Interreg Nord
European Regional Development Fund

EUROPEAN UNION

SEAmBOTH
Seamless Bothnian Bay

Blogs2

METSÄHALLITUS

SGU Sveriges geologiska undersökning

SYKE

Swedish Agency for Marine and Water Management

Länsstyrelsen Norrbotten

GTK

Centre for Economic Development, Transport and the Environment

LAPIN LIITTO

Table of contents

HOW WE DO IT

FIELD STORIES

Table of contents

Table of contents

Table of contents

METSÄHALLITUS MERELLÄ

Foreword

Often the end product and the final report of a project are aimed at the scientific community or the people working professionally with the issues tackled in the project. In the *Seamless Mapping and Management of the Bothnian Bay* (SEAmBOTH) project we wanted to show everyone how special the underwater nature of the northern Bothnian Bay is, and why we should all try to protect it together. Since most of the people will never be able to go underwater themselves, we wanted to bring the underwater nature to them instead. We also wanted to write to people who are not necessarily biologist, geologist, modellers, or any other professionals in the field of underwater biology, geology, bathymetry, or management. That's why we started to write blogs on various topics early on.

We wanted to tell everyone, how we are going about with the underwater mapping and how the field data is modified into beautiful maps ("*How we do it*" -blogs), who the people behind the work are ("*People behind the scenes*" -category), about the special species, habitats, and places in the project area, as well as about the human pressures in the northern Bothnian Bay. We also wanted to take everyone out to visit the field site where we collect the data every summer ("*Field stories*" -blogs), because it's something that many people were wondering about, or sometimes even envy (although there is nothing to envy about a windy and a rainy day with +6°C temperature when you have to stay in an open boat the whole day).

All partners and almost everyone involved in the project has written blogs, some more and some less, and together they tell the story of the SEAmBOTH project with plenty of pictures. In a way, this collection of blogs will give you the same information as the final report, but from a little different angle and maybe also in a more easily approachable way.

The project was funded by Interreg Nord and cofounded by the Swedish Agency for Marine and Water Management and Lapin liitto. The project was coordinated by Metsähallitus, while other partners were the County Administrative Board of Norrbotten, Geological Survey of Sweden, Geological Survey of Finland, Centre for Economic Development, Transport and the Environment (North Ostrobothnia and Lapland), and the Finnish Environment Institute. The project started May 1st, 2017 and finished on April 30th, 2020. These blogs were written during the SEAmBOTH project between Dec 12th, 2017 and April 30th, 2020.

This is the second edition of the Blog collection and contains all published SEAmBOTH blogs. There are many more photos in the original blogs so if you want to see them, go to the website https://seamboth.com/blogg/ and see the pictures and the videos. The new category "Final results" contains the most important findings we did during our three year journey as a SEAmBOTH project group. I hope you enjoy the blogs. We certainly enjoyed writing them.

In Oulu May 14th 2020

Essi Keskinen

Project coordinator, Marine Biologist, Metsähallitus

Investigating underwater vegetation

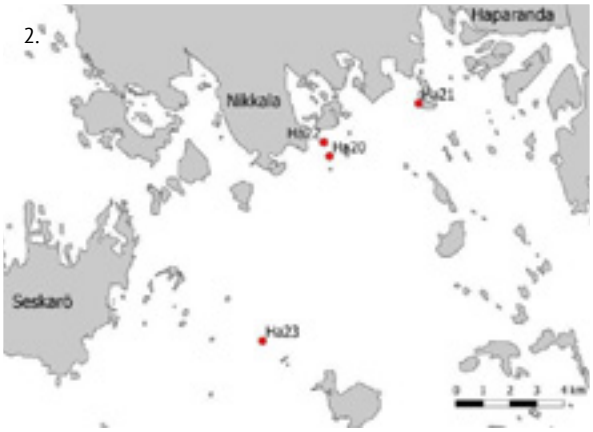
Linnea Bergdahl, Länsstyrelsen, 4 January 2018

What plants grow at the bottoms of the northern Bothnian Bay? What species can you expect to find, and do they differ depending upon location?

Inventories of the underwater vegetation are crucial in order to increase the knowledge of the marine environment of the Bothnian Bay. As part of the SEAmBOTH project, inventories were made in the pilot areas of Haparanda and Råneå in september 2017 at in total 13 different locations.

When investigating the underwater vegetation, the divers laid a transect (a 100-200 meter long measuring tape) straight out from the shoreline towards sea. They then swam along the line, recording the type of bottom (soft, sandy, rocky etc) as well as what species of plants were there and the percentage of area each specie covered. The coast of Norrbotten is very shallow, and swimming along the transect line the divers never reached a depth deeper than six meters.

For birds and many species of fish, shallow bottoms with vegetation are very important. They provide food, shelter and protected places for young fish to grow up in. How much vegetation and to what depth the plants can grow depends for example upon the salinity (salt content of the water), the availability of light at depth, the type of bottom and the exposure to waves.



1. Species and the percentage of plant cover are some of the things the diver notes and writes down during the inventory. (Photo by: Anders Wallin, Sveriges Vattenekologer AB)
2. Location of sites around Råneå and Haparanda archipelagos where divers did underwater inventories of vegetation. (Maps by: Sveriges Vattenekologer AB)

Wading points

Suvi Saarnio, Metsähallitus, 16 March 2018

In SEAmBOTH we are mapping shallow areas because most of the vegetation grows there, and one of the best ways for mapping in shallow water is wading.

Here is a couple of photos of our team doing wading points.

Photos by Lari Järvinen, Niina Kurikka, Claes Björkholm, Ville Savilampi, Essi Keskinen.

Drop-videos

Suvi Saarnio, Metsähallitus, 24 April 2018

In short, drop-videos are taken while on a boat and lowering a video camera under the surface, close to the bottom. We take 60 seconds long videos and analyze the videos later at the office. From the videos we can analyze the bottom quality and species seen on the video.

When taking drop-videos, it is very important to hold the camera steady. If there are waves, the camera needs to be moved with the movement of the waves, so that we get good video quality, and it doesn't look like the camera is on a roller coaster.

1. Our "office" is sometimes very small. (Photo by Ville Savilampi, Metsähallitus)
2. Lowering video camera from the boat. (Photo by Essi Keskinen, Metsähallitus)

Field excursion to the Bothnian Bay National Park, Finland

Essi Keskinen, Metsähallitus, 2 July 2018

Last week the project group made its way from the offices to the nature. Many of the SEAmBOTH partners are forever stuck in the office and don't do any field work while some of us collect more data at the sea.

The aim of the field excursion was to get to know the project pilot areas. We visited both in the Haparanda Skärgårds national park in the Swedish side and stayed in Bothnian Bay National Park in Finland. We also had a contact with one of the local stakeholder groups when we organized a taxi boat from Tornio to take the group around.

One of the first things that everyone could see was that the weather conducts everything while doing fieldwork. When everyone arrived on Wednesday, the wind was 10 m/s from Northwest. The boat trip that usually takes us about 35-45 minutes took way longer than an hour. The sea was trying to get into the boat and we were soaked. But the sun was shining and we had good equipment, so the wind was just a perfect example of a weather prohibiting us from working.

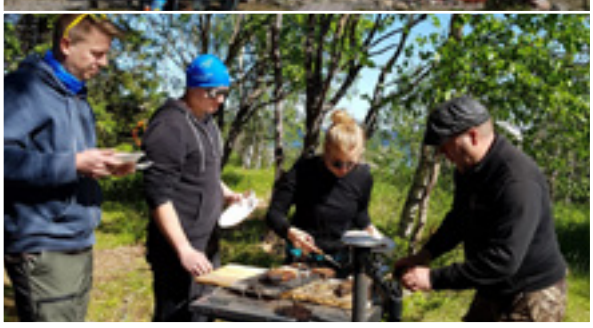
Lunch was exotic. Since there was an archipelago event going on through the week, Perämeren Saaristopäivät, there was a pop up restaurant with Bothnian Bay salmon and white fish prepared on fire in one of the islands in Bothnian Bay national park. That was a perfect way to start a field trip.

In the evening we discussed the project and went to sauna and woke up to a perfectly calm but rainy weather. We divided into two groups and Metsähallitus taught the office workers how to do drop-videos and wading points. Suvi taught drop videos in the boat Inca, and Essi and Ville paraded around in the bright orange survival suits with two extra orange people, the office workers, in tow. Everyone carried a water binocular, orange as well.

Many of the project group members knew in theory, how to do underwater nature inventories, but most of them had not done it in person. We found for example an endangered vascular plant Alisma wahlenbergii and a dead seal.

Everyone thought the field excursion was a lot of fun as well as quite educational. It always makes much more sense in the office if you've seen how the data is collected in the field.

We hope to organize another field trip next year, hopefully this time on the Swedish side of the project border.



Archipelago days, Perämeren saaristopäivät

Essi Keskinen, Metsähallitus, 6 July 2018

Photos by Mikko Nieminen, Essi Keskinen.

There is an annual boating event in the Bothnian Bay national park known as Sarvipäivät. This year Metsäahallitus organized a week-long archipelago event, Saaristopäivät, instead. The week 25.6-1.7.2018 we celebrated the archipelago life, the national park, recreational boating and all things marine in the Northern Bothnian Bay.

