

DIPLOMA PROGRAM:

aho, spring 2017

**candidate**

Cecilie Schjetlein Sundt

**title:**

Processing Facility for Seaweed

**institute:**

The Institute of Form, Theory and History

**supervisor:**

Erik Fenstad Langdalen

## PROCESSING FACILITY FOR SEAWEED

Seaweed is one of the most unexploited natural resources on the planet. Norway has a large and rich occurrence of this re-growing resource and it can be turned into an important source of income. In the ongoing development of this new type of industry the use of seaweed is investigated in a huge range of commercial items including food, cosmetics, fertilizers and biomass. Because this resource is naturally spread along the coast both large-scale ocean farming and the small to medium-scale industry can and should be developed simultaneously.

I wish to investigate the architectural potential in this new industry, more specifically the small to medium scale industrial building where high quality food products, from wild growing seaweed are produced. The scale of the project is purposely chosen to be medium because it is a scale that can thrive simultaneously in multiple communities along the coast. Many small communities suffer from depopulation and lack of employment because of the ongoing centralization of the fishing industry. The seaweed industry is an opportunity to revitalize and sustain some coastal communities that are in danger of disappearing.

In all industry there is a production line and a set of requirements, which defines the dimensions, the structure and the spatial qualities of the building. The aim with this diploma is to develop a typology and a set of spatial qualities for the small to medium-scale seaweed industry. To do that I also have to envisage the production process and define a set of rules as a base for the architectural work. The island Selvær in the Træna archipelago, 65km of the coast of Northern Norway, is the chosen location and the The Northern Company will serve as the business template for this typology and project.



