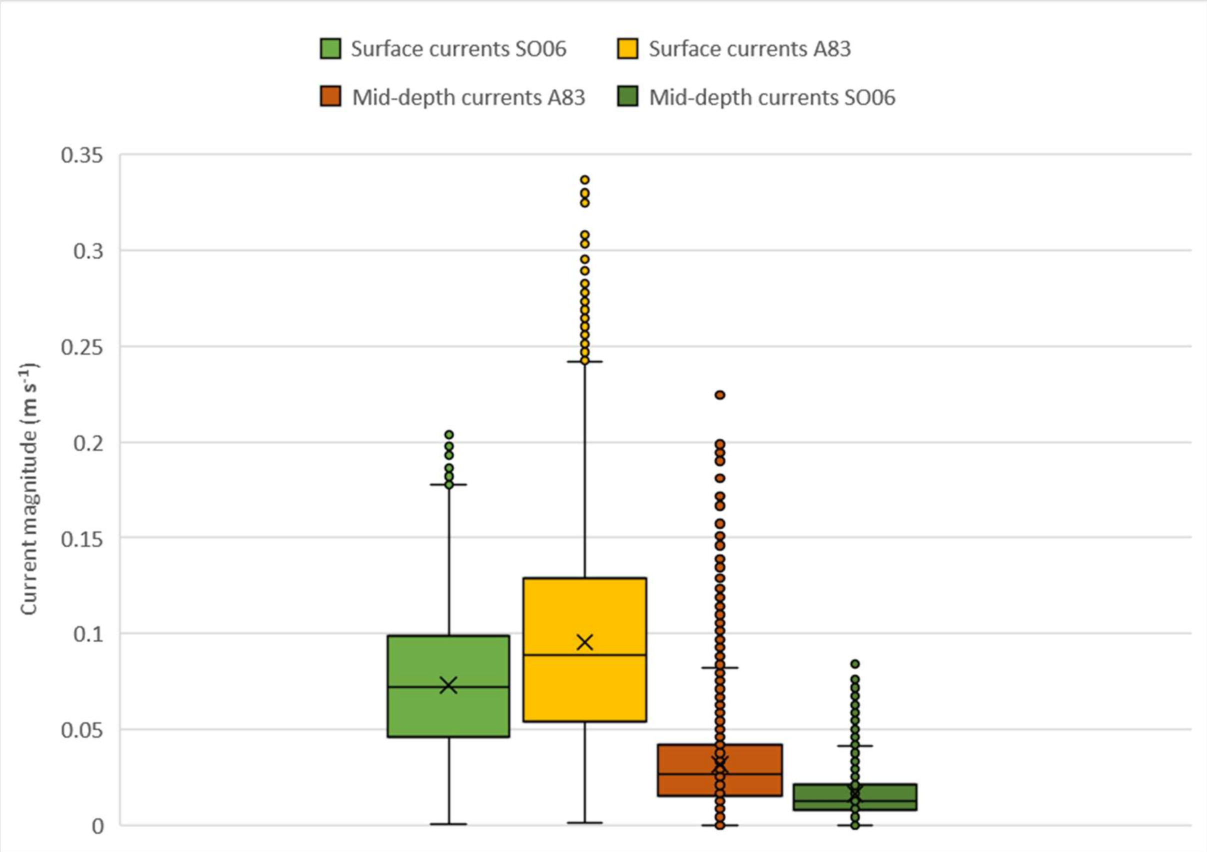

Figure 15: Boxplot diagram of the surface and mid-depth current strengths (m s^{-1}) at the reference site (SO06) and the IMTA site (A83) in Sørvágsfjørður. Illustration: M. Schlund, 2021.

Figure 15 presents the boxplot diagram of the current magnitudes of the surface currents and the two mid-depths at the reference site and the IMTA site. The boxplot diagram illustrates the distribution of all current magnitudes data in m s^{-1}. Data from the reference site are illustrated in green and the data from the IMTA site are shown in yellow. It is immediately apparent that the two graphs from A83 have a higher spread in both depth levels and showed higher median values compared to SO06. The mid-depth current magnitudes showed more outliers.

3.1.2.2.4. Average current magnitudes

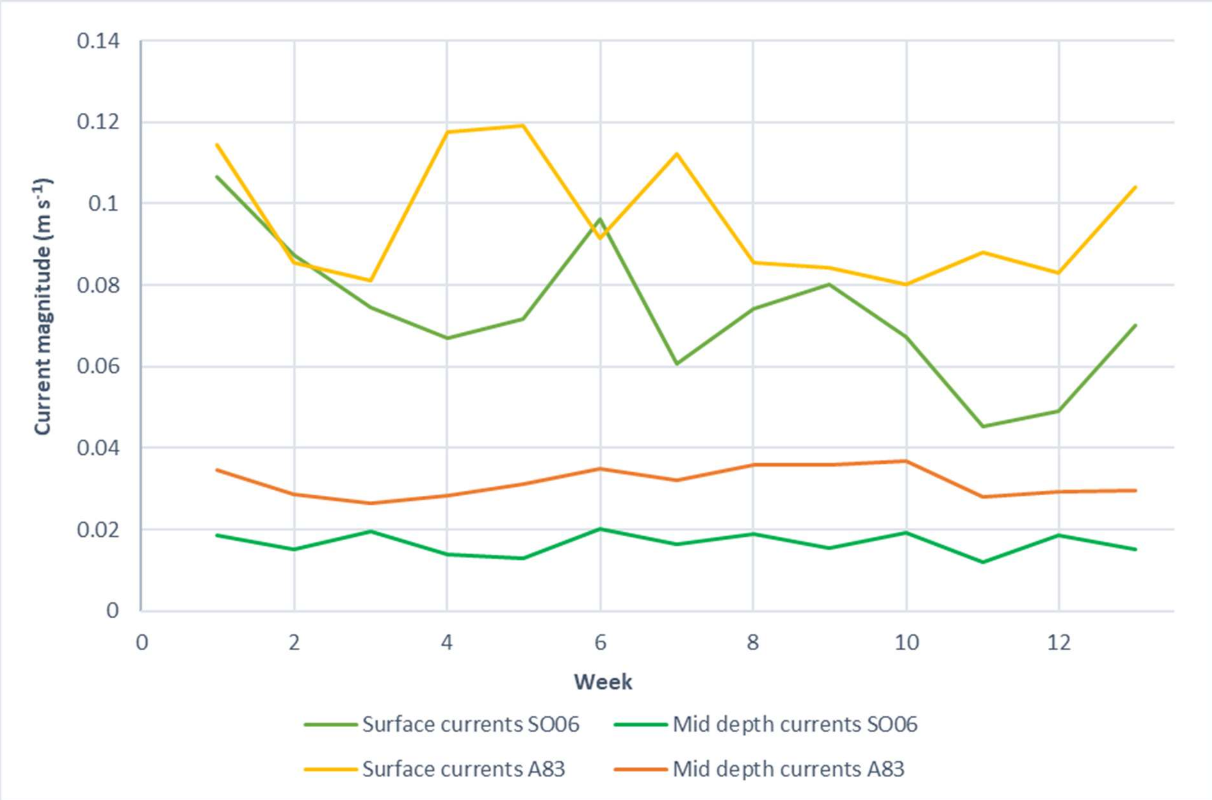

Figure 16: Weekly average surface and mid-depth current magnitudes (m s^{-1}) at the reference site (SO06) and the IMTA site (A83). Illustration: M. Schlund, 2021.

Figure 16 shows the average weekly current magnitude at the surface and mid-depth levels at SO06 and A83 in meter per second. The average surface currents of both sites were significantly higher than the average mid-depth currents, and a significantly stronger average currents was recognizable at the IMTA site A83. Here, a maximum occurred in week five (01.03.2017 - 07.03.2017) at approximately 0.12 m s^{-1}. Both average surface currents exhibited similar trends at the beginning, however, SO06 was significantly lower and the currents slowed down to 0.045 m s^{-1} towards week eleven (12.04.2017 – 18.04.2017).

The mid-depths had lower average current magnitudes compared to the average surface currents. The reference site was also modelled with smaller current strengths compared to the IMTA site. Both average currents flowed approximately the same and showed weekly magnitude peaks and troughs. Nonetheless, water flow remained constant with a maximum of 0.02 m s^{-1} at SO06 in week six and a maximum of 0.37 m s^{-1} at the IMTA site in week ten.

F-tests for equality of variances and t-tests for significant differences were conducted for the study period in 2017. For the t-tests, the currents data were separately tested for surface and mid-depth currents. The t-tests compared the variances and calculated significant differences ($P < \alpha = 0.05$) between each depth of both sites.

3.1.3. Nutrients

Nutrient concentrations in the seawater were determined using methods as described in the methods section. Both sites at Sørvágsfjørður were sampled and documented at two- and four-meter depths. All nutrient data of the mid-depth at the reference site SO06 was sampled at a depth of 5 instead of 4 meters after July 2020.

3.1.3.1. Nitrate

As mentioned in the methodology, first data for the IMTA site were available in February 2020 (figure 17), whereas the reference site was already sampled from April to September 2019 (figure 18). The diagrams illustrate the nitrate concentrations in micromole (µM) at both sites at two- and four- (/five-) meter depths. The selection of the considered depths based on the availability and quantity of the sampled data in order to generate representative and robust results. During the measurements, one error measurement occurred, which was adjusted to 0 µM.

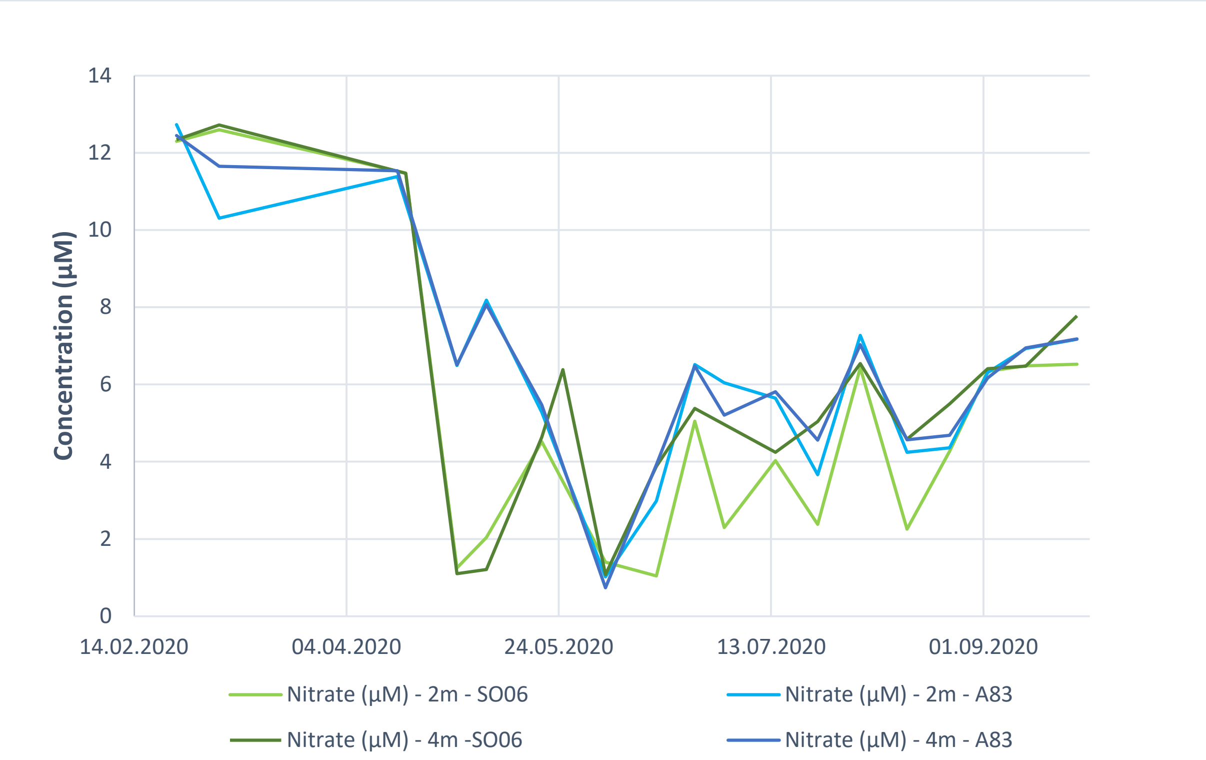

Figure 17: Nitrate concentration (µM) at the IMTA site (A83) and the reference site (SO06) in two- and four- (/five-) meter depths in 2020. Illustration: M. Schlund, 2021.

In April 2020, strong reductions in nitrate concentrations occurred at both sites. At the reference site SO06, stronger reductions in nitrate concentrations occurred compared to the IMTA site. From April to May 2020, the concentration of nitrate decreased from approximately 1 µM to 12 µM at both sites and depths. The reference site reached low nitrate concentration in two- and four- (/five-) meter depths at the end of April (1.1 µM). At A83, the nitrate concentrations were reduced to a minimum value of 0.7 µM two months later than at the reference site.

The nitrate concentration fluctuated during the measured summer period. Each month, the nitrate value reached a peak of about 6 µM to 7 µM and then decreased to approximately 2 µM again. From June onward, nitrate concentrations were steadily increasing, up to 7.2 µM by the end of September. However, A83 stood out with slightly higher concentrations, both at two- and four- (/five-) meter depths and exhibited higher fluctuations.

Compared to 2020, 2019 was very similar to the data from the reference site at four (/five)-meter depth. Figure 18 shows the nitrate concentrations of 2019 at the reference site in two- and four-meter depths. The initially high nitrate concentrations of 10.6 µM decreased to 0 µM within two months and then raised again to 6.6 µM in June. In July, the concentration decreased to 1.0 µM after which it steadily increased again. The last measured concentration on 05th September 2019 was at 7.2 µM. At two-meter depth, the nitrate concentration was even at SO06. The reference site was sampled first in May 2019 and the nitrate concentration increased consistently to 6.5 µM by September 2019.

A general increase in nitrate levels was observed over the winter period. The first sampled data of nitrate concentration of around 12 µM (February 2020) at SO06 were higher than the last sampled nitrate concentration in September 2019 at the reference site.

Figure 18: Concentration of nitrate (µM) at the reference site (SO06) in two- and four-meter depth in 2019. Illustration: M. Schlund, 2021.

In comparison, the nitrate concentrations of the reference site of both depths were very similar. Both depths at SO06 depict a comparable trend with peaks and troughs throughout the year. The IMTA site was very similar at both depths and compared to the reference site, the data were mostly similar. Only in April/May, the concentration did not decrease as fast as at SO06.

The nitrate data were tested for equality of variances (f-test) and significant differences (t-test). The measured period was divided into a winter (January to May) and summer period (May to September) to reduce influences of seasonal variances. All variances of all depth and seasons were tested equally. In summer, there were significant differences tested between the two-meter depths of A83 and SO06. In four-/ five-meter depths, no significant differences were measured. For the winter period, no significant differences were tested.

3.1.3.2. Silicate

Silicate concentrations were measured at the IMTA site and reference site from February to September of 2020 in two- and four- (/five-) meter depths (figure 19). In 2020, both sites showed similar forms of peaks and troughs. The diagram illustrates the silicate concentrations in micromole (µM) in both sites at two- and four- (/five-) meter depth. The concentrations of silicates were relatively high at the beginning of the year (> 6 µM), but in May 2020, the values steadily decreased and fluctuated slightly over several months at both depths and sites. At the end of June 2020, the concentration started to increase again and by August, the concentration peaked at approximately 4 µM. Moreover, a silicate concentration of 6.5 µM stands out at two-meter depth at the reference site in September 2020.

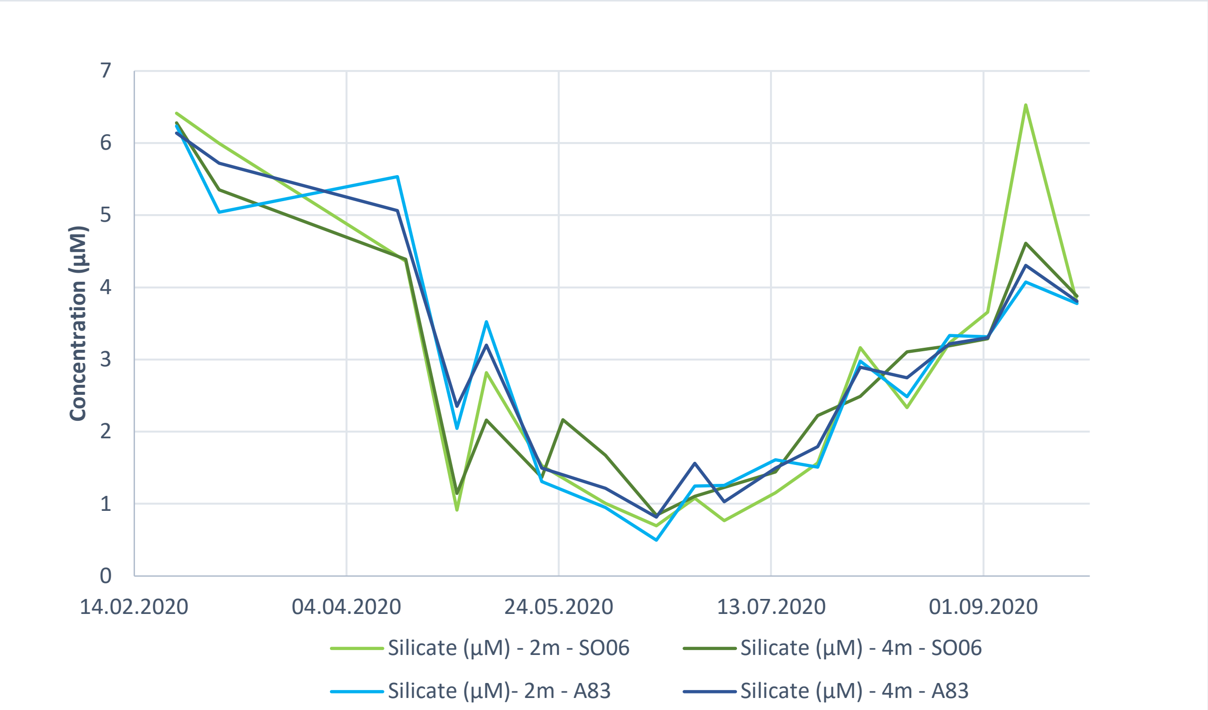

Figure 19: Silicate concentration (µM) in 2020 in two- and four- (/five-) meter depth at the IMTA site (A83) and the reference site (SO06) in 2020. Illustration: M. Schlund, 2021.

The equality of variances and significant differences were tested with a f-test and a t-test. Therefore, the data was divided in a winter period (January – May) and a summer period (May – September). Except the summer period in two-meter depths, all variances were tested equally. The t-test showed no significant differences in all depths at both sites.

3.1.3.3. Phosphate

Phosphate was measured at the IMTA site (A83) and at the reference site (SO06) in 2020. Figure 20 shows the phosphate concentration in micromole (µM) in relation to time. In 2020, monthly cycles of phosphate concentration were recognizable at both sites. In the middle of the month, the phosphate concentration dropped to a minimum and reached its highest level by the end of the month. The maximum at two-meter depth was at 1.04 µM at A83 in August and at SO06 in February (0.93 µM). The two-meter depth minimum was 0.35 µM in June 2020 at A83 and 0.29 µM at SO06 in 2020. The maximum at four- (/five-) meter depth at SO06 showed 0.86 µM and A83 displayed a phosphate concentration of 1.14 µM. The four-meter depths minimums were measured with 0.38 µM at SO06 in April 2020 and with at 0.34 µM at A83 in June.

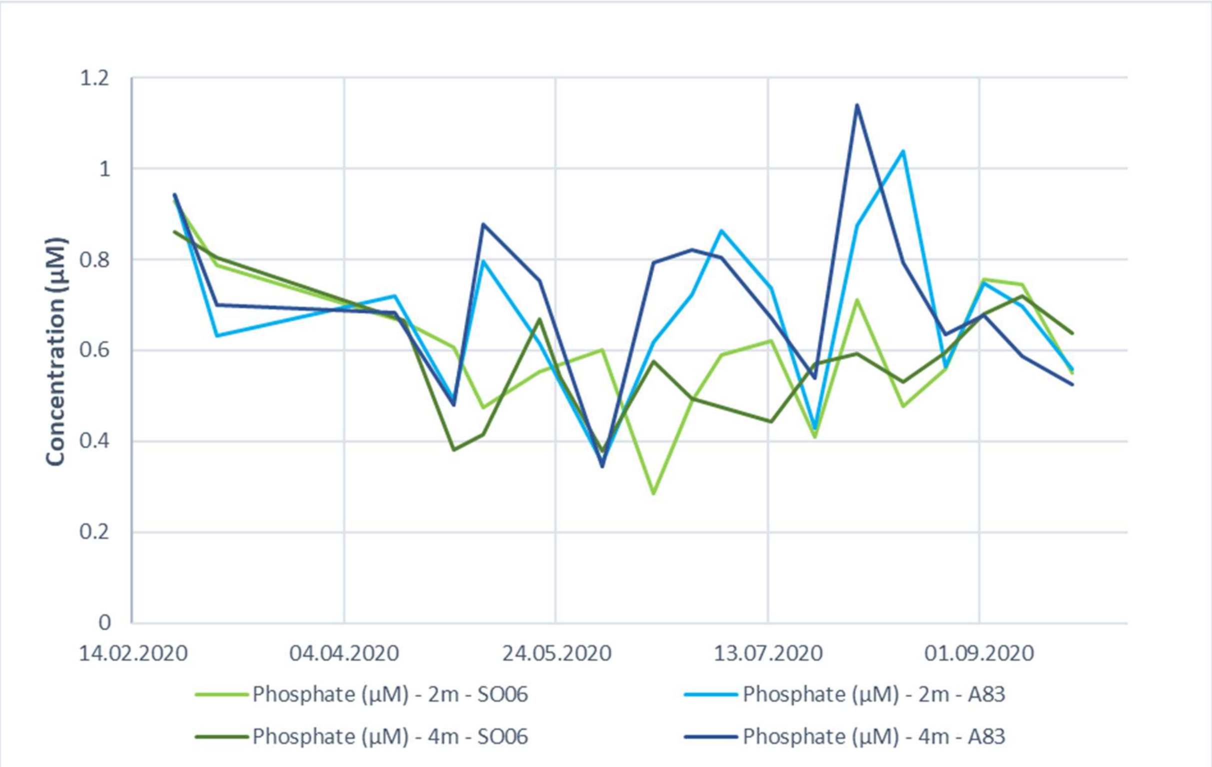

Figure 20: Concentration of phosphate (µM) in two- and four- (/five-) meter depths the IMTA site (A83) and the reference site (SO06) in 2020. Illustration: M. Schlund, 2021.

In comparison, the phosphate concentrations were measured similar at both sites in the beginning but showed large variations since May 2020. After May, the phosphate concentration at A83 recorded higher values than the reference site. All phosphate data were tested for equal or unequal variances (f-test) and significant differences (t-test) at both sites and depths. Therefore, the sampled data were divided in a summer (May to September) and a winter period (January to May). All variances of the phosphate data were tested equally. Only the summer period in four-meter depth was tested unequally. The t-test showed significant differences ($P < 0.05$) in summer in two- and four-meter depth between the IMTA site and the reference site, whereas the winter measurements showed no significant differences.

3.1.3.4. Ammonium

Ammonium was measured at the reference site and IMTA site from May to September 2020. At SO06, only measurements of four-meter depth were considered, whereas at A83 samples were obtained for both two- and four-meter depths. Figure 21 shows the ammonium concentration in micromole in relation to time at both sites.

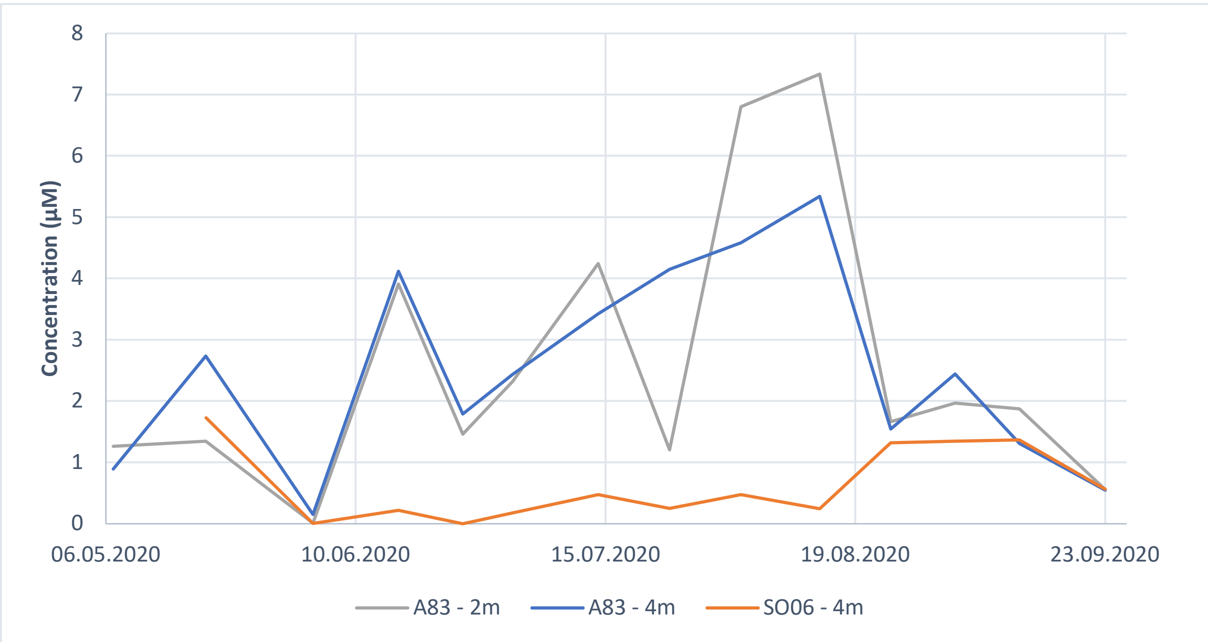

Figure 21: Ammonium concentration (µM) in two- and four-meter depth at the IMTA site (A83) and in four-meter depth at the reference site (SO06) in 2020. Illustration: M. Schlund, 2021.

The data at SO06 showed an increased ammonium concentration in May 2020, with a strong fluctuation of up to 2.9 µM, which also was the maximum measured concentration. From June onwards, the concentrations remained on a comparatively low level, with no measurable concentrations (0 µM) on 25th June. At the end of August, the ammonium concentration at the reference site started to increase slightly to 1.36 µM but decreased again to 0.56 µM by the end of September.

The ammonium concentration at A83 in two- and four-meter depth showed similar trends. Monthly peaks (temporally variation) were reached only to subsequently fall back to a lower concentration of approximately 1.5 µM within a few days. The maximum ammonium concentration at two meter depth was at 7.3 µM in August 2020, and the minimum in June with no measured ammonium concentration (0 µM). At four-meter depth, the maximum was documented at 5.34 µM in August and the minimum at 0.15 µM in June 2020. The ammonium concentration at the IMTA site showed significantly higher values than the reference site during the measured period in 2020. Also, f-tests and t-test were conducted on equality of variances and statistically significant difference between the two sites. All tested variances were unequal and presented significant differences in ammonium concentration in four-meter depth between the two sites.
All statistically tested nutrient values can be taken from the appendix C and F.

3.2. Results of Saccharina latissima

As described in the methods section, all data of *Saccharina latissima* were used to perform f-tests and t-tests. On April 18th, all measurements of *S. latissima* were conducted at the reference site. One rope was afterwards transferred to the IMTA site on April 20th, 2020. Consequently, all subsequent measurements are site-specific since May 2020.

3.2.1. Statistical Analysis

Before referring to the statistical results of the growth period 2020, a development from June to September must be pointed out. During the seaweed growth, the snail species *Lacuna vincta* consumed almost the entire stock of the *S. latissima* on the rope at the IMTA site (A83). Only the stripes and holdfasts remained. The snail was first observed in June 2020. Figure 22 shows the yield of the reference site on September 23rd, 2020. Figure 23 shows the loss of *S. latissima* at the IMTA site the same day. All following growth results of *S. latissima* showed data loss in September 2020 as consequence of the herbivores *Lacuna vincta* (figure 24).

Figure 22: Harvest of Saccharina latissima at the reference site on September 23rd, 2020. Source: Gunnvør á Norði.

Figure 23: Harvest of the Saccharina latissima at the IMTA site (A83) on September 23rd, 2020. Source: Gunnvør á Norði.

Figure 24: Lacuna vincta (Telnes, 2022).

3.2.2. Weight of Seaweeds

A statistical consideration of the given data of *S. latissima* showed an increase in weight at both locations during the summer months of 2020. Figure 25 shows the average weight development in grams in relation to the measured period in days. Both weights of S. *latissima* were measured at the reference site on April 18th, 2020. The initial situation was identical for both ropes, showing an average minimum weight on April 18th, 2020 (SO06: 10.1 g; A83; 5.8 g). On April 20th, one rope was transferred to the IMTA site. Small initial growth differences before the trial must be considered. However, the reference site showed higher weight development compared to A83 in all months. The highest average measured weight at the reference site was on August 3rd, 2020 with 108.7 grams. The average maximum of A83 was measured at 81.6 grams on June 25th, 2020. Already in June, the weight of the measured individuals at site A83 decreased. In September were no more data of the seaweeds available at A83 due to snail herbivory of *Lacuna vincta*.

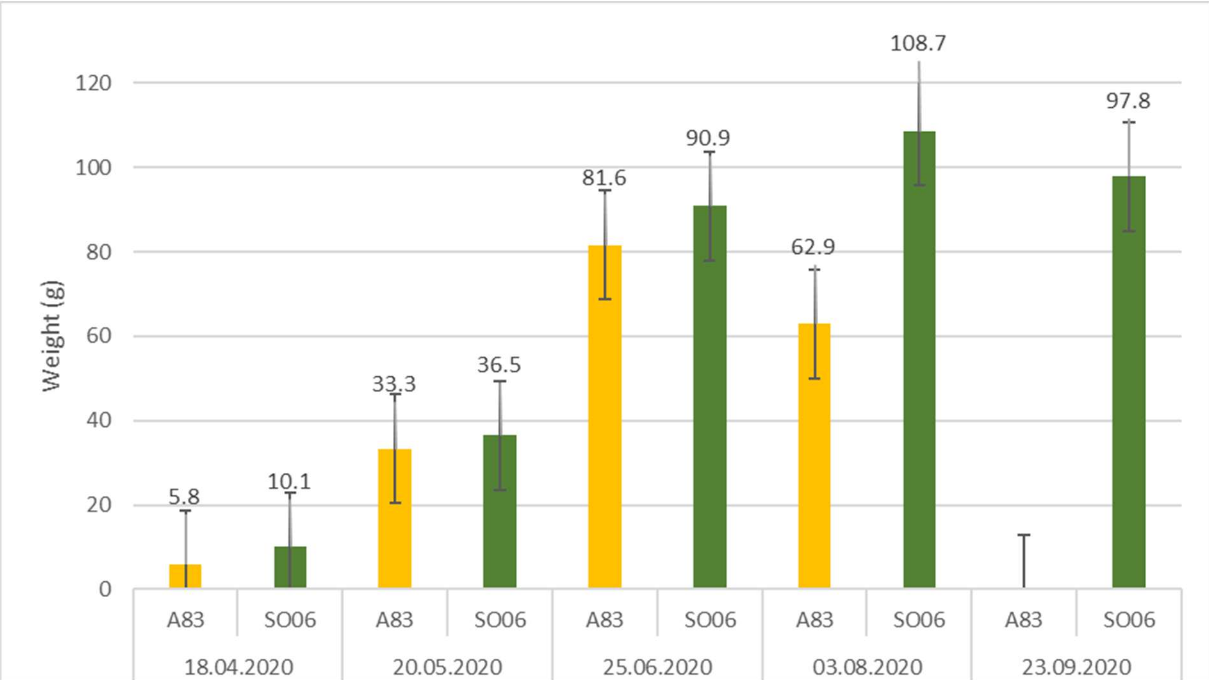

Figure 25: Average weight development in grams (g) of Saccharina latissima at the IMTA site (A83) and the reference site (SO06) in 2020. Illustration: M. Schlund, 2021.