SEAmBOTH registered the event as a European Maritime Day, and the week included the project's group member's field excursion and the Dive Perämeri event as well. All of the activities took place in the SEAmBOTH project pilot area in the Finnish side of the border.

During the week, charter boats brought people to the national park every day. On Saturday, a traditional sailing ship brought almost 40 passengers. There was a pop up restaurant on one of the islands, guided tours in an old fishing shelter in the tiny fishing museum on another island and guided walks on the nature trail to the Southern tip of Selkä-Sarvi island.

Metsähallitus's SEAmBOTH team talked with the people coming to the national park, many of whom were visiting the national park for the first time. It always surprises me how little many people know about underwater nature, but at the same time, how interested they are to learn about it. Many were shocked to learn that Finnish and Swedish environmental authorities have so little common data to work on, despite the fact that the border of the two countries lies in the middle of the sea, and the water moves around throughout both countries..

We were also able to help a gentleman whose hobby was to "collect" vascular plants. He knew that there were a lot of underwater plant species, which he hadn't seen before, in the Bothnian Bay National Park. He was quite happy to use water binoculars and write a few new names of underwater species to his little notebook.

The event was successful, and even some SEAmBOTH sponsors visited with one of the charter boats. In the beginning of the event, we had one cubic meter blue European Maritime Day canvas bags to give to visitors, courtesy of the European Union. After we had given them to all visitors, we had hardly any left. At the same time, a lot of information about the project was distributed to the regional and national stakeholders and residents.

Intern edition

Susanna Greus, Metsähallitus, 11 October 2018

Hi everyone!

My name is Susanna, and I was an intern in the SEAmBOTH team last summer in Oulu. I study geography at the University of Oulu and thought that it was time for me to get some work experience in my own field of expertise. Even though I have not studied biology that much, I am interested in nature, different ways of studying it, and conserving the environment. So this sounded like an amazing opportunity for me to get to know the Bothnian Bay area more. There were so many things that happened during my internship, that it is hard to collect my thoughts. But anyways, here is my experience with the marine biology team of Oulu!

I started my internship in the middle of summer in July, and on my first day we moved to Ulko-Krunni for the next two weeks. The team is a well-oiled machine and jumping into that machine was very overwhelming in the beginning. Luckily, I learned everything quite well during the first two weeks, except for the plant species' names, but we'll get to that later. Ulko-Krunni is a conservation area in the middle of the Bothnian Bay, and it was a beautiful place to start my internship. In addition to doing basic drop videos and wading points, there were many things to learn in the team. Everyone was assigned their own tasks, and I was responsible for saving the pictures on the hard drives and checking the field forms at the end of the day. Still, everyone did everything, helping others if their workload got too big.

The heat wave of summer 2018 began when we were at Ulko-Krunni, and we got to work in beautiful weather for the rest of the summer. We probably used a tubful of sunscreen during that time. We took videos of the bottom of the sea and did wading points on the shores. The first two weeks I could not recognize the plant species for the life of me. Then, we moved to Simo and by coincidence I was forced to do my first wading points basically by myself. We were supposed to be taking videos, but the water was too shallow so some of the points became wading points. After that, I began to recognize the plants, but I still could not remember the names. So I gave them my own names! Zannichellia palustris became "Bananas", Stuckenia pectinata "The Big Dill", and Callitriche hermaphroditica "The Spruce". Other species I gave more imaginative names that do not translate that well to English but trust me, they were good.

My favorite part of the work was doing the wading points by myself on the SUP board. Even though I enjoy the teamwork, it was nice to get some "me time" in the middle of all the hassle on the field. Also, I tend to get seasick on boats if the wind and waves get too high, so my co-workers were nice enough to let me go SUP boarding whenever the weather was not the best. I sincerely thank the whole team for that. And at the end of the summer I finally knew the real names for most of the species!

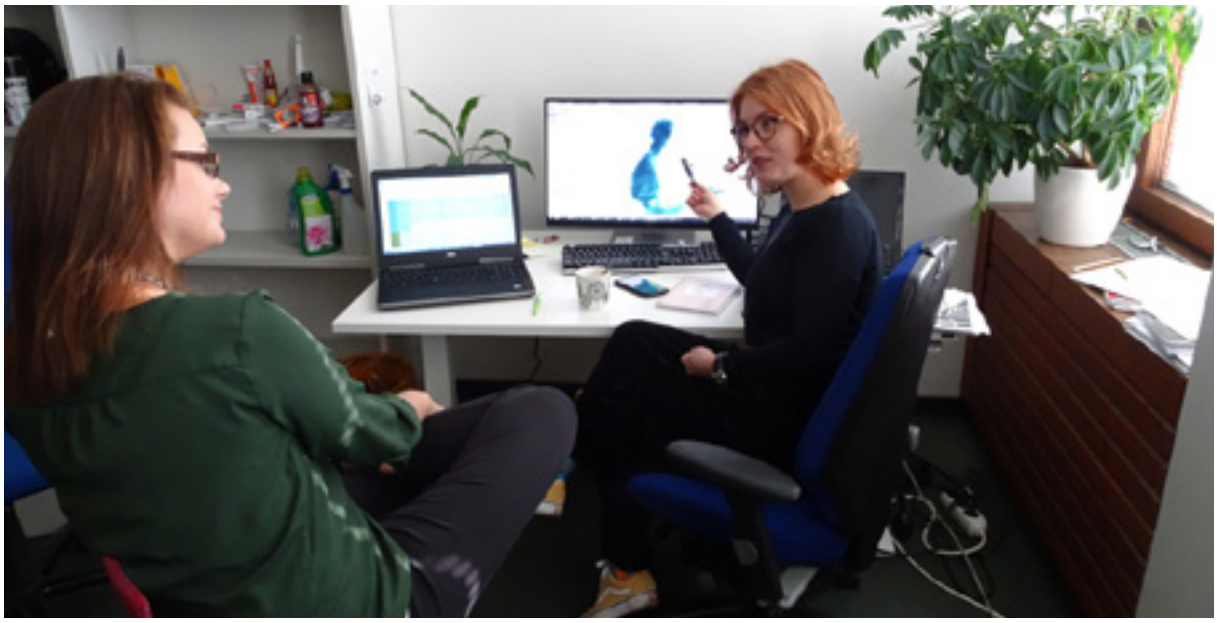
In case you are wondering about joining the SEAmBOTH team, you definitely should. If not for the work itself, but for the other perks that the team offers. The project leader Essi, for example, makes food every day for everyone. The food is amazing! At the end of the summer, we made a cookbook of her recipes. That's how great it is. We also had an event called Pookitanssit in Ulko-Krunni, where we had good food and danced the whole night in beautiful surroundings. Also, in Keminmaa we had a traditional Finnish Rapujuhla – or Crayfish Party – where we ate crayfish (or artichoke if you were vegetarian), played goofy marine team related games, and sang songs.

If you want to spend your summer outside experiencing the beautiful nature at sea, with a fun and outgoing group of people, eating the best food, and enjoying the Finnish summer, this is the job for you!

P.S. In Ulko-Krunni there are billions of mosquitoes. But for anyone who hates to sleep with thousand mosquitoes, there are mosquito nets hidden in one of the cupboards! Use them, even though the others might give you "princess points" for that.

Estimating human pressures at the Bothnian Bay

Leena Laamanen, SYKE, 25 October 2018



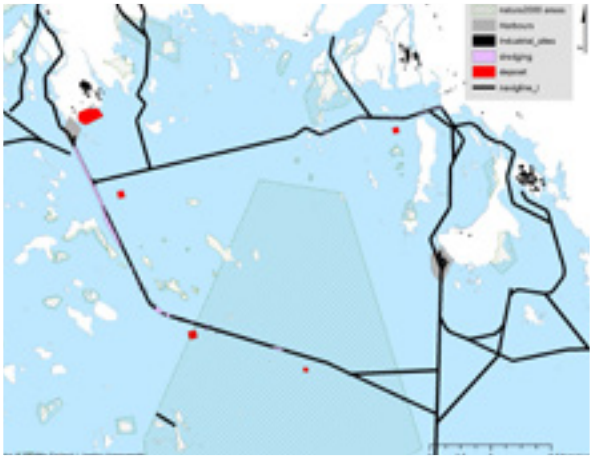
Elina and Leena working with spatial data of human activities. (Photo by Waltteri Niemelä, SYKE)

The marine environment of the Baltic Sea is fragile and vulnerable due to its unique location and structure. 85 million people live on its catchment area and 15 million of them live within 10 kms from the shoreline. Therefore this has an effect on the marine environment both below and above the sea surface.

Even though the most severe pressures in the Baltic Sea come from eutrophication, the Northern part of the Bothnian Bay struggles with slightly different problems. The discharge from large rivers and limited water exchange creates demanding environment both for marine and freshwater species. For example the aquatic mosses inhabiting the otherwise bare reefs create habitats unlike any other in the Baltic Sea.