Photo by Alex Asensi



Photo by Alex Asensi

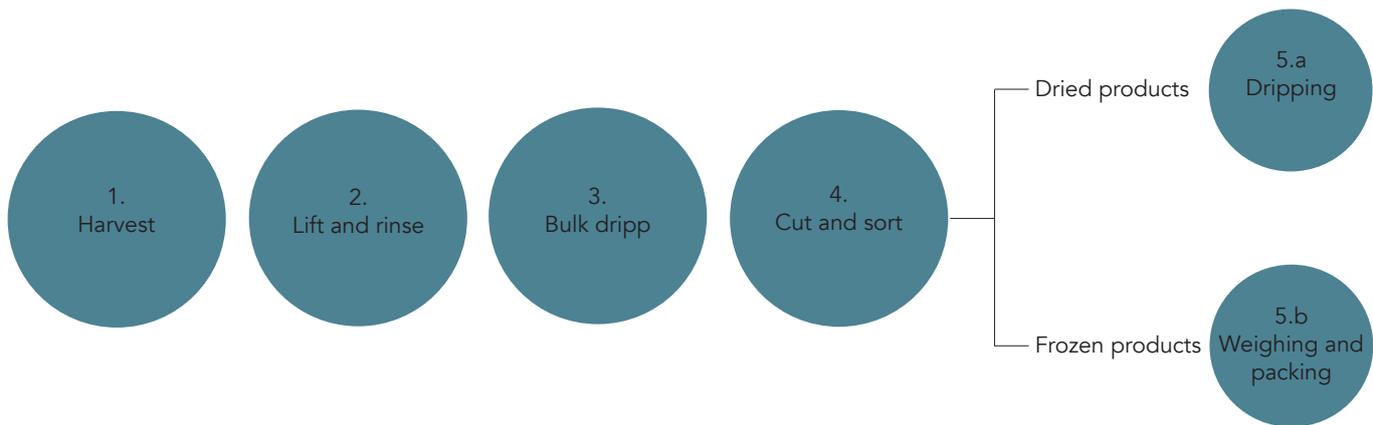
## THESES

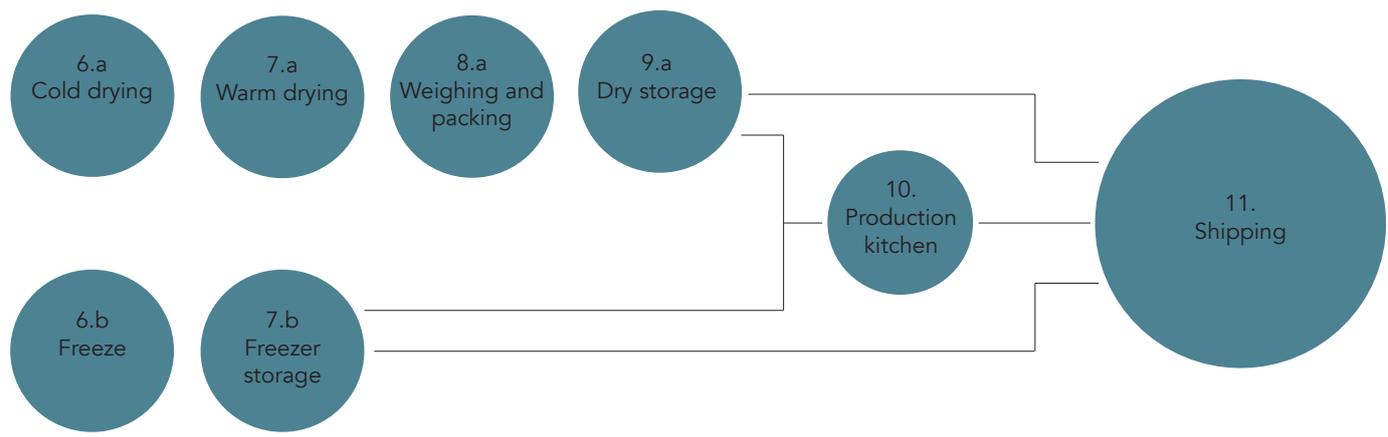
With the diploma I wish to investigate how the conditions and the requirements of a production process can inform architectural space. What are the spatial qualities, the structure, the dimensions and the functional qualities in a commercial production building where handpicked naturally grown seaweed is processed? The aim is to develop a typology and an architectural identity for the small to medium scale seaweed industry.

## APPROACH

This project is closely linked to real life. The conditions and requirements for a commercial production line are used to inform the architecture. How the architecture relates to nature (the seasons of the year, the climate, the tidal cycles, the ocean, the water, wind, sun etc) then becomes essential. The relationship between the exterior and interior environment and the buildings placement in the terrain is a key part of this project. Another key part of the project is the building process itself. Challenging weather conditions and limited access to tools and materials complicates the building. The seaweed industry will always be in coastal regions and building for it will face similar challenges regardless of location.

# THE PRODUCTION LINE





## **common production line for both frozen and dried products**

### **1. Harvest**

Harvesting can be done at low tide - 2 times a day from March-Jun.

The seaweed is collected from the reefs and small islands (many which only appears at low tide) that surrounds Selvær

Waders (a piece of clothing) and a knife is used in the process

### **2. Lift and rinse**

The container with the seaweed, weighing 100 – 200 kilos, is hoisted from the boat into the processing facility using a suspension monorail crane

The seaweed is rinsed in a cold-water container

### **3. Bulk drip**

The seaweed is lifted out of the cold-water container in bulks

The seaweed is left to drip for a little while to rid it of the excess water

### **4. Cut and sort**

The seaweed is transported onto the processing table

The seaweed is sorted and cut in appropriate sizes

## **continued production line for dried products**

### **5a. Dripping**

The seaweed is hanged on racks or grates and left there to drip for 30min-1h until apprx. 20 % of the water has evaporates

### **6a. Cold drying**

The racks are moved into a room with cold circulating air and left there to dry for 6-8h until apprx. 40 % of the water has evaporates

### **7a. Warm drying**

The racks are moved into a room with warm circulating air (apprx. 40 ° C) and left there to dry for 2-4h until 25% of the water has evaporated

The finished product contain 10-15% of its original water content

### **8a. Weighing and packing**

The dry seaweed is weighed and split into portions.

The portions are packed in foil bags.