Weight data of *S. latissima* were tested for equality of variances and significant differences as well. Each month, data from A83 and SO06 were tested with f-tests and further with t-tests. All months, except of August, showed no significant differences. September showed significant differences due to *Lacuna vincta*.

3.2.3. Width of Seaweeds

The width of the seaweeds blade developed comparatively to the weight trend described in chapter 3.2.2. Figure 26 shows the average period width in centimetres in relation to the measured period in days. The blade width grew better at the reference site than at A83. The maxima of both ropes were measured in June (SO06: 7.8 g; A83: 6.0 g). In May 2020, the blade widths of both sampled sites showed similar measurements and average width differed by only 0.13 cm. In June, the previous development of the blade started to slow down. In comparison, SO06 remained constant in width growth. From July to August, the development decreased at A83. The IMTA site had no measurable data available in September 2020.

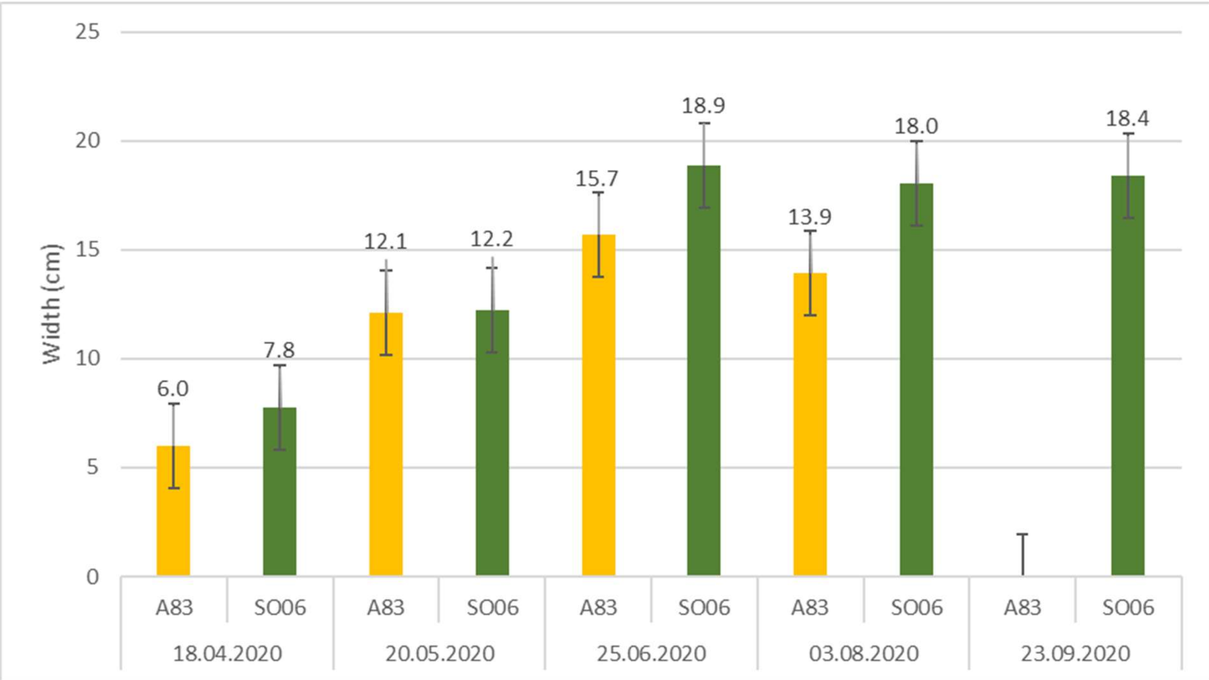

Figure 26: Average width development (cm) of Saccharina latissima at the IMTA site (A83) and the reference site (SO06) in 2020. Illustration: M. Schlund, 2021.

All width data were tested on monthly significant differences between the sites monthly. Only August and September showed significant differences in width growth between the IMTA site and the reference site.

3.2.4. Length of Blades

Figure 27 presents the average development of *S. latissima* length at A83 and SO06 in relation to the measured period in days. The initial recording of the length already showed a difference between both locations. This difference was reflected in the later measurements. The development in blade length however was similar at both sites, with maximum measured length in June (49.8 cm at SO06 and 33.9 cm at A83). Data from September 2020 were not available for the IMTA site.

Significant differences were observed in the total blade lengths of the *S. latissima* individuals cultivated at different exposures. April, August and September 2020 were tested with significant differences (f-tests and t-tests) between the IMTA site and the reference site.

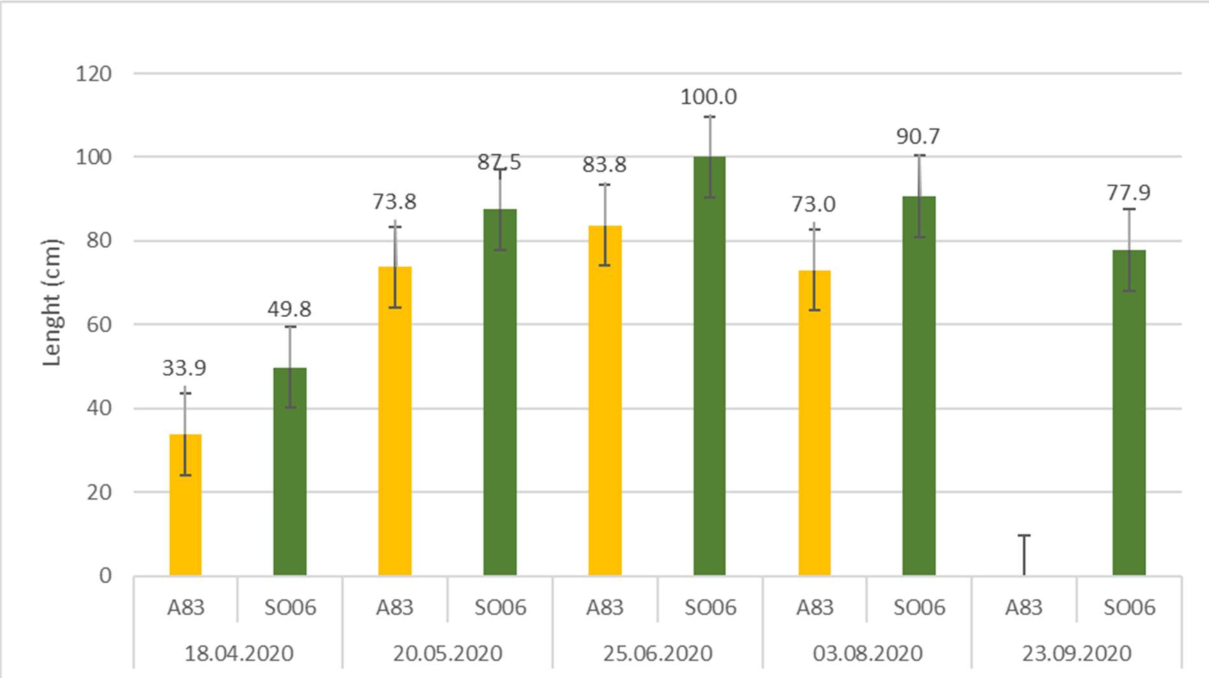

Figure 27: Average length development (cm) of Saccharina latissima at the IMTA site (A83) and the reference site (SO06) in 2020. Illustration: M. Schlund, 2021.

3.2.5. Yield and density

To evaluate the density of seaweed individuals on the rope, the numbers of individuals were counted and calculated as described in chapter 2.5.3. The resulting average numbers of individuals per meter on the rope in relation of time are presented in figure 28.

The results showed a high variation in number of individuals. The initial data in April presented an average difference of 27 individuals per meter. The maximum density of average individuals at SO06 was determined site in August 2020. At the IMTA site, the highest density was measured in May with 233 individuals per meter. There were no measurable data in September 2020 for the IMTA site either. The data of counted individuals showed significant differences between the sites since June 2020.

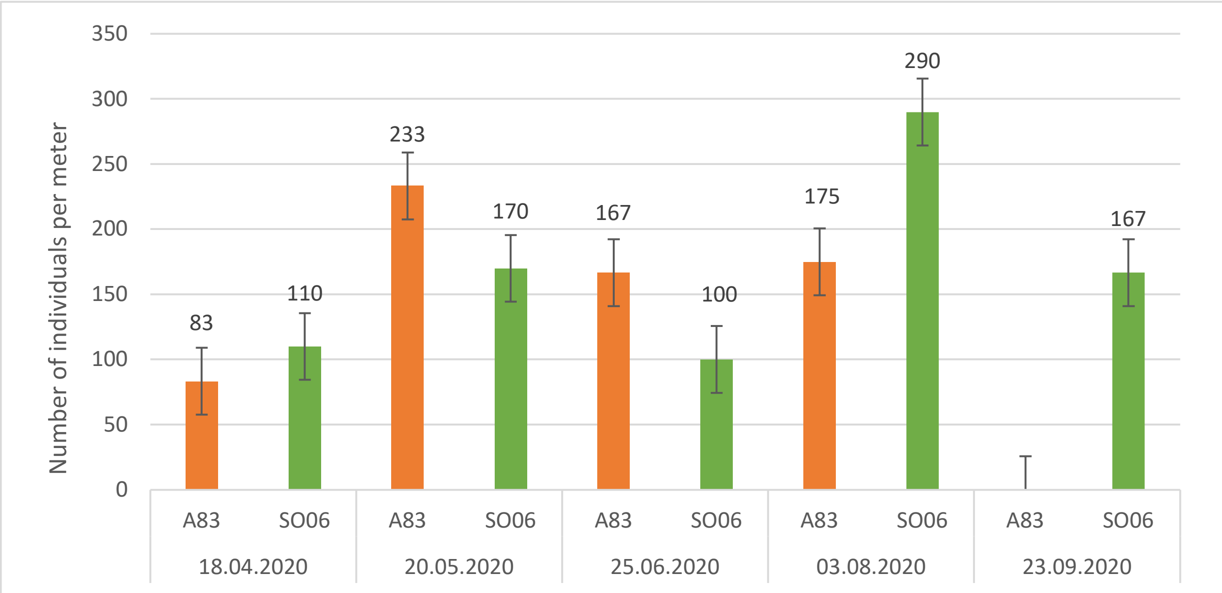

Figure 28: The average of sampled individuals m^{-1} of Saccharina latissima at the IMTA site (A83) and the reference site (SO06) in 2020. Illustration: M. Schlund, 2021.

Figure 29 shows the biomass of the *S. latissima* per meter in grams in relation of time at the IMTA site (A83) and the reference site (SO06). The biomass of the seaweeds was measured higher at A83 in the beginning of the measurement period than at the reference site. A83 showed a smaller biomass with 497 grams than SO06 with 1257 grams. Since May 2020, the seaweeds at the reference site doubled in biomass weight per meter every month. In June, the biomass development was approximately the same at both sites. In August however, the development at the reference site was almost twice as large as at the IMTA site. There was no biomass measurable at A83 in September 2020. The biomass weight of the seaweed at the reference site decreased by around 30 percent from August to September 2020. The maximum in biomass of both sites was shown in August with 17800 grams at SO06 and 9977 grams at A83.

Biomass had been tested for significant differences and equality of variances. No significant differences were found in statistical data analysis (f-tests and t-tests). All taken tests are presented in the appendix B.a.iv and B.a.v.

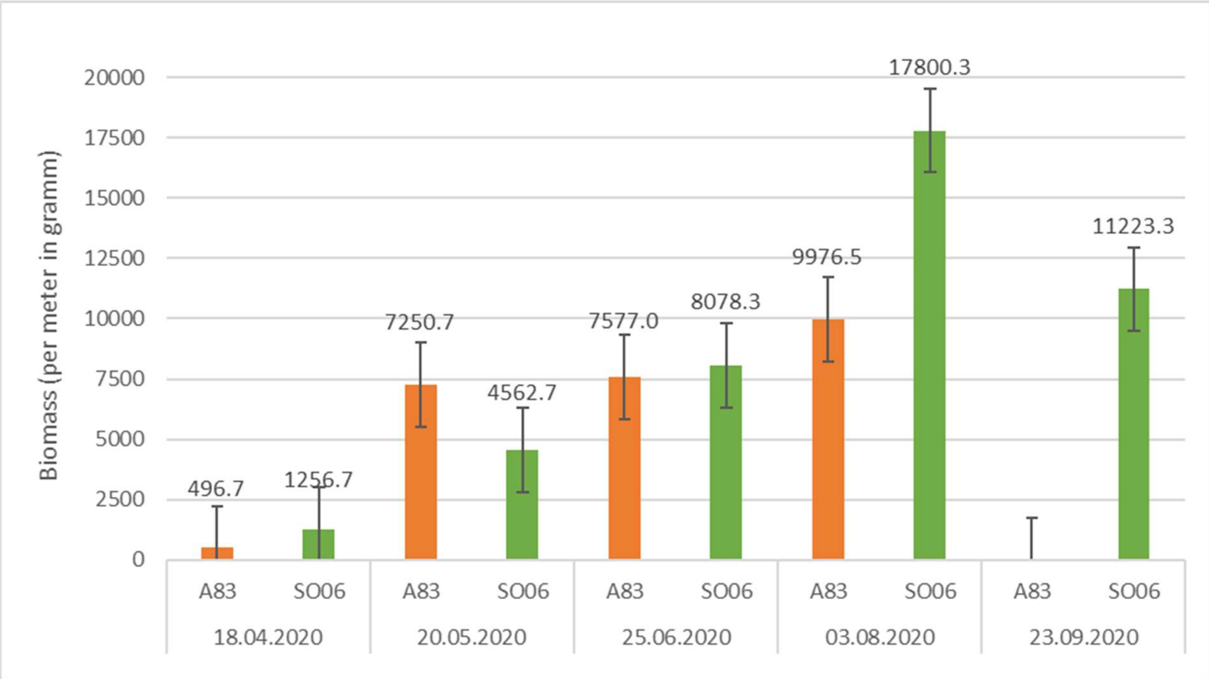

Figure 29: The average development of biomass (per meter in grams) of Saccharina latissima at the IMTA site (A83) and the reference site (SO06) in 2020. Illustration: M. Schlund, 2021.

3.2.6. Growth rates

Monthly and seasonal growth rates were calculated according to equation 1. For this purpose, the weight of the measured individuals (30 individuals) and the average biomass of three meter of rope were used. Based on the average biomass, the documented growth rate of 9.1 g/day at the IMTA site (A83) on June 25th, 2020 reflected a relatively slow development. In August, the growth rate of the biomass at A83 increased to 61.5 g/day. Compared to the reference site, A83 showed lower values. The growth rate more than doubled from June 2020 to August 2020. The total growth rate considered 107 growth days and resulted 25.5 g/day at A83 and at 123.7 g/day at SO06.

According to the weight data, similar ratios in growth rates were obtained. The monthly and seasonal growth rates from A83 are plotted in table 1. The reference site growth rates are presented in table 2. The growth rates for the average biomass and average weight at the reference site were higher than at the IMTA site.

A83		GR (average biomass)		GR (average weight)	
	Past days	Monthly (g/day)	Total (g/day)	Monthly (g/day)	Total (g/day)
20.05.2020	32			0.86	
25.06.2020	36	9.065		1.34	
03.08.2020	39	61.53	25.48	0.48	0.53
23.09.2020	51	-195.62		-1.23	

Table 1: Growth rate of average biomass weight m^{-1} (g/day) and average weight of 30 individuals (g / day) at the IMTA site (A83). The calculations based on the day of deployment on April 18th, 2020.

SO06		GR (average biomass)		GR (average weight)	
	Past days	Monthly (g/day)	Total rate (g/day)	Monthly (g/day)	Total (g/day)
20.05.2020	32			1.51	
25.06.2020	36	97.66		1.70	
03.08.2020	39	249.28	123.72	0.46	0.92
23.09.2020	51	-128.96		-0.21	

Table 2: Growth rate of average biomass weight m^{-1} (g/ day) and average weight of 30 individuals (g/ day) at the reference site (SO06). The calculation based on the day of deployment April 18th, 2020.

3.3. Production data - Hiddenfjord

Figure 30 shows the number of fish that were deployed in the cage of the IMTA site and the development of the biomass in kilograms in relation to time. In August 2019, fish was already deployed at A83. Around 910,000 fish were regularly deployed in cage A83 until October 2019. Since the deployment of fish in 2019, the fish biomass increased continuously, with a maximum recorded in July 2020 (3,381 tons). The number of fish remained stable since October 2019. In July 2020, the fish was harvested, resulting an abrupt decrease in number of fish as well as fish biomasses. The fish were not replaced. The provided recordings ended on September 30th, with approximately 290,000 fish remaining in the cage.

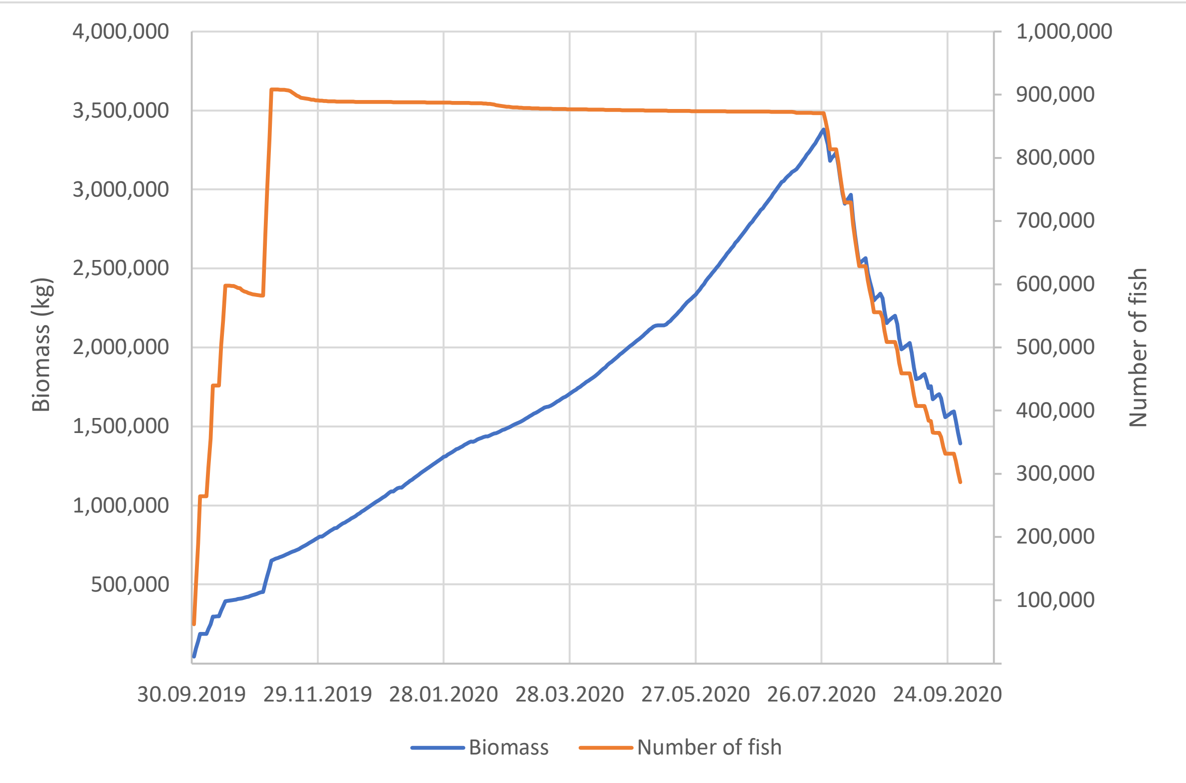

Figure 30: Production data from the company Hiddenfjord, 2019/2020.Comparison of number of fish in the cage of the IMTA site (A83) and the biomass production (kg). Illustration: M. Schlund, 2021.

4. Discussion

Six months of S. latissima growth were monitored in a commercial open net fish farm (A83) using integrated multi-tropic aquaculture and a reference site (SO06) in Sørvágsfjørður, Faroe Islands. This research used two ropes that were first deployed at the reference site SO06 on April 18th, 2020, and which were seeded with the brown algae species *S. latissima*. One rope was transferred to the IMTA site on April 20th, 2020.

The consideration was done to look at possible growth differences of *S. latissima*. The environmental conditions of growth at the two sites, such as water nutrients and CTD data were measured. Samples of *S. latissima* were taken from April 2020 to September 2020 and were examined for significant differences by applying f-tests and t-tests in Microsoft Excel. Based on the result it is discussed what influences respective parameter might had on the growth of *S. latissima*.

The results of the blade weights, widths and lengths of *S. latissima* showed no statistically significant differences ($P > 0.05$) during the first months of the study period (April to July 2020). The exception were the blade lengths, which already showed significant differences in April 2020. Retaining initial difference, the seaweeds indicated comparable growth at both sites. However, differences in growth between the IMTA site and the reference site were recorded later in the year. In August t-tests resulted significant differences ($P < 0.05$) in all observed growth parameters.

To ensure the sample quality and quantity, only a small area of 10 cm was sampled on the rope. The results of the sampled 10 cm of rope showed variation in numbers of individuals of *S. latissima* each month. The highest population density on the rope was measured on May 20th, 2020 at the IMTA site (n = 233) and on August 3rd, 2020 at the reference site (n = 290). Variations in number of individuals could be random occurrence or perhaps potentially explained by the chosen seeding method (Mols-Mortensen *et al.*, 2017). The applied method of cutting 10 cm off the rope assumed a steady growth of *S. latissima* on the rope. This method generalized the growth and did not consider density variations on the rope. Inaccuracies could resulted from extrapolating the sampled seaweeds of 10 cm rope to 1 meter (Marinho *et al.*, 2015). Inconsistencies on the rope can be caused either by seaweeds falling of the rope, environmental changes and influences or other natural reasons (Mols-Mortensen *et al.*, 2017).

The number of individuals were reflected in the biomass data in the beginning of the measured period. In June, 167 individuals per meter were counted at the IMTA site, but the biomass weight per meter was less compared to the reference site with only 100 counted individuals. Extrapolated from 10 cm yield of the rope, 17.8 kg m^{-1} of biomass weight was measured at the reference site. The highest value of biomass weight was 10 kg m^{-1} at the IMTA site. Since June, the ratios between the IMTA site and the reference site changed and larger differences in growth were observed. Comparable study results showed similar biomass yields within a range of 6.2 to 16 kg m^{-1}, and observed significant differences between a sheltered and a non-sheltered site (Peteiro and Freire, 2013; Wang *et al.*, 2013; Kim, Kraemer and Yarish, 2015; Augyte *et al.*, 2016). For example Sanderson et al. (2012) documented average yields of *S. latissima* of 28 kg m^{-1}.

Generally, *S. latissima* is reported to have a tendency to increase in biomass during the early part of the year, followed by a subsequent loss of biomass during late summer months (Augyte *et al.*, 2016). This type of growth may be due to an endogenous growth cycle or other factors such as nutrient limitation (Marinho *et al.*, 2015). This cycle of biomass reduction was observed at the reference site in September 2020 (Biomass growth rate at SO06: -128.96 g/day).

Especially the monthly and total biomass growth rate (107 days) analysis showed four to five times higher growth of *S. latissima* at the reference site since deployment compared to the IMTA site. The maximum growth rates were at the reference site between June and August (average biomass GR: 61.53 g/day [August 2020]; average weight GR: 1.34 g/day [June 2020]). In Augyte et al. (2016), maximum growth rates of *S. latissima* were observed between March and May.

The development of *S. latissima* and the significant differences between the sites indicates that the seaweed growth was influenced by environmental factors, such as temperatures, irradiance and nutrient availability (Wang *et al.*, 2013).

Variation in temperature and salinity occurred at both sites, as shown in chapter 3.1.1. Different vertical profiles in salinity and temperature were ascertainable at both sites on each sampled day.

Since the cultivation of *S. latissima* commonly took place over multiple months, seasonal variations were more interesting to consider, not only daily vertical changes. The seasonal results of temperature and salinity showed no significant difference between the IMTA site and the reference site ($P > 0.05$). During the growth period, temperature and salinity showed similar range at both sites.

The optimal salinities for the growth of *S. latissima* were documented to be at approximately 23 PSU to 31 PSU, while unfavourable growth conditions were reported at 16 PSU with high mortality rates below 8 PSU (Bartsch *et al.*, 2008). The average seasonal comparison between the sites showed slightly higher values in salinity (34.84 PSU – 35.09 PSU) at both sites but still indicated good growth environment for the macroalgae.

S. latissima exhibited optimal growth between 10 °C – 15 °C and disintegration at 23 °C (Bolton and Lüning, 1982). The seasonal average of water temperatures ranged between 9.72 °C and 10.01 °C at both sites, indicating that these locations provided close to good temperature growth conditions. Other studies described the conditions at Faroese fjords as constant and showed similar values of temperatures and salinity (Gaard, Nordi and Simonsen, 2011; Mols-Mortensen *et al.*, 2017).

Since there was no clear temperature change with depth at both sites during the growth period in 2020, the influence of large currents is presupposed. As discussed in previous chapters, the Gulf Stream and estuarine circulation strongly influence the surrounding waters of the Faroe Islands, causing stable water conditions (Bak, Mortensen and Gregersen, 2018). The constancy of the temperature and salinity variables could be attributed to the influence of local physical forces (Gaard, Nordi and Simonsen, 2011). Due to small differences in temperature and salinity between both sites, other environmental factors must determine the growth differences of *S. latissima*.

Water currents are an important variable to identify optimal growth location for seaweeds (Peteiro and Freire, 2013). Clear differences in surface and mid-depths currents were modelled with the hydrodynamics model Delft-3D. The surface directions of the modelled fjord on February 7th, 2017 showed different values between the two sites (A83 = 283.1°; SO06 = 17.1°). In Sørvágsfjørður, the IMTA site was located within the fjords main channel flow, whereas the reference site was located more remotely at an inlet in the fjord and experienced less strong currents. According to Mols-Mortensen et al. (2017), the IMTA site can be considered as a current exposed location and the reference site as a sheltered location.

According to the hydrodynamic model, surface currents flowed out of the fjord on February 02nd, 2017. Since no data were available from 2020, it was assumed that the current conditions in 2020 were comparable to those measured in 2017. The results showed significant different current strengths of both sites and depths in 2017.

Daily fluctuations as shown in figures 11 to 14 were generated by the impact of strong tidal changes in the fjord due to periodically water of different current strengths flowing out and into the fjord (Erenbjerg *et al.*, 2021). Tidal changes can cause mixing of the water in the fjord and distribution of nutrients, creating a nutrient rich environment (Danielsen and á Norði, 2021). In addition, movement of fish in the IMTA cage could support cross-field mixing in the water.

Since there were significant differences between both sites ($P < 0.05$), current conditions, especially the surface currents, could have a major impact on differential growth and quality of *S. latissima* (Peteiro and Freire, 2013). While current speeds are able to limit the growth of *S. latissima*, the seaweed can withstand speeds up to 1.52 m s^{-1} depending on the applied seeding method (Mols-Mortensen *et al.*, 2017). Data from the IMTA site in 2017 presented maximum current magnitudes in the surface currents of only 0.336 m s^{-1}. Mid-depth and surface currents of the reference site did not exhibit speeds that could negatively influence the growth of *S. latissima*.

S. latissima and other macroalgae took up nutrients from its surrounding water. The nutrient uptake of *S. latissima* is saturated at currents magnitudes of 0.25 m s^{-1} (Gerard, 1982). Based on the results, both sites were below the absolute saturation of average velocity values. The IMTA site exceeded the absolute saturation values at the surface more frequently in daily courses in 2017 (figure 12). This can also be seen from the outliers in the boxplot diagram (figure 15). Besides, this could be a reason for growth differences of *S. latissima* at the IMTA site compared to the reference site. But a study from the Faroe Islands, in which the growth of *S. latissima* was compared at another fjord, reported that current exposure had no influence on the biomass production of the seaweeds (Mols-Mortensen *et al.*, 2017).

The currents data were generated in the hydrodynamic model Delft-3D. This could have resulted in inaccuracies because the model cannot reflect reality. Moreover, only data of a short period of the current magnitude and direction in Sørvágsfjørður were provided. However, current data did not originate from 2020 and the modelled period in 2017 overlapped very briefly with the growth period of *S. latissima* after deployment into the fjord in 2020. Additionally, inaccuracies in the modelled data may result from different modelled depth (SO06 = 15 m; A83 = 21 m).

Despite the differences in surface and mid-depth currents between the two sites, no differences in the growth of *S. latissima* were recognizable in the first months after deployment. In August, significant differences in the growth of the seaweed became apparent. Therefore, the currents differences that occurred seemed to be insignificant for macroalgae growth but a factor of nutrient distribution in the fjord (Bak, Mortensen and Gregersen, 2018). Since low nitrogen concentrations can limit the growth of seaweeds it could be a factor that differentiate the growth of *S. latissima* (Gerard and Mann, 1979).

In 2020, the measured nitrate concentration showed similarities to the nitrate course in 2019. A correlation between the fish development at the IMTA site, the nitrate and ammonium concentrations at A83 and the growth of *S. latissima* crystallized as other research correlate these parameters as well (e.g. Sanderson et al., 2012; Wang et al., 2013). Figure 30 shows the deployment of fish during 2019 and the development of fish biomass in the cage of the IMTA site. Since the deployment of the salmon in 2019, the fish continuously increased in biomass. In April 2020, the biomass reached approximately 2,000 tons with around 900,000 fish in the cage. As already mentioned, nitrates are side products of aquaculture activities. Dissolved ammonium released by the fish is converted into nitrate by bacteria through nitrification (Boyd, 2007). The ammonium concentrations between the IMTA site and the reference site in four-meter depth exhibited significant differences. The ammonium concentration at the IMTA site was variating each month and slowly increased since July when the seaweed growth decreased. Due to low ammonium concentrations at the reference site, a passive influence of the aquaculture activities can be assumed. Dissolved nutrients could be transported through the fjord by mixed currents (Danielsen and á Norði, 2021).

High nitrate concentrations in the water in two- and four-meter depths at both sites before April 2020 (max. nitrate: A83 [2 m] = 12.73 µM [February 2020]; SO06 [4 m] = 12.73 µM [March 2020]) can be traced back to aquaculture activities. Since *S. latissima* was deployed in April, the nitrate concentrations decreased at both sites. The results at the IMTA site showed a slower decrease of nitrate in the water. This development can be explained by direct emissions and constant increased biomass production from the fish and/or smaller seaweed yield on the rope at the IMTA site. Less macroalgae can absorb less nutrients from the water (Marinho *et al.*, 2015). Consistent emission through the fish could compensate the absorbed nutrients by *S. latissima* at the IMTA site causing slower nitrate reduction. In comparison, the seaweeds at the reference site reached lower values more quickly, probably by only indirect dissolved emissions and natural nitrate concentration appeared.

S. latissima takes up nitrate from the water and requires at least 3 µM for biomass production, and reaches optimal growth at nitrate concentrations of 10 µM (Dahlen, 2018). Both sites showed initially high concentrations of nitrate, which can be explained by the influence of the mixed currents in the fjord. Furthermore, a study from the Faroe Islands showed similar seasonal nitrate concentrations in May and decreasing values throughout the cultivation period (Mols-Mortensen *et al.*, 2017).

During the winter period of 2019 to 2020, nitrate concentrations increased at both sites. No measurements were taken during this period, but the concentrations were high (approximately 12 µM) in February 2020. These increased nitrate concentrations support the effect of *S. latissima* taking up nutrients from the water due to zero seaweed activities during the winter period 2019/2020. Similar cycles are also recorded in Marinho et al. (2015) in danish waters. After the growth rate of *S. latissima* decreased in September 2020, the nitrate concentration increased again.

Phosphate forms an essential nutrient to sustain the growth development of seaweeds (Douglas, Haggitt and Rees, 2014; Timmermans and Lubsch, 2019) and is a key nutrient in fish feeds in aquacultures (Sugiura, 2018). Temporal variation occurred during the sampling period in 2020 at the IMTA site and the reference site. Seasonal fluctuations in nutrient availabilities can reflect differences in the seasonal growth of seaweeds. Concentrations of phosphate ranged between 0.344 µM to 1.14 µM in four-meter depth during the growth period (April to September) at the IMTA site. At the reference site phosphate concentrations range between 0.38 µM and 0.72 µM in four/five-meter depth. Before *S. latissima* was deployed, phosphate indicated higher concentrations in four-meter depths (A83 = 0.94 µM; SO06 = 0.86 µM). According to Pedersen et al. (2010), nutrient concentrations, including phosphate, are commonly higher during the winter period compared to summer. *S. latissima* is able to take up phosphate from its surrounding water even at low concentrations (Pedersen, Borum and Leck Fotel, 2010).