In addition to the pressures from the catchment area, the sensitive habitats of the SEAmBOTH project area, such as reefs and sandy bottoms, are affected by several human activities occurring at sea. The increasing marine traffic, construction of offshore wind farms, maintenance dredging of shipping routes and harbours, the deposition of the dredged material and constructed shoreline all effect the physical structure of the sea bed and habitats. These activities cause e.g. physical loss of habitats by destroying the sea bottom or by disturbing the physiochemical environment maintaining the habitats. Usually a single human activity at sea does not cause only one pressure but effects the marine environment through several pathways.

So – what we do to estimate these anthropogenic pressures? We work with spatial data of human activities and algorithms to estimate the extent and intensity of the pressures. It contains several hours of working on the computer and researching the phenomena in theory. By knowing where the human activities take place, we can estimate the pressures affecting the marine environment. It includes estimation of the buffer zones and attenuation rates from the activities as well as methods to combine several activities together. To better understand and define areas most affected by human pressures, it is essential to combine the varying effects of different activities. When we overlap these pressure data sets with knowledge on the sensitive habitats and species, we can get a clue on the stress caused on the marine environment.



Natura2000 -areas and different human pressures in the northern Bothnian Bay on the Finnish side.
(Map by Jaakko Haapamäki, Metsähallitus)

Harmonizing definitions

Essi Keskinen, Metsähallitus, 15 November 2018

One task that the SEAmBOTH project took part in solving was trying to harmonize the use of different Natura 2000 nature type descriptions between Finland and Sweden.

Yes, there are official descriptions of the nature types from the EU. Yes, there are official translations and national adaptations to the special conditions of the Baltic Sea. But NO, even the national definitions don't really match the nature in the Northernmost part of the Baltic Sea and NO, the two countries don't really interpret everything the same way.

If the name of the nature type is "Tidal mudflats", Finland says that "We don't have a tide = We don't have tidal mudflats" and Sweden says "We have tide on our West coast and significant water level changes on the Northeast coast = we have tidal mudflats". If the name of the nature type is "Sandbanks" and the official description tells us that they are "predominantly less than 20 m deep and always covered by water, and they might have vegetation like Ruppia ssp.", Finland asks "Can the sand be moving, and we don't have Ruppia ssp. all the way up to the North", while Sweden says "Do the sandbanks have to rise from the seabed or can they just be flat". And if the name of the nature type is "Reefs" and they should be covered in a succession of filamentous algal zones and bladder wrack and blue mussels, we in the North of the Bothnian Bay ask: "What about our naked reefs? We don't have bladder wrack or blue mussels here because of the low salinity, and we don't have a zonation of benthic organisms. Are they still called reefs, or are they just piles of rock?"

At the same time, if a marine biologist dives underwater and tries to think hard, is she diving on a sandbank or is this just a pile of sand but not a sandbank by definition, or a GIS-planner is looking at a map and trying to decide, where to draw the digitalized boundaries of a river estuary. And the definitions become even more relevant when we try to create joint maps from Finland to Sweden and the nature types should be defined exactly the same way. At the same time, there are political decisions behind all this.

Where does this leave Nature? It leaves Nature to be whatever it is – there will be sand and Chara aspera here, whether it should be called a sandbank or not. There grows Sparganium -species in very low salinity water at the delta of that river, whether it should be called an estuary or not. The Nature doesn't care about definitions. It's we marine biologists, politicians, environmental bureaucrats and decision makers who need to draw the lines on the map, even though sometimes the lines are fuzzy and the boundaries and overlapping between nature types is wide.

Data collation

Jaakko Haapamäki, Metsähallitus, 7 December 2018

Finnish and Swedish sea lanes presented as lines and polygons. (Illustration by Jaakko Haapamäki, Metsähallitus)

We gather large amounts of data in SEAmBOTH. A very simple goal of the project is combining national datasets into a common one for the Bothnian Bay. Mostly the data is almost identical, and the process is straight forward, but sometimes it's not really compatible, which means we must get creative.

In the data itself, there are a lot of factors to consider. The timeline should be the same and sometimes we might not have the same units in use. In SEAmBoth, we have chosen to use data from 2010-2015, since that time frame we can rely on being available from both countries. It's not too old and the temporal window is big enough.

In addition, the types of the geometry may vary. For example, Finland has the sea lanes as lines (black) and Sweden as polygons (green). The polygons could be transformed into lines, but the process is quite time consuming and the lanes are mainly used as a human pressure indicator. It's a lot easier to transform the Finnish lanes to polygons and combine the two. So that's what we did.

With most of the data we only have to merge it into one layer and even the ones that need work are usually very simple to put together. However, when you gather them all up, they make for a pretty elaborate mesh of human pressures, environmental variables and existing mapping data, in which we'll later use for modeling our end results.

The same sea lanes after they have been combined into one shape.
(Illustration by Jaakko Haapamäki, Metsähallitus)

Organization

Essi Keskinen, Metsähallitus, 28 December 2018

Before: The cluttered cave

If you are familiar with any type of field work, or even other outdoor activities such as camping, you know that there are all types of gear and equipment needed. Not only do we need the appropriate clothing, but also different field computers, hard drives, cameras, GPS devices, safety gear, diving equipment, sampling gear, microscopes, species guides, maps, field papers/data forms, and all sorts of other stuff are needed. Field work is not clean nor pretty and the SEAmBOTH work is no different. We spend about four months living out of a van, trailer and whatever cottage we can acquire during the weeks. During this time, our gear is spread over our boat and our living area. We stay as organized as we can, but usually everything is organized enough for work the next day. Our survival suits, dive suits and anything used in the water are left to dry each evening and occasionally, we have time to properly clean the gear at the end of the week. However, by the end of field season, our gear is ready for a good cleaning. Unfortunately, at the end of the season, taking care of the gear is not our first priority. It is stored and put aside in our storage room, or as we like to call it, 'the cave'. In summer, 'the cave' is quite empty and often used as a weekend living area for visiting workers or volunteers, but after the field season, all the gear piled in 'the cave', just waiting to be organized.

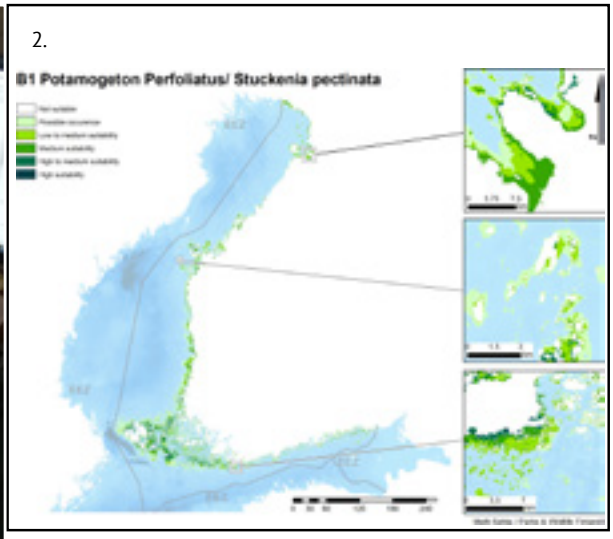
Our gear is symbolic to the rest of our work as well. Similarly, our data is treated about the same way. Since we have a limited amount of days we can work at sea, we need to get as much sampling done in the time we have. This means that most of our data and any office work is also left to be organized until after the field season too. At the end of each day, GPS points, pictures, and videos are input into the computers, and our data forms are numbered and organized into folders, but very little data is put in Excel or sorted. Our data often waits until after we are back in the office sometime in September. Once back in the office, we spend the next two months or so entering all the summer's data into Excel spreadsheets. This is tedious work and needs complete focus so that as few mistakes as possible occur.

After the data is ready, it's back to the cave to start sorting the gear. In the beginning, everything is piled up and cluttered. It takes quite a few days to wash and dry all the survival suits, overalls, hats, gloves and hoods. We take inventory of all the boxes and gear to make lists of what is needed for the next summer and repair any equipment that has been lost or damaged. Once everything is ready, all gear is packed up in the appropriate bags or boxes and organized on the shelves. Just as with any cave, ours is cold, dark and silent. Like bears, our gear is left to hibernate until it is time to begin the work for next field season. Fortunately, this year we were able to get started in 'the cave' a bit earlier. Unlike the gear, our data is not hibernating. It has been submitted and being used for analyzing and modeling by other various marine team members. While there are still quite a few things to do, most gear is now organized and ready for the New Year and new field season.

After: Organized Cave

Modelling biotopes

Matti Sahla, Metsähallitus, 15 March 2019



1. Matti the modeler.
2. Modeling results show how suitable different areas are for certain biotopes or species.

A modeler is the person, who dares to point out the places where certain type of seaweed grows even though the site had never been visited before. A modeler is the person who says where the field staff will be sent to find a rare species of beetle that lives in the sea. A modeler is also the one who takes the heat when exhausted divers return without ever encountering this mythical creature.

A map on my screen shows that we have mapped most of the broad areas in our coastal seas. A closer look; however, reveals that only a small portion of the seafloor has been actually visited. Mapping every inch of the seafloor on site is not possible, so we have to find alternative means to understand what is in the areas between the visited locations.

Identifying the type of surrounding environment based on few sample points can be difficult. The type of environment might be totally different in a location 100 m away from a diving transect or a video point. You could imagine doing mapping on land by filming your feet and trying to guess what kind of environment is surrounding you. Under your feet might be a road, but next to it could be a field, forest or someone's yard.