The bags are packed in cardboard boxes

The boxes are placed on pallets for transportation

### **9a. Dry storage**

The pallets are stored in a space where the temperature and humidity is controlled

### **11. Shipping**

The product can be shipped in any dry container.

## **continued production line for frozen products**

### **5b. Weighing and packing**

The wet seaweed is weighed and split into portions of approx. 250 grams

The portions are packed in foil bags and vacuum sealed.

The bags are packed in cardboard boxes each weighing approx. 3 kg

The boxes are placed on pallets for transportation

### **6b. Freezer**

The pallets are transported with a pallet truck to the freezer - 25 ° C to freeze

### **7b. Freezer storage**

When the seaweed is frozen it is moved to an -18° C storage freezer where it sits until shipping

### **11. Shipping**

The product can be shipped in any refrigerated container.

## **further processing of the dried and frozen products**

### **10. Production kitchen**

In the facility's kitchen the processed seaweed can be transformed to a wide range of different products. Each producer can have their own variations and own range of products. The possibilities are many - pesto, pasta, snacks, soups, spices to mention some.

### **11. Storage and shipping**

Storage and shipping will depend on the type of product. The facility provides 3 different types of storage; dry, frozen and a cooling storage; which covers all parts of the production. Depending on the product it can be shipped in a freezer container, dry container or a cooling truck.

## PROGRAM

A lifting and rinsing space

A space to cut and sort the seaweed (a general production space)

A place to pack theseaweed to be frozen

Freezer storage

Dripping room

Cold drying room

Warm drying room

Packing room

Dry storage

Storage for equipment and packaging for the products

Wardrobe with a toilet, shower and a drying cabinet

Production kitchen with a cold storage

Office space and break room

Workshop and tool shed

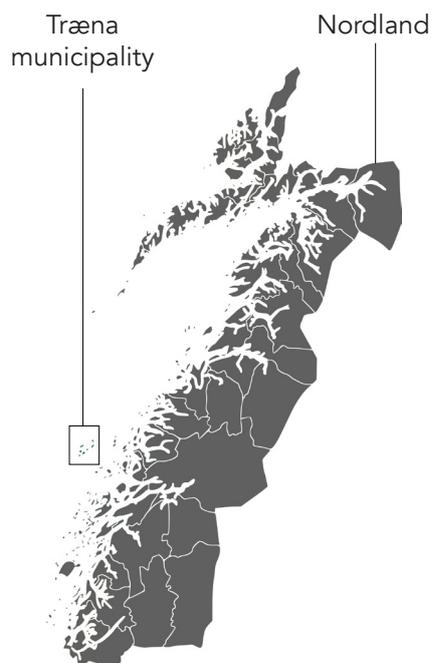
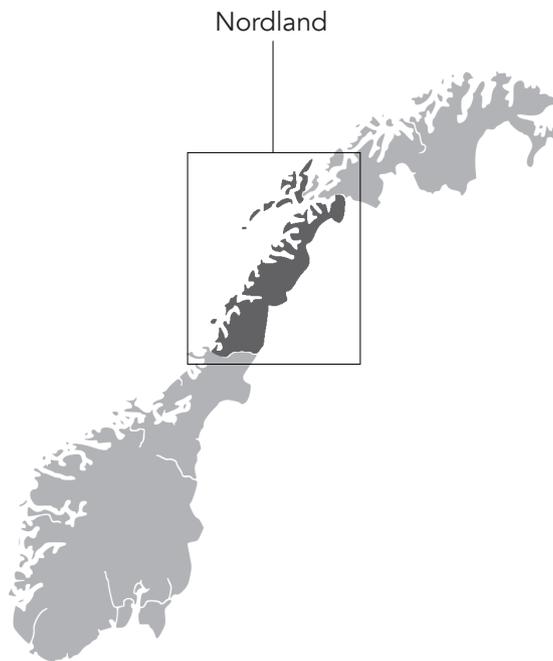
Hallway



Photo by Alex Asensi

## SITE

The chosen site for this project is the small island Selvær in the Træna archipelago 65 km off the Norwegian coast. A deciding factor for the choice of site, in addition to the access to the large supply of natural growing seaweed, is the shortage of viable industries and livelihoods for the populations on the island. The seaweed industry is an opportunity to create jobs and sustain small communities on the Norwegian coastline.