Silicates in aquaculture can result from fertilization and Arctic water circulation (Boyd, 2014; Hátún *et al.*, 2017). Seaweeds take up silicates from the surrounding water and it has already been reported that silicate is a nutritional requirement of various seaweed species (Mizuta and Yasui, 2012). *S. latissima* use silicates for protection, strengthening its seaweed structure and regenerative abilities of the sporophyte (Mizuta and Yasui, 2012; Boyd, 2014). However, the exact process of the silicate uptake by brown seaweeds is not fully elucidated yet (Mizuta, Uji and Yasui, 2021). The silicate concentration as shown in the results decreased during April 2020 and increased at the end of the cultivation of *S. latissima*. This indicated a nutrient uptake of the seaweeds at both sites as well.

In addition, microalgae are involved in the processes of nutrient uptake and are mainly limited by silicate. Macroalgae are outcompeting other species for nutrient availability (Egge and Aksnes, 1992; Augyte *et al.*, 2016; Hátún *et al.*, 2017).

The presented concentration of silicate showed similar values as in Hátún et al. (2017) in the Faroe Shelf. In April 2020, the concentrations were measured around 5 µM in two- and four-meter depths at the IMTA and reference site in Sørvágsfjørður. The average upper ocean layer (0 to 200 m) documented silicate concentrations of circa 4 µM in the Faroe Shelf (Hátún *et al.*, 2017). Similar silicate concentrations at both sites could result from well mixed water in the fjord due to tidal changes and influences of large-scale currents (Danielsen and á Norði, 2021).

Nevertheless, the phosphate and silicate concentrations in Sørvágsfjørður were determined to be a marginal factor for *S. latissima.* Instead, other factors may explain growth differences between the IMTA and the reference site.

Both sites provided a nutrient rich environment for a good growth of *S. latissima*. For a more detailed growth and location analysis, tissue analyses of *S. latissima* would be advisable as other research already analysed seaweed nutrient contents (Marinho *et al.*, 2015; Augyte *et al.*, 2016). This would show whether the macroalgae are absorbing the nutrients or if other factors would have influenced the change in nutrient values and seaweed growth in Sørvágsfjørður (e.g. high hydrodynamical factors or depth dependence on the sites (Wang *et al.*, 2013)). An extended study of natural nutrients without the influence of a fish culture in a same fjord would also be appropriate to better assess natural influences on seaweeds in the Faroe Islands. In addition, Marinho et al. (2015) analysed that nutrients released from fish farms were negligible compared to naturally occurring nutrient concentrations in the study area, as highest nitrate concentrations were recorded in the seaweeds at the reference site, not at the IMTA site.

Besides the previously discussed parameters, the appearance of the snail *Lacuna vincta* caused a striking difference. In June 2020, the snail species *L. vincta* was observed at the IMTA site first. The differences in growth were due to the snail consuming the seaweeds. The habitat of *L. vincta* is on algae, usually on rocky shores in Alaska and the north Atlantic. The 5 to 10 mm large snail rips deeply into diverse macroalgae species. Among other species, *S. latissima* belongs to the main food source of *L. vincta* (Fralick, Turgeon and Mathieson, 1974; Telnes, 2022). Already in August, the impact of the snail species was significantly observed. In September 2020, the yield of the IMTA site was reduced to nearly zero. The reference site had no significant signs of *L. vincta* influences.

In addition to the most significant influence through the snail, other parameters can also be included in consideration of the growth *of S. latissima*. For example, the photosynthesis strength due to the influence of irradiance and variation in depth or the applied seeding method on the rope could be examined. Unfortunately, no data were available for these parameters.

Critical consideration of the procedure and data size is significant. The data sets of the growth season 2020 and environmental parameter in the water were analysed. The small data sets, especially for nutrient and growth analysis, could have led to inaccuracies in performance of f- and t-tests. For further research, long-term data and bigger data sets for each year are necessary to ensure results of high quality. In addition, extrapolation may underestimate the yield of *S. latissima* (Marinho *et al.*, 2015). Another important aspect to consider is that different cultivation setups were used in some compared studies, which can lead to inaccuracies in the comparison of the results. Most discussed studies also had results from other locations including other environmental conditions compared to Sørvágsfjørður in the Faroe Islands.

S. latissima was successfully deployed in Sørvágsfjørður in April 2020 and showed good growth development until August 2020. The reference site and the IMTA site were suitable for cultivation of *S. latissima*, as indicated by high yields and similar growth developments at both locations from April to June 2020. The appearance of *L. vincta* stopped the growth development at the IMTA site. It would be useful to consider other environmental parameters to identify further influences, the origin of *L. vincta*. and why the snail only impacted the IMTA site in Sørvágsfjørður.

A nutrient rich environment and stable temperature and salinity indicates unlimited growth of *S. latissima* in the fjord in the Faroe Islands. The current strengths were relatively low to significant influence in growth development of *S. latissima* at the two sites. The surface and mid-depth current speeds were relatively low at both sites. The nutrients and pollutions from the fish were dissolved and spread throughout the fjord, creating stable and above average conditions for the growth of *S. latissima*. Therefore, the fjord could provide a suitable habitat for cultivating *S. latissima* also in greater distances from fish farms (Sanderson *et al.*, 2012). Since the required growing conditions of *S. latissima* were similar to the environmental conditions of the Faroe Islands it would theoretically allow unrestricted growth in whole fjord. *S. latissima* showed faster growth compared to other seaweed species (Wegeberg, Mols-Mortensen and Engell-Sørensen, 2013). The cultivation would be more independent of vicinity to fish farms at all.

The cultivation of *S. latissima* and the emissions from the fish are of greater importance for regions of low natural nutrient environments. Nutrient availability can be naturally limited in some regions during summer month. Therefore, using IMTA for seaweed enables steady growth, due to sufficient nutrient supply through fish emissions (Sanderson *et al.*, 2012; Augyte *et al.*, 2016; Dahlen, 2018). This makes the choice of the ideal location for best possible bioremediation capacities of the *S. latissima* most important, in addition to exposure and vicinity to the fish farm (Marinho *et al.*, 2015; Dahlen, 2018).

A brief look at the economic efficiency of *S. latissima* shows that large-scale cultivation would be necessary to compensate emissions from large commercial salmon farms (Sanderson *et al.*, 2012; Broch *et al.*, 2013). Long-term experience and data would be necessary to estimate the economic potential of the cultivation of *S. latissima*. Currently, there is just small knowledge and poor information about the potential of *S. latissima* available (Aldridge *et al.*, 2021). This might be an interesting topic for further research, especially in the suitable fjord habitat of Sørvágsfjørður.

Nevertheless, many studies recommend *S. latissima* in IMTA for bioremediation. However, in terms of efficient bio-extraction, co-culture cultivation was recommended to enhance photosynthesis due to more transparent water and thus improve the biomass production of the seaweed. Suitable potential species for co-culture would be for example shellfish and other seaweed species (Broch *et al.*, 2013; Kim, Kraemer and Yarish, 2015; Marinho *et al.*, 2015; Fossberg *et al.*, 2018).

5. Conclusion

The aim of this thesis was to investigate the growth of *Saccharina latissima* when cultivated at an IMTA site in comparison to a non-aquaculture site, the reference site in the same fjord, Sørvágsfjørður. The results presented growth differences since weight, length, width and biomass yield do significantly differ ($P < 0.05$) between both sites in August and September 2020.

The IMTA site as well as the reference site defined similar values of temperatures and salinity in the seasonal observations and provided conditions for good seaweed growth. Daily fluctuations were neglected since the growth of the *S. latissima* was considered on a long-term basis.

The currents of the two sites significantly differed in the surface and mid-depth. But the current strengths (< 1.52 $m\,s^{-1}$) in the fjord were negligible for affecting the growth of *S. latissima* at the sites. Mixed water layers due to tidal chance in the fjord indicated nutrient distribution through the fjord.

The considered nutrients differed partially. Silicates showed no significant differences in the measured period 2020. Phosphate showed significant differences between the sites. Silicate and phosphate provided enough nutrients during the growing season of *S. latissima* and were no growth limiting factors.

Differences in ammonium concentration could be due to nitrification. As ammonium was increasingly emitted by fish from aquaculture, ammonium was transformed to nitrate. Therefore, lower maximum ammonium values were measured at the reference site and higher concentrations at the IMTA site in four-meter depth (A83 = 5.34 µM; SO06 = 2.89 µM).

This explained among others the initially high concentrations of nitrates, which decreased significantly after deployment of the seaweed in April 2020. Both sides significantly differed in two-meter depth ($P < 0.05$). Differences in nitrate degradation in April/May 2020 between the two sites could result from close vicinity of one rope to the fish farm along with lower biomass density on the rope which could absorb less nitrates from the water. But nitrate concentrations were sufficiently measured in the water during the entire growth period. Nitrates were no limiting but a supporting factor for the growth of the *S. latissima* causing probably unlimited growth areas in Sørvágsfjørður for *S. latissima*.

The fjord offered ideal growth conditions for *S. latissima* and environmental differences were not crucial for growth differences. Accordingly, the growth differences of *S. latissima* in August and September 2020 depended on other factors.

In July the snail species *Lacuna vincta* was observed first. This snail had the greatest influence on the growth of *S. latissima*. The impact of *L. vincta* prevented the cultivation of *S. latissima* at the IMTA site in 2020. Whereas seaweed growth at the reference site was successful. The occurrence of the snail in Sørvágsfjørður and the influence on *S. latissima* should be further researched. As well as further research on growth of *S. latissima* and environmental data of Sørvágsfjørður could provide additional foundation for evaluating the growth of this seaweed species. Both subject areas would be suitable for further studies.

The statistical tests used in this thesis seem to be uncertain. Inaccuracies could occur due to small data sets used for the testing. Furthermore, the modelled current data are from 2017 and it is difficult to project these data to the growth period of *S. latissima* in 2020.

Despite the impact of *L. vincta* in this study, *S. latissima* was recommended for cultivation in IMTA in the Faroe Islands. Especially co-cultivation with additional multi-trophic species should be considered to improve growth conditions for *S. latissima*.

Acknowledgement

First, this thesis was implemented in collaboration with Fiskaaling, the AquaVitae project and SureAqua. Focusing on the impacts of aquaculture on environmental conditions, all three institutions research the influences and potentials of aquaculture and water-based animals and plants. The research station Fiskaaling in the Faroe Islands provided the different data sets from Sørvágsfjørður and formed the basis of this thesis. Therefore, I would like to thank AquaVitae, SureAqua and Fiskaaling for supporting and funding this bachelor thesis.

Especially thanks to my supervisors Gunnvør á Norði (Fiskaaling) and Tinka Kristin Kuhn (Institute of Physical Geography and Landscape Ecology/ Leibniz University of Hannover) for their support throughout the whole project.

Special thanks to Agnes Mols Mortensen (Fiskaaling/ Tari) for organization and guidance during my stay in the Faroe Islands. Thanks go to the staff of Fiskaaling for statistical support, provision of data and the boat excursions.

Finally, I would also like to express my gratitude to my family and friends for their support.

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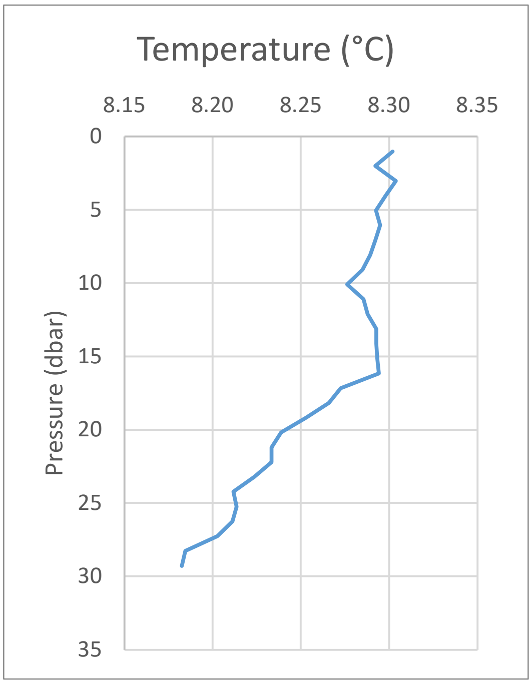
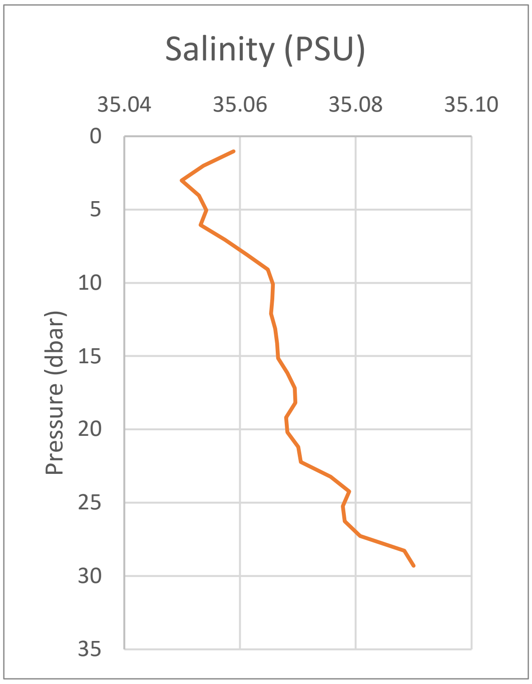
The vertical profiles of the CTD data were sampled at both sites, the IMTA site (A83) and the reference site (SO06) between June 2020 and September. The temperature and salinity measurements were performed with a Seabird SBE-25 plus CTD according to Seabird guidelines.