The job of a modeler is to map areas, where certain species or species groups are most likely to occur. Modeling is done on the basis of known traits of the environment and what kind of locations the species in question prefers. If we try to model suitability for a delicate plant that will break in strong wave activity, a modeler will limit the possible areas to sheltered locations. If we know that the plant is a marine species that cannot handle low salinities, we can leave those areas out. We know that plants need sunlight, so we can select the areas of the seafloor that are well enough illuminated. Sounds easy right?

Even though the basic concept is simple, there are a couple of major obstacles. One is lacking data on the constantly changing environment. There are very few stable traits in the sea, so we must work with statistical means, minimums and maximums a lot. For e.g. in the Baltic Sea, salinity is dependent on rainfall, flow of the rivers and pulses of more saline water from the Atlantic Ocean. More saline water is heavier, so we might have layers of water with different salinities. A storm the next day might mix these layers and again the salinity changes.

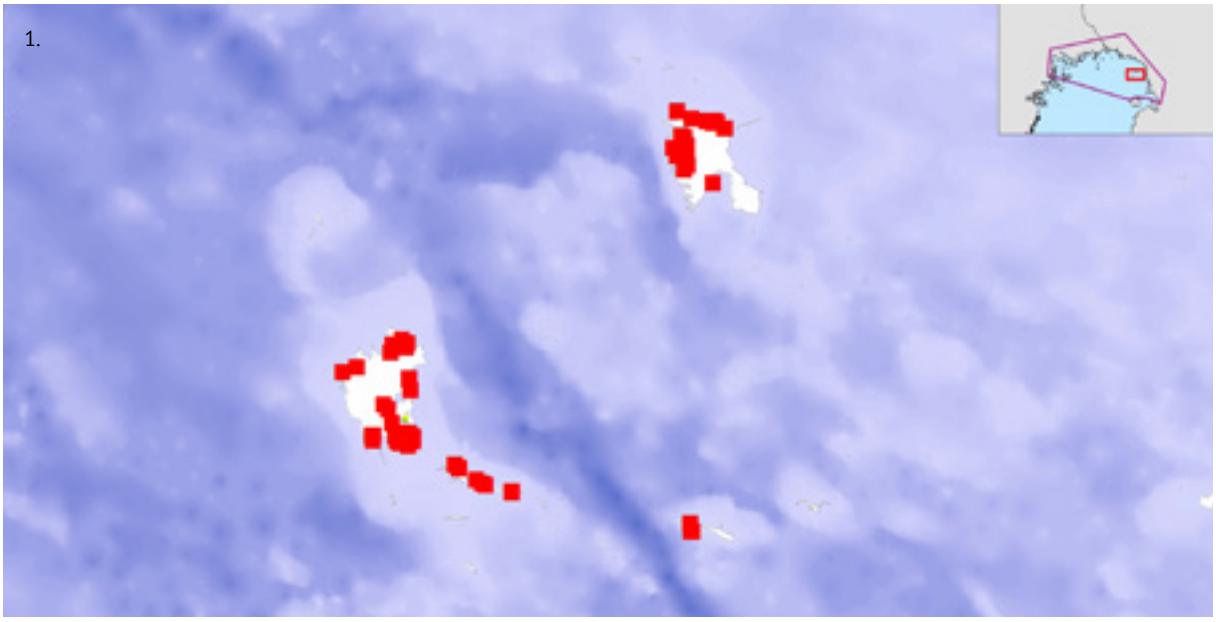
Another major obstacle is our information about what kind of environments certain species or species groups prefer. We most often look at our field inventory data to see where we have found certain species before. The size of our boats can affect the depth distribution of our inventories, and hard to reach places, such as outer reefs or densely vegetated inlets, are less often visited. The number of our observations is affected by the places most visited according to our mapping efforts. The locations where we have found most often the species to be modeled might not be in surroundings they prefer to grow in.

We can use statistical calculations to correct the observations with the inventory effort, but there is also trouble with communicating the results. When people see the model and try to evaluate how good it is, they tend to visually or statistically inspect, how well the observations are aligning with the model. This will not tell the whole truth. A modeler has at this point considered, where the species has been found, but also suggests where it prefers to live and should be looked at more closely when working in the field in the future.

Modeling of potential habitats for Fourleaf mare's tail

Jaakko Haapamäki, Metsähallitus, 5 April 2019

1.



One of the aims of the project is combining the data from Sweden and Finland and seeing what we can glean from the full data. One thing you notice very quickly from a full dataset is an absence of a species from one country, when it is present in the other. Especially if it's a directive species, such as Hippuris tetraphylla, or Fourleaf mare's tail.

There are quite a lot of observations of Hippuris tetraphylla on the Finnish side of the project area, but they are relatively close together, so to maybe find the species in Sweden and possibly get some new observations in Finland, we did a quick model of the species in anticipation of the 2019 field season.
We started off by plotting the known observations on a map. A lot of the known positions are in the Krunnit area in Finland, so that's where we're going to look.

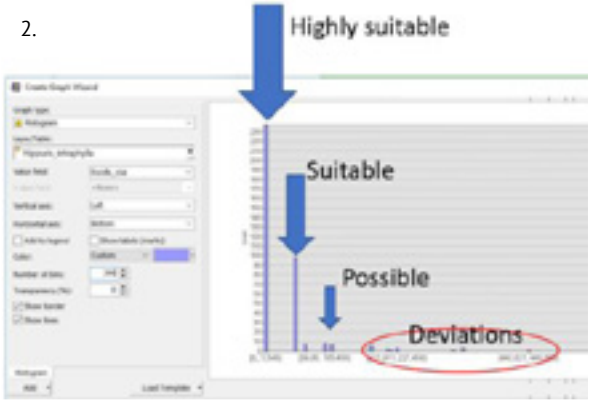
The next phase is to look at some environmental variables and check if there are any that correspond with the occurrence of the species. Hippuris usually grows really close to the shoreline, so a simple 'distance from shore' variable should work well.

After the classes are made into a raster file, we can repeat this process for several suitable variables. In this case we chose to only use distance to shore, bottom exposure and bottom light. The latter two are derived from different variable layers.

After you combine these, you get a layer giving different levels of occurrence probability. The higher the value, the better. The old observations are well within the red areas signaling high probability.

For the final models we would add more variables to increase accuracy, but for now this will do. The model still has some flaws, like high probabilities inside estuaries, but for planning purposes we can just ignore them. The model predicts that there at least should be some Hippuris tetraphylla in Sweden too, so maybe we can find some next summer.

2.



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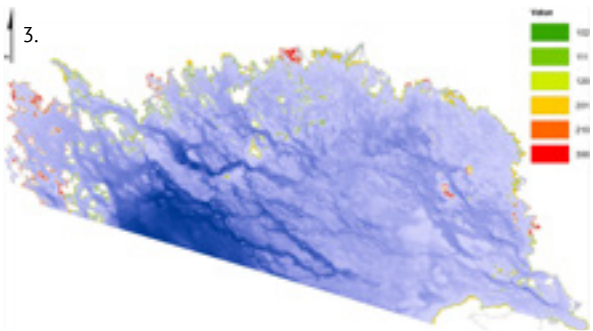
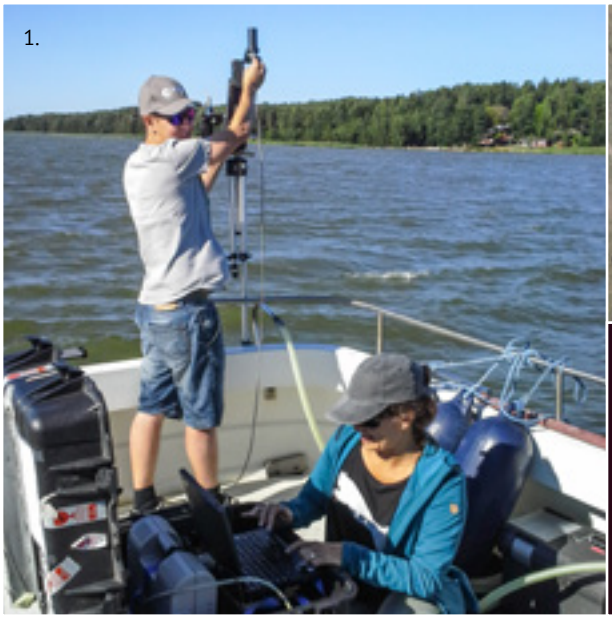
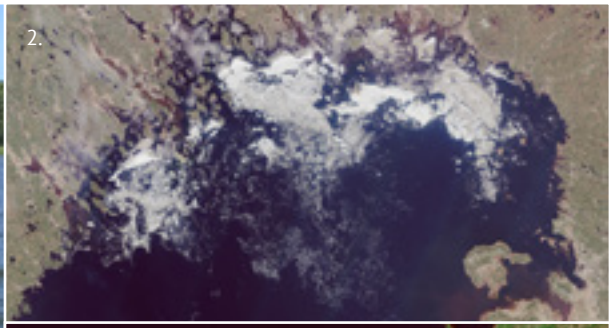


1. Hippuris tetraphylla observations in Krunnit.
2. After plotting, the histogram gives us an easy way to classify the values in three classes: possible, suitable and highly suitable. X-axis is distance from shoreline, Y is count of observations.
3. There're high probabilities especially in the estuary of Torne river, but these should be eliminated from the final models by introducing an estuary effect model.