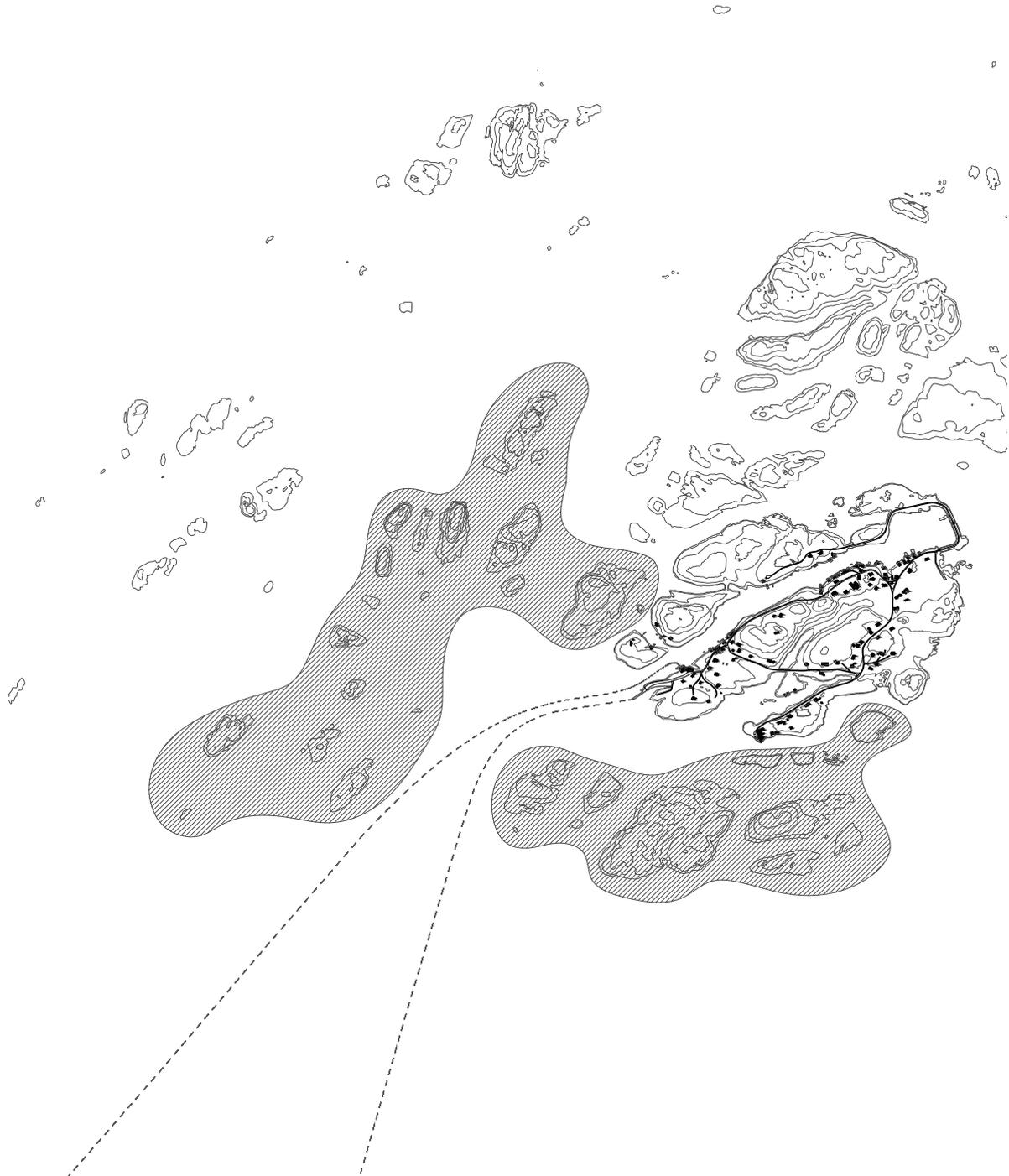
Træna municipality



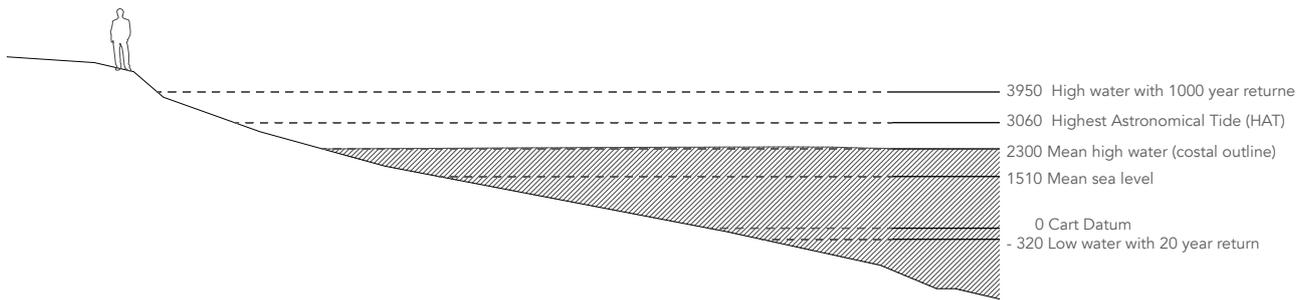
# Selvær



harvest areas



## tidal heights



# SEASONS

## harvest

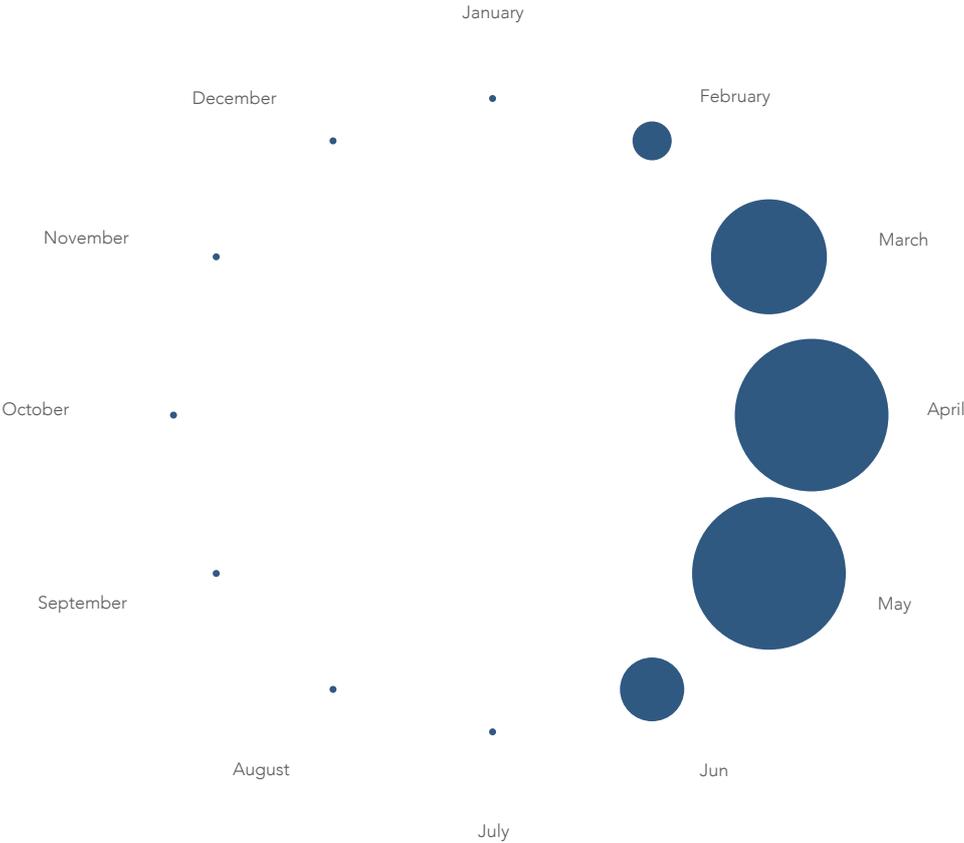




Photo by Alex Asensi

# SUBMITTED MATERIAL

## **drawings**

Site plans 1: 50 000/ 1:4 000/1:200

Sections 1:100/1:50

Plans 1:100/50

Elevations 1:100/1:50

Details 1:20-1:10

## **spatial illustrations**

Exterior and interior

## **models**

Site models 1:100/1:200

Section model 1:25

Sketch models 1:200-1:50

## **diagrams**

The production line

Seasons

## **process**

Diploma program

Process

Research

## SCHEDULE

<b>week</b>	<b>plan</b>
Week 02	Continue with the rapport
Week 03	Site visit to Træna + meetings
Week 04	Sketch, structure models, spatial investigations
Week 05	Sketch, structure models, spatial investigations
Week 06	Consept
Week 07	Consept
Week 08	Consept
Week 09	Plan. sections, model
Week 10	Plan. sections, model
Week 11	Plan. sections, model
Week 12	Plan. sections, model
Week 13	Site visit and observation of the production on Træna
Week 14	Presentation dummy - Layout and final decicions