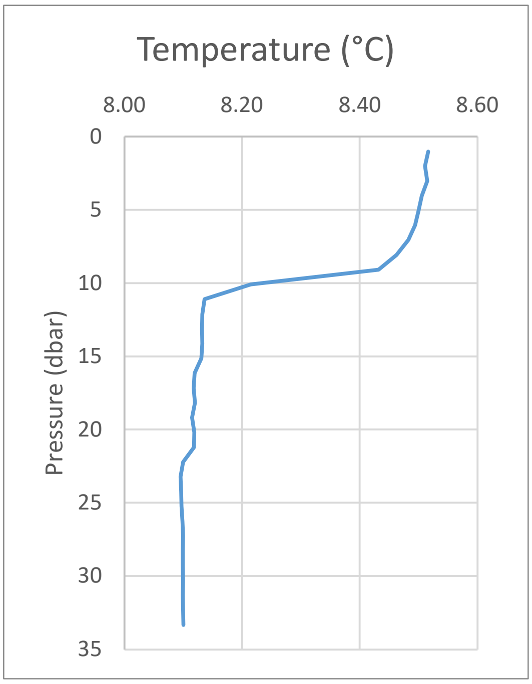
a. June 4th, 2020

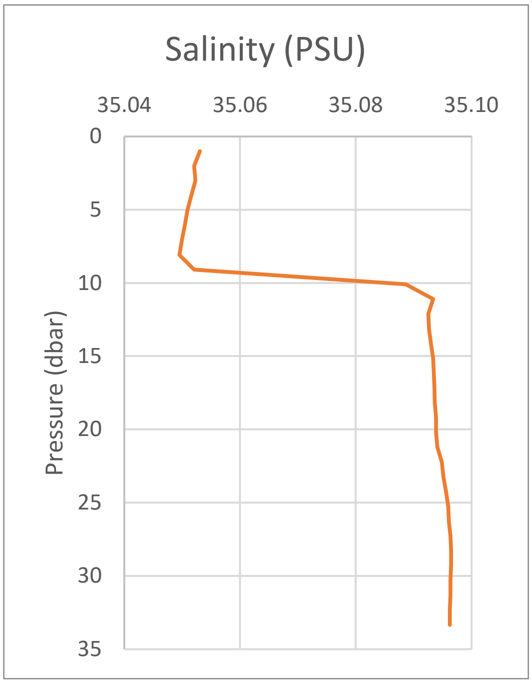
- The reference site - SO06





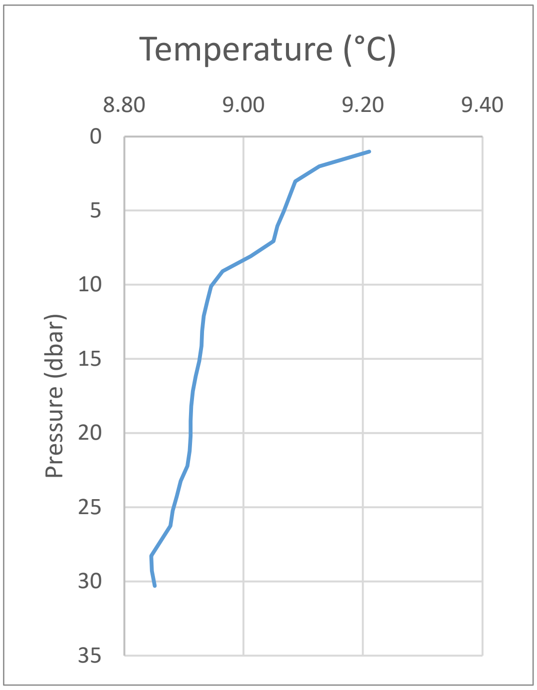
- The IMTA site - A83

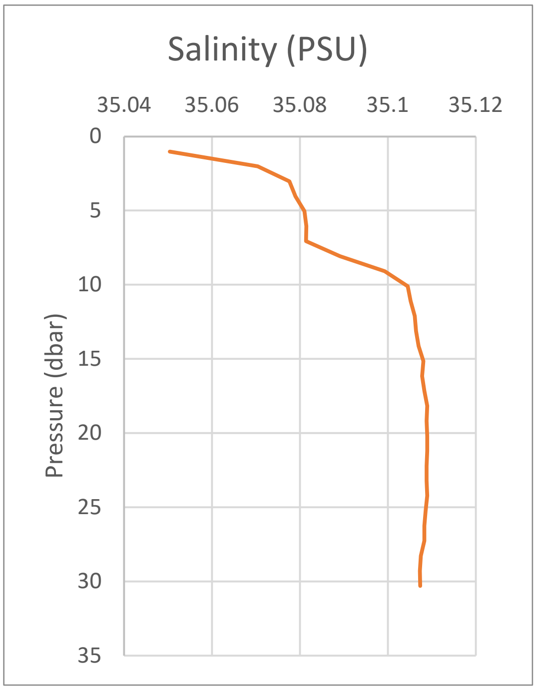




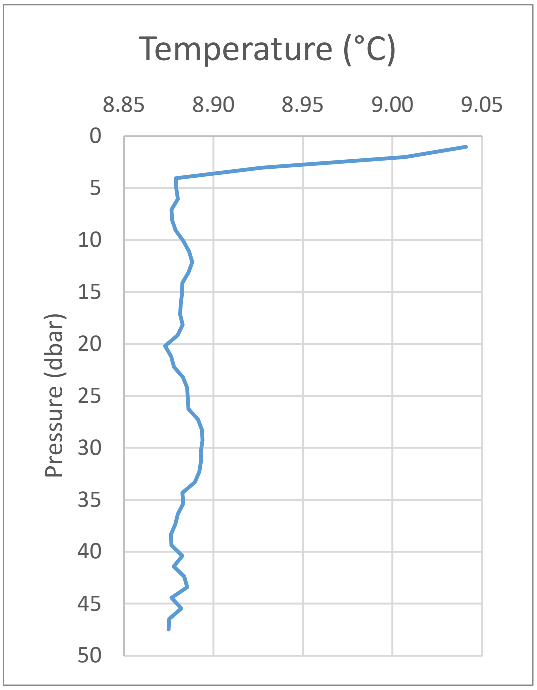
b. June 25th, 2020

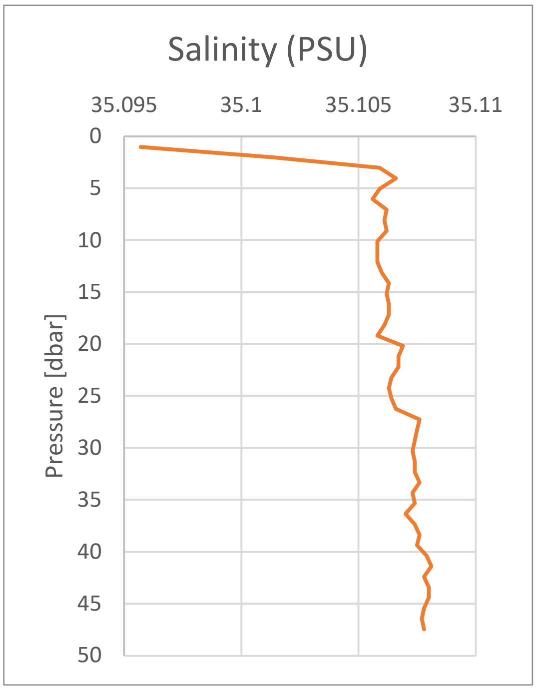
- The reference site - SO06





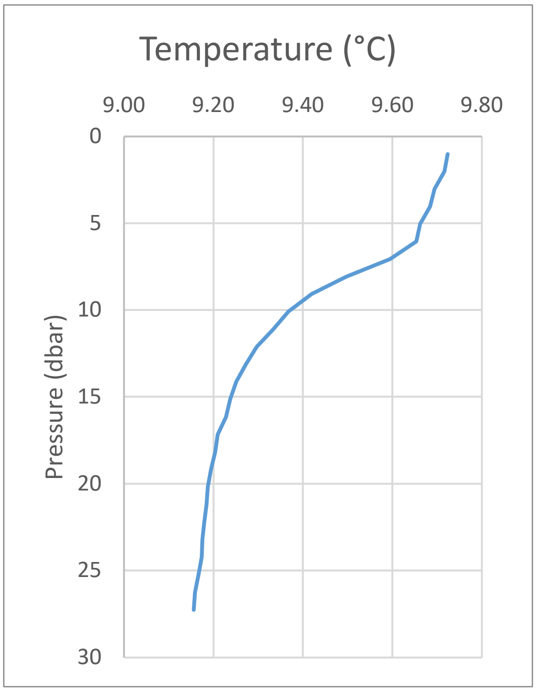
- The IMTA site - A83

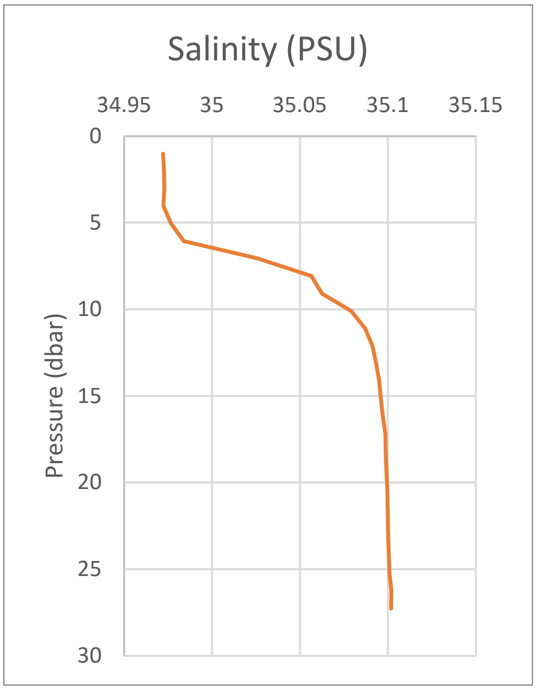




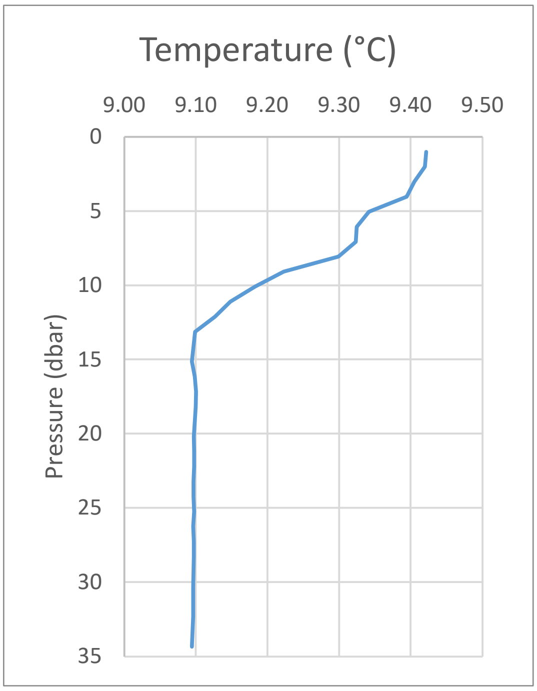
c. **July 2nd, 2020**

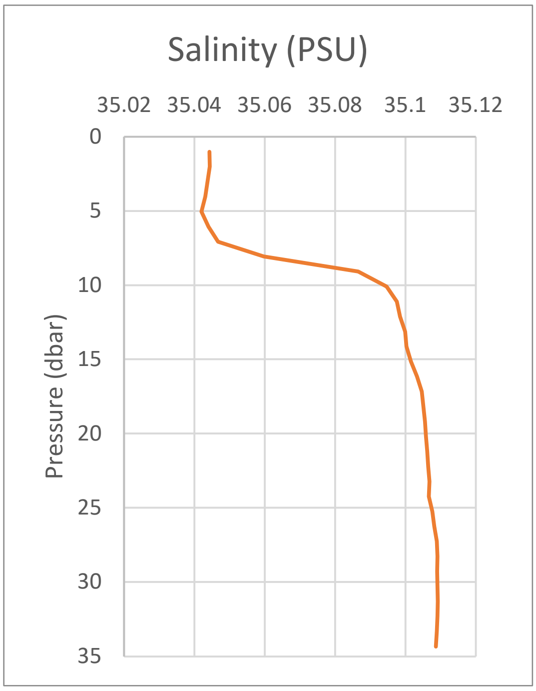
- The reference site - SO06





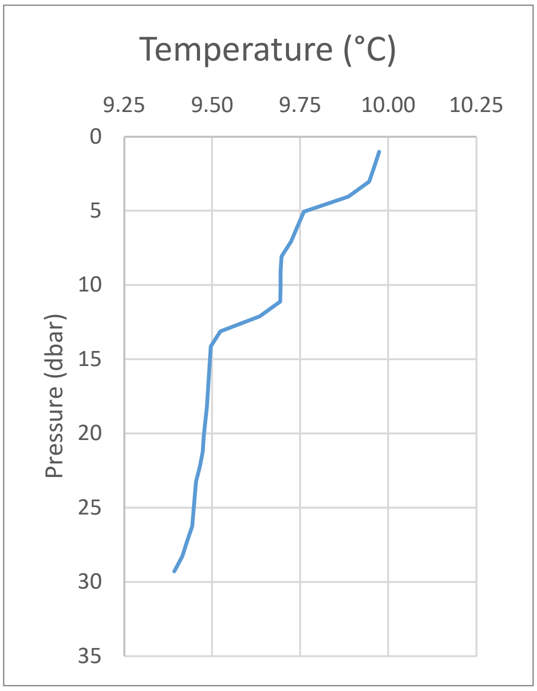
- The IMTA site - A83

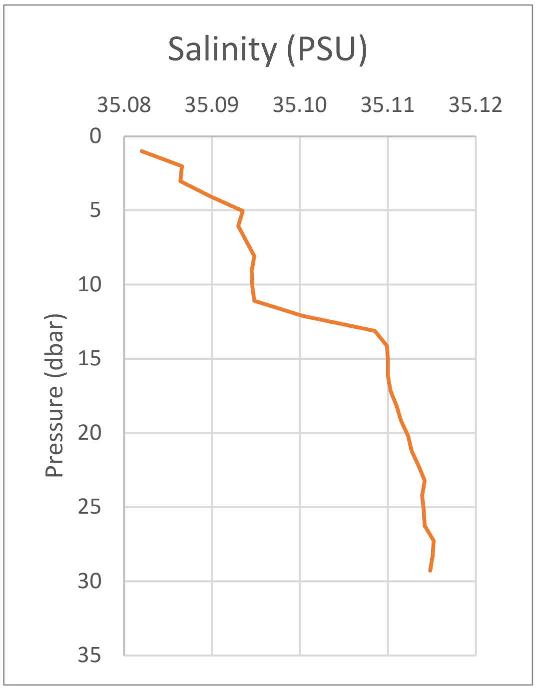




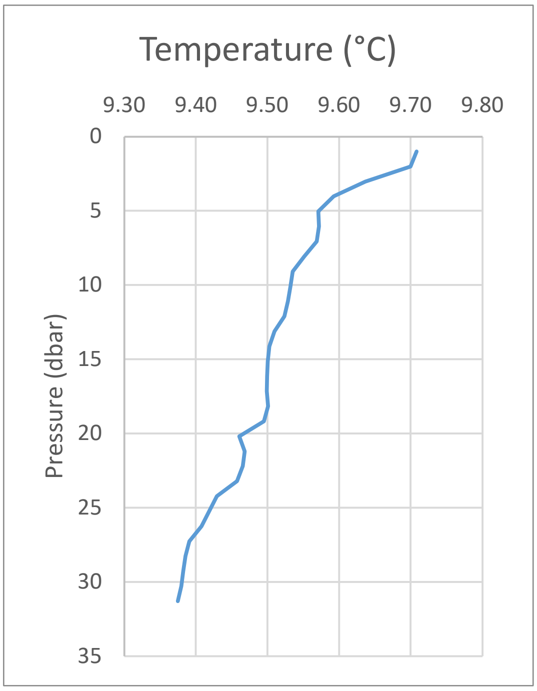
d. July 14th, 2020

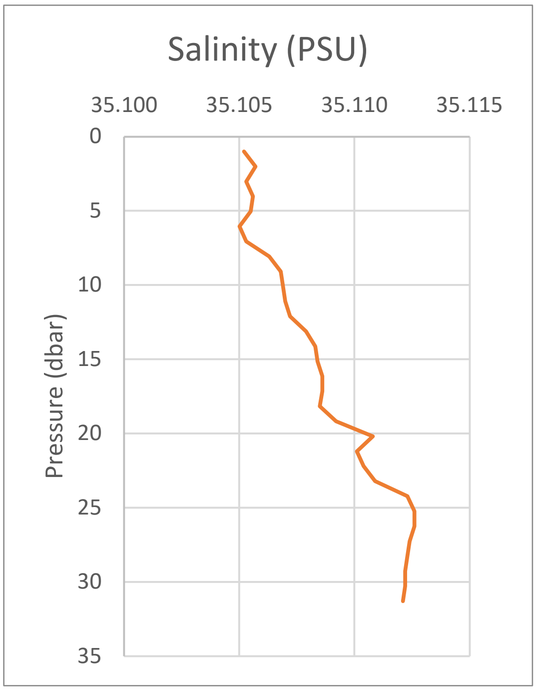
- The reference site - SO06





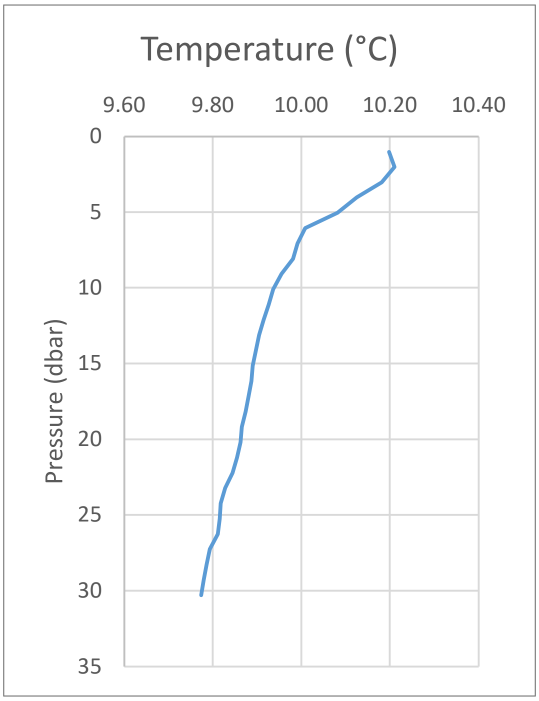
- The IMTA site - A83

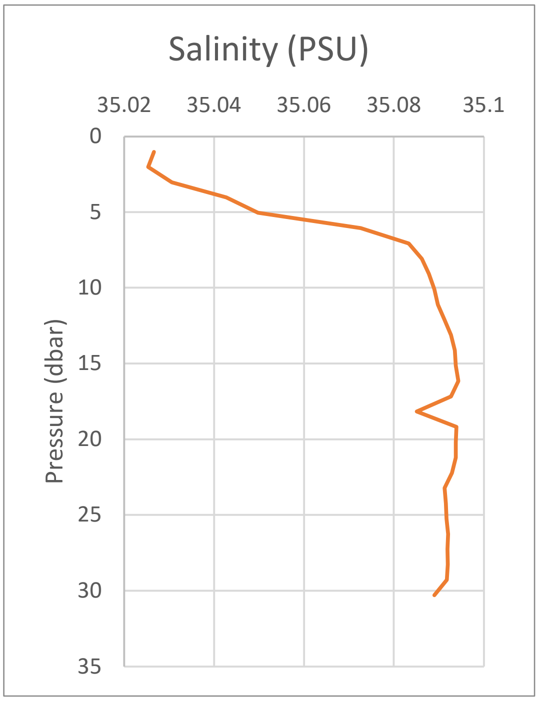




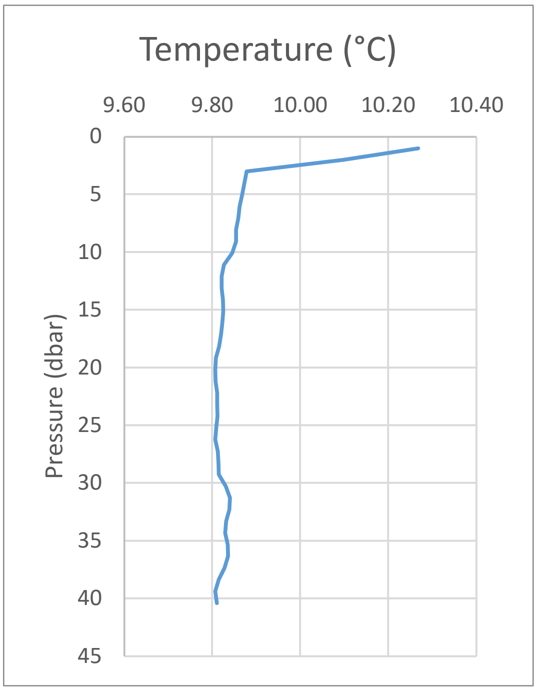
e. July 24th, 2020

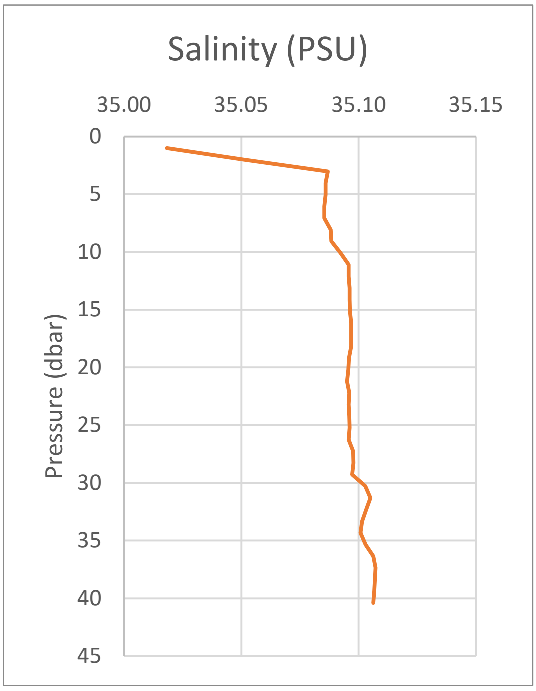
- The reference site - SO06





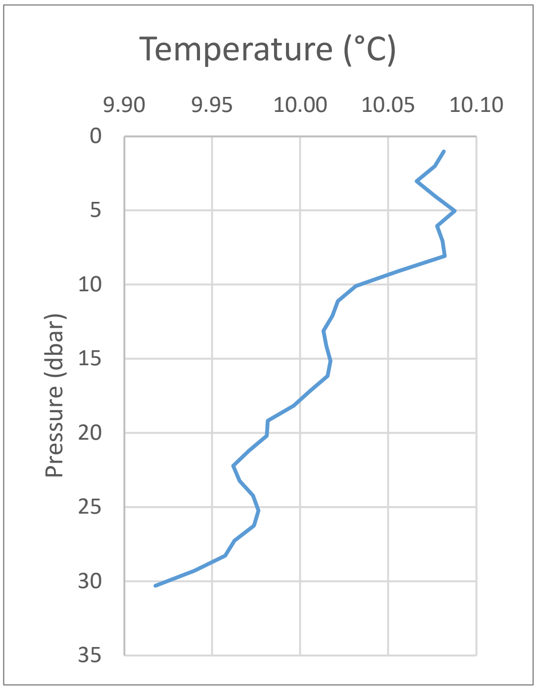
- The IMTA site - A83

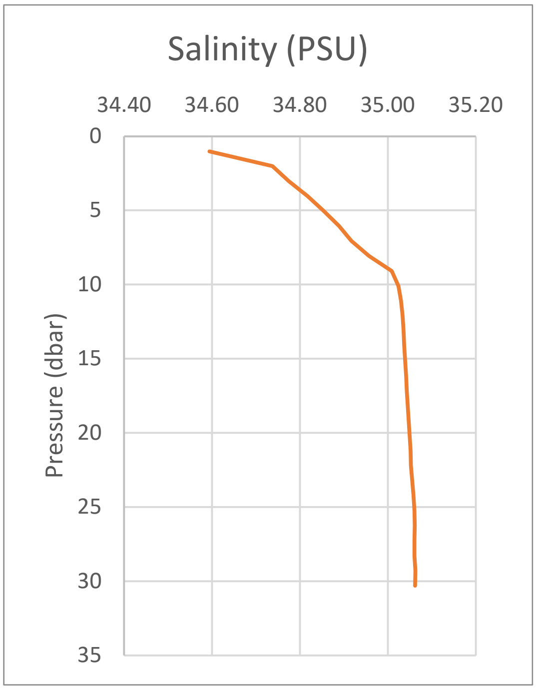




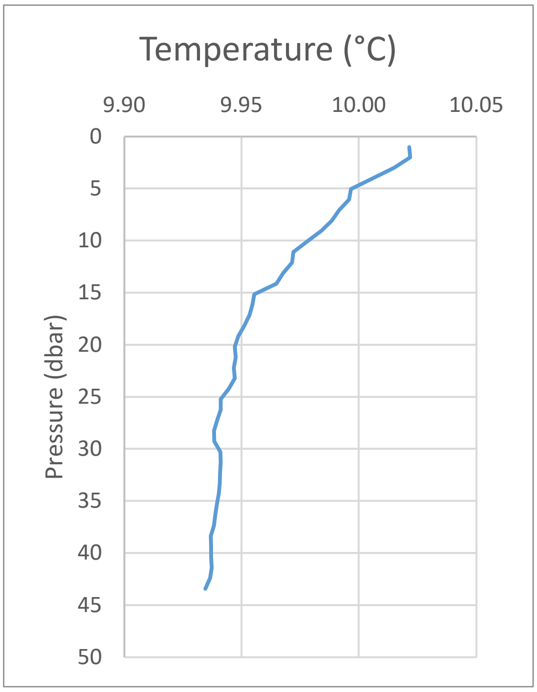
f. August 3rd, 2020

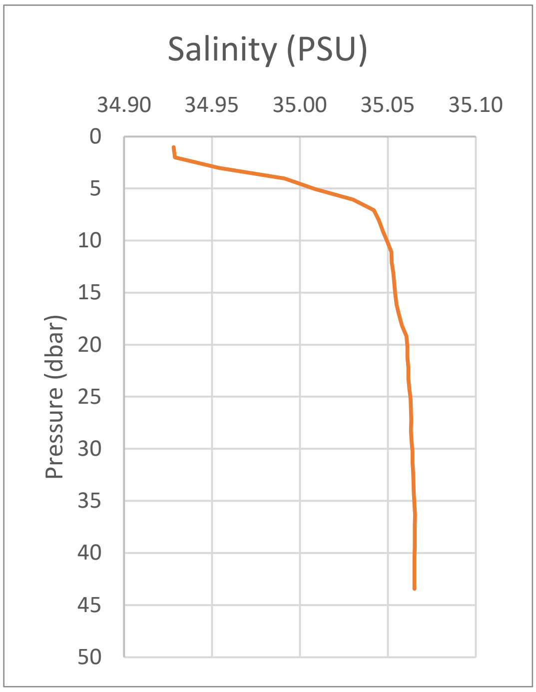
- The reference site - SO06





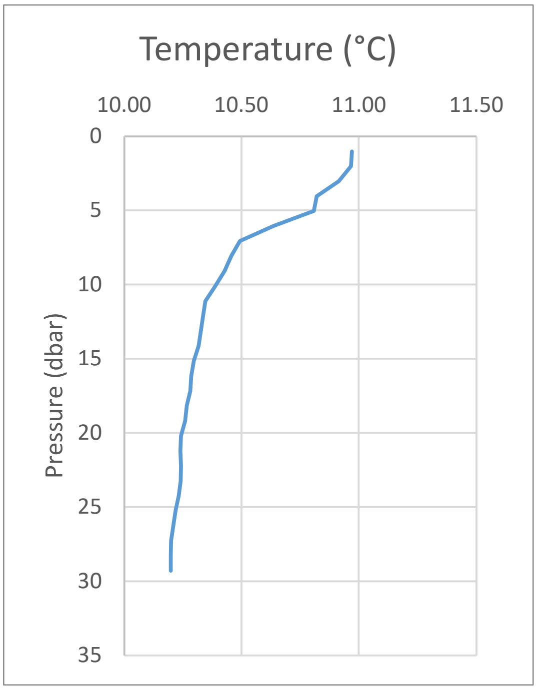
- The IMTA site - A83

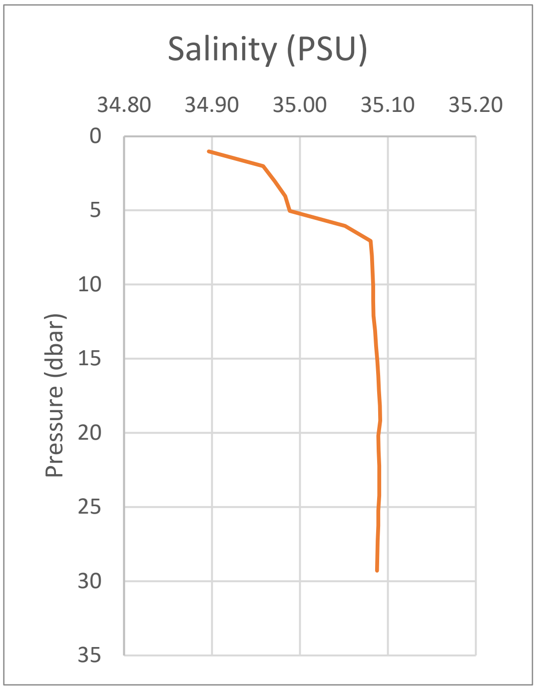




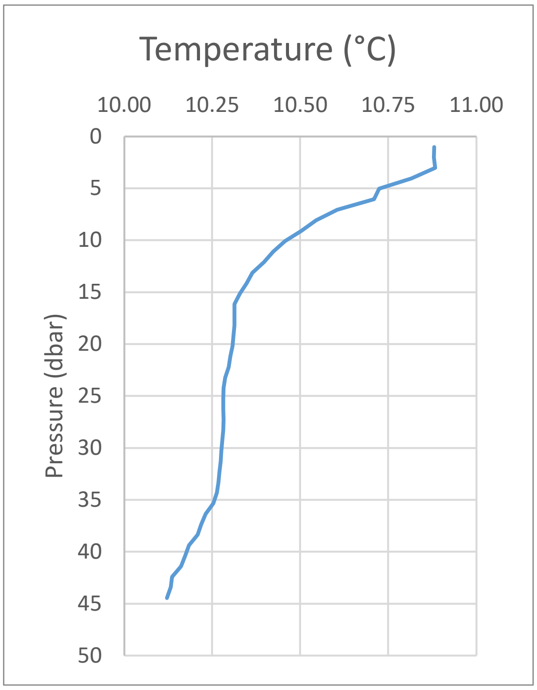
g. August 14th, 2020

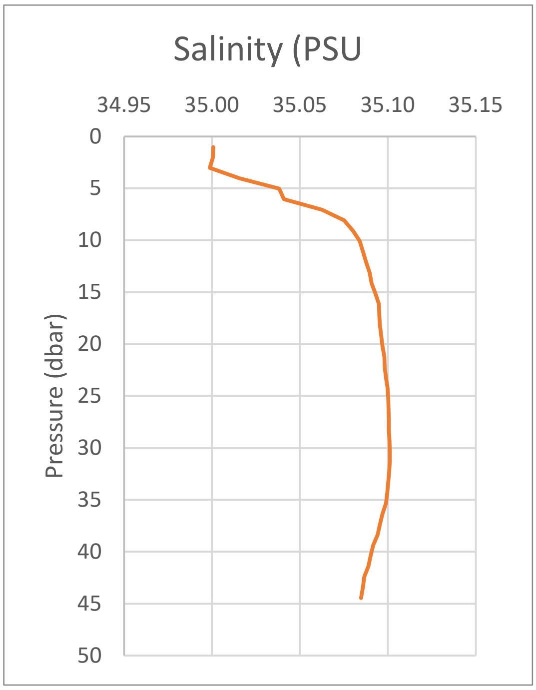
- The reference site - SO06





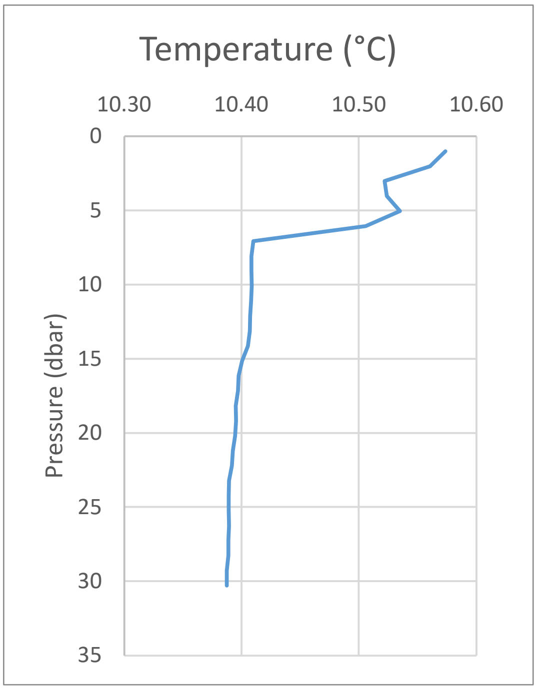
- The IMTA site - A83

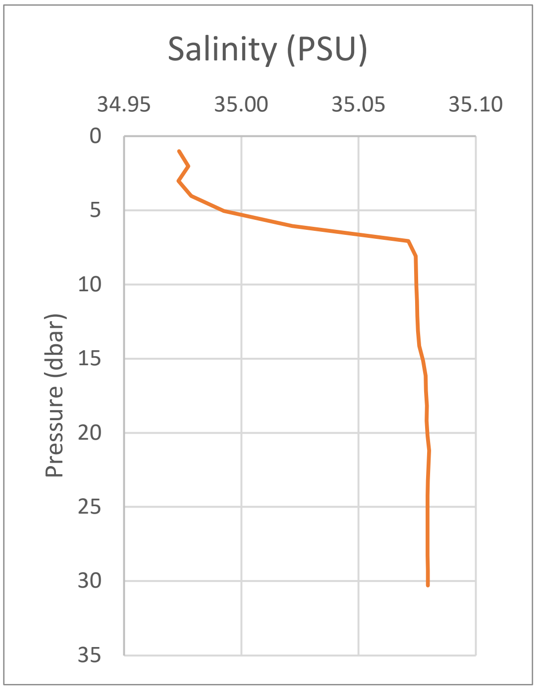




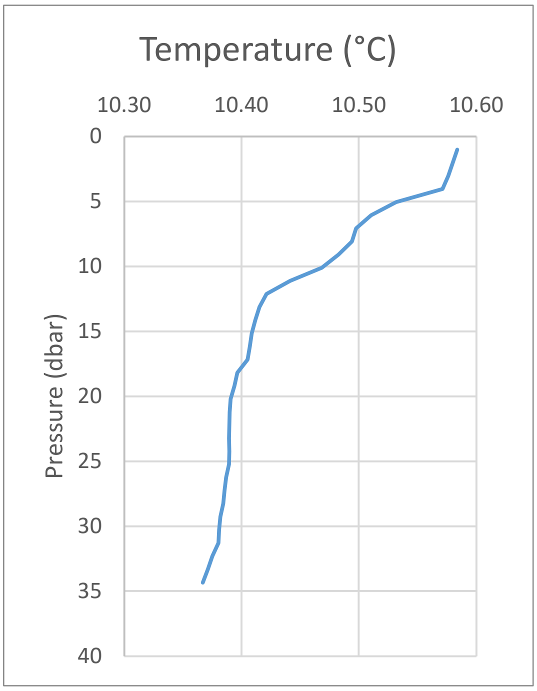
h. August 24th, 2020

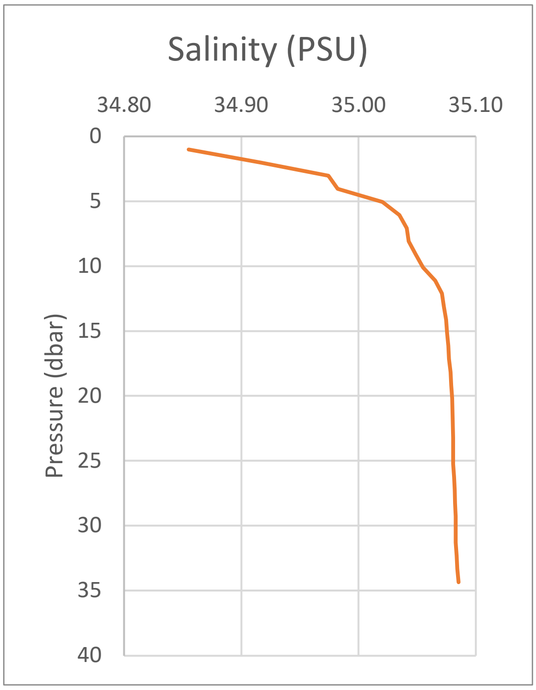
- The reference site - SO06





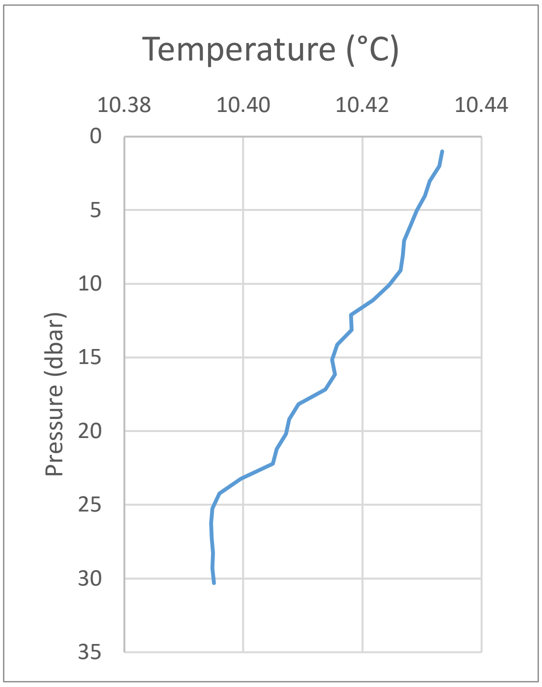
- The IMTA site - A83

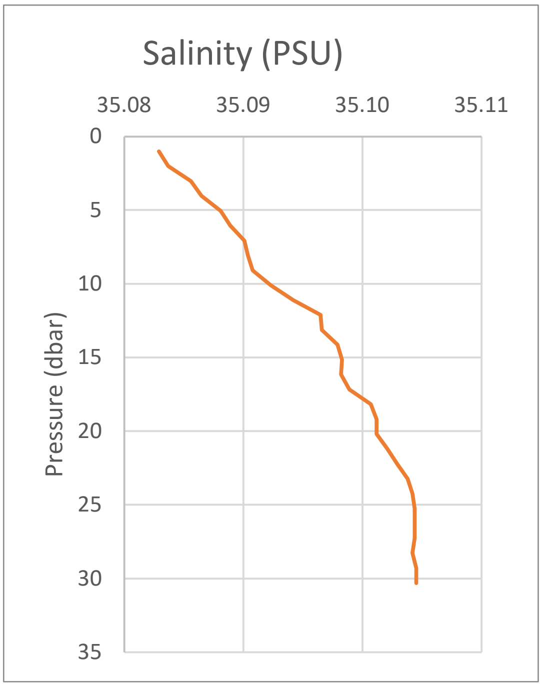




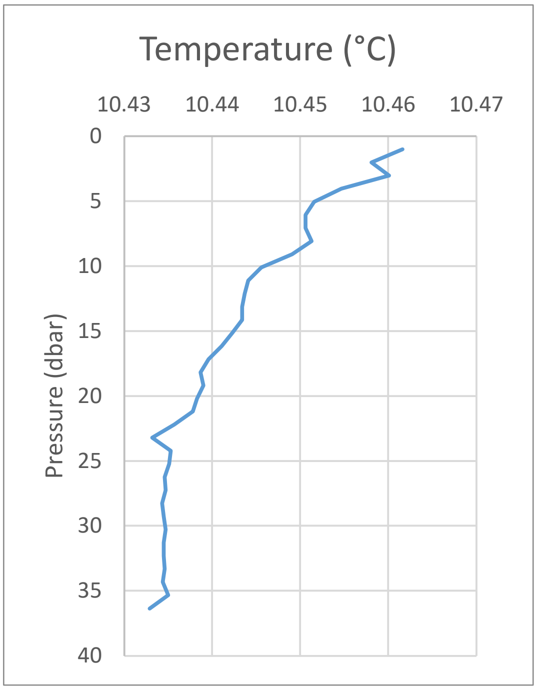
i. **September 02nd, 2020**

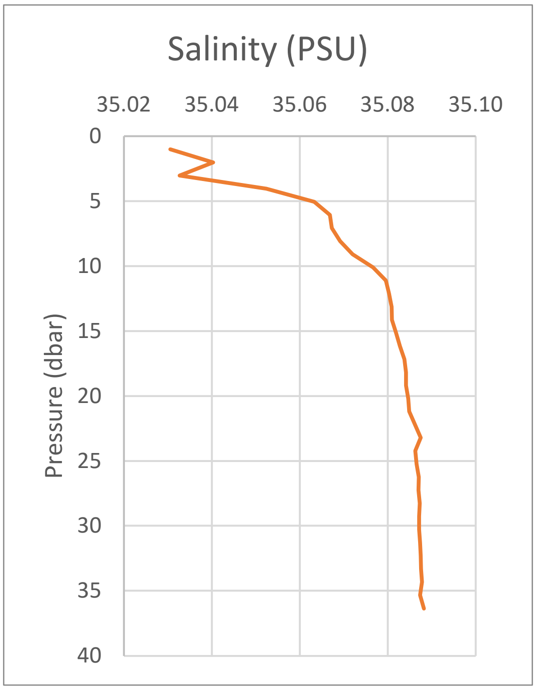
- The reference site - SO06





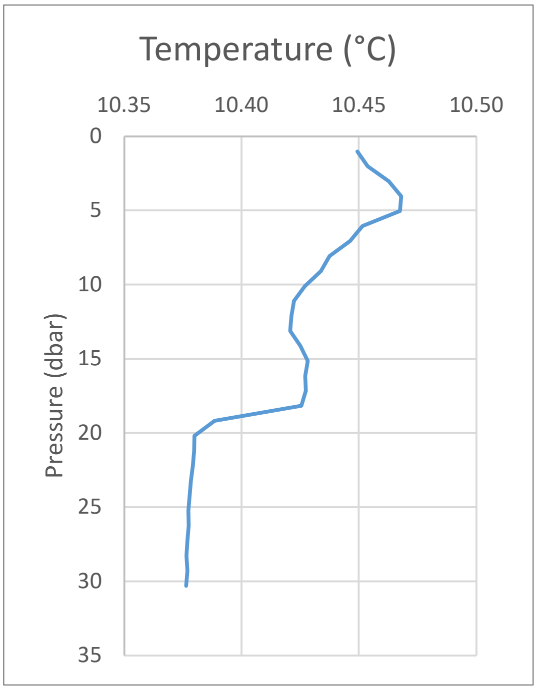
- The IMTA site - A83

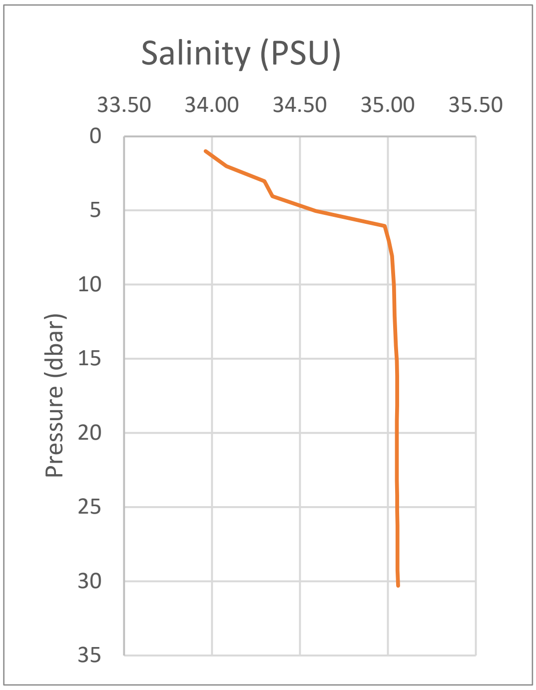




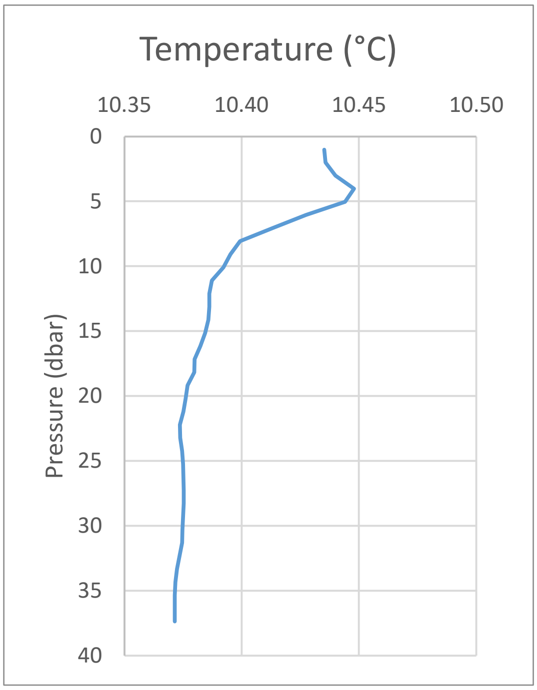
j. **September 11th, 2020**

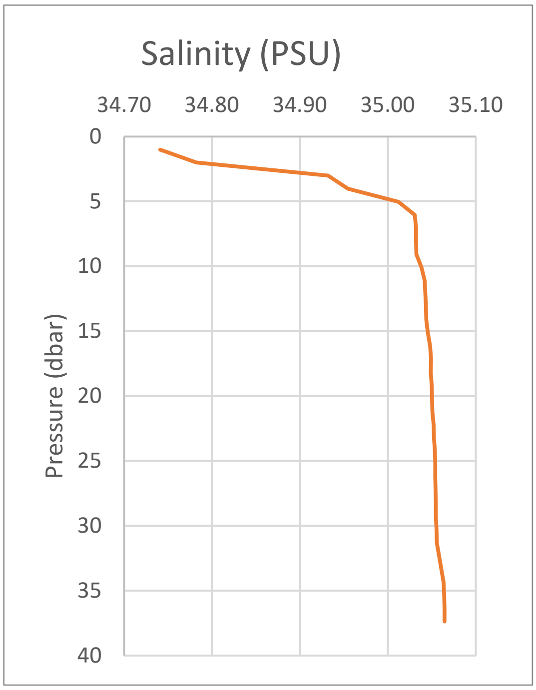
- The reference site - SO06





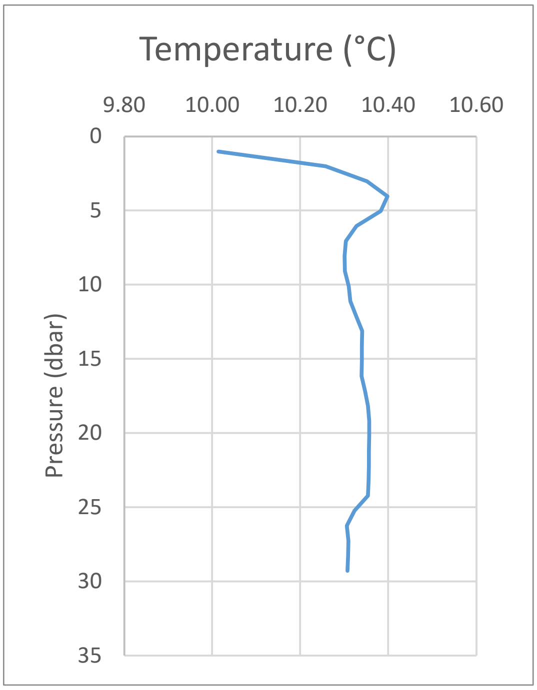
- The IMTA site - A83

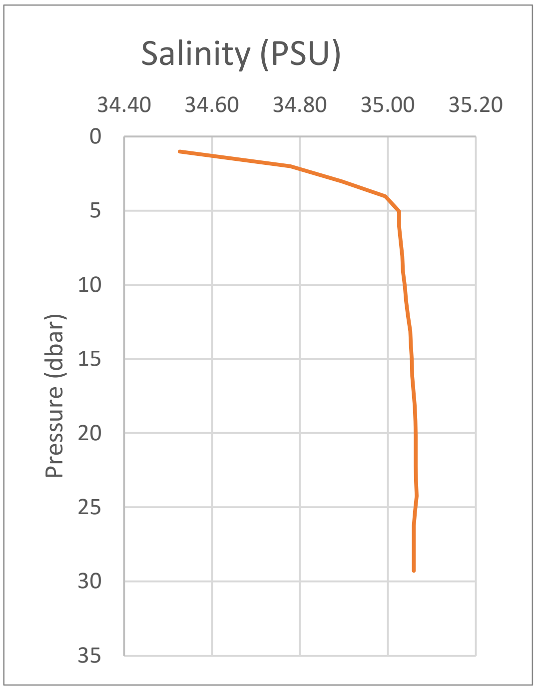




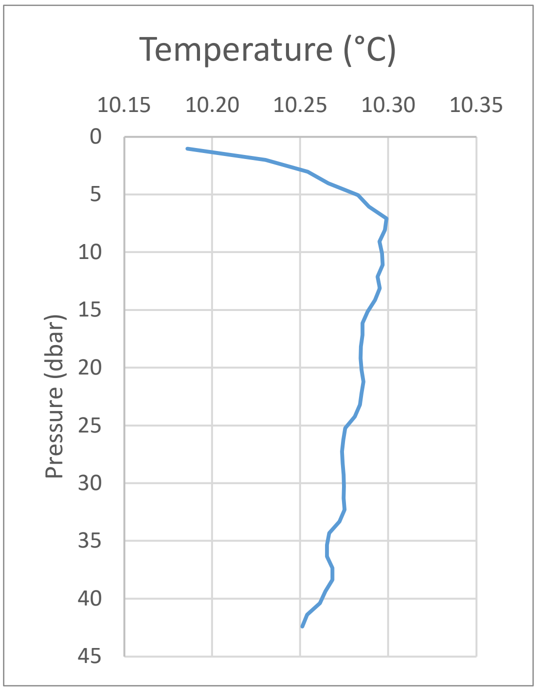
k. September 23rd, 2020

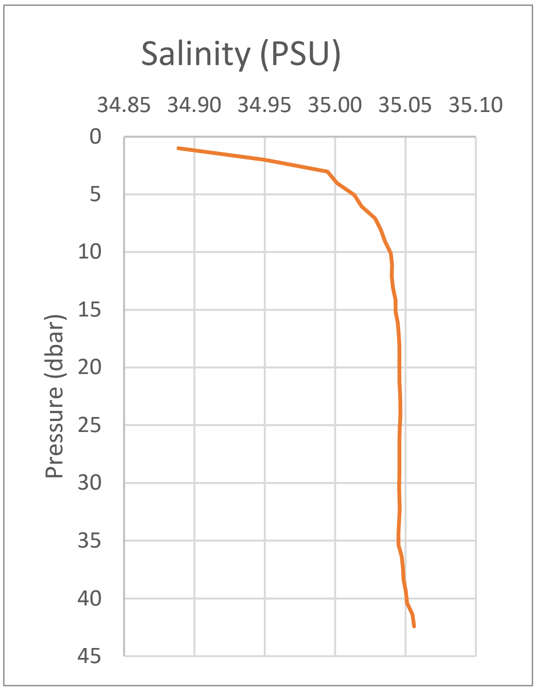
- The reference site - SO06





- The IMTA site - A83





B. Statistical analysis: F-tests and t-tests

a. *Saccharina latissima* – statistical growth data analysis

All growth data of the *S. latissima* (weight, width and length) based on 30 individuals collected from each sample day between April 2020 and September 2020.