Use of Earth Observation for monitoring of aquatic environment

Sampsa Koponen, Kari Kallio, Jenni Attila, Hanna Alasalmi, Mikko Kervinen, Vesa Keto, Eeva Bruun, SYKE, 18 April 2019



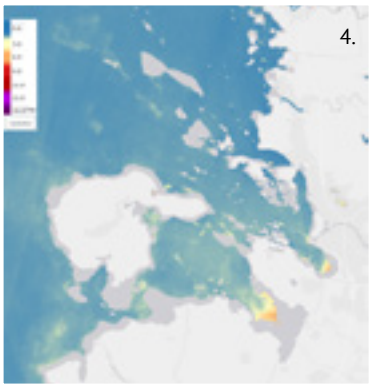


The Sentinel satellites of the European Union's Copernicus programme have brought the monitoring of aquatic environment to a new era. These satellites offer frequent overpasses, long term availability of images and good data quality, which enables building powerful new monitoring tools.

Earth Observation (EO) satellites capture optical or microwave images of the Earth. The optical images are composed of sunlight reflected by the target in different wavelengths. Some properties of the target (e.g. surface color, concentrations of certain substances) affect how the sunlight is reflected, and thus by analyzing the spectra captured by the satellite instrument the physical and biogeochemical characteristics of the target can be determined.

Although there are mathematical methods in use to analyze satellite observations, the simplest analysis is to look at the images with one's own eyes, and see the complex variations in water. The high spatial resolution images of Sentinel-2 are excellent for this purpose. Below are examples where various targets can be seen in so called true color images, which show the colors as close as possible to the human vision. These are available through SYKE's TARKKA map application (http://www.syke.fi/tarkka/en). TARKKA is a publicly available service designed for visualization of not only EO images and products, but also in situ data and various geographical information layers related to water bodies.

The first example shows a springtime image from the Bay of Bothnia. Sea ice is visible and the reddish hue in some coastal areas indicates that rivers bring suspended and dissolved material from land to water during the melting period. By clicking the link below the image you can access TARKKA, and pan and zoom the map in your browser.



The second example shows the area north of Hailuoto in the northern coast of Finland. The features of the coastal areas (especially sandy beaches) are clearly visible.

Estimation of water quality parameters such as turbidity and the concentration of Chlorophyll a is possible by utilizing more complex methods. These methods often utilize neural network solutions to model the interactions between the measured spectra and the water quality parameters. Water quality cannot be determined in shallow waters, through clouds or areas covered by the shadows of the clouds. Therefore, these are removed from the image before it is delivered via interfaces. Examples of these products are also available in TARKKA.

We are constantly adding more products, parameters and other data to TARKKA so stay tuned for more updates. If you have questions or comments you can contact our team in SYKE by sending an email to eotuki.syke@ymparisto.fi.

1. Sampsa Koponen and Jenni Attila making reference reflectance measurements with hand-held spectrometers in the Archipelago Sea. These measurements are important for the validation of the satellite products. (Photo Eeva Bruun).
2. True color visualization of Sentinel-2 image taken on 14.5.2018.
3. True color visualization of Sentinel-2 image taken on 20.6.2018.
4. Aggregate of all summerly turbidity observations (Sentinel-2) in 2018. The areas in light gray color are land. The areas in dark gray color are shallow areas that are masked from the image.

Zonation - Planners' little helper

Elina Virtanen, SYKE, 17 May 2019

Zonation is a quantitative decision support tool for spatial conservation planning, developed for solving various problems around spatial management and resource allocation. Zonation was developed in CBIG – Conservation Biology Informatics Group in the department of Biosciences of the University of Helsinki. The team was led by the professor Atte Moilanen who is currently part of the Digital Geography Lab.

Zonation is a spatial prioritization tool, where different interests (e.g. ecology, costs) are balanced in a way that loss of biodiversity is kept as low as possible. Zonation eats huge amount of spatial data, such as information on ecology or threats to biodiversity, and synthetizes information in a way that most important areas (for purpose in question) can be identified.

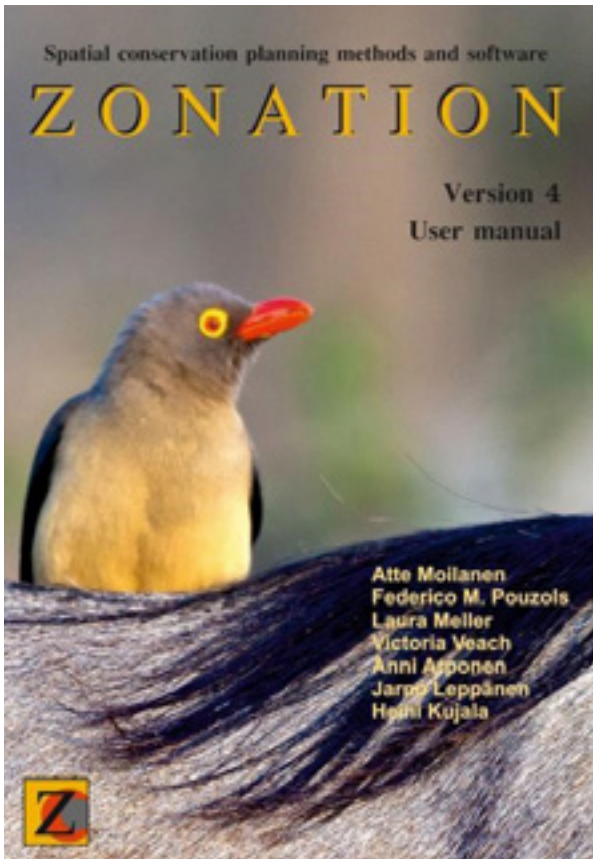
Using Zonation, one could ask questions (and receive answers) related to (and not limited to):

- Reserve planning/selection, expansion, evaluation of proposed/existing reserve network
- Impact avoidance – identification of ecologically low-value areas for economic use
- Target-based planning
- Biodiversity offsets – areas for ecological compensation
- Planning under changing environment
- Habitat restoration/management

Zonation produces a hierarchical, iterative prioritization across the landscape based on the value of a site (cell), which depends on e.g. amount of data and weights given. Zonation first removes the least valuable cells from the landscape, while at the same time minimizing the loss to biodiversity. This means that areas you would not like to conserve would be dropped out first. Terrestrially speaking, areas for instant go would be parking lots, dense urban areas, etc. while untouched forests with rare habitat types, threatened species, etc. would stay until the end (and given highest priority rank). At sea, analogous marine environments would be for instance, hypoxic areas and shallow bays with dense vegetation and low human-induced disturbance, respectively.

As a result of Zonation analysis, you get a sequence of cell removal, and curves telling at which point each feature (i.e. threatened species) is lost. For instance, for reserve network evaluation, you could get an idea how much of a species X (you are interested in), is at the moment conserved, and what (and where) needs to be done to conserve it more.

From the impact avoidance point of view, you could also get an idea, where the least valuable areas are located. Areas of low value would be suitable for instance for economic purposes or for other human activities. Compared to the least valuable areas, those with high value are areas with high species richness, threatened and rarely occurring species, connected habitats etc.



How does this relate to sea and especially to SEAmBOTH? Well. Analytically, it does not matter whether areas to be analysed are land- or sea-based. What does matter is that there is enough (high-quality) data for doing stuff like this. Zonation is an attractive option for synthetizing information for the use of marine spatial planning, as one can solve questions related to sustainable use of the sea, while accounting for interests in economic development (e.g. offshore wind-farms), and for conservation (marine conservation areas). In SEAmBOTH, we are going to identify most valuable underwater areas, which will be species rich, contain threatened and rarely occurring species, have a higher number of ecosystem engineers, and be well-connected and less disturbed. How we are actually going to do that requires co-operation and a lot of GIS-stuff. Stay tuned!

2.

Increases the site value	Decreases the site value
+ Rarity, threatened status	- Generality, vitality
+ "Wilderness", i.e. untouched state	- Threats, pressurized environments
+ Abundance of features	- Scarcity of features
+ Well-connected	- Isolated
+ Key species, ecosystem engineer	- Non-indigenous species

1. Zonation user manuals, along with the actual Zonation tool, can be found online.
2. Examples of type of reasons why site value is increased and decreased in spatial prioritization.

Practice makes a professional

Essi Keskinen, Metsähallitus, 14 June 2019

Local Search and rescue team was happy to take part in a sea rescue and first aid training session. (Photo Suvi Saarnio, Metsähallitus)

Biological field season at sea always starts around June. New people come to work, some of them for the first time. There are also interns who haven't even finished their university or other degrees yet. The first two things that need to be done in the beginning of the field season are to teach or remind everyone about working safely at sea and about how to do the job.

Sea or field safety is an important thing. Most of the people who come to work in Metsähallitus or Länsstyrelsen in the marine teams already know about navigation, code of conduct at sea and first aid, but there are always new people who don't know as much as the rest. Also, it pays to do a little rehearsing and freshening up last summer's teachings even with people who have worked at the sea for many summers.