Week 15	Completion of plans and solutions
Week 16	Production: Model, visualization, diagrams, text
Week 17	Production: Model, visualization, diagrams, text
Week 18	Production: Finalizing, test plotting
Week 19	Production: Last finish and printing
Week 20	Deadline 15th of May

## REFERENCES

### **literature**

- Christensen, Arne Lie: Den norske byggeskikk, Oslo, 1995
- Ellefsen, Karlo Otto og Lundevall, Tarald: Fisekvær, Myre på Yttersida, Pax Forlag A/S, Oslo 2017
- Printz, Henrik: Vi sanker tang og tare: kort oversikt over de viktigste arter og deres innsamling, Oslo, 1953
- Aasland, Trond: Utfordringen fra havet: om utnyttelse av norske tang- og tareressurser, Didakta Norsk Forlag 1997

### **web**

- <http://www.northerncompany.no>
- <http://www.tenktraena.no>
- <http://www.tenktraena.no/wp-content/uploads/2016/03/kunnskapsgrunnlag-traena-kommune-12-05-2016.pdf>
- <http://www.tenktraena.no/wp-content/uploads/2016/03/161221-samfunnsplan-til-horing.pdf>
- <http://www.tenktraena.no/wp-content/uploads/2016/01/aloha-traena.pdf>