i. Width (blade) analysis – f-tests and t-tests

1. April 18th, 2020

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	6	7.756521739
Variance	15.55363636	18.16711462
Observations	23	23
df	22	22
F	0.856142359	
P(F<=f) one-tail	0.359438017	
F Critical one-tail	0.488336019	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	6	7.756521739
Variance	15.55363636	18.16711462
Observations	23	23
Pooled Variance	16.86037549	
Hypothesized Mean Di	0	
df	44	
t Stat	-1.450670662	
P(T<=t) one-tail	0.076981867	
t Critical one-tail	1.680229977	
P(T<=t) two-tail	0.153963733	
t Critical two-tail	2.015367574	

2. May 20th, 2020

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	12.11	12.24333333
Variance	37.31265517	34.01633333
Observations	30	30
df	29	29
F	1.09690409	
P(F<=f) one-tail	0.402507979	
F Critical one-tail	1.860811435	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	12.11	12.24333333
Variance	37.31265517	34.01633333
Observations	30	30
Pooled Variance	35.66449425	
Hypothesized Mean Di	0	
df	58	
t Stat	-0.086470174	
P(T<=t) one-tail	0.465695248	
t Critical one-tail	1.671552762	
P(T<=t) two-tail	0.931390495	
t Critical two-tail	2.001717484	

3. June 25th, 2020

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	15.7125	18.85833333
Variance	76.61244565	70.80688406
Observations	24	24
df	23	23
F	1.081991485	
P(F<=f) one-tail	0.425870459	
F Critical one-tail	2.014424842	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	15.7125	18.85833333
Variance	76.61244565	70.80688406
Observations	24	24
Pooled Variance	73.70966486	
Hypothesized Mean Di	0	
df	46	
t Stat	-1.269299517	
P(T<=t) one-tail	0.105359442	
t Critical one-tail	1.678660414	
P(T<=t) two-tail	0.210718884	
t Critical two-tail	2.012895599	

4. **August 3rd, 2020**

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	13.94615385	18.01333333
Variance	37.14658462	45.13912644
Observations	26	30
df	25	29
F	0.82293539	
P(F<=f) one-tail	0.312388876	
F Critical one-tail	0.519335438	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	13.94615385	18.01333333
Variance	37.14658462	45.13912644
Observations	26	30
Pooled Variance	41.43887559	
Hypothesized Mean Di	0	
df	54	
t Stat	-2.357993725	
P(T<=t) one-tail	0.011012821	
t Critical one-tail	1.673564906	
P(T<=t) two-tail	0.022025641	
t Critical two-tail	2.004879288	

5. **September 23rd, 2020**

September could not be tested as no more width (blade) data of *S. latissima* site were available from the IMTA site. The growth differences between the two sides were nevertheless significant.

ii. Length (blade) analysis – f-tests and t-tests

1. April 18th, 2020

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	33.88695652	49.84347826
Variance	507.6884585	640.4589328
Observations	23	23
df	22	22
F	0.792694789	
P(F<=f) one-tail	0.295260661	
F Critical one-tail	0.488336019	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	33.88695652	49.84347826
Variance	507.6884585	640.4589328
Observations	23	23
Pooled Variance	574.0736957	
Hypothesized Mean Differe	0	
df	44	
t Stat	-2.258412789	
P(T<=t) one-tail	0.01446466	
t Critical one-tail	1.680229977	
P(T<=t) two-tail	0.028929321	
t Critical two-tail	2.015367574	

2. May 20th, 2020

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	73.8	87.53333333
Variance	1404.906897	1381.964368
Observations	30	30
df	29	29
F	1.016601389	
P(F<=f) one-tail	0.482470972	
F Critical one-tail	1.860811435	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	73.8	87.53333333
Variance	1404.906897	1381.964368
Observations	30	30
Pooled Variance	1393.435632	
Hypothesized Mean Differ	0	
df	58	
t Stat	-1.424879489	
P(T<=t) one-tail	0.079775534	
t Critical one-tail	1.671552762	
P(T<=t) two-tail	0.159551067	
t Critical two-tail	2.001717484	

3. June 25th, 2020

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	83.77083333	100
Variance	1569.325634	2763.043478
Observations	24	24
df	23	23
F	0.567969938	
P(F<=f) one-tail	0.091246397	
F Critical one-tail	0.496419613	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	83.77083333	100
Variance	1569.325634	2763.043478
Observations	24	24
Pooled Variance	2166.184556	
Hypothesized Mean Differ	0	
df	46	
t Stat	-1.207922625	
P(T<=t) one-tail	0.116625365	
t Critical one-tail	1.678660414	
P(T<=t) two-tail	0.23325073	
t Critical two-tail	2.012895599	

4. **August 3rd, 2020**

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	73.00769231	90.69
Variance	1265.062338	1354.388517
Observations	26	30
df	25	29
F	0.934046858	
P(F<=f) one-tail	0.434314771	
F Critical one-tail	0.519335438	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	73.00769231	90.69
Variance	1265.062338	1354.388517
Observations	26	30
Pooled Variance	1313.033805	
Hypothesized Mean Differ	0	
df	54	
t Stat	-1.821185893	
P(T<=t) one-tail	0.037060165	
t Critical one-tail	1.673564906	
P(T<=t) two-tail	0.07412033	
t Critical two-tail	2.004879288	

5. **September 23rd, 2020**

September could not be tested as no more length data of *S. latissima* site were available from the IMTA site. The growth differences between the two sides were nevertheless significant.

iii. Weight (blade) analysis – f-tests and t-tests

1. April 18th, 2020

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	5.83478261	10.1
Variance	60.7587352	128.303636
Observations	23	23
df	22	22
F	0.47355427	
P(F<=f) one-tail	0.04327566	
F Critical one-tail	0.48833602	

t-Test: Two-Sample Assuming Unequal Variances		
	Variable 1	*Variable 2*
Mean	5.83478261	10.1
Variance	60.7587352	128.303636
Observations	23	23
Hypothesized Mean Difference	0	
df	39	
t Stat	-1.48765607	
P(T<=t) one-tail	0.07244153	
t Critical one-tail	1.68487512	
P(T<=t) two-tail	0.14488306	
t Critical two-tail	2.02269092	

2. May 20th, 2020

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	33.27	36.4533333
Variance	1179.58769	1060.22947
Observations	30	30
df	29	29
F	1.11257772	
P(F<=f) one-tail	0.38793255	
F Critical one-tail	1.86081144	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	33.27	36.4533333
Variance	1179.58769	1060.22947
Observations	30	30
Pooled Variance	1119.90858	
Hypothesized Mean Difference	0	
df	58	
t Stat	-0.36841428	
P(T<=t) one-tail	0.35695283	
t Critical one-tail	1.67155276	
P(T<=t) two-tail	0.71390565	
t Critical two-tail	2.00171748	

3. June 25th, 2020

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	81.6333333	90.8958333
Variance	10358.2519	7642.95868
Observations	24	24
df	23	23
F	1.35526729	
P(F<=f) one-tail	0.23584892	
F Critical one-tail	2.01442484	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	81.6333333	90.8958333
Variance	10358.2519	7642.95868
Observations	24	24
Pooled Variance	9000.60528	
Hypothesized Mean Difference	0	
df	46	
t Stat	-0.33820731	
P(T<=t) one-tail	0.36837288	
t Critical one-tail	1.67866041	
P(T<=t) two-tail	0.73674576	
t Critical two-tail	2.0128956	

4. **August 3rd, 2020**

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	62.9269231	108.723333
Variance	6152.45085	8563.83151
Observations	26	30
df	25	29
F	0.71842269	
P(F<=f) one-tail	0.20213511	
F Critical one-tail	0.51933544	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	62.9269231	108.723333
Variance	6152.45085	8563.83151
Observations	26	30
Pooled Variance	7447.45157	
Hypothesized Mean Difference	0	
df	54	
t Stat	-1.98052752	
P(T<=t) one-tail	0.0263741	
t Critical one-tail	1.67356491	
P(T<=t) two-tail	0.0527482	
t Critical two-tail	2.00487929	

5. **September 23rd, 2020**

September could not be tested as no more weight data of *S. latissima* site were available from the IMTA site. The growth differences between the two sides were nevertheless significant.

iv. Biomass/ yield of *S. latissima* per meter

The statistical tests were made using the biomass weight from all sampled biomass/yield of 10 cm rope which were extrapolated to 1 meter rope.

1. May 20th, 2020

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	7250.666667	4562.666667
Variance	88650208.33	6811334.333
Observations	3	3
df	2	2
F	13.01510159	
P(F<=f) one-tail	0.071351606	
F Critical one-tail	19	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	7250.666667	4562.666667
Variance	88650208.33	6811334.333
Observations	3	3
Pooled Variance	47730771.33	
Hypothesized Mean Difference	0	
df	4	
t Stat	0.476514003	
P(T<=t) one-tail	0.329285413	
t Critical one-tail	2.131846786	
P(T<=t) two-tail	0.658570826	
t Critical two-tail	2.776445105	

2. June 25th, 2020

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	7577	8078.333333
Variance	55143757	73779120.33
Observations	3	3
df	2	2
F	0.74741684	
P(F<=f) one-tail	0.427726701	
F Critical one-tail	0.052631579	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	7577	8078.333333
Variance	55143757	73779120.33
Observations	3	3
Pooled Variance	64461438.67	
Hypothesized Mean Dif	0	
df	4	
t Stat	-0.07647548	
P(T<=t) one-tail	0.471356584	
t Critical one-tail	2.131846786	
P(T<=t) two-tail	0.942713168	
t Critical two-tail	2.776445105	

3. August 03rd, 2020

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	9976.5	17800.33333
Variance	95925100.5	144609040.3
Observations	2	3
df	1	2
F	0.663340966	
P(F<=f) one-tail	0.4990626	
F Critical one-tail	0.005012531	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	9976.5	17800.33333
Variance	95925100.5	144609040.3
Observations	2	3
Pooled Variance	128381060.4	
Hypothesized Mean Differen	0	
df	3	
t Stat	-0.756414306	
P(T<=t) one-tail	0.252189938	
t Critical one-tail	2.353363435	
P(T<=t) two-tail	0.504379876	
t Critical two-tail	3.182446305	

4. September 23rd, 2020

September could not be tested as no more biomass data of *S. latissima* site were available from the IMTA site. The growth differences between the two sides were nevertheless significant.

v. Number of individuals

The basis for the statistical tests were the cut biomass/yield of 10 cm rope. The counted individuals of 10 cm rope were extrapolated to 1 meter of rope.

1. May 20th, 2020

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	233.3333333	170
Variance	31033.33333	10900
Observations	3	3
df	2	2
F	2.847094801	
P(F<=f) one-tail	0.259936407	
F Critical one-tail	19	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	233.3333333	170
Variance	31033.33333	10900
Observations	3	3
Pooled Variance	20966.66667	
Hypothesized Mean D	0	
df	4	
t Stat	0.535689681	
P(T<=t) one-tail	0.310285926	
t Critical one-tail	2.131846786	
P(T<=t) two-tail	0.620571852	
t Critical two-tail	2.776445105	

2. **June 25th, 2020**

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	166.6666667	100
Variance	2533.333333	300
Observations	3	3
df	2	2
F	8.444444444	
P(F<=f) one-tail	0.105882353	
F Critical one-tail	19	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	166.6666667	100
Variance	2533.333333	300
Observations	3	3
Pooled Variance	1416.666667	
Hypothesized Mean Dif	0	
df	4	
t Stat	2.169304578	
P(T<=t) one-tail	0.047942361	
t Critical one-tail	2.131846786	
P(T<=t) two-tail	0.095884721	
t Critical two-tail	2.776445105	

3. August 03rd, 2020

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	175	290
Variance	1250	1900
Observations	2	3
df	1	2
F	0.657894737	
P(F<=f) one-tail	0.497518595	
F Critical one-tail	0.005012531	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	175	290
Variance	1250	1900
Observations	2	3
Pooled Variance	1683.333333	
Hypothesized Mean [	0	
df	3	
t Stat	-3.0704597	
P(T<=t) one-tail	0.027271335	
t Critical one-tail	2.353363435	
P(T<=t) two-tail	0.054542671	
t Critical two-tail	3.182446305	

4. September 23rd, 2020

September could not be tested as no individuals of *S. latissima* were measurable on the rope ate the IMTA site. The growth differences between the two sides were significant.

C. Nutrient analysis of the water in Sørvágsfjørður

a. Nitrate concentration

The sampled nitrate concentrations in two- and four-meter depth were statistically tested on significant differences between the IMTA site and the reference site. Therefore, the data were divided in winter period (January to May 2020) and a summer period (May to October 2020).

i. F- and t-tests of the nitrate concentrations in two-meter depth – summer period

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	3.932857143	5.403071429
Variance	4.101139824	3.827316071
Observations	14	14
df	13	13
F	1.071544588	
P(F<=f) one-tail	0.451373682	
F Critical one-tail	2.576927084	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	3.932857143	5.403071429
Variance	4.101139824	3.827316071
Observations	14	14
Pooled Variance	3.964227948	
Hypothesized Mean Diffe	0	
df	26	
t Stat	-1.953666137	
P(T<=t) one-tail	0.030789557	
t Critical one-tail	1.70561792	
P(T<=t) two-tail	0.061579114	
t Critical two-tail	2.055529439	

ii. F- and t-tests of the nitrate concentrations in two-meter depth – winter period

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	9.4089375	10.23025
Variance	29.80483268	7.179522917
Observations	4	4
df	3	3
F	4.151366745	
P(F<=f) one-tail	0.13642579	
F Critical one-tail	9.276628153	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	9.4089375	10.23025
Variance	29.80483268	7.179522917
Observations	4	4
Pooled Variance	18.4921778	
Hypothesized Mean Diffe	0	
df	6	
t Stat	-0.270102995	
P(T<=t) one-tail	0.398065528	
t Critical one-tail	1.943180281	
P(T<=t) two-tail	0.796131056	
t Critical two-tail	2.446911851	

iii. F- and t-tests of the nitrate concentrations in four-meter depth – summer period

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	4.938785714	5.487357143
Variance	3.725917258	3.311882863
Observations	14	14
df	13	13
F	1.125014807	
P(F<=f) one-tail	0.417512891	
F Critical one-tail	2.576927084	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	4.938785714	5.487357143
Variance	3.725917258	3.311882863
Observations	14	14
Pooled Variance	3.51890006	
Hypothesized Mean Diffe	0	
df	26	
t Stat	-0.773710941	
P(T<=t) one-tail	0.223040059	
t Critical one-tail	1.70561792	
P(T<=t) two-tail	0.446080118	
t Critical two-tail	2.055529439	

iv. **F- and t-tests of the nitrate concentrations in four-meter depth – winter period**

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	9.40875	10.5390625
Variance	30.98151892	7.369555516
Observations	4	4
df	3	3
F	4.203987452	
P(F<=f) one-tail	0.134452576	
F Critical one-tail	9.276628153	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	9.40875	10.5390625
Variance	30.98151892	7.369555516
Observations	4	4
Pooled Variance	19.17553722	
Hypothesized Mean D	0	
df	6	
t Stat	-0.365039414	
P(T<=t) one-tail	0.363802004	
t Critical one-tail	1.943180281	
P(T<=t) two-tail	0.727604007	
t Critical two-tail	2.446911851	

b. **Silicate concentration**

The sampled silicate concentrations in two- and four-meter depth were statistically tested on significant differences between the IMTA site and the reference site. Therefore, the data were divided in winter period (January to May 2020) and a summer period (May to October 2020).

i. Statistical tests (f- and t-tests) of the silicate concentration in two-meter depth (winter period)

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	3.932857143	2.275428571
Variance	4.101139824	1.444637033
Observations	14	14
df	13	13
F	2.838872139	
P(F<=f) one-tail	0.035416392	
F Critical one-tail	2.576927084	

t-Test: Two-Sample Assuming Unequal Variances		
	Variable 1	*Variable 2*
Mean	2.378928571	2.275428571
Variance	2.636441918	1.444637033
Observations	14	14
Hypothesized Mean Diffe	0	
df	24	
t Stat	0.191697686	
P(T<=t) one-tail	0.424795829	
t Critical one-tail	1.71088208	
P(T<=t) two-tail	0.849591659	
t Critical two-tail	2.063898562	

ii. **Statistical tests (f- and t-tests) of the silicate concentration in two-meter depth (winter period)**

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	9.4089375	4.71275
Variance	29.80483268	3.408566917
Observations	4	4
df	3	3
F	8.744094926	
P(F<=f) one-tail	0.054061971	
F Critical one-tail	9.276628153	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	4.420875	4.71275
Variance	6.253292729	3.408566917
Observations	4	4
Pooled Variance	4.830929823	
Hypothesized Mean Diffe	0	
df	6	
t Stat	-0.187800408	
P(T<=t) one-tail	0.428611672	
t Critical one-tail	1.943180281	
P(T<=t) two-tail	0.857223345	
t Critical two-tail	2.446911851	

iii. **Statistical tests (f- and t-tests) of the silicate concentration in four-meter depth (summer period)**

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	2.395285714	2.348857143
Variance	1.21195222	1.273762901
Observations	14	14
df	13	13
F	0.951473951	
P(F<=f) one-tail	0.464952416	
F Critical one-tail	0.388059098	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	2.395285714	2.348857143
Variance	1.21195222	1.273762901
Observations	14	14
Pooled Variance	1.24285756	
Hypothesized Mean Diffe	0	
df	26	
t Stat	0.110185301	
P(T<=t) one-tail	0.456554264	
t Critical one-tail	1.70561792	
P(T<=t) two-tail	0.913108528	
t Critical two-tail	2.055529439	

iv. **Statistical tests (f- and t-tests) of the silicate concentration in four-meter depth (winter period)**

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	4.2913125	4.8186875
Variance	4.998402724	2.898238391
Observations	4	4
df	3	3
F	1.724634778	
P(F<=f) one-tail	0.332704465	
F Critical one-tail	9.276628153	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	4.2913125	4.8186875
Variance	4.998402724	2.898238391
Observations	4	4
Pooled Variance	3.948320557	
Hypothesized Mean D	0	
df	6	
t Stat	-0.375343011	
P(T<=t) one-tail	0.360158196	
t Critical one-tail	1.943180281	
P(T<=t) two-tail	0.720316392	
t Critical two-tail	2.446911851	

c. **Phosphate concentration**

The sampled phosphate concentrations in two- and four-meter depth were statistically tested on significant differences between the IMTA site and the reference site. Therefore, the data were divided in winter period (January to May 2020) and a summer period (May to October 2020).

i. **Statistical analysis (f- and t-tests) of phosphate concentrations in two-meter depth (summer period).**

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	0.558857143	0.687071429
Variance	0.01688244	0.032995302
Observations	14	14
df	13	13
F	0.511661917	
P(F<=f) one-tail	0.120109836	
F Critical one-tail	0.388059098	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	0.558857143	0.687071429
Variance	0.01688244	0.032995302
Observations	14	14
Pooled Variance	0.024938871	
Hypothesized Mean Diffe	0	
df	26	
t Stat	-2.148063145	
P(T<=t) one-tail	0.020600127	
t Critical one-tail	1.70561792	
P(T<=t) two-tail	0.041200254	
t Critical two-tail	2.055529439	

ii. **Statistical analysis (f- and t-tests) of phosphate concentrations in two-meter depth (winter period).**

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	0.7463125	0.69625
Variance	0.020238391	0.03583225
Observations	4	4
df	3	3
F	0.564809372	
P(F<=f) one-tail	0.325258662	
F Critical one-tail	0.107797789	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	0.7463125	0.69625
Variance	0.020238391	0.03583225
Observations	4	4
Pooled Variance	0.02803532	
Hypothesized Mean Diffe	0	
df	6	
t Stat	0.42283874	
P(T<=t) one-tail	0.343574139	
t Critical one-tail	1.943180281	
P(T<=t) two-tail	0.687148279	
t Critical two-tail	2.446911851	

iii. Statistical analysis (f- and t-tests) of phosphate concentrations in four-meter depth (summer period).

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	0.56	0.711214286
Variance	0.010248	0.036080335
Observations	14	14
df	13	13
F	0.284032838	
P(F<=f) one-tail	0.015398535	
F Critical one-tail	0.388059098	

t-Test: Two-Sample Assuming Unequal Variances		
	Variable 1	*Variable 2*
Mean	0.56	0.711214286
Variance	0.010248	0.036080335
Observations	14	14
Hypothesized Mean Diffe	0	
df	20	
t Stat	-2.628654411	
P(T<=t) one-tail	0.008047973	
t Critical one-tail	1.724718243	
P(T<=t) two-tail	0.016095946	
t Critical two-tail	2.085963447	

iv. **Statistical analysis (f- and t-tests) of phosphate concentrations in four-meter depth (winter period).**

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	0.6780625	0.701125
Variance	0.046089682	0.035668729
Observations	4	4
df	3	3
F	1.292159361	
P(F<=f) one-tail	0.419076492	
F Critical one-tail	9.276628153	

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	0.6780625	0.701125
Variance	0.046089682	0.035668729
Observations	4	4
Pooled Variance	0.040879206	
Hypothesized Mean D	0	
df	6	
t Stat	-0.161313293	
P(T<=t) one-tail	0.438570691	
t Critical one-tail	1.943180281	
P(T<=t) two-tail	0.877141381	
t Critical two-tail	2.446911851	

d. Ammonium concentration

The sampled ammonium concentration in four-meter depth were statistically tested on significant differences between the IMTA site and the reference site.

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	2.545066667	0.827333
Variance	2.721161638	0.800323
Observations	15	15
df	14	14
F	3.400080075	
P(F<=f) one-tail	0.014429667	
F Critical one-tail	2.483725741	

t-Test: Two-Sample Assuming Unequal Variances		
	Variable 1	*Variable 2*
Mean	2.545066667	0.827333
Variance	2.721161638	0.800323
Observations	15	15
Hypothesized Mean Diffe	0	
df	22	
t Stat	3.545181592	
P(T<=t) one-tail	0.000907981	
t Critical one-tail	1.717144374	
P(T<=t) two-tail	0.001815962	
t Critical two-tail	2.073873068	

D. Current strengths analysis

The basis of these data formed the modelling data of the Delft-3D hydrodynamics model from February 01st, 2017 to May 1st, 2017. Significant differences in current strengths ($\frac{m}{s}$) between the IMTA site and the reference site were tested (f- and t-tests).

a. F- and t-tests analysis – surface currents

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	0.073181295	0.095735891
Variance	0.00125227	0.002903054
Observations	12817	12817
df	12816	12816
F	0.431362961	
P(F<=f) one-tail	0	
F Critical one-tail	0.971358083	

t-Test: Two-Sample Assuming Unequal Variances		
	Variable 1	*Variable 2*
Mean	0.073181295	0.095735891
Variance	0.00125227	0.002903054
Observations	12817	12817
Hypothesized Mean Diff	0	
df	22138	
t Stat	-39.61191103	
P(T<=t) one-tail	0	
t Critical one-tail	1.64492246	
P(T<=t) two-tail	0	
t Critical two-tail	1.960071149	

b. F- and t-tests analysis – mid-depth currents

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	0.01666304	0.031788392
Variance	0.000134762	0.000479187
Observations	12817	12817
df	12816	12816
F	0.281229652	
P(F<=f) one-tail	0	
F Critical one-tail	0.971358083	

t-Test: Two-Sample Assuming Unequal Variances		
	Variable 1	*Variable 2*
Mean	0.01666304	0.031788392
Variance	0.000134762	0.000479187
Observations	12817	12817
Hypothesized Mean Diffe	0	
df	19496	
t Stat	-69.10869618	
P(T<=t) one-tail	0	
t Critical one-tail	1.644931789	
P(T<=t) two-tail	0	
t Critical two-tail	1.960085672	

E. Growth data of *S. latissima* - statistics

a. Mean growth data (weight, length, width) of *S. latissima*

date	location	weight_g_mean	blade_lenght_cm_mean	width_cm_mean
18.04.2020	A83	5.8	33.9	6.0
	SO06	10.1	49.8	7.8
20.05.2020	A83	33.3	73.8	12.1
	SO06	36.5	87.5	12.2
25.06.2020	A83	81.6	83.8	15.7
	SO06	90.9	100.0	18.9
03.08.2020	A83	62.9	73.0	13.9
	SO06	108.7	90.7	18.0
23.09.2020	A83	0.0	0.0	0.0
	SO06	97.8	77.9	18.4

b. Maximum growth data (weight, length, width) of *S. latissima*

date	location	weight_g_max	blade_lenght_cm_max	width_cm_max
18.04.2020	A83	26.9	80.5	15.5
	SO06	51.9	96.5	20.3
20.05.2020	A83	136.8	149.0	26.2
	SO06	130.7	154.0	24.2
25.06.2020	A83	339.0	176.5	37.6
	SO06	304.1	177.0	32.0
03.08.2020	A83	256.6	147.0	27.6
	SO06	295.1	181.0	29.5
23.09.2020	A83	0.0	0.0	0.0
	SO06	301.0	157.0	31.6

c. Minimum growth data (weight, length, width) of *S. latissima*

date	location	weight_g_min	blade_lenght_cm_min	width_cm_min
18.04.2020	A83	0.1	6.0	1.0
	SO06	0.4	13.5	2.0
20.05.2020	A83	0.1	6.5	1.9
	SO06	0.4	12.5	2.5
25.06.2020	A83	2.4	24.0	4.9
	SO06	1.7	21.0	3.8
01.07.2020	A83	0.0	0.0	0.0
	SO06	0.0	0.0	0.0
03.08.2020	A83	5.4	24.5	7.1
	SO06	5.3	35.0	6.0
23.09.2020	A83	0.0	0.0	0.0
	SO06	29.0	35.0	13.0

d. Biomass m^{-1} and Individual data - statistics

Date	Location	Biomass_mean	Individuals_mean	Comments
20.05.2020	A83	7250.7	233.3	
	SO06	4562.7	170.0	
25.06.2020	A83	7577.0	166.7	
	SO06	8078.3	100.0	
03.08.2020	A83	9976.5	175.0	(A83) just 2 samples!
	SO06	17800.3	290.0	
23.09.2020	A83	0.0	0.0	
	SO06	11223.3	166.7	

F. Nutrient data in two- and four- (/five-) meter depth– statistics

a. Statistics (Nitrate, Silicate, Phosphate) – IMTA site

2 meter	Nitrate (µM)	Silicate (µM)	Phosphate (µM)
Mean	6.48	2.82	0.69
Max	12.73	6.24	1.04
Min	1.02	0.50	0.35

4 meter	Nitrate (µM)	Silicate (µM)	Phosphate (µM)
Mean	6.61	2.90	0.71
Max	12.45	6.14	1.14
Min	0.74	0.82	0.34

b. Statistics (Nitrate, Silicate, Phosphate) – Reference site

2 meter	Nitrate (µM)	Silicate (µM)	Phosphate (µM)
Mean	5.15	2.83	0.60
Max	12.61	6.53	0.93
Min	1.05	0.70	0.29

4 meter	Nitrate (µM)	Silicate (µM)	Phosphate (µM)
Mean	5.93	2.82	0.59
Max	12.73	6.28	0.86
Min	1.08	0.84	0.38

c. Statistics – Ammonium concentration

i. Statistics – IMTA site

	Mean	Max	Min
Ammonium (µM) 2 meter	2.48	7.34	0.01
Ammonium(µM) 4 meter	2.55	5.34	0.15

ii. Statistics – Reference site

	Mean	Max	Min
Ammonium (µM) 2 meter	0.44	0.68	0.17
Ammonium(µM) 4 meter	0.70	2.89	0.00

G. CTD data

a. Seasonal variations – IMTA site

depth (m)	pressure (dbar)	temperature (°C)	salility (PSU)
1	1	9.96	34.98
2	2	9.94	35.00
3	3	9.91	35.03
4	4	9.89	35.04
5	5	9.87	35.05
6	6	9.87	35.06
7	7	9.85	35.06
8	8	9.84	35.06
9	9	9.82	35.07
10	10	9.79	35.08
11	11	9.77	35.08
12	12	9.76	35.08
13	13	9.76	35.08
14	14	9.75	35.08
15	15	9.75	35.08
16	16	9.75	35.08
17	17	9.75	35.08
18	18	9.74	35.08
19	19	9.74	35.08
20	20	9.74	35.08
21	21	9.74	35.08
22	22	9.73	35.09
23	23	9.73	35.09
24	24	9.73	35.09
25	25	9.73	35.09
26	26	9.73	35.09
27	27	9.73	35.09
28	28	9.73	35.09
29	29	9.72	35.09
30	30	9.73	35.09

	Temperture (°C)	Salinity (PSU)
Mean	9.78	35.07
Min	9.72	34.98
Max	9.96	35.09

b. Seasonal variations – Reference site

depth (m)	pressure (dbar)	temperature (°C)	salility (PSU)
1	1	9.99	34.84
2	2	10.01	34.89
3	3	10.00	34.93
4	4	9.98	34.95
5	5	9.96	34.98
6	6	9.93	35.03
7	7	9.89	35.05
8	8	9.87	35.06
9	9	9.85	35.07
10	10	9.84	35.07
11	11	9.83	35.07
12	12	9.82	35.08
13	13	9.80	35.08
14	14	9.80	35.08
15	15	9.79	35.08
16	16	9.79	35.08
17	17	9.79	35.08
18	18	9.78	35.08
19	19	9.77	35.08
20	20	9.77	35.08
21	21	9.76	35.08
22	22	9.76	35.08
23	23	9.76	35.09
24	24	9.75	35.09
25	25	9.75	35.09
26	26	9.74	35.09
27	27	9.73	35.09
28	28	9.79	35.08
29	29	9.78	35.09
30	30	9.95	35.08