Another thing that needs to be gone through is how to do the job properly. The "old" field surveyors might want to freshen up their skills and compare them with others, and new employees and interns have to learn all the equipment and methods for the first time.

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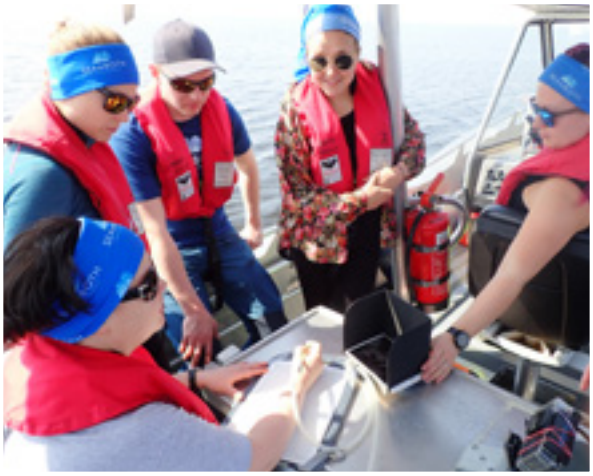
The first week or two will always go to orienteering, but that will also guarantee that the data quality is good and that everything is done as safely as possible.



New field surveyors of field season 2019 are learning the drop video technique at Metsähallitus field boat.
(Photo by Sjef Heijnen, Metsähallitus)

Diving into human pressures

Eveliina Lampinen, Metsähallitus, 18 October 2019

Summer of 2019 was my first experience of diving into a life of a marine biologist. My name is Eveliina and I'm studying biology in the University of Oulu. I got to spend the summer as a trainee for SEAmBOTH and also collect data for my master's thesis in the Bothnian Bay. My thesis concentrates on how human pressures, such as boat ways, affect the underwater vegetation. Some pressures us humans put on marine ecosystems also on the Baltic Sea can be clearly seen, such as trash or old fishing equipment laying around beaches. Some are vastly known but difficult to tackle, such as eutrophication. Some are new, impossible to see but getting more and more attention, like the microplastics. All of these and more are affecting the Baltic Sea in more ways we can even think, so to know more, studies and mappings must be done.

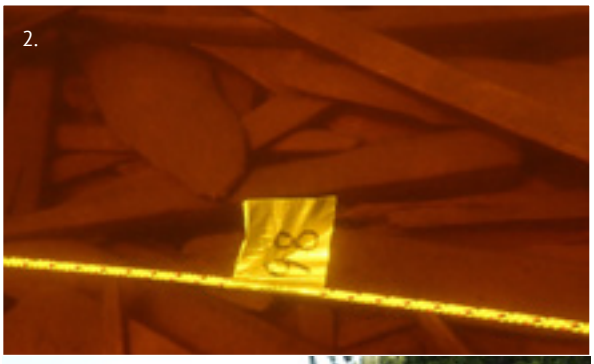
To put it shortly, the summer was full of new and interesting experiences. Our team was wonderful, and our days on the field consisted mainly of doing wading points, drop videos and dive transects. I finished my SSI Open Water Diver (OWD) dive course in June, so I got to be part of the diving and collect data for my thesis while doing it! With having so little experience in diving, it was very thrilling to go on my first proper dives, where actual work was supposed to get done. It's amazing, how you can really work analyzing the bottom and tiny plants underwater! The dives in the Bothnian Bay are usually fairly shallow and the other divers in Metsähallitus, dive elderly (which usually means the dive partner), are extremely experienced divers, so it wasn't like I didn't feel safe. My concern was that I didn't want to get in the way of them working or make it more difficult by stirring the water too much! But of course, like as always when working with professionals, everything went fine and soon I got used to being underwater. As my confidence and skills as a diver and in identifying species grew, I got to be more involved and then do my own transects as an analyser. I like to think that during the summer I evolved from a dabbling duck to some kind of frog like creature!

We did 200-meter-long transect lines from the shore, to as close to a boat way as possible. Every 50 meters an area of 4 m2 got analysed (bottom sediment type, plants, sedimentation, other). Other things close to the transect line were also documented, such as fish, trash, logs… All the dives were fantastic experiences, not one like the other. Some were more exciting, like the clay canyon and some were more "ordinary", with beautiful water mosses and algae nonetheless! Possibly the weirdest experience was to dive close to an island in Tornio, called Kuusiluoto where used to be a big sawmill (more information in Finnish of the history of this island).

The human pressures we documented during the dives this summer were mostly miscellaneous trash, boating equipment, big pieces of wood and very intriguing light mud or muck like sedimentation layer on the bottom. The latter one is something I'm very interested in, it started as a thin layer on the bottom and gradually the layer got thicker and thicker the closer we got to the boat way.

Our theory is, it's caused by the ships and boats, when the motors stir the water causing light particles to start floating and then settle to the bottom some distance away. At many places the sedimentation was so thick it would be impossible for plants to grow at the bottom. I wonder if this has any real effect on the vegetation and will it show on the data analysis of my thesis! We'll see!

Now is time for the real challenge: getting my buttocks to endure all the hours of sitting in front of the computer writing away..



1. Survived the first work dive. (Photo by Suvi Saarnio, Metsähallitus)
2. Bottom full of planks in front of the Kuusioluoto-island in Tornio. (Photo by Suvi Saarnio, Metsähallitus)
3. Kuusiluoto, Tornio. (Photo by Sjef Heijnen, Metsähallitus)

Empowering the stakeholders

Essi Keskinen, Metsähallitus, 1 November 2019

Getting instructions for the action painting. (Photo by Essi Keskinen, Metsähallitus)

What do you get when you give paints, sticks and canvases to a bunch of SEAmBOTH stakeholders and tell them to drip, drop, slam, splatter and splurge us a better and a healthier Bothnian Bay? You get a triptyck of three individual, yet still connected paintings with beautifully balanced colors and patterns, that look like they were made by one individual or at least in close cooperation.

What we wanted to demonstrate with the action painting part of the workshop was that we are all working towards the same goal, a healthier Bothnian Bay (or a triptyck), and we all have to work together, with different coworkers with a different view to the task, and we might have to pick up the work that others left behind, and we are not always able to do everything as we plan and from the beginning, but the result might still be acceptable or even good.

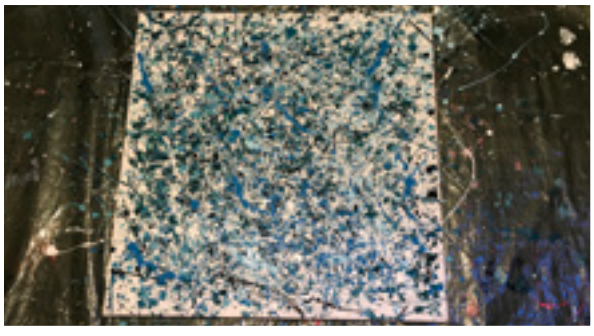
A local artist Hanna Holopainen from Oulu navigated us through the action painting workshop.

We also heard presentations about Zonation (Elina Virtanen from SYKE), national EMMA -work in Finland (ecologically significant marine areas, Juho Lappalainen, SYKE) and different conservation areas in the Finnish marine areas (Joonas Hoikkala, Metsähallitus). The rest of the time we went through the results which the SEAmBOTH project has gained, and what kind of maps can be drawn from them.

Among the approximately 30 participants, we had civil cervants and students, biologists, geographers, GIS-people, scuba divers, recreational boaters, travel promotional people, marine spatial planners and meny more. We had a lively conversation about the many uses of maps, how to improve them, what everyone expects from them and how to gain the best from the information collected by SEAmBOTH.

Everyone agreed, that one of the best and most informative, if not the best, maps was the one where underwater nature was somehow valued for the benefit of the viewer – the most biodiverse areas with most threatened species with the least amount of human pressures were already picked out and colored the darkest in the map. This way the end user doesn't have to know biology, doesn't have to combine information from many different maps and doesn't have to make any more decisions than whether to believe in the expert work behind the map and what to do with that information.

As much as we appreciate the feedback given by the participants, we also wanted to promote a great local location for various venues, Kokardiklubi. The premises used to serve as a movie theater for solders training at the area. Now the place hosts plays, shows, bands, meetings etc. Oulu is applying for a cultural capital of Europe 2026 and we in SEAmBOTH wanted to promote the venue and point out, that everyone around the Bothnian Bay is connected to a healthy and ecologically functioning sea – we all draw inspiration, health, food, mental nourishment, recreation and relaxation from it. None of us is cut of from the sea – we all get something from it.



One of our paintings. (Photo by Essi Keskinen, Metsähallitus)

One Bothnian Bay, and a sea of laws regulating it...

Linnea Bergdahl, Länsstyrelsen, 12 November 2019

The today's and future status of the northern Bothnian Bay is to a large extent decided by the laws regulating activities in and around it and the regulations stating what quality of environment we want and don't want. The sea is the same but the legal framework looks different in Sweden and Finland. One thing we have in common though is the fact that we are all answering to the same EU-directives, which set the overall framework for the marine environment within the whole EU.