- [http://www.moreforsk.no/download.aspx?object\\_id=6AB644DB3CBD44F3AE9CF4A284BF2ED2](http://www.moreforsk.no/download.aspx?object_id=6AB644DB3CBD44F3AE9CF4A284BF2ED2)
- [http://www.moreforsk.no/download.aspx?object\\_id=CD8DDAAE819846C89A282EC78D0AEAC7.pdf](http://www.moreforsk.no/download.aspx?object_id=CD8DDAAE819846C89A282EC78D0AEAC7.pdf)
- <http://www.moreforsk.no/publikasjoner/rapporter/marin/potensial-for-makroalger-som-mat-i-en-nordisk-sammenheng>
- <http://www.seaweedenergysolutions.com>
- <http://www.seaweedenergysolutions.com/assets/files/2014.06.11%20Tare-reportasjen.pdf>

### **conversation**

Zoe Christiansen:

The founder of *The Northern Company* and *Træna Food labs*

Moa Bjørnson:

Project leader for the development of *Træna (Think Træna)*

Lars Skimten:

The founder of *Kimten Seaweed Harvest* which harvest for *The Northern Company*

Oda:

Harvest manager for *The Northern Company*

Franz Christiansen:

Works for the *Northern Company*

Merete Lillegård:

Owning partner of *The Northern Seaweed Company* and inhabitant on *Selvær*

Turid Myhre:

An inhabitant on *Selvær* who has lived on the island her whole life

Kåre Myhre:

An inhabitant on *Selvær*