	Temperture (°C)	Salinity (PSU)
Mean	9.83	35.05
Min	9.73	34.84
Max	10.01	35.09

H. Current magnitudes and directions data - Sørvágsfjørður

a. Weekly average – IMTA site

		Surface currents A83		Mid depth currents A83	
Week	Weekly average	Current magnitude (m/s)	Current direction (°)	Current magnitude (m/s)	Current direction (°)
1	01.02.2020 - 07.02.2020	0.114	267.577	0.035	138.939
2	08.02.2020 - 14.02.2020	0.086	267.925	0.029	142.370
3	15.02.2020 - 21.02.2020	0.081	194.238	0.027	160.172
4	22.02.2020 - 28.02.2020	0.118	254.780	0.028	151.929
5	01.03.2020 - 07.03.2020	0.119	276.315	0.031	118.449
6	08.03.2020 - 14.03.2020	0.092	195.236	0.035	170.099
7	15.03.2020 - 21.03.2020	0.112	222.789	0.032	179.736
8	22.03.2020 -28.02.2020	0.086	191.964	0.036	217.486
9	29.03.2020 - 04.04.2020	0.084	213.864	0.036	158.049
10	05.04.2020 - 11.04.2020	0.080	203.655	0.037	185.699
11	12.04.2020 - 18.04.2020	0.088	255.834	0.028	119.868
12	19.04.2020 - 25.04.2020	0.083	213.924	0.029	161.136
13	26.04.2020 - 30.04.2020	0.104	265.557	0.030	112.062

b. Weekly average – Reference site

		Surface currents SO06		Mid depth currents SO06	
Week	Weekly average	Current magnitude (m/s)	Current direction (°)	Current magnitude (m/s)	Current direction (°)
1	01.02.2020 - 07.02.2020	0.107	268.610	0.019	202.648
2	08.02.2020 - 14.02.2020	0.087	217.565	0.015	181.744
3	15.02.2020 - 21.02.2020	0.075	78.391	0.019	137.979
4	22.02.2020 - 28.02.2020	0.067	199.296	0.014	192.087
5	01.03.2020 - 07.03.2020	0.072	242.996	0.013	203.795
6	08.03.2020 - 14.03.2020	0.096	147.132	0.020	172.627
7	15.03.2020 - 21.03.2020	0.061	145.201	0.016	192.084
8	22.03.2020 -28.02.2020	0.074	143.562	0.019	151.197
9	29.03.2020 - 04.04.2020	0.080	153.775	0.016	177.649
10	05.04.2020 - 11.04.2020	0.067	118.917	0.019	140.856
11	12.04.2020 - 18.04.2020	0.045	134.378	0.012	200.868
12	19.04.2020 - 25.04.2020	0.049	136.091	0.019	190.562
13	26.04.2020 - 30.04.2020	0.070	233.873	0.015	154.197

I. Raw data

a. Seaweed growth data (weight, length and width)

Seaweed_individual	weight_g	blade_length_ cm	width_cm	date	location	project	measured by
1	0.1	10.2	1.9	18.04.2020	A83	SUREAQUA	Fiskaaling
2	1.8	25.4	5	18.04.2020	A83	SUREAQUA	Fiskaaling
3	26.9	67.5	15.5	18.04.2020	A83	SUREAQUA	Fiskaaling
4	0.6	19.2	3	18.04.2020	A83	SUREAQUA	Fiskaaling
5	0.5	16.5	3	18.04.2020	A83	SUREAQUA	Fiskaaling
6	0.2	7.5	2	18.04.2020	A83	SUREAQUA	Fiskaaling
7	0.3	13	2.5	18.04.2020	A83	SUREAQUA	Fiskaaling
8	3.8	38.5	6.5	18.04.2020	A83	SUREAQUA	Fiskaaling
9	6.8	44.7	7	18.04.2020	A83	SUREAQUA	Fiskaaling
10	2.3	30.5	5	18.04.2020	A83	SUREAQUA	Fiskaaling
11	17.9	70.5	11.5	18.04.2020	A83	SUREAQUA	Fiskaaling
12	3.5	34	5.6	18.04.2020	A83	SUREAQUA	Fiskaaling
13	0.4	13.9	3.2	18.04.2020	A83	SUREAQUA	Fiskaaling
14	11.8	52.5	10.9	18.04.2020	A83	SUREAQUA	Fiskaaling

Seaweed_individual	weight_g	blade_length_ cm	width_cm	date	location	project	measured by
15	0.3	12	3	18.04.2020	A83	SUREAQUA	Fiskaaling
16	0.5	13	3.5	18.04.2020	A83	SUREAQUA	Fiskaaling
17	2.4	35.5	4	18.04.2020	A83	SUREAQUA	Fiskaaling
18	0.1	6	1	18.04.2020	A83	SUREAQUA	Fiskaaling
19	23.4	80.5	12.9	18.04.2020	A83	SUREAQUA	Fiskaaling
20	9.1	51.5	8.5	18.04.2020	A83	SUREAQUA	Fiskaaling
21	7.9	46	9	18.04.2020	A83	SUREAQUA	Fiskaaling
22	1.2	24	4	18.04.2020	A83	SUREAQUA	Fiskaaling
23	12.4	67	9.5	18.04.2020	A83	SUREAQUA	Fiskaaling
24	1.7	20	5	18.04.2020	SO06	SUREAQUA	Fiskaaling
25	7	52.5	7.5	18.04.2020	SO06	SUREAQUA	Fiskaaling
26	16.6	78.5	11	18.04.2020	SO06	SUREAQUA	Fiskaaling
27	20.4	96.5	11.1	18.04.2020	SO06	SUREAQUA	Fiskaaling
28	3.8	41.5	5.9	18.04.2020	SO06	SUREAQUA	Fiskaaling
29	7.6	58.2	8	18.04.2020	SO06	SUREAQUA	Fiskaaling
30	4.3	38	5.6	18.04.2020	SO06	SUREAQUA	Fiskaaling

Seaweed_individual	weight_g	blade_length_ cm	width_cm	date	location	project	measured by
31	1.9	25.5	5	18.04.2020	SO06	SUREAQUA	Fiskaaling
32	8.8	45.7	10	18.04.2020	SO06	SUREAQUA	Fiskaaling
33	3.7	36.7	4.6	18.04.2020	SO06	SUREAQUA	Fiskaaling
34	0.5	13.5	2.5	18.04.2020	SO06	SUREAQUA	Fiskaaling
35	0.4	15.5	2.2	18.04.2020	SO06	SUREAQUA	Fiskaaling
36	19.1	87.3	10	18.04.2020	SO06	SUREAQUA	Fiskaaling
37	18.9	63.5	13.5	18.04.2020	SO06	SUREAQUA	Fiskaaling
38	8.6	53	8.6	18.04.2020	SO06	SUREAQUA	Fiskaaling
39	14	74	10.4	18.04.2020	SO06	SUREAQUA	Fiskaaling
40	12.2	66.5	9.5	18.04.2020	SO06	SUREAQUA	Fiskaaling
41	0.5	15	2	18.04.2020	SO06	SUREAQUA	Fiskaaling
42	3.2	39	4.8	18.04.2020	SO06	SUREAQUA	Fiskaaling
43	17.7	69.5	10.9	18.04.2020	SO06	SUREAQUA	Fiskaaling
44	0.5	15.5	3	18.04.2020	SO06	SUREAQUA	Fiskaaling
45	9	56	7	18.04.2020	SO06	SUREAQUA	Fiskaaling
46	51.9	85	20.3	18.04.2020	SO06	SUREAQUA	Fiskaaling

Seaweed_individual	weight_g	blade_length_ cm	width_cm	date	location	project	measured by
47	136.8	110	26.2	20.05.2020	A83	SUREAQUA	Fiskaaling
48	17.1	58.5	10.9	20.05.2020	A83	SUREAQUA	Fiskaaling
49	47.1	83	17.9	20.05.2020	A83	SUREAQUA	Fiskaaling
50	6.6	40	8	20.05.2020	A83	SUREAQUA	Fiskaaling
51	10	42	10.4	20.05.2020	A83	SUREAQUA	Fiskaaling
52	22	71	12.8	20.05.2020	A83	SUREAQUA	Fiskaaling
53	2.5	24.5	6	20.05.2020	A83	SUREAQUA	Fiskaaling
54	1.4	25	3.5	20.05.2020	A83	SUREAQUA	Fiskaaling
55	0.7	16	3	20.05.2020	A83	SUREAQUA	Fiskaaling
56	1.3	21	4	20.05.2020	A83	SUREAQUA	Fiskaaling
57	1.1	15	4.5	20.05.2020	A83	SUREAQUA	Fiskaaling
58	32.1	69.5	15.3	20.05.2020	A83	SUREAQUA	Fiskaaling
59	28.9	76.5	14	20.05.2020	A83	SUREAQUA	Fiskaaling
60	0.1	6.5	1.9	20.05.2020	A83	SUREAQUA	Fiskaaling
61	19.5	77	10.8	20.05.2020	A83	SUREAQUA	Fiskaaling
62	31.6	92	14.5	20.05.2020	A83	SUREAQUA	Fiskaaling

Seaweed_individual	weight_g	blade_length_ cm	width_cm	date	location	project	measured by
63	50.6	106	17.5	20.05.2020	A83	SUREAQUA	Fiskaaling
64	27.5	104.5	10.5	20.05.2020	A83	SUREAQUA	Fiskaaling
65	32.8	90	12.9	20.05.2020	A83	SUREAQUA	Fiskaaling
66	9.4	65	5.6	20.05.2020	A83	SUREAQUA	Fiskaaling
67	68.2	108.5	19	20.05.2020	A83	SUREAQUA	Fiskaaling
68	96.6	124.5	20.6	20.05.2020	A83	SUREAQUA	Fiskaaling
69	45	110.5	15	20.05.2020	A83	SUREAQUA	Fiskaaling
70	24.8	81	11.5	20.05.2020	A83	SUREAQUA	Fiskaaling
71	118.1	149	21.5	20.05.2020	A83	SUREAQUA	Fiskaaling
72	7.7	49.5	7	20.05.2020	A83	SUREAQUA	Fiskaaling
73	56.2	120	18.5	20.05.2020	A83	SUREAQUA	Fiskaaling
74	40.2	101	15.5	20.05.2020	A83	SUREAQUA	Fiskaaling
75	15.5	71	9.5	20.05.2020	A83	SUREAQUA	Fiskaaling
76	46.7	106	15	20.05.2020	A83	SUREAQUA	Fiskaaling
77	9.2	55	6.6	20.05.2020	SO06	SUREAQUA	Fiskaaling
78	35.5	93	11.4	20.05.2020	SO06	SUREAQUA	Fiskaaling

Seaweed_individual	weight_g	blade_length_ cm	width_cm	date	location	project	measured by
79	5.6	48	5.3	20.05.2020	SO06	SUREAQUA	Fiskaaling
80	47.8	102	15	20.05.2020	SO06	SUREAQUA	Fiskaaling
81	60.8	130	17.6	20.05.2020	SO06	SUREAQUA	Fiskaaling
82	38.9	110	14.5	20.05.2020	SO06	SUREAQUA	Fiskaaling
83	106.9	154	20	20.05.2020	SO06	SUREAQUA	Fiskaaling
84	18.9	94	8.9	20.05.2020	SO06	SUREAQUA	Fiskaaling
85	47.2	103.5	16.6	20.05.2020	SO06	SUREAQUA	Fiskaaling
86	48.4	115.5	14.2	20.05.2020	SO06	SUREAQUA	Fiskaaling
87	16	76	10.1	20.05.2020	SO06	SUREAQUA	Fiskaaling
88	6.3	47.5	6.5	20.05.2020	SO06	SUREAQUA	Fiskaaling
89	12.5	64	9.5	20.05.2020	SO06	SUREAQUA	Fiskaaling
90	46.3	102.5	14.2	20.05.2020	SO06	SUREAQUA	Fiskaaling
91	20.1	89	9.5	20.05.2020	SO06	SUREAQUA	Fiskaaling
92	17.3	70.5	10.5	20.05.2020	SO06	SUREAQUA	Fiskaaling
93	7.5	51.5	6	20.05.2020	SO06	SUREAQUA	Fiskaaling
94	42.1	114	15	20.05.2020	SO06	SUREAQUA	Fiskaaling

Seaweed_individual	weight_g	blade_length_ cm	width_cm	date	location	project	measured by
95	82.7	143	20.5	20.05.2020	SO06	SUREAQUA	Fiskaaling
96	0.4	12.5	2.5	20.05.2020	SO06	SUREAQUA	Fiskaaling
97	59.6	136.5	15	20.05.2020	SO06	SUREAQUA	Fiskaaling
98	130.7	139.5	24.2	20.05.2020	SO06	SUREAQUA	Fiskaaling
99	58.5	87	19.8	20.05.2020	SO06	SUREAQUA	Fiskaaling
100	1.2	21.5	3.3	20.05.2020	SO06	SUREAQUA	Fiskaaling
101	3.6	40	4.5	20.05.2020	SO06	SUREAQUA	Fiskaaling
102	41.8	97.5	15.2	20.05.2020	SO06	SUREAQUA	Fiskaaling
103	9.3	59.5	7.9	20.05.2020	SO06	SUREAQUA	Fiskaaling
104	8.3	48.5	7	20.05.2020	SO06	SUREAQUA	Fiskaaling
105	28.9	91	14	20.05.2020	SO06	SUREAQUA	Fiskaaling
106	81.3	129.5	22	20.05.2020	SO06	SUREAQUA	Fiskaaling
107	2.4	24	5.1	25.06.2020	A83	SUREAQUA	Fiskaaling
108	6.7	46	8	25.06.2020	A83	SUREAQUA	Fiskaaling
109	11.1	55.5	8	25.06.2020	A83	SUREAQUA	Fiskaaling
110	13.6	51.5	9.4	25.06.2020	A83	SUREAQUA	Fiskaaling

Seaweed_individual	weight_g	blade_length_ cm	width_cm	date	location	project	measured by
111	21.6	74	13.7	25.06.2020	A83	SUREAQUA	Fiskaaling
112	41.3	96.5	17.5	25.06.2020	A83	SUREAQUA	Fiskaaling
113	3.1	31	4.9	25.06.2020	A83	SUREAQUA	Fiskaaling
114	31	75	14	25.06.2020	A83	SUREAQUA	Fiskaaling
115	14.4	66	11.5	25.06.2020	A83	SUREAQUA	Fiskaaling
116	13.8	58	9.5	25.06.2020	A83	SUREAQUA	Fiskaaling
117	20.7	78	10	25.06.2020	A83	SUREAQUA	Fiskaaling
118	222.2	176.5	23.1	25.06.2020	A83	SUREAQUA	Fiskaaling
119	224.1	115	29.5	25.06.2020	A83	SUREAQUA	Fiskaaling
120	174.7	130	21.9	25.06.2020	A83	SUREAQUA	Fiskaaling
121	126.1	70	25.2	25.06.2020	A83	SUREAQUA	Fiskaaling
122	307.2	160	28	25.06.2020	A83	SUREAQUA	Fiskaaling
123	19.7	75	10.2	25.06.2020	A83	SUREAQUA	Fiskaaling
124	339	111	37.6	25.06.2020	A83	SUREAQUA	Fiskaaling
125	4.9	38.5	5	25.06.2020	A83	SUREAQUA	Fiskaaling
126	69.1	107	18.3	25.06.2020	A83	SUREAQUA	Fiskaaling

Seaweed_individual	weight_g	blade_length_ cm	width_cm	date	location	project	measured by
127	74.1	111.5	16.8	25.06.2020	A83	SUREAQUA	Fiskaaling
128	157.9	115	22.4	25.06.2020	A83	SUREAQUA	Fiskaaling
129	6.8	41	8	25.06.2020	A83	SUREAQUA	Fiskaaling
130	53.7	104.5	19.5	25.06.2020	A83	SUREAQUA	Fiskaaling
131	118.9	128.5	21.5	25.06.2020	SO06	SUREAQUA	Fiskaaling
132	2.3	39.5	3.8	25.06.2020	SO06	SUREAQUA	Fiskaaling
133	3.4	33.5	6	25.06.2020	SO06	SUREAQUA	Fiskaaling
134	19	28	9	25.06.2020	SO06	SUREAQUA	Fiskaaling
135	37.8	89	14	25.06.2020	SO06	SUREAQUA	Fiskaaling
136	202.4	157	29	25.06.2020	SO06	SUREAQUA	Fiskaaling
137	22.3	33	14.2	25.06.2020	SO06	SUREAQUA	Fiskaaling
138	97.1	121.5	22	25.06.2020	SO06	SUREAQUA	Fiskaaling
139	246.2	171	31	25.06.2020	SO06	SUREAQUA	Fiskaaling
140	126.8	127.5	28.5	25.06.2020	SO06	SUREAQUA	Fiskaaling
141	68.5	132	18.8	25.06.2020	SO06	SUREAQUA	Fiskaaling
142	304.1	151	32	25.06.2020	SO06	SUREAQUA	Fiskaaling

Seaweed_individual	weight_g	blade_length_ cm	width_cm	date	location	project	measured by
143	219.9	176.5	29.5	25.06.2020	SO06	SUREAQUA	Fiskaaling
144	191	177	26.8	25.06.2020	SO06	SUREAQUA	Fiskaaling
145	150.4	146	22	25.06.2020	SO06	SUREAQUA	Fiskaaling
146	109.9	152	22.1	25.06.2020	SO06	SUREAQUA	Fiskaaling
147	67.9	115.5	21.6	25.06.2020	SO06	SUREAQUA	Fiskaaling
148	22	66	16.6	25.06.2020	SO06	SUREAQUA	Fiskaaling
149	23	59	16.6	25.06.2020	SO06	SUREAQUA	Fiskaaling
150	78.6	93.5	23.1	25.06.2020	SO06	SUREAQUA	Fiskaaling
151	8.5	39	9.5	25.06.2020	SO06	SUREAQUA	Fiskaaling
152	39.4	86	16.5	25.06.2020	SO06	SUREAQUA	Fiskaaling
153	1.7	21	4.2	25.06.2020	SO06	SUREAQUA	Fiskaaling
154	20.4	57	14.3	25.06.2020	SO06	SUREAQUA	Fiskaaling
155	256.6	147	24	03.08.2020	A83	SUREAQUA	Fiskaaling
156	209.4	103	27.6	03.08.2020	A83	SUREAQUA	Fiskaaling
157	232.1	132	23.5	03.08.2020	A83	SUREAQUA	Fiskaaling
158	31.2	65.5	12.5	03.08.2020	A83	SUREAQUA	Fiskaaling

Seaweed_individual	weight_g	blade_length_ cm	width_cm	date	location	project	measured by
159	72.3	114.5	16.2	03.08.2020	A83	SUREAQUA	Fiskaaling
160	232.7	128.5	22.9	03.08.2020	A83	SUREAQUA	Fiskaaling
161	11.8	45.5	7.1	03.08.2020	A83	SUREAQUA	Fiskaaling
162	20.8	61.3	11.5	03.08.2020	A83	SUREAQUA	Fiskaaling
163	110.5	111	20.4	03.08.2020	A83	SUREAQUA	Fiskaaling
164	52.8	62.6	20	03.08.2020	A83	SUREAQUA	Fiskaaling
165	11.5	45.3	7.7	03.08.2020	A83	SUREAQUA	Fiskaaling
166	75.8	112.5	15.7	03.08.2020	A83	SUREAQUA	Fiskaaling
167	9.8	42	8.2	03.08.2020	A83	SUREAQUA	Fiskaaling
168	49.1	76.2	16.8	03.08.2020	A83	SUREAQUA	Fiskaaling
169	7.3	30	8.1	03.08.2020	A83	SUREAQUA	Fiskaaling
170	33.3	71.2	9.3	03.08.2020	A83	SUREAQUA	Fiskaaling
171	10.4	37	9.1	03.08.2020	A83	SUREAQUA	Fiskaaling
172	23.2	71	7.4	03.08.2020	A83	SUREAQUA	Fiskaaling
173	13.2	46.5	10.2	03.08.2020	A83	SUREAQUA	Fiskaaling
174	12.6	39.6	9	03.08.2020	A83	SUREAQUA	Fiskaaling

Seaweed_individual	weight_g	blade_length_ cm	width_cm	date	location	project	measured by
175	29.3	73.7	12.9	03.08.2020	A83	SUREAQUA	Fiskaaling
176	57.1	101	16.4	03.08.2020	A83	SUREAQUA	Fiskaaling
177	12.7	47	10.4	03.08.2020	A83	SUREAQUA	Fiskaaling
178	49.1	84.3	17.9	03.08.2020	A83	SUREAQUA	Fiskaaling
179	6.1	24.5	9.7	03.08.2020	A83	SUREAQUA	Fiskaaling
180	5.4	25.5	8.1	03.08.2020	A83	SUREAQUA	Fiskaaling
181	127.3	102	24.5	03.08.2020	SO06	SUREAQUA	Fiskaaling
182	214.7	99	26.1	03.08.2020	SO06	SUREAQUA	Fiskaaling
183	203.4	130	23.2	03.08.2020	SO06	SUREAQUA	Fiskaaling
184	24.5	66.5	12.4	03.08.2020	SO06	SUREAQUA	Fiskaaling
185	45	80	15.7	03.08.2020	SO06	SUREAQUA	Fiskaaling
186	12.9	56.5	9	03.08.2020	SO06	SUREAQUA	Fiskaaling
187	11	59	9	03.08.2020	SO06	SUREAQUA	Fiskaaling
188	24.2	54.5	14	03.08.2020	SO06	SUREAQUA	Fiskaaling
189	10.2	47	9.2	03.08.2020	SO06	SUREAQUA	Fiskaaling
190	6.6	41	7.2	03.08.2020	SO06	SUREAQUA	Fiskaaling

Seaweed_individual	weight_g	blade_length_ cm	width_cm	date	location	project	measured by
191	193.5	123.3	22.8	03.08.2020	SO06	SUREAQUA	Fiskaaling
192	5.3	35	6	03.08.2020	SO06	SUREAQUA	Fiskaaling
193	295.1	147.5	29.5	03.08.2020	SO06	SUREAQUA	Fiskaaling
194	44.3	68.5	14.6	03.08.2020	SO06	SUREAQUA	Fiskaaling
195	67.2	67	20	03.08.2020	SO06	SUREAQUA	Fiskaaling
196	54.1	86	16.6	03.08.2020	SO06	SUREAQUA	Fiskaaling
197	96	75	18	03.08.2020	SO06	SUREAQUA	Fiskaaling
198	261.5	181	20.5	03.08.2020	SO06	SUREAQUA	Fiskaaling
199	16.5	61	9.3	03.08.2020	SO06	SUREAQUA	Fiskaaling
200	28.8	63	15.3	03.08.2020	SO06	SUREAQUA	Fiskaaling
201	86.4	77.9	24.4	03.08.2020	SO06	SUREAQUA	Fiskaaling
202	214.6	142	25.5	03.08.2020	SO06	SUREAQUA	Fiskaaling
203	28.7	63	10.3	03.08.2020	SO06	SUREAQUA	Fiskaaling
204	159.1	132	23.4	03.08.2020	SO06	SUREAQUA	Fiskaaling
205	134.5	110	16.8	03.08.2020	SO06	SUREAQUA	Fiskaaling
206	207	104.5	22.1	03.08.2020	SO06	SUREAQUA	Fiskaaling

Seaweed_individual	weight_g	blade_length_ cm	width_cm	date	location	project	measured by
207	85.7	79	21.8	03.08.2020	SO06	SUREAQUA	Fiskaaling
208	216	104.5	25.1	03.08.2020	SO06	SUREAQUA	Fiskaaling
209	275.3	152.5	27	03.08.2020	SO06	SUREAQUA	Fiskaaling
210	112.3	112.5	21.1	03.08.2020	SO06	SUREAQUA	Fiskaaling
211	280	152	26	23.09.2020	SO06	SUREAQUA	Fiskaaling
212	85	65.2	16.2	23.09.2020	SO06	SUREAQUA	Fiskaaling
213	120	88.2	19	23.09.2020	SO06	SUREAQUA	Fiskaaling
214	96	55.5	17.5	23.09.2020	SO06	SUREAQUA	Fiskaaling
215	117	67.2	22.2	23.09.2020	SO06	SUREAQUA	Fiskaaling
216	59	100	15.7	23.09.2020	SO06	SUREAQUA	Fiskaaling
217	60	60	16	23.09.2020	SO06	SUREAQUA	Fiskaaling
218	81	81	14.9	23.09.2020	SO06	SUREAQUA	Fiskaaling
219	42	45	14.6	23.09.2020	SO06	SUREAQUA	Fiskaaling
220	158	95	18	23.09.2020	SO06	SUREAQUA	Fiskaaling
221	194	114	23.6	23.09.2020	SO06	SUREAQUA	Fiskaaling
222	107	69	22.9	23.09.2020	SO06	SUREAQUA	Fiskaaling

Seaweed_individual	weight_g	blade_length_ cm	width_cm	date	location	project	measured by
223	184	106	31.6	23.09.2020	SO06	SUREAQUA	Fiskaaling
224	34	58	13.4	23.09.2020	SO06	SUREAQUA	Fiskaaling
225	186	135	23.6	23.09.2020	SO06	SUREAQUA	Fiskaaling
226	30	45.8	14.5	23.09.2020	SO06	SUREAQUA	Fiskaaling
227	301	157	29	23.09.2020	SO06	SUREAQUA	Fiskaaling
228	151	70	25.6	23.09.2020	SO06	SUREAQUA	Fiskaaling
229	44	75.5	14.2	23.09.2020	SO06	SUREAQUA	Fiskaaling
230	38	53.5	15.7	23.09.2020	SO06	SUREAQUA	Fiskaaling
231	42	62	16	23.09.2020	SO06	SUREAQUA	Fiskaaling
232	52	62	17	23.09.2020	SO06	SUREAQUA	Fiskaaling
233	55	67.6	16.5	23.09.2020	SO06	SUREAQUA	Fiskaaling
234	58	78	17.7	23.09.2020	SO06	SUREAQUA	Fiskaaling
235	112	114	19.7	23.09.2020	SO06	SUREAQUA	Fiskaaling
236	29	38.5	14	23.09.2020	SO06	SUREAQUA	Fiskaaling
237	56	52.5	14.6	23.09.2020	SO06	SUREAQUA	Fiskaaling
238	90	93.7	16	23.09.2020	SO06	SUREAQUA	Fiskaaling

Seaweed_individual	weight_g	blade_length_ cm	width_cm	date	location	project	measured by
239	39	39.5	13	23.09.2020	SO06	SUREAQUA	Fiskaaling
240	35	35	13	23.09.2020	SO06	SUREAQUA	Fiskaaling

b. Biomass and Individuals

Biomass_pr_m_g	Individuals_pr_m	date	location	project	measured by
3059	210	20.05.2020	A83	SUREAQUA	Fiskaaling
659	70	20.05.2020	A83	SUREAQUA	Fiskaaling
18034	420	20.05.2020	A83	SUREAQUA	Fiskaaling
7567	290	20.05.2020	SO06	SUREAQUA	Fiskaaling
3265	100	20.05.2020	SO06	SUREAQUA	Fiskaaling
2856	120	20.05.2020	SO06	SUREAQUA	Fiskaaling
1860	220	25.06.2020	A83	SUREAQUA	Fiskaaling
15970	160	25.06.2020	A83	SUREAQUA	Fiskaaling
4901	120	25.06.2020	A83	SUREAQUA	Fiskaaling
2012	90	25.06.2020	SO06	SUREAQUA	Fiskaaling
17907	120	25.06.2020	SO06	SUREAQUA	Fiskaaling
4316	90	25.06.2020	SO06	SUREAQUA	Fiskaaling
16902	150	03.08.2020	A83	SUREAQUA	Fiskaaling

Biomass_pr_m_g	Individuals_pr_m	date	location	project	measured by
3051	200	03.08.2020	A83	SUREAQUA	Fiskaaling
8060	240	03.08.2020	SO06	SUREAQUA	Fiskaaling
14100	310	03.08.2020	SO06	SUREAQUA	Fiskaaling
31241	320	03.08.2020	SO06	SUREAQUA	Fiskaaling
10050	90	23.09.2020	SO06	SUREAQUA	Fiskaaling
16850	200	23.09.2020	SO06	SUREAQUA	Fiskaaling
6770	210	23.09.2020	SO06	SUREAQUA	Fiskaaling

c. **Data of water nutrients (nitrate, silicate and phosphate) at A83 and SO06**

Sample no.	Date	Station	Depth (m)	Nitrate (µM)	Silicate (µM)	Phosphate (µM)
4.1	24.02.2020	A 83	2	12.732	6.235	0.942
4.2	24.02.2020	A 83	4	12.45225	6.13775	0.9415
10.1	05.03.2020	A 83	2	10.31	5.039	0.633
10.2	05.03.2020	A 83	4	11.655	5.722	0.7
15.1	16.04.2020	A 83	2	11.383	5.534	0.72
15.2	16.04.2020	A 83	4	11.536	5.062	0.683
20.1	30.04.2020	A 83	2	6.496	2.043	0.49
20.2	30.04.2020	A 83	4	6.513	2.353	0.48
23.1	07.05.2020	A 83	2	8.185	3.525	0.797
23.2	07.05.2020	A 83	4	8.067	3.2	0.879
29.1	20.05.2020	A 83	2	5.285	1.308	0.616
29.2	20.05.2020	A 83	4	5.474	1.495	0.753
186	04.06.2020	A 83	2	1.024	0.947	0.354
187	04.06.2020	A 83	4	0.736	1.214	0.344
199	16.06.2020	A 83	2	2.986	0.5	0.618

Sample no.	Date	Station	Depth (m)	Nitrate (µM)	Silicate (µM)	Phosphate (µM)
200	16.06.2020	A 83	4	3.92	0.819	0.792
212	25.06.2020	A 83	2	6.514	1.245	0.723
213	25.06.2020	A 83	4	6.472	1.563	0.82
225	02.07.2020	A 83	2	6.046	1.253	0.864
226	02.07.2020	A 83	4	5.203	1.029	0.803
238	14.07.2020	A 83	2	5.648	1.612	0.737
239	14.07.2020	A 83	4	5.809	1.495	0.671
252	24.07.2020	A 83	2	3.662	1.506	0.428
253	24.07.2020	A 83	4	4.559	1.794	0.539
265	03.08.2020	A 83	2	7.273	2.975	0.875
266	03.08.2020	A 83	4	7.03	2.895	1.139
278	14.08.2020	A 83	2	4.242	2.484	1.039
279	14.08.2020	A 83	4	4.566	2.745	0.792
291	24.08.2020	A 83	2	4.358	3.334	0.565
292	24.08.2020	A 83	4	4.685	3.218	0.635
304	02.09.2020	A 83	2	6.311	3.315	0.747

Sample no.	Date	Station	Depth (m)	Nitrate (µM)	Silicate (µM)	Phosphate (µM)
305	02.09.2020	A 83	4	6.169	3.303	0.677
317	11.09.2020	A 83	2	6.934	4.074	0.696
318	11.09.2020	A 83	4	6.949	4.306	0.587
330	23.09.2020	A 83	2	7.175	3.778	0.56
331	23.09.2020	A 83	4	7.184	3.808	0.526
1	16.04.2019	SO 6	4	10.624	3.797	0.716
9	26.04.2019	SO 6	4	10.46	3.882	0.64
17	01.05.2019	SO 6	4	9.711	3.589	0.608
29	08.05.2019	SO 6	4	4.342	3.739	0.282
37	14.05.2019	SO 6	4	4.113	3.119	0.658
41	22.05.2019	SO 6	4	-0.451	1.779	0.034
2.1	23.05.2019	SO 6	2	0.836	1.425	0.101
49	29.05.2019	SO 6	4	-0.195	0.669	0.035
57	06.06.2019	SO 6	4	7.101	3.049	0.595
65	11.06.2019	SO 6	4	6.045	2.907	0.705
73	17.06.2019	SO 6	4	6.555	3.34	0.581

Sample no.	Date	Station	Depth (m)	Nitrate (µM)	Silicate (µM)	Phosphate (µM)
2.3	18.06.2019	SO 6	2	4.968	2.367	0.466
81	26.06.2019	SO 6	4	1.136	1.636	0.283
1.5	27.06.2019	SO 6	2	5.471	2.925	0.612
93	04.07.2019	SO 6	4	1.012	2.069	0.544
97	11.07.2019	SO 6	4	3.192	2.375	0.462
105	18.07.2019	SO 6	4	4.064	3.107	0.578
2.5	26.07.2019	SO 6	2	6.017	3.594	0.67
113	26.07.2019	SO 6	4	5.978	3.778	0.564
121	01.08.2019	SO 6	4	5.578	3.769	0.603
129	08.08.2019	SO 6	4	5.227	4.147	0.596
137	13.08.2019	SO 6	4	6.021	3.906	0.745
2.7	22.08.2019	SO 6	2	6.026	2.708	0.591
145	22.08.2019	SO 6	4	6.324	3.305	0.563
153	28.08.2019	SO 6	4	6.628	3.325	0.466
161	05.09.2019	SO 6	4	7.231	3.339	0.642
3.1	24.02.2020	SO 6	2	12.30075	6.4125	0.92725