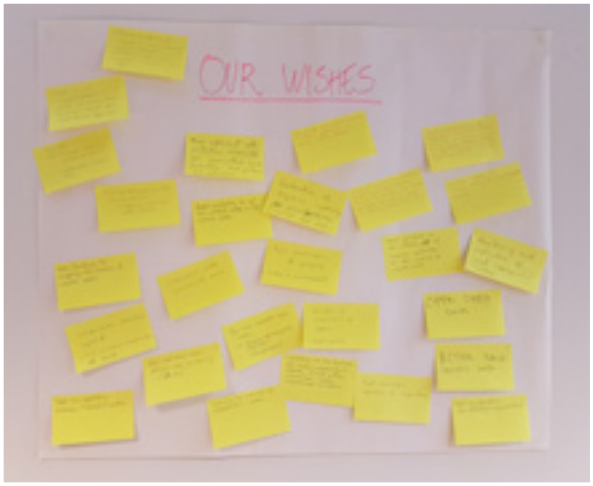
Sounds complicated and bureaucratic? Wouldn't say it is easy, but never the less, it can be quite interesting and ever so important to consider when it comes to working for a sustainable marine environment.

For two days we therefor gathered experts, working with different aspects of marine management and it's legal application, from around the northern Bothnian Bay. Together we shared knowledge and working practices to gain a better understanding of what is regulating the sea on the other side of our own country border.

Knowing we are all guided in our work by the same goal in the EU-directives, we came to discuss the local issues regarding protection of the sea. The protection of the sea may come in different forms, as laws for establishment of protected areas, as regulations concerning threatened species and habitats or as permits granting what activities are allowed and not within the water and on the shores.

We could quickly conclude that our legal framework and organisations are quite different. However, our major difficulties and daily struggles seemed to be exactly the same. The lack of knowledge and information about the marine environment reoccuringly was brought up as a hindrance. When we don't know what species could be living there and how they are affected by human activities, it is very difficult to assess cases and apply laws accordingly. This is where the marine maps produced in SEAmBOTH can come into good use. Playing with the thought that we could wish for anything, as children around Christmas time, we wrote down our wishes on a "wish-list" for marine management:
"more information on the effects of human impacts"
"Ecosystem approach to legislaiton"
"Open accessible GIS data"
"Monitoring of ecological status"
... to mention a few of them.

Who knows, one day these wishes may come true? Or hopefully some of them at least. We are very hopeful, and just by starting talking to each other across the border and sharing our knowledge with each other we have taken one first step forward.



Our wishes! for a more sustainable, cooperative marine management in the northern Bothnian Bay

What is valuable nature?

Linnea Bergdahl, Länsstyrelsen, 29 November 2019

One of the things we do in the SEAmBOTH project is to produce maps which can help us identify valuable areas in the sea. Because we know that valuable areas are those that we should not destroy, those we should take extra care of to ensure the sea remains healthy and in good status. Therefore, a map of them can help us when we plan and do activities so we avoid harming them.

Within this task lies a fundamental question of a rather philosophical character – what is "valuable" nature? Some might say it's the fish in the sea that is most valuable, maybe based upon their taste for fish or economic dependency of it. Another person might say it is the shallow, sandy bottoms because they find them very pleasant to use as swimming beaches. As soon as we start talking about more "valuable" or less "valuable" parts of nature we are going to get as many answers as number of people we ask. Saying something is "valuable" is a highly subjective act where no answer is more "right" or "wrong" than the other.

How on earth are we to make a map then?!

This is where we use science. From a long history of research, scientists from all around the world have gathered results, knowledge and drawn conclusions about how the nature function and its inhabitants interact. This has helped clarifying what makes "valuable nature", from an ecological perspective. We know far from everything about the nature and its intricate functioning (this is important to keep in mind) but some general conclusions exist. For example, biodiversity is important. The variation within genes, species, habitats and landscape is a crucial factor to a well-funtioning and thriving nature. Therefore we also regard areas, species, or functions which uphold the biodiversity as highly "valuable" (notice this is from an ecologicaly perspective. A sandy beach might just as well be regarded as highly valuble for the pleasure it brings a swimmer, but that is from a personal perspective).

In SEAmBOTH, we have our gathered data in thousands of datapoints from where we know the existance of species. To put these on a map where we can locate areas of higher and lower nature values, we have worked on several steps.

First, we used a nature value assessing tool called MOSAIC to assess a nature value of the different species and habitats we have in our sea. See more from our workshop in a previous blog https://seamboth.com/2019/02/15/is-our-most-valuable-nature-also-our-most-endangered/

Based upon the scientific knowledge, the MOSAIC tool have evaluated ecosystem components i.e species and habitats, for their value from an ecological perspective. How they contribute to biodiversity is one aspect, their function within the ecosystem another example. Very little of scientific research is made especially up here in our norhtern seas. That is why we needed a local

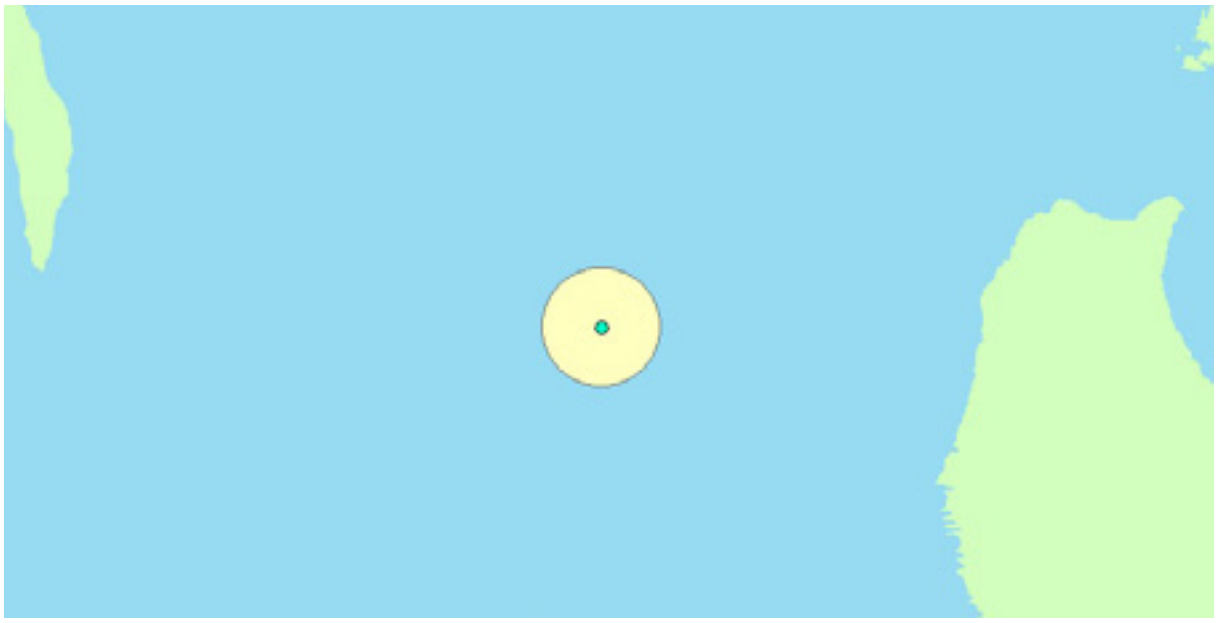
assessment for nature values wihtin SEAmBOTH. What is regarded as highly valuable in the south of the Baltic Sea may not necessarliy be the same here in the north as the conditions of our marine environments differs. Secondly, with the nature values for the SEAmBOTH area in our hand, we could feed this into the ZONATION spatial planning tool.

The biologcal data together wIth the data of human pressures located around the sea will be processed in ZONATION. When it has done its job (mastered by our collegue Elina) we have a map of valuable areas in the sea in our hands. The highlited areas on that map will be valuable areas from an ecologically, scientific perspective. A mudddy, shallow bay with thick vegetation and loads of mosquitoes might turn up there as highly valuable. Doesn't seem too valuable to me who likes beautiful, sandy beaches, one might think. But then keep in mind it is a valuable area for the sea and nature itself. And as well for us humans as we hihgly depend upon a healthy, well functioning sea for our wellbeing.

Sandy beach outside of Luleå city.
(Photo by Petra Pohjola, County Administrative Board of Norrbotten)

Modelling anthropogenic pressures

Marco Nurmi, SYKE, 6 December 2019



Human impact modelling typically seeks to assess how strong the cumulative impact of anthropogenic ecological stressors is on the ecosystem, i.e. where nature is experiencing stress due to human activities. Impact modelling might in some cases assess the impact of only one specific stressor or activity; in other cases, the ecosystem and its components might not be included at all in the analysis, resulting in a product that estimates the amount of stressors present but not their impact.

The process of human impact modelling can roughly be divided into two stages: data processing and analysis. In the first stage, geographic information system (GIS) software like ArcGIS and spreadsheet programs like Microsoft Excel are usually the main tools used to process ecosystem and human activities data, with custom scripts used as support (though scripts can also be used as a main tool). In the second stage the processed data is entered into a program or script that calculates the cumulative impact.