Sample no.	Date	Station	Depth (m)	Nitrate (µM)	Silicate (µM)	Phosphate (µM)
3.2	24.02.2020	SO 6	4	12.342	6.28225	0.86025
9.1	05.03.2020	SO 6	2	12.605	5.995	0.788
9.2	05.03.2020	SO 6	4	12.727	5.351	0.805
16.1	18.04.2020	SO 6	2	11.479	4.364	0.662
16.2	18.04.2020	SO 6	4	11.469	4.387	0.667
19.1	30.04.2020	SO 6	2	1.251	0.912	0.608
19.2	30.04.2020	SO 6	4	1.097	1.145	0.38
24.1	07.05.2020	SO 6	2	2.034	2.817	0.475
24.2	07.05.2020	SO 6	4	1.21	2.161	0.415
30.1	20.05.2020	SO 6	2	4.518	1.531	0.554
30.2	20.05.2020	SO 6	4	4.636	1.366	0.669
173	25.05.2020	SO 6	4	6.386	2.165	0.541
177	04.06.2020	SO 6	2	1.402	1.005	0.602
178	04.06.2020	SO 6	4	1.079	1.674	0.378
190	16.06.2020	SO 6	2	1.045	0.697	0.286
191	16.06.2020	SO 6	4	3.876	0.844	0.575

Sample no.	Date	Station	Depth (m)	Nitrate (µM)	Silicate (µM)	Phosphate (µM)
207	25.06.2020	SO 6	2	5.05	1.076	0.489
208	25.06.2020	SO 6	4	5.382	1.102	0.494
216	02.07.2020	SO 6	2	2.294	0.766	0.589
229	14.07.2020	SO 6	2	4.031	1.151	0.62
230	14.07.2020	SO 6	5	4.243	1.441	0.444
243	24.07.2020	SO 6	2	2.376	1.566	0.409
244	24.07.2020	SO 6	5	5.042	2.222	0.571
256	03.08.2020	SO 6	2	6.438	3.165	0.712
257	03.08.2020	SO 6	5	6.546	2.489	0.592
269	14.08.2020	SO 6	2	2.25	2.334	0.477
270	14.08.2020	SO 6	5	4.581	3.105	0.53
282	24.08.2020	SO 6	2	4.271	3.229	0.559
283	24.08.2020	SO 6	5	5.494	3.188	0.595
295	02.09.2020	SO 6	2	6.34	3.658	0.756
296	02.09.2020	SO 6	5	6.409	3.286	0.679
308	11.09.2020	SO 6	2	6.482	6.531	0.746

Sample no.	Date	Station	Depth (m)	Nitrate (µM)	Silicate (µM)	Phosphate (µM)
309	11.09.2020	SO 6	5	6.478	4.611	0.719
321	23.09.2020	SO 6	2	6.529	3.779	0.55
322	23.09.2020	SO 6	5	7.781	3.88	0.638

d. Data of ammonium concentration

Sample no.	Date	Station	Depth (m)	Ammonium (µM)
1	07.05.2020	A 83	2	1.261
9	20.05.2020	A 83	2	1.688
13	20.05.2020	A 83	2	0.996
26	04.06.2020	A 83	2	0.007
31	16.06.2020	A 83	2	3.91
36	25.06.2020	A 83	2	1.456
41	02.07.2020	A 83	2	2.318
46	14.07.2020	A 83	2	4.241
51	24.07.2020	A 83	2	1.202
56	03.08.2020	A 83	2	6.802
61	14.08.2020	A 83	2	7.335
66	24.08.2020	A 83	2	1.664
71	02.09.2020	A 83	2	1.964
76	11.09.2020	A 83	2	1.872
81	23.09.2020	A 83	2	0.557
2	07.05.2020	A 83	4	0.888
10	20.05.2020	A 83	4	1.208
14	20.05.2020	A 83	4	4.261
27	04.06.2020	A 83	4	0.152
32	16.06.2020	A 83	4	4.117
37	25.06.2020	A 83	4	1.787
42	02.07.2020	A 83	4	2.434
47	14.07.2020	A 83	4	3.423
52	24.07.2020	A 83	4	4.149

Sample no.	Date	Station	Depth (m)	Ammonium (µM)
57	03.08.2020	A 83	4	4.579
62	14.08.2020	A 83	4	5.34
67	24.08.2020	A 83	4	1.543
72	02.09.2020	A 83	4	2.441
77	11.09.2020	A 83	4	1.308
82	23.09.2020	A 83	4	0.546
5	07.05.2020	SO 6	2	0.174
17	20.05.2020	SO 6	2	0.678
21	20.05.2020	SO 6	2	0.479
6	07.05.2020	SO 6	4	2.542
18	20.05.2020	SO 6	4	0.565
22	20.05.2020	SO 6	4	2.885
25	04.06.2020	SO 6	4	0.004
30	16.06.2020	SO 6	4	0.218
35	25.06.2020	SO 6	4	0
40	02.07.2020	SO 6	4	0.176
45	14.07.2020	SO 6	4	0.473
50	24.07.2020	SO 6	4	0.249
55	03.08.2020	SO 6	4	0.469
60	14.08.2020	SO 6	4	0.24
65	24.08.2020	SO 6	4	1.318
70	02.09.2020	SO 6	4	1.345
75	11.09.2020	SO 6	4	1.366
80	23.09.2020	SO 6	4	0.56

e. Station positions

station	lat	Long
SO 6	62.07378	-7.36007
A 83	62.07988	7.3841

f. Production data from Sørvágur

Date	Number of fish	Biomass
2019-10-01 00:00:00	62,338	43,637
2019-10-02 00:00:00	123,409	93,411
2019-10-03 00:00:00	189,750	140,788
2019-10-04 00:00:00	264,640	186,693
2019-10-05 00:00:00	264,600	186,665
2019-10-06 00:00:00	264,589	186,657
2019-10-07 00:00:00	264,585	187,225
2019-10-08 00:00:00	310,228	216,572
2019-10-09 00:00:00	355,607	247,134
2019-10-10 00:00:00	439,967	295,762
2019-10-11 00:00:00	439,920	296,398
2019-10-12 00:00:00	439,885	297,710
2019-10-13 00:00:00	439,871	299,133
2019-10-14 00:00:00	503,446	334,565
2019-10-15 00:00:00	542,134	360,339
2019-10-16 00:00:00	597,801	392,778
2019-10-17 00:00:00	597,721	395,383
2019-10-18 00:00:00	597,561	397,615
2019-10-19 00:00:00	597,318	399,823
2019-10-20 00:00:00	597,105	402,169

Date	Number of fish	Biomass
2019-10-21 00:00:00	595,763	404,378
2019-10-22 00:00:00	594,383	406,757
2019-10-23 00:00:00	593,531	409,714
2019-10-24 00:00:00	590,478	412,199
2019-10-25 00:00:00	588,622	415,475
2019-10-26 00:00:00	587,464	419,450
2019-10-27 00:00:00	585,878	422,736
2019-10-28 00:00:00	585,082	427,009
2019-10-29 00:00:00	584,161	431,504
2019-10-30 00:00:00	583,402	435,424
2019-10-31 00:00:00	582,864	440,123
2019-11-01 00:00:00	582,583	445,218
2019-11-02 00:00:00	582,229	449,162
2019-11-03 00:00:00	581,872	452,860
2019-11-04 00:00:00	679,195	508,919
2019-11-05 00:00:00	753,289	554,222
2019-11-06 00:00:00	829,866	601,227
2019-11-07 00:00:00	908,443	651,489
2019-11-08 00:00:00	908,323	656,679
2019-11-09 00:00:00	908,216	662,115
2019-11-10 00:00:00	908,040	667,558
2019-11-11 00:00:00	907,931	672,939
2019-11-12 00:00:00	907,661	677,951
2019-11-13 00:00:00	907,519	683,938
2019-11-14 00:00:00	907,188	689,039
2019-11-15 00:00:00	906,477	694,624

Date	Number of fish	Biomass
2019-11-16 00:00:00	905,637	700,984
2019-11-17 00:00:00	903,306	706,562
2019-11-18 00:00:00	901,086	711,872
2019-11-19 00:00:00	898,766	717,428
2019-11-20 00:00:00	896,831	724,217
2019-11-21 00:00:00	895,208	731,434
2019-11-22 00:00:00	894,495	739,095
2019-11-23 00:00:00	894,079	746,216
2019-11-24 00:00:00	893,465	753,564
2019-11-25 00:00:00	892,779	762,131
2019-11-26 00:00:00	892,178	769,616
2019-11-27 00:00:00	891,888	778,210
2019-11-28 00:00:00	891,128	786,141
2019-11-29 00:00:00	890,895	793,999
2019-11-30 00:00:00	890,640	802,870
2019-12-01 00:00:00	890,434	802,717
2019-12-02 00:00:00	890,208	811,636
2019-12-03 00:00:00	889,949	820,378
2019-12-04 00:00:00	889,714	829,559
2019-12-05 00:00:00	889,494	838,950
2019-12-06 00:00:00	889,362	846,356
2019-12-07 00:00:00	889,265	855,337
2019-12-08 00:00:00	889,184	856,439
2019-12-09 00:00:00	889,110	866,824
2019-12-10 00:00:00	888,981	876,962
2019-12-11 00:00:00	888,981	885,269

Date	Number of fish	Biomass
2019-12-12 00:00:00	888,895	892,723
2019-12-13 00:00:00	888,844	900,476
2019-12-14 00:00:00	888,844	908,317
2019-12-15 00:00:00	888,783	917,770
2019-12-16 00:00:00	888,745	924,366
2019-12-17 00:00:00	888,715	932,398
2019-12-18 00:00:00	888,698	941,462
2019-12-19 00:00:00	888,676	950,524
2019-12-20 00:00:00	888,640	959,988
2019-12-21 00:00:00	888,617	968,986
2019-12-22 00:00:00	888,617	977,999
2019-12-23 00:00:00	888,564	987,563
2019-12-24 00:00:00	888,543	996,889
2019-12-25 00:00:00	888,525	1,006,051
2019-12-26 00:00:00	888,504	1,015,383
2019-12-27 00:00:00	888,479	1,024,441
2019-12-28 00:00:00	888,417	1,032,008
2019-12-29 00:00:00	888,386	1,039,613
2019-12-30 00:00:00	888,337	1,048,890
2019-12-31 00:00:00	888,308	1,058,315
2020-01-01 00:00:00	888,308	1,068,916
2020-01-02 00:00:00	888,266	1,080,174
2020-01-03 00:00:00	888,266	1,087,761
2020-01-04 00:00:00	888,178	1,087,640
2020-01-05 00:00:00	888,161	1,099,318
2020-01-06 00:00:00	888,120	1,108,923

Date	Number of fish	Biomass
2020-01-07 00:00:00	888,097	1,113,251
2020-01-08 00:00:00	888,097	1,113,251
2020-01-09 00:00:00	888,046	1,124,343
2020-01-10 00:00:00	888,017	1,134,994
2020-01-11 00:00:00	888,017	1,144,733
2020-01-12 00:00:00	888,017	1,154,488
2020-01-13 00:00:00	887,932	1,163,593
2020-01-14 00:00:00	887,885	1,173,276
2020-01-15 00:00:00	887,863	1,183,690
2020-01-16 00:00:00	887,836	1,194,246
2020-01-17 00:00:00	887,810	1,203,467
2020-01-18 00:00:00	887,810	1,212,913
2020-01-19 00:00:00	887,751	1,221,595
2020-01-20 00:00:00	887,685	1,231,166
2020-01-21 00:00:00	887,640	1,240,127
2020-01-22 00:00:00	887,603	1,249,638
2020-01-23 00:00:00	887,563	1,259,647
2020-01-24 00:00:00	887,509	1,268,796
2020-01-25 00:00:00	887,478	1,278,208
2020-01-26 00:00:00	887,434	1,287,774
2020-01-27 00:00:00	887,384	1,297,247
2020-01-28 00:00:00	887,349	1,306,655
2020-01-29 00:00:00	887,310	1,312,151
2020-01-30 00:00:00	887,274	1,321,631
2020-01-31 00:00:00	887,235	1,328,829
2020-02-01 00:00:00	887,195	1,336,731

Date	Number of fish	Biomass
2020-02-02 00:00:00	887,157	1,346,100
2020-02-03 00:00:00	887,115	1,355,725
2020-02-04 00:00:00	887,071	1,358,772
2020-02-05 00:00:00	887,001	1,367,755
2020-02-06 00:00:00	886,939	1,374,958
2020-02-07 00:00:00	886,885	1,383,248
2020-02-08 00:00:00	886,804	1,390,852
2020-02-09 00:00:00	886,727	1,398,421
2020-02-10 00:00:00	886,662	1,405,168
2020-02-11 00:00:00	886,573	1,403,109
2020-02-12 00:00:00	886,461	1,408,852
2020-02-13 00:00:00	886,407	1,416,334
2020-02-14 00:00:00	886,346	1,423,088
2020-02-15 00:00:00	886,227	1,426,635
2020-02-16 00:00:00	886,054	1,432,501
2020-02-17 00:00:00	885,846	1,437,597
2020-02-18 00:00:00	885,666	1,436,896
2020-02-19 00:00:00	885,299	1,443,075
2020-02-20 00:00:00	884,735	1,448,466
2020-02-21 00:00:00	884,162	1,454,201
2020-02-22 00:00:00	883,573	1,456,820
2020-02-23 00:00:00	883,134	1,463,171
2020-02-24 00:00:00	882,547	1,469,701
2020-02-25 00:00:00	882,092	1,476,350
2020-02-26 00:00:00	881,451	1,482,198
2020-02-27 00:00:00	881,010	1,486,456

Date	Number of fish	Biomass
2020-02-28 00:00:00	880,723	1,493,541
2020-02-29 00:00:00	880,316	1,500,357
2020-03-01 00:00:00	880,021	1,507,736
2020-03-02 00:00:00	879,829	1,512,987
2020-03-03 00:00:00	879,619	1,520,359
2020-03-04 00:00:00	879,366	1,524,893
2020-03-05 00:00:00	879,154	1,532,348
2020-03-06 00:00:00	879,037	1,540,011
2020-03-07 00:00:00	878,909	1,548,106
2020-03-08 00:00:00	878,758	1,555,515
2020-03-09 00:00:00	878,602	1,563,778
2020-03-10 00:00:00	878,498	1,571,619
2020-03-11 00:00:00	878,357	1,579,751
2020-03-12 00:00:00	878,246	1,587,599
2020-03-13 00:00:00	878,126	1,595,685
2020-03-14 00:00:00	878,059	1,602,480
2020-03-15 00:00:00	877,953	1,610,963
2020-03-16 00:00:00	877,852	1,618,671
2020-03-17 00:00:00	877,783	1,623,040
2020-03-18 00:00:00	877,703	1,625,950
2020-03-19 00:00:00	877,658	1,631,925
2020-03-20 00:00:00	877,568	1,639,156
2020-03-21 00:00:00	877,488	1,648,025
2020-03-22 00:00:00	877,419	1,656,934
2020-03-23 00:00:00	877,331	1,664,163
2020-03-24 00:00:00	877,288	1,673,896

Date	Number of fish	Biomass
2020-03-25 00:00:00	877,209	1,681,611
2020-03-26 00:00:00	877,110	1,687,760
2020-03-27 00:00:00	877,047	1,696,795
2020-03-28 00:00:00	877,047	1,706,931
2020-03-29 00:00:00	877,047	1,716,848
2020-03-30 00:00:00	876,880	1,723,575
2020-03-31 00:00:00	876,811	1,732,513
2020-04-01 00:00:00	876,733	1,742,332
2020-04-02 00:00:00	876,671	1,750,882
2020-04-03 00:00:00	876,619	1,760,046
2020-04-04 00:00:00	876,591	1,770,070
2020-04-05 00:00:00	876,591	1,781,269
2020-04-06 00:00:00	876,483	1,790,210
2020-04-07 00:00:00	876,483	1,799,384
2020-04-08 00:00:00	876,332	1,806,718
2020-04-09 00:00:00	876,332	1,817,595
2020-04-10 00:00:00	876,243	1,827,959
2020-04-11 00:00:00	876,243	1,840,667
2020-04-12 00:00:00	876,135	1,852,701
2020-04-13 00:00:00	876,135	1,863,603
2020-04-14 00:00:00	876,021	1,874,917
2020-04-15 00:00:00	875,943	1,887,648
2020-04-16 00:00:00	875,891	1,900,853
2020-04-17 00:00:00	875,829	1,908,889
2020-04-18 00:00:00	875,829	1,920,168
2020-04-19 00:00:00	875,737	1,930,327

Date	Number of fish	Biomass
2020-04-20 00:00:00	875,667	1,943,348
2020-04-21 00:00:00	875,581	1,955,905
2020-04-22 00:00:00	875,505	1,966,368
2020-04-23 00:00:00	875,440	1,977,107
2020-04-24 00:00:00	875,385	1,988,469
2020-04-25 00:00:00	875,337	2,000,640
2020-04-26 00:00:00	875,337	2,009,905
2020-04-27 00:00:00	875,263	2,021,027
2020-04-28 00:00:00	875,207	2,031,318
2020-04-29 00:00:00	875,178	2,042,301
2020-04-30 00:00:00	875,121	2,053,160
2020-05-01 00:00:00	875,086	2,063,391
2020-05-02 00:00:00	875,086	2,075,203
2020-05-03 00:00:00	875,024	2,086,956
2020-05-04 00:00:00	874,976	2,098,914
2020-05-05 00:00:00	874,938	2,111,531
2020-05-06 00:00:00	874,900	2,121,785
2020-05-07 00:00:00	874,846	2,131,835
2020-05-08 00:00:00	874,846	2,137,524
2020-05-09 00:00:00	874,846	2,139,525
2020-05-10 00:00:00	874,765	2,139,309
2020-05-11 00:00:00	874,718	2,139,192
2020-05-12 00:00:00	874,619	2,140,703
2020-05-13 00:00:00	874,561	2,146,492
2020-05-14 00:00:00	874,478	2,157,015
2020-05-15 00:00:00	874,411	2,168,085

Date	Number of fish	Biomass
2020-05-16 00:00:00	874,411	2,181,356
2020-05-17 00:00:00	874,331	2,196,239
2020-05-18 00:00:00	874,281	2,210,352
2020-05-19 00:00:00	874,281	2,224,615
2020-05-20 00:00:00	874,230	2,239,673
2020-05-21 00:00:00	874,230	2,256,151
2020-05-22 00:00:00	874,139	2,271,188
2020-05-23 00:00:00	874,139	2,285,395
2020-05-24 00:00:00	874,034	2,296,896
2020-05-25 00:00:00	873,995	2,310,047
2020-05-26 00:00:00	873,962	2,321,991
2020-05-27 00:00:00	873,927	2,334,793
2020-05-28 00:00:00	873,912	2,349,559
2020-05-29 00:00:00	873,887	2,367,186
2020-05-30 00:00:00	873,887	2,385,099
2020-05-31 00:00:00	873,858	2,400,622
2020-06-01 00:00:00	873,858	2,420,639
2020-06-02 00:00:00	873,800	2,438,981
2020-06-03 00:00:00	873,766	2,455,332
2020-06-04 00:00:00	873,722	2,471,322
2020-06-05 00:00:00	873,670	2,488,564
2020-06-06 00:00:00	873,670	2,503,957
2020-06-07 00:00:00	873,618	2,521,004
2020-06-08 00:00:00	873,586	2,538,741
2020-06-09 00:00:00	873,560	2,557,452
2020-06-10 00:00:00	873,541	2,575,143

Date	Number of fish	Biomass
2020-06-11 00:00:00	873,521	2,592,777
2020-06-12 00:00:00	873,502	2,609,054
2020-06-13 00:00:00	873,478	2,625,922
2020-06-14 00:00:00	873,478	2,642,273
2020-06-15 00:00:00	873,432	2,661,573
2020-06-16 00:00:00	873,384	2,677,189
2020-06-17 00:00:00	873,355	2,693,638
2020-06-18 00:00:00	873,326	2,711,320
2020-06-19 00:00:00	873,305	2,728,586
2020-06-20 00:00:00	873,284	2,746,443
2020-06-21 00:00:00	873,284	2,765,274
2020-06-22 00:00:00	873,252	2,781,437
2020-06-23 00:00:00	873,252	2,795,872
2020-06-24 00:00:00	873,219	2,814,078
2020-06-25 00:00:00	873,194	2,833,249
2020-06-26 00:00:00	873,162	2,850,466
2020-06-27 00:00:00	873,147	2,868,654
2020-06-28 00:00:00	873,147	2,880,856
2020-06-29 00:00:00	873,102	2,899,741
2020-06-30 00:00:00	873,065	2,917,393
2020-07-01 00:00:00	873,037	2,933,971
2020-07-02 00:00:00	873,008	2,952,657
2020-07-03 00:00:00	872,987	2,972,296
2020-07-04 00:00:00	872,987	2,991,583
2020-07-05 00:00:00	872,959	3,010,367
2020-07-06 00:00:00	872,937	3,028,086

Date	Number of fish	Biomass
2020-07-07 00:00:00	872,904	3,047,041
2020-07-08 00:00:00	872,881	3,053,076
2020-07-09 00:00:00	872,860	3,070,988
2020-07-10 00:00:00	872,849	3,083,420
2020-07-11 00:00:00	872,826	3,096,754
2020-07-12 00:00:00	872,826	3,109,635
2020-07-13 00:00:00	872,030	3,118,652
2020-07-14 00:00:00	871,446	3,129,378
2020-07-15 00:00:00	871,191	3,145,153
2020-07-16 00:00:00	871,191	3,163,373
2020-07-17 00:00:00	871,103	3,181,790
2020-07-18 00:00:00	871,103	3,199,696
2020-07-19 00:00:00	871,053	3,219,192
2020-07-20 00:00:00	871,029	3,235,605
2020-07-21 00:00:00	870,999	3,255,305
2020-07-22 00:00:00	870,969	3,274,424
2020-07-23 00:00:00	870,945	3,292,964
2020-07-24 00:00:00	870,908	3,314,796
2020-07-25 00:00:00	870,881	3,337,721
2020-07-26 00:00:00	870,881	3,359,802
2020-07-27 00:00:00	870,881	3,380,691
2020-07-28 00:00:00	857,911	3,340,019
2020-07-29 00:00:00	840,635	3,283,633
2020-07-30 00:00:00	813,758	3,180,602
2020-07-31 00:00:00	813,737	3,200,743
2020-08-01 00:00:00	813,707	3,215,441

Date	Number of fish	Biomass
2020-08-02 00:00:00	813,707	3,234,350
2020-08-03 00:00:00	792,947	3,153,712
2020-08-04 00:00:00	770,388	3,066,141
2020-08-05 00:00:00	746,001	2,971,420
2020-08-06 00:00:00	729,493	2,909,486
2020-08-07 00:00:00	729,464	2,930,450
2020-08-08 00:00:00	729,432	2,948,886
2020-08-09 00:00:00	729,432	2,966,577
2020-08-10 00:00:00	694,089	2,813,193
2020-08-11 00:00:00	671,570	2,713,818
2020-08-12 00:00:00	647,791	2,608,814
2020-08-13 00:00:00	628,880	2,529,597
2020-08-14 00:00:00	628,842	2,542,192
2020-08-15 00:00:00	628,842	2,555,103
2020-08-16 00:00:00	628,763	2,565,249
2020-08-17 00:00:00	605,898	2,469,862
2020-08-18 00:00:00	590,384	2,418,674
2020-08-19 00:00:00	574,232	2,366,101
2020-08-20 00:00:00	555,726	2,298,549
2020-08-21 00:00:00	555,678	2,313,206
2020-08-22 00:00:00	555,616	2,326,033
2020-08-23 00:00:00	555,616	2,339,902
2020-08-24 00:00:00	546,768	2,311,390
2020-08-25 00:00:00	526,534	2,228,828
2020-08-26 00:00:00	508,734	2,154,777
2020-08-27 00:00:00	508,601	2,167,343

Date	Number of fish	Biomass
2020-08-28 00:00:00	508,547	2,179,402
2020-08-29 00:00:00	508,494	2,189,975
2020-08-30 00:00:00	508,428	2,200,174
2020-08-31 00:00:00	496,053	2,147,002
2020-09-01 00:00:00	475,277	2,057,696
2020-09-02 00:00:00	458,951	1,988,756
2020-09-03 00:00:00	458,951	1,994,928
2020-09-04 00:00:00	458,951	2,009,031
2020-09-05 00:00:00	458,951	2,017,019
2020-09-06 00:00:00	458,868	2,029,197
2020-09-07 00:00:00	445,134	1,966,570
2020-09-08 00:00:00	424,257	1,873,167
2020-09-09 00:00:00	407,525	1,799,688
2020-09-10 00:00:00	407,477	1,804,115
2020-09-11 00:00:00	407,419	1,810,317
2020-09-12 00:00:00	407,419	1,821,014
2020-09-13 00:00:00	407,293	1,831,437
2020-09-14 00:00:00	397,429	1,795,806
2020-09-15 00:00:00	383,780	1,743,434
2020-09-16 00:00:00	383,747	1,754,042
2020-09-17 00:00:00	365,035	1,672,549
2020-09-18 00:00:00	364,974	1,684,031
2020-09-19 00:00:00	364,974	1,695,169
2020-09-20 00:00:00	364,920	1,704,776
2020-09-21 00:00:00	357,951	1,676,903
2020-09-22 00:00:00	342,113	1,607,629

Date	Number of fish	Biomass
2020-09-23 00:00:00	331,706	1,559,229
2020-09-24 00:00:00	331,697	1,568,571
2020-09-25 00:00:00	331,697	1,578,815
2020-09-26 00:00:00	331,697	1,588,023
2020-09-27 00:00:00	331,671	1,594,852
2020-09-28 00:00:00	319,969	1,536,621
2020-09-29 00:00:00	302,254	1,458,928
2020-09-30 00:00:00	286,869	1,392,909

g. Modelled currents data from A83 and SO06

Due to high data (count: 12,817 per site) of current magnitudes and directions, these data sets were provided in a separate Microsoft Excel (name: modelled_currents_A83_SO06).

h. CTD data from the IMTA site and reference site

i. June 04th, 2020

1. The reference site

cast001/SOR06/SO06		**29.3m depth**	
date,time	2020-06-04,09:17:42		
lon,lat	-7.358670020475984,62.073851013556116		
col_data	depth,temperature,salinity,fluorescence		
col_names	depth,pres,temp,sal,flu,ox		
col_units	m,degC,PSU,mg/m3		
depth	pres	temp	sal
1	1.01	8.302	35.0589
2	2.019	8.2922	35.0537
3	3.029	8.3038	35.0499
4	4.039	8.298	35.0529
5	5.048	8.2925	35.0542
6	6.058	8.295	35.0532
7	7.068	8.2922	35.0574
8	8.078	8.2894	35.0612
9	9.087	8.2849	35.0648
10	10.097000000000001	8.2762	35.0657
11	11.107000000000001	8.2855	35.0656
12	12.116	8.2879	35.0654
13	13.126	8.2928	35.0661
14	14.136	8.2927	35.0664
15	15.145999999999999	8.2933	35.0666
16	16.155	8.2942	35.0682
17	17.165	8.2726	35.0695
18	18.175	8.266	35.0696
19	19.185	8.2531	35.068
20	20.195	8.2388	35.0682
21	21.204	8.2334	35.0701
22	22.214000000000002	8.2334	35.0705
23	23.224	8.2236	35.0757
24	24.234	8.2118	35.0789
25	25.243000000000002	8.2136	35.0778
26	26.253	8.2113	35.0781
27	27.263	8.2027	35.0808
28	28.273000000000003	8.1847	35.0884
29	29.283	8.1825	35.09

2. The IMTA site

cast003/SOR11/A83		37.8m depth	
date,time	2020-06-04,10:05:17		
lon,lat	-7.376432027667762,62.07827799953521		
col_data	depth,temperature,salinity,fluorescence		
col_names	depth,pres,temp,sal,flu,ox		
col_units	m,degC,PSU,mg/m3		
depth	pres	temp	sal
1	1.01	8.5164	35.0531
2	2.019	8.5108	35.0521
3	3.029	8.515	35.0523
4	4.039	8.5054	35.0516
5	5.048	8.4999	35.0509
6	6.058	8.4943	35.0505
7	7.068	8.4827	35.05
8	8.078	8.4628	35.0495
9	9.087	8.4319	35.0521
10	10.097000000000001	8.2148	35.0887
11	11.107000000000001	8.1367	35.0934
12	12.116	8.1325	35.0926
13	13.126	8.1322	35.0927
14	14.136	8.1325	35.093
15	15.145999999999999	8.1311	35.0934
16	16.155	8.1196	35.0935
17	17.165	8.1178	35.0936
18	18.175	8.1201	35.0937
19	19.185	8.1153	35.0939
20	20.195	8.1189	35.0939
21	21.204	8.1183	35.0941
22	22.214000000000002	8.1001	35.0949
23	23.224	8.0954	35.0952
24	24.234	8.0965	35.0956
25	25.243000000000002	8.0972	35.096
26	26.253	8.0992	35.0961
27	27.263	8.0999	35.0964
28	28.273000000000003	8.0996	35.0965
29	29.283	8.0996	35.0965
30	30.293000000000003	8.0999	35.0964
31	31.302	8.0995	35.0964
32	32.312	8.0999	35.0963
33	33.321999999999996	8.1007	35.0963

ii. June 25th, 2020

1. The reference site

cast001/SOR06/SO06		29.3m depth	
date,time	2020-06-25,10:02:30		
lon,lat	-7.359030023,62.07394598		
col_data	depth,pressure,temperature,salinity,fluorescence,oxygen consentration		
col_names	depth,press,temp,sal,flu,ox_cons		
col_units	m,dbar,degC,PSU,mg/m3,mg/L		
depth	press	temp	sal
1	1.010	9.2104	35.0504
2	2.019	9.1270	35.0704
3	3.029	9.0867	35.0776
4	4.039	9.0770	35.0790
5	5.048	9.0674	35.0810
6	6.058	9.0569	35.0815
7	7.068	9.0504	35.0814
8	8.078	9.0124	35.0891
9	9.087	8.9652	35.0993
10	10.097	8.9455	35.1045
11	11.107	8.9395	35.1052
12	12.116	8.9335	35.1061
13	13.126	8.9306	35.1064
14	14.136	8.9299	35.1070
15	15.146	8.9257	35.1081
16	16.155	8.9200	35.1078
17	17.165	8.9149	35.1083
18	18.175	8.9125	35.1089
19	19.185	8.9116	35.1088
20	20.194	8.9114	35.1089
21	21.204	8.9100	35.1089
22	22.214	8.9058	35.1088
23	23.224	8.8948	35.1088
24	24.234	8.8885	35.1089
25	25.243	8.8814	35.1086
26	26.253	8.8778	35.1083
27	27.263	8.8617	35.1083
28	28.273	8.8450	35.1075
29	29.283	8.8467	35.1073
30	30.293	8.8513	35.1074

2. The IMTA site

cast003/SOR11/A83		37.8m depth	
date,time	2020-06-25,11:02:07		
lon,lat	-7.376222983,62.078523		
col_data	depth,pressure,temperature,salinity,fluorescence,oxygen consentration		
col_names	depth,press,temp,sal,flu,ox_cons		
col_units	m,dbar,degC,PSU,mg/m3,mg/L		
depth	press	temp	sal
1	1.010	9.0409	35.0957
2	2.019	9.0069	35.1013
3	3.029	8.9273	35.1059
4	4.039	8.8790	35.1066
5	5.048	8.8792	35.1059
6	6.058	8.8802	35.1056
7	7.068	8.8766	35.1062
8	8.078	8.8769	35.1061
9	9.087	8.8789	35.1062
10	10.097	8.8832	35.1058
11	11.107	8.8864	35.1058
12	12.116	8.8882	35.1058
13	13.126	8.8860	35.1060
14	14.136	8.8826	35.1063
15	15.146	8.8825	35.1062
16	16.155	8.8818	35.1063
17	17.165	8.8814	35.1063
18	18.175	8.8828	35.1061
19	19.185	8.8800	35.1058
20	20.195	8.8729	35.1069
21	21.204	8.8764	35.1067
22	22.214	8.8781	35.1067
23	23.224	8.8830	35.1064
24	24.234	8.8853	35.1063
25	25.243	8.8857	35.1064
26	26.253	8.8861	35.1066
27	27.263	8.8914	35.1076
28	28.273	8.8936	35.1075
29	29.283	8.8939	35.1074
30	30.292	8.8931	35.1073
31	31.302	8.8930	35.1074
32	32.312	8.8922	35.1074
33	33.322	8.8897	35.1076
34	34.332	8.8827	35.1073
35	35.342	8.8832	35.1074
36	36.352	8.8801	35.1070
37	37.361	8.8788	35.1074
38	38.371	8.8762	35.1076
39	39.381	8.8765	35.1075
40	40.391	8.8826	35.1079
41	41.401	8.8779	35.1081
42	42.411	8.8838	35.1078
43	43.421	8.8854	35.1080
44	44.431	8.8766	35.1080
45	45.440	8.8821	35.1078
46	46.450	8.8753	35.1077
47	47.460	8.8750	35.1078

iii. July 02nd, 2020

1. The reference site

cast001/SOR06/SO06		29.3m depth	
date,time	2020-07-02,09:28:02		
lon,lat	-7.358809998258947,62.073568040505045		
col_data	depth,pressure,temperature,salinity,fluorescence,oxygen consentration		
col_names	depth,press,temp,sal,flu,ox_cons		
col_units	m,dbar,degC,PSU,mg/m3,mg/L		
depth	press	temp	sal
1	1.010	9.7232	34.9722
2	2.019	9.7164	34.9727
3	3.029	9.6944	34.9729
4	4.039	9.6845	34.9724
5	5.048	9.6622	34.9767
6	6.058	9.6534	34.9841
7	7.068	9.5949	35.0261
8	8.078	9.4972	35.0566
9	9.087	9.4198	35.0626
10	10.097	9.3678	35.0791
11	11.107	9.3337	35.0872
12	12.116	9.2971	35.0913
13	13.126	9.2726	35.0934
14	14.136	9.2514	35.0952
15	15.146	9.2376	35.0961
16	16.155	9.2285	35.0972
17	17.165	9.2098	35.0985
18	18.175	9.2037	35.0988
19	19.185	9.1946	35.0992
20	20.195	9.1872	35.0997
21	21.204	9.1845	35.0998
22	22.214	9.1797	35.1001
23	23.224	9.1754	35.1003
24	24.234	9.1740	35.1006
25	25.243	9.1668	35.1010
26	26.253	9.1590	35.1019
27	27.263	9.1558	35.1018

2. The IMTA site

cast003/SOR11/A83		37.8m depth	
date,time	2020-07-02,10:16:39		
lon,lat	-7.37617202103138,62.07825696095824		
col_data	depth,pressure,temperature,salinity,fluorescence,oxygen consentration		
col_names	depth,press,temp,sal,flu,ox_cons		
col_units	m,dbar,degC,PSU,mg/m3,mg/L		
depth	press	temp	sal
1	1.010	9.4214	35.0443
2	2.019	9.4200	35.0444
3	3.029	9.4053	35.0437
4	4.039	9.3945	35.0431
5	5.048	9.3418	35.0420
6	6.058	9.3249	35.0440
7	7.068	9.3233	35.0467
8	8.078	9.2992	35.0597
9	9.087	9.2230	35.0866
10	10.097	9.1826	35.0947
11	11.107	9.1483	35.0976
12	12.116	9.1269	35.0985
13	13.126	9.0992	35.0999
14	14.136	9.0968	35.1003
15	15.146	9.0945	35.1016
16	16.155	9.0986	35.1033
17	17.165	9.1004	35.1047
18	18.175	9.0999	35.1051
19	19.185	9.0987	35.1056
20	20.195	9.0974	35.1058
21	21.204	9.0977	35.1062
22	22.214	9.0978	35.1065
23	23.224	9.0969	35.1068
24	24.234	9.0967	35.1067
25	25.243	9.0977	35.1077
26	26.253	9.0965	35.1082
27	27.263	9.0975	35.1089
28	28.273	9.0975	35.1091
29	29.283	9.0969	35.1090
30	30.293	9.0966	35.1091
31	31.302	9.0966	35.1092
32	32.312	9.0964	35.1091
33	33.322	9.0953	35.1089
34	34.332	9.0945	35.1087

iv. July 14th, 2020

1. The reference site

cast004/SOR06/SO06		29.3m depth	
date,time	2020-07-14,12:19:56		
lon,lat	-7.35876197,62.07377901		
col_data	depth,pressure,temperature,salinity,fluorescence,oxygen consentration		
col_names	depth,press,temp,sal,flu,ox_cons		
col_units	m,dbar,degC,PSU,mg/m3,mg/L		
depth	press	temp	sal
1	1.010	9.9738	35.0820
2	2.019	9.9605	35.0866
3	3.029	9.9467	35.0864
4	4.039	9.8874	35.0898
5	5.048	9.7606	35.0935
6	6.058	9.7426	35.0930
7	7.068	9.7240	35.0939
8	8.078	9.6968	35.0948
9	9.087	9.6943	35.0945
10	10.097	9.6946	35.0946
11	11.107	9.6935	35.0948
12	12.116	9.6350	35.1003
13	13.126	9.5236	35.1085
14	14.136	9.4963	35.1099
15	15.146	9.4933	35.1100
16	16.155	9.4908	35.1100
17	17.165	9.4883	35.1103
18	18.175	9.4848	35.1110
19	19.185	9.4805	35.1115
20	20.195	9.4762	35.1123
21	21.204	9.4738	35.1127
22	22.214	9.4656	35.1135
23	23.224	9.4544	35.1142
24	24.234	9.4508	35.1139
25	25.243	9.4473	35.1141
26	26.253	9.4437	35.1142
27	27.263	9.4288	35.1152
28	28.273	9.4155	35.1151
29	29.283	9.3918	35.1148

2. The IMTA site

cast003/SOR11/A83		**37.8m depth**	
date,time	2020-07-14,12:04:52		
lon,lat	-7.3761860189999995,62.07811698		
col_data	depth,pressure,temperature,salinity,fluorescence,oxygen consentration		
col_names	depth,press,temp,sal,flu,ox_cons		
col_units	m,dbar,degC,PSU,mg/m3,mg/L		
depth	press	temp	sal
1	1.010	9.7082	35.1052
2	2.019	9.7000	35.1057
3	3.029	9.6369	35.1053
4	4.039	9.5926	35.1056
5	5.048	9.5711	35.1055
6	6.058	9.5722	35.1050
7	7.068	9.5690	35.1053
8	8.078	9.5515	35.1063
9	9.087	9.5352	35.1068
10	10.097	9.5324	35.1069
11	11.107	9.5287	35.1070
12	12.116	9.5240	35.1072
13	13.126	9.5099	35.1079
14	14.136	9.5029	35.1083
15	15.146	9.5007	35.1084
16	16.155	9.4996	35.1086
17	17.165	9.4992	35.1086
18	18.175	9.5008	35.1085
19	19.185	9.4952	35.1092
20	20.195	9.4607	35.1108
21	21.204	9.4685	35.1101
22	22.214	9.4659	35.1104
23	23.224	9.4575	35.1109
24	24.234	9.4296	35.1123
25	25.243	9.4187	35.1126
26	26.253	9.4082	35.1126
27	27.263	9.3910	35.1124
28	28.273	9.3855	35.1123
29	29.283	9.3825	35.1122
30	30.293	9.3798	35.1122
31	31.302	9.3749	35.1121

v. July 24th, 2020

1. The reference site

cast001/SOR06/SO06		29.3m depth	
date,time	2020-07-24,09:39:24		
lon,lat	-7.35831303521991,62.0738289691508		
col_data	depth,pressure,temperature,salinity,fluorescence,oxygen con:		
col_names	depth,press,temp,sal,flu,ox_cons		
col_units	m,dbar,degC,PSU,mg/m3,mg/L		
depth	press	temp	sal
1	1.010	10.1984	35.0266
2	2.019	10.2104	35.0253
3	3.029	10.1814	35.0306
4	4.039	10.1254	35.0427
5	5.048	10.0822	35.0498
6	6.058	10.0088	35.0726
7	7.068	9.9916	35.0833
8	8.078	9.9814	35.0862
9	9.087	9.9552	35.0878
10	10.097	9.9367	35.0890
11	11.107	9.9266	35.0898
12	12.116	9.9148	35.0913
13	13.126	9.9045	35.0927
14	14.136	9.8974	35.0936
15	15.146	9.8903	35.0938
16	16.155	9.8873	35.0943
17	17.165	9.8807	35.0927
18	18.175	9.8742	35.0851
19	19.185	9.8655	35.0939
20	20.195	9.8628	35.0938
21	21.204	9.8552	35.0938
22	22.214	9.8451	35.0929
23	23.224	9.8282	35.0913
24	24.234	9.8184	35.0916
25	25.243	9.8159	35.0917
26	26.253	9.8119	35.0921
27	27.263	9.7934	35.0919
28	28.273	9.7865	35.0920
29	29.283	9.7798	35.0918
30	30.293	9.7733	35.0890

2. The IMTA site

cast003/SOR11/A83		**37.8m depth**	
date,time	2020-07-24,10:33:10		
lon,lat	-7.376570999622349,62.0784390158951		
col_data	depth,pressure,temperature,salinity,fluorescence,oxygen con:		
col_names	depth,press,temp,sal,flu,ox_cons		
col_units	m,dbar,degC,PSU,mg/m3,mg/L		
depth	press	temp	sal
1	1.010	10.2678	35.0182
2	2.019	10.0974	35.0512
3	3.029	9.8784	35.0869
4	4.039	9.8731	35.0859
5	5.048	9.8683	35.0859
6	6.058	9.8621	35.0854
7	7.068	9.8596	35.0854
8	8.078	9.8543	35.0881
9	9.087	9.8541	35.0884
10	10.097	9.8458	35.0924
11	11.107	9.8269	35.0958
12	12.116	9.8217	35.0958
13	13.126	9.8220	35.0961
14	14.136	9.8243	35.0961
15	15.146	9.8250	35.0963
16	16.155	9.8230	35.0968
17	17.165	9.8203	35.0969
18	18.175	9.8157	35.0968
19	19.185	9.8089	35.0959
20	20.194	9.8068	35.0956
21	21.204	9.8078	35.0951
22	22.214	9.8118	35.0960
23	23.224	9.8117	35.0958
24	24.234	9.8125	35.0960
25	25.243	9.8095	35.0961
26	26.253	9.8073	35.0957
27	27.263	9.8127	35.0977
28	28.273	9.8144	35.0978
29	29.283	9.8152	35.0972
30	30.293	9.8309	35.1029
31	31.302	9.8409	35.1050
32	32.312	9.8389	35.1032
33	33.322	9.8321	35.1015
34	34.332	9.8298	35.1008
35	35.342	9.8355	35.1030
36	36.352	9.8365	35.1062
37	37.361	9.8281	35.1071
38	38.371	9.8150	35.1070
39	39.381	9.8073	35.1066
40	40.391	9.8111	35.1063

vi. August 03rd, 2020

1. The reference site

cast001/SOR06/SO06		**29.3m depth**	
date,time	2020-08-03,09:18:06		
lon,lat	-7.358418982476,62.0739279594272		
col_data	depth,pressure,temperature,salinity,fluorescence,oxygen con:		
col_names	depth,press,temp,sal,flu,ox_cons		
col_units	m,dbar,degC,PSU,mg/m3,mg/L		
depth	press	temp	sal
1	1.010	10.0817	34.5936
2	2.019	10.0765	34.7373
3	3.029	10.0661	34.7749
4	4.039	10.0768	34.8175
5	5.048	10.0878	34.8537
6	6.058	10.0778	34.8892
7	7.068	10.0809	34.9174
8	8.078	10.0822	34.9570
9	9.087	10.0559	35.0090
10	10.097	10.0317	35.0245
11	11.107	10.0214	35.0298
12	12.116	10.0183	35.0333
13	13.126	10.0133	35.0355
14	14.136	10.0149	35.0375
15	15.146	10.0173	35.0393
16	16.155	10.0157	35.0415
17	17.165	10.0056	35.0432
18	18.175	9.9963	35.0452
19	19.185	9.9816	35.0476
20	20.194	9.9810	35.0499
21	21.204	9.9709	35.0517
22	22.214	9.9619	35.0523
23	23.224	9.9656	35.0554
24	24.234	9.9732	35.0587
25	25.243	9.9764	35.0603
26	26.253	9.9738	35.0610
27	27.263	9.9627	35.0604
28	28.273	9.9574	35.0605
29	29.283	9.9400	35.0625
30	30.292	9.9176	35.0622

2. The IMTA site

cast003/SOR11/A83		**37.8m depth**	
date,time	2020-08-03,10:44:42		
lon,lat	-7.376212002709511,62.0784499961883		
col_data	depth,pressure,temperature,salinity,fluorescence,oxygen con:		
col_names	depth,press,temp,sal,flu,ox_cons		
col_units	m,dbar,degC,PSU,mg/m3,mg/L		
depth	press	temp	sal
1	1.010	10.0215	34.9282
2	2.019	10.0219	34.9290
3	3.029	10.0149	34.9541
4	4.039	10.0058	34.9913
5	5.048	9.9967	35.0086
6	6.058	9.9958	35.0303
7	7.068	9.9916	35.0420
8	8.078	9.9885	35.0449
9	9.087	9.9840	35.0471
10	10.097	9.9780	35.0497
11	11.107	9.9721	35.0520
12	12.116	9.9715	35.0522
13	13.126	9.9677	35.0532
14	14.136	9.9649	35.0537
15	15.146	9.9555	35.0543
16	16.155	9.9547	35.0550
17	17.165	9.9534	35.0564
18	18.175	9.9513	35.0581
19	19.185	9.9487	35.0606
20	20.195	9.9471	35.0611
21	21.204	9.9475	35.0612
22	22.214	9.9467	35.0616
23	23.224	9.9471	35.0616
24	24.234	9.9446	35.0623
25	25.243	9.9411	35.0629
26	26.253	9.9412	35.0632
27	27.263	9.9396	35.0633
28	28.273	9.9383	35.0632
29	29.283	9.9384	35.0635
30	30.293	9.9410	35.0640
31	31.302	9.9412	35.0640
32	32.312	9.9409	35.0644
33	33.322	9.9407	35.0646
34	34.332	9.9403	35.0648
35	35.342	9.9395	35.0652
36	36.352	9.9388	35.0655
37	37.361	9.9383	35.0654
38	38.371	9.9369	35.0653
39	39.381	9.9371	35.0653
40	40.391	9.9371	35.0652
41	41.401	9.9373	35.0652
42	42.411	9.9366	35.0652
43	43.421	9.9345	35.0651

vii. August 14th, 2020

1. The reference site

cast001/SOR06/SO06		**29.3m depth**	
date,time	2020-08-14,10:05:02		
lon,lat	-7.358837994,62.07394397		
col_data	depth,pressure,temperature,salinity,fluorescence,oxygen consentration		
col_names	depth,press,temp,sal,flu,ox_cons		
col_units	m,dbar,degC,PSU,mg/m3,mg/L		
depth	press	temp	sal
1	1.010	10.9705	34.8964
2	2.019	10.9669	34.9582
3	3.029	10.9150	34.9712
4	4.039	10.8203	34.9832
5	5.048	10.8087	34.9885
6	6.058	10.6367	35.0514
7	7.068	10.4932	35.0805
8	8.078	10.4568	35.0820
9	9.087	10.4285	35.0826
10	10.097	10.3890	35.0834
11	11.107	10.3454	35.0835
12	12.116	10.3362	35.0836
13	13.126	10.3276	35.0854
14	14.136	10.3179	35.0865
15	15.146	10.2965	35.0882
16	16.155	10.2865	35.0892
17	17.165	10.2816	35.0899
18	18.175	10.2672	35.0911
19	19.185	10.2601	35.0912
20	20.195	10.2423	35.0892
21	21.204	10.2400	35.0894
22	22.214	10.2422	35.0901
23	23.224	10.2410	35.0904
24	24.234	10.2335	35.0902
25	25.243	10.2197	35.0893
26	26.253	10.2096	35.0892
27	27.263	10.2006	35.0885
28	28.273	10.1989	35.0882
29	29.283	10.1977	35.0877

2. The IMTA site

cast003/SOR11/A83		**37.8m depth**	
date,time	2020-08-14,10:59:42		
lon,lat	-7.376134972999999,62.07846299		
col_data	depth,pressure,temperature,salinity,fluorescence,oxygen consentration		
col_names	depth,press,temp,sal,flu,ox_cons		
col_units	m,dbar,degC,PSU,mg/m3,mg/L		
depth	press	temp	sal
1	1.010	10.8807	35.0007
2	2.019	10.8803	35.0006
3	3.029	10.8833	34.9987
4	4.039	10.8165	35.0158
5	5.048	10.7242	35.0383
6	6.058	10.7099	35.0409
7	7.068	10.6052	35.0625
8	8.078	10.5454	35.0752
9	9.087	10.5036	35.0802
10	10.097	10.4567	35.0840
11	11.107	10.4236	35.0858
12	12.116	10.3970	35.0877
13	13.126	10.3647	35.0896
14	14.136	10.3479	35.0908
15	15.146	10.3291	35.0929
16	16.155	10.3133	35.0949
17	17.165	10.3131	35.0952
18	18.175	10.3132	35.0955
19	19.185	10.3107	35.0962
20	20.194	10.3076	35.0970
21	21.204	10.3014	35.0980
22	22.214	10.2967	35.0982
23	23.224	10.2868	35.0989
24	24.234	10.2821	35.0999
25	25.243	10.2813	35.1003
26	26.253	10.2812	35.1004
27	27.263	10.2821	35.1006
28	28.273	10.2819	35.1006
29	29.283	10.2790	35.1009
30	30.293	10.2764	35.1010
31	31.302	10.2746	35.1010
32	32.312	10.2711	35.1008
33	33.322	10.2680	35.1003
34	34.332	10.2634	35.0996
35	35.342	10.2534	35.0989
36	36.352	10.2315	35.0970
37	37.361	10.2186	35.0955
38	38.371	10.2086	35.0942
39	39.381	10.1846	35.0916
40	40.391	10.1732	35.0903
41	41.401	10.1616	35.0890
42	42.411	10.1357	35.0865
43	43.421	10.1324	35.0859
44	44.431	10.1215	35.0848

viii. August 24th, 2020

1. The reference site

cast001/SOR06/SO06		29.3m depth	
date,time	2020-08-24,09:20:06		
lon,lat	-7.358741015,62.07394497		
col_data	depth,pressure,temperature,salinity,fluorescence,oxygen consentration		
col_names	depth,press,temp,sal,flu,ox_cons		
col_units	m,dbar,degC,PSU,mg/m3,mg/L		
depth	press	temp	sal
1	1.010	10.5737	34.9734
2	2.019	10.5606	34.9774
3	3.029	10.5221	34.9731
4	4.039	10.5240	34.9786
5	5.048	10.5351	34.9925
6	6.058	10.5058	35.0218
7	7.068	10.4102	35.0713
8	8.078	10.4084	35.0744
9	9.087	10.4085	35.0746
10	10.097	10.4089	35.0747
11	11.107	10.4081	35.0749
12	12.116	10.4075	35.0751
13	13.126	10.4071	35.0753
14	14.136	10.4054	35.0759
15	15.146	10.4006	35.0776
16	16.155	10.3977	35.0786
17	17.165	10.3971	35.0787
18	18.175	10.3951	35.0792
19	19.185	10.3953	35.0791
20	20.195	10.3947	35.0794
21	21.204	10.3926	35.0801
22	22.214	10.3918	35.0798
23	23.224	10.3893	35.0796
24	24.234	10.3892	35.0795
25	25.243	10.3891	35.0795
26	26.253	10.3893	35.0794
27	27.263	10.3889	35.0795
28	28.273	10.3888	35.0795
29	29.283	10.3873	35.0796
30	30.293	10.3875	35.0796

2. The IMTA site

cast003/SOR11/A83		**37.8m depth**	
date,time	2020-08-24,10:10:47		
lon,lat	-7.376374025,62.07820600000001		
col_data	depth,pressure,temperature,salinity,fluorescence,oxygen consentration		
col_names	depth,press,temp,sal,flu,ox_cons		
col_units	m,dbar,degC,PSU,mg/m3,mg/L		
depth	press	temp	sal
1	1.010	10.5839	34.8550
2	2.019	10.5801	34.9168
3	3.029	10.5762	34.9743
4	4.039	10.5713	34.9821
5	5.048	10.5318	35.0204
6	6.058	10.5106	35.0350
7	7.068	10.4977	35.0412
8	8.078	10.4942	35.0428
9	9.087	10.4828	35.0487
10	10.097	10.4684	35.0551
11	11.107	10.4414	35.0654
12	12.116	10.4214	35.0713
13	13.126	10.4152	35.0727
14	14.136	10.4117	35.0746
15	15.146	10.4089	35.0754
16	16.155	10.4070	35.0766
17	17.165	10.4051	35.0772
18	18.175	10.3966	35.0786
19	19.185	10.3941	35.0791
20	20.195	10.3907	35.0800
21	21.204	10.3900	35.0802
22	22.214	10.3897	35.0805
23	23.224	10.3893	35.0807
24	24.234	10.3896	35.0806
25	25.243	10.3895	35.0806
26	26.253	10.3870	35.0814
27	27.263	10.3855	35.0820
28	28.273	10.3845	35.0824
29	29.283	10.3819	35.0828
30	30.293	10.3810	35.0829
31	31.302	10.3804	35.0830
32	32.312	10.3752	35.0838
33	33.322	10.3713	35.0843
34	34.332	10.3669	35.0852

ix. September 02nd, 2020

1. The reference site

cast001/SOR06/SO06		**29.3m depth**	
date,time	2020-09-02,09:22:21		
lon,lat	-7.35884998,62.07399501		
col_data	depth,pressure,temperature,salinity,fluorescence,oxygen consentration		
col_names	depth,press,temp,sal,flu,ox_cons		
col_units	m,dbar,degC,PSU,mg/m3,mg/L		
depth	press	temp	sal
1	1.010	10.4334	35.0829
2	2.019	10.4329	35.0837
3	3.029	10.4313	35.0856
4	4.039	10.4305	35.0865
5	5.048	10.4291	35.0881
6	6.058	10.4281	35.0889
7	7.068	10.4270	35.0901
8	8.078	10.4268	35.0904
9	9.087	10.4264	35.0908
10	10.097	10.4245	35.0923
11	11.107	10.4218	35.0942
12	12.116	10.4181	35.0965
13	13.126	10.4182	35.0966
14	14.136	10.4158	35.0979
15	15.146	10.4149	35.0983
16	16.155	10.4154	35.0982
17	17.165	10.4138	35.0989
18	18.175	10.4093	35.1007
19	19.185	10.4077	35.1012
20	20.195	10.4072	35.1012
21	21.204	10.4056	35.1021
22	22.214	10.4050	35.1029
23	23.224	10.3996	35.1038
24	24.234	10.3960	35.1042
25	25.243	10.3948	35.1044
26	26.253	10.3946	35.1044
27	27.263	10.3947	35.1044
28	28.273	10.3949	35.1042
29	29.283	10.3948	35.1045
30	30.293	10.3951	35.1045

2. The IMTA site

cast003/SOR11/A83		37.8m depth	
date,time	2020-09-02,10:02:00		
lon,lat	-7.376433033,62.07835302		
col_data	depth,pressure,temperature,salinity,fluorescence,oxygen consentration		
col_names	depth,press,temp,sal,flu,ox_cons		
col_units	m,dbar,degC,PSU,mg/m3,mg/L		
depth	press	temp	sal
1	1.010	10.4616	35.0305
2	2.019	10.4581	35.0403
3	3.029	10.4601	35.0327
4	4.039	10.4547	35.0524
5	5.048	10.4516	35.0633
6	6.058	10.4506	35.0669
7	7.068	10.4506	35.0673
8	8.078	10.4513	35.0692
9	9.087	10.4491	35.0720
10	10.097	10.4456	35.0767
11	11.107	10.4441	35.0796
12	12.116	10.4437	35.0803
13	13.126	10.4434	35.0809
14	14.136	10.4434	35.0810
15	15.146	10.4423	35.0819
16	16.156	10.4411	35.0828
17	17.165	10.4396	35.0838
18	18.175	10.4387	35.0842
19	19.185	10.4390	35.0842
20	20.195	10.4383	35.0847
21	21.204	10.4378	35.0849
22	22.214	10.4357	35.0862
23	23.224	10.4332	35.0875
24	24.234	10.4353	35.0863
25	25.243	10.4351	35.0866
26	26.253	10.4346	35.0871
27	27.263	10.4347	35.0870
28	28.273	10.4343	35.0873
29	29.283	10.4345	35.0872
30	30.293	10.4347	35.0872
31	31.302	10.4345	35.0874
32	32.312	10.4345	35.0875
33	33.322	10.4346	35.0876
34	34.332	10.4344	35.0878
35	35.342	10.4350	35.0874
36	36.352	10.4329	35.0882

x. September 11th, 2020

1. The reference site

cast001/SOR06/SO06		29.3m depth	
date,time	2020-09-11,12:01:41		
lon,lat	-7.358341031,62.073892		
col_data	depth,pressure,temperature,salinity,fluorescence,oxygen consentration		
col_names	depth,press,temp,sal,flu,ox_cons		
col_units	m,dbar,degC,PSU,mg/m3,mg/L		
depth	press	temp	sal
1	1.010	10.4494	33.9635
2	2.019	10.4538	34.0826
3	3.029	10.4628	34.2982
4	4.039	10.4680	34.3446
5	5.048	10.4675	34.5899
6	6.058	10.4516	34.9825
7	7.068	10.4463	35.0051
8	8.078	10.4375	35.0234
9	9.087	10.4339	35.0299
10	10.097	10.4270	35.0344
11	11.107	10.4224	35.0365
12	12.116	10.4213	35.0390
13	13.126	10.4208	35.0414
14	14.136	10.4251	35.0462
15	15.146	10.4282	35.0515
16	16.155	10.4272	35.0532
17	17.165	10.4275	35.0532
18	18.175	10.4255	35.0532
19	19.185	10.3886	35.0517
20	20.195	10.3800	35.0508
21	21.204	10.3798	35.0513
22	22.214	10.3793	35.0519
23	23.224	10.3785	35.0522
24	24.234	10.3779	35.0531
25	25.243	10.3774	35.0540
26	26.253	10.3775	35.0544
27	27.263	10.3770	35.0546
28	28.273	10.3766	35.0549
29	29.283	10.3770	35.0555
30	30.293	10.3763	35.0577

2. The IMTA site

cast003/SOR11/A83		**37.8m depth**	
date,time	2020-09-11,12:49:22		
lon,lat	-7.376113012,62.07825897		
col_data	depth,pressure,temperature,salinity,fluorescence,oxygen consentration		
col_names	depth,press,temp,sal,flu,ox_cons		
col_units	m,dbar,degC,PSU,mg/m3,mg/L		
depth	press	temp	sal
1	1.010	10.4352	34.7408
2	2.019	10.4357	34.7823
3	3.029	10.4400	34.9322
4	4.039	10.4478	34.9547
5	5.048	10.4441	35.0122
6	6.058	10.4274	35.0308
7	7.068	10.4132	35.0322
8	8.078	10.3993	35.0320
9	9.087	10.3953	35.0326
10	10.097	10.3922	35.0381
11	11.107	10.3873	35.0419
12	12.116	10.3863	35.0428
13	13.126	10.3862	35.0432
14	14.136	10.3859	35.0439
15	15.146	10.3845	35.0455
16	16.155	10.3825	35.0480
17	17.165	10.3800	35.0491
18	18.175	10.3799	35.0490
19	19.185	10.3770	35.0500
20	20.195	10.3761	35.0503
21	21.204	10.3752	35.0507
22	22.214	10.3737	35.0520
23	23.224	10.3739	35.0525
24	24.234	10.3746	35.0534
25	25.243	10.3751	35.0538
26	26.253	10.3752	35.0538
27	27.263	10.3754	35.0542
28	28.273	10.3754	35.0547
29	29.283	10.3751	35.0548
30	30.293	10.3748	35.0552
31	31.302	10.3746	35.0559
32	32.312	10.3736	35.0582
33	33.322	10.3725	35.0609
34	34.332	10.3718	35.0634
35	35.342	10.3715	35.0642
36	36.352	10.3715	35.0644
37	37.362	10.3715	35.0643

xi. September 23rd, 2020

1. The reference site

cast001/SOR06/SO06		29.3m depth	
date,time	2020-09-23,09:03:51		
lon,lat	-7.358817961000001,62.07387901		
col_data	depth,pressure,temperature,salinity,fluorescence,oxygen consent		
col_names	depth,press,temp,sal,flu,ox_cons		
col_units	m,dbar,degC,PSU,mg/m3,mg/L		
depth	press	temp	sal
1	1.010	10.0139	34.5262
2	2.019	10.2583	34.7780
3	3.029	10.3519	34.8946
4	4.039	10.3984	34.9943
5	5.048	10.3831	35.0253
6	6.058	10.3279	35.0256
7	7.068	10.3039	35.0295
8	8.078	10.3008	35.0329
9	9.087	10.3017	35.0344
10	10.097	10.3107	35.0388
11	11.107	10.3138	35.0414
12	12.116	10.3275	35.0459
13	13.126	10.3408	35.0510
14	14.136	10.3400	35.0525
15	15.146	10.3400	35.0544
16	16.155	10.3395	35.0558
17	17.165	10.3476	35.0587
18	18.175	10.3544	35.0613
19	19.185	10.3573	35.0627
20	20.194	10.3567	35.0631
21	21.204	10.3564	35.0633
22	22.214	10.3563	35.0637
23	23.224	10.3559	35.0643
24	24.234	10.3544	35.0654
25	25.243	10.3237	35.0622
26	26.253	10.3063	35.0588
27	27.263	10.3097	35.0594
28	28.273	10.3089	35.0594
29	29.283	10.3076	35.0593

2. The IMTA site

cast003/SOR11/A83		37.8m depth	
date,time	2020-09-23,09:52:25		
lon,lat	-7.3762170320000005,62.07839803		
col_data	depth,pressure,temperature,salinity,fluorescence,oxygen consent		
col_names	depth,press,temp,sal,flu,ox_cons		
col_units	m,dbar,degC,PSU,mg/m3,mg/L		
depth	press	temp	sal
1	1.010	10.1859	34.8886
2	2.019	10.2304	34.9498
3	3.029	10.2544	34.9947
4	4.039	10.2659	35.0014
5	5.048	10.2828	35.0137
6	6.058	10.2891	35.0190
7	7.068	10.2990	35.0284
8	8.078	10.2981	35.0326
9	9.087	10.2950	35.0356
10	10.097	10.2966	35.0396
11	11.107	10.2969	35.0404
12	12.116	10.2939	35.0403
13	13.126	10.2952	35.0412
14	14.136	10.2925	35.0429
15	15.146	10.2883	35.0430
16	16.155	10.2854	35.0446
17	17.165	10.2854	35.0452
18	18.175	10.2845	35.0457
19	19.185	10.2843	35.0458
20	20.194	10.2849	35.0457
21	21.204	10.2860	35.0457
22	22.214	10.2849	35.0463
23	23.224	10.2839	35.0465
24	24.234	10.2810	35.0465
25	25.244	10.2757	35.0460
26	26.253	10.2746	35.0458
27	27.263	10.2738	35.0457
28	28.273	10.2741	35.0457
29	29.283	10.2747	35.0457
30	30.293	10.2749	35.0455
31	31.302	10.2747	35.0457
32	32.312	10.2752	35.0459
33	33.322	10.2723	35.0456
34	34.332	10.2666	35.0450
35	35.342	10.2652	35.0451
36	36.352	10.2653	35.0474
37	37.361	10.2683	35.0482
38	38.371	10.2684	35.0487
39	39.381	10.2643	35.0503
40	40.391	10.2613	35.0513
41	41.401	10.2539	35.0550
42	42.411	10.2512	35.0560

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11.01.2022 M. Schlund

Date/ Datum Signature / Unterschrift

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