Typically, the ecosystem is represented by a collection of ecosystem components, each as a separate spatial dataset. Examples of ecosystem components are seabed habitats or different mammal and fish species. Ecosystem components can also in turn be aggregates of several datasets or be composed of only a single dataset. If we take whale occurrence data as an example: the occurrence of all whale species could be aggregated into one ecosystem component, or they could be divided into a couple of ecosystem components based on specific species traits or taxonomy, or each whale species could be left as a separate component. What is the best approach depends on things such as data quality, scale, objectives, computer processing power, and time.

Human activities are often divided into stressors, or pressures, much in the same way as the ecosystem is divided into ecosystem components. A single human activity, ship traffic for example, can cause several different types of stress on the surrounding ecosystem. Thus, the ship traffic dataset might be processed into two or more stressor layers, one maybe representing the underwater noise caused by ship machinery and propellers, the other representing the re-suspension of sediments caused by ship passage. Furthermore, these stressor layers might be aggregated with other stressors of the same type, combining all noise stressors into one dataset for example.

The first step when preparing and processing raw human activities data is usually the conversion data into the GIS format needed for further processing. The desired format in this stage might be raster, polygon, point or line, depending on the activity, scale, data quality, or stress it produces. The simplest way of assessing the extent and intensity of a pressure is to take the spatial data of the corresponding activity, and calculate how many times that activity is present in each location (raster cell). Another simple method is creating a buffer around each feature (activity) to simulate the spatial extent of the pressure caused by the activity.

Simple methods for processing data are in some cases perfectly suitable, for example when calculating how much of the seabed surface is lost from dredged material being deposited there; other times, however, more advanced methods and tools are needed to estimate the extent and intensity. Advanced methods might take into consideration the diminishing effects of a stressor when the distance to the source of the stressor increases or when there are obstacles in the way, weakening the propagation of an expanding stressor like underwater noise. Advanced methods might also account for varying intensities within an activity, for example by considering ship size and speed when calculating physical

disturbance caused to the seabed. With ArcGIS, these phenomena can be accounted for using tools such as ring buffer, focal statistics, Euclidean distance, cost path, viewshed, zonal statistics, and many others.

Ecosystem data processing can require similar methods as stressor data processing, but is often more straightforward due to the stationary and present/absent nature of many ecosystem components, such as substrate type or seagrasses. Typically, the majority of ecosystem components are presented as presence/absence data (1/0), while stressor data tends to be a fairly balanced mix of presence/absence and continuous (0.01 – 1.00) data. For both ecosystem components and stressors the final processed data is almost always in raster/grid format. Expert opinions and scientific literature are the main sources when deciding how a dataset should be processed, for example when determining the size of buffers used to simulate the spatial extent of a pressure.

When all datasets are processed, the actual cumulative impact analysis can finally be run. All datasets are fed as input into the software or script chosen to run the analysis. Software suitable or meant for human impact modelling includes ArcGIS, Zonation, and ImpactMapper. At this point, so called sensitivity scores or "weights" (Fig. 4.) are also entered into the software; these determine how strong the effect of a specific stressor is on any specific ecosystem component when they intersect. Sensitivity scores are typically based on expert opinions.

The main final product is usually a quantitative map that shows cumulative impact, i.e. where and how much the ecosystem is under stress. Typically, the more ecosystem components and stressors there are present in the same area, the higher the cumulative impact value will be. Human impact modelling is a concept that is still in a relatively early stage of development, especially when the focus is on the marine environment. New methods are constantly being developed, better data is becoming more available, and computer processing power is steadily rising, leading to new opportunities almost every year!

Diving

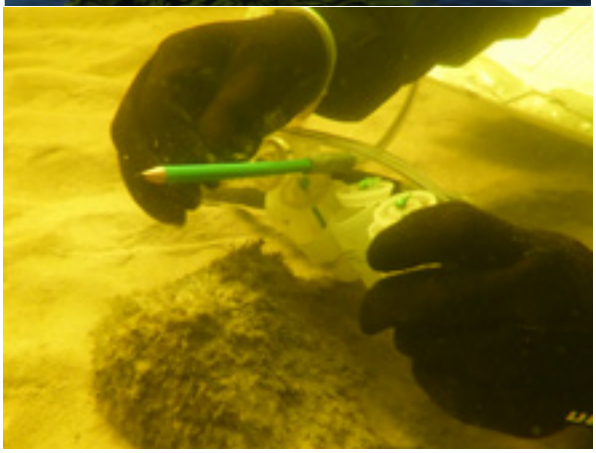
Suvi Saarnio, Metsähallitus, 20 December 2019

Diving is one of our three main methods for collecting biological data from the Bothnian Bay. The other two are drop-videos and wading.

When we want species data from deeper than 1 meter we do a 100 m transect line or dive points (which are basically the same as wading points, only done with the help of dive gear). Wading cannot be done in deeper than 1 meter because at that depth we cannot see the bottom substrate or the species that well anymore and there is a big chance for losing valuable information. With drop-videos we can do mapping in deeper areas but we cannot get accurate species information with species coverage.

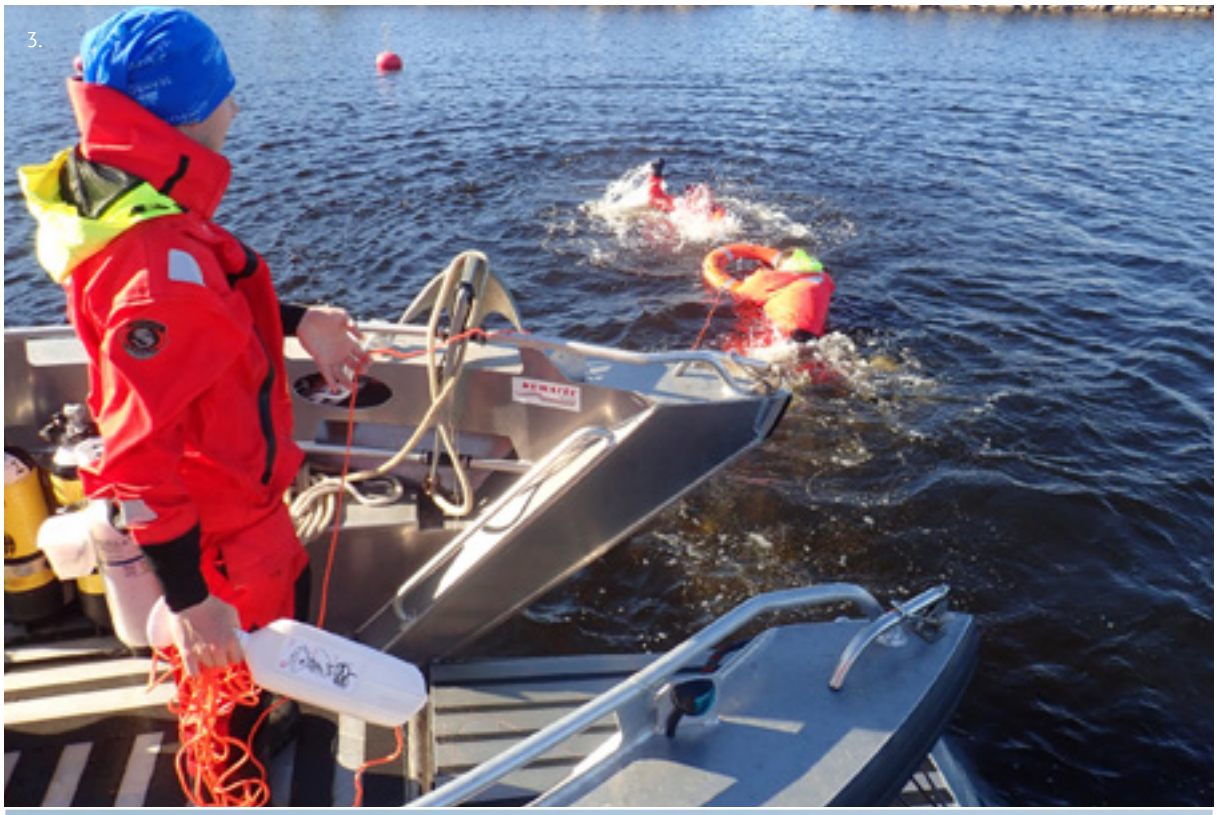
Diving is time consuming but it is also our most valuable method. Usually we choose the dive site carefully in advance at the office and on the field we just drive the boat to the right spot and start putting the 100 m transect line down. Often the other end of the transect is put on a shore of an island and the other end goes straight out from the shore. We mark both ends of the transect with a buoy so that the divers can find it easily and so that it is easy to see that there is something going on in the water and that people driving boats should be aware. We of course also have a dive flag on the boat when divers are down.

We have to have a team of three when diving. We can choose if two divers go down and one dive supervisor stays on the boat or if one diver goes down with a rope and two supervisors stay on the boat and communicate with the diver by giving signals with the rope. The team of three is very important for safety because usually two persons are needed for pulling one person up to the boat from the sea and for transporting the victim to the shore.



1. (Photo by Essi Keskinen, Metsähallitus)
2. Diver taking samples. (Photo by Johanna Kantanen, Metsähallitus)
3. Safety training is an important part of our work. (Photo by Eveliina Lampinen, Metsähallitus)
4. Team of two divers ready to start the dive. (Photo by Anna Soirinsuo, Metsähallitus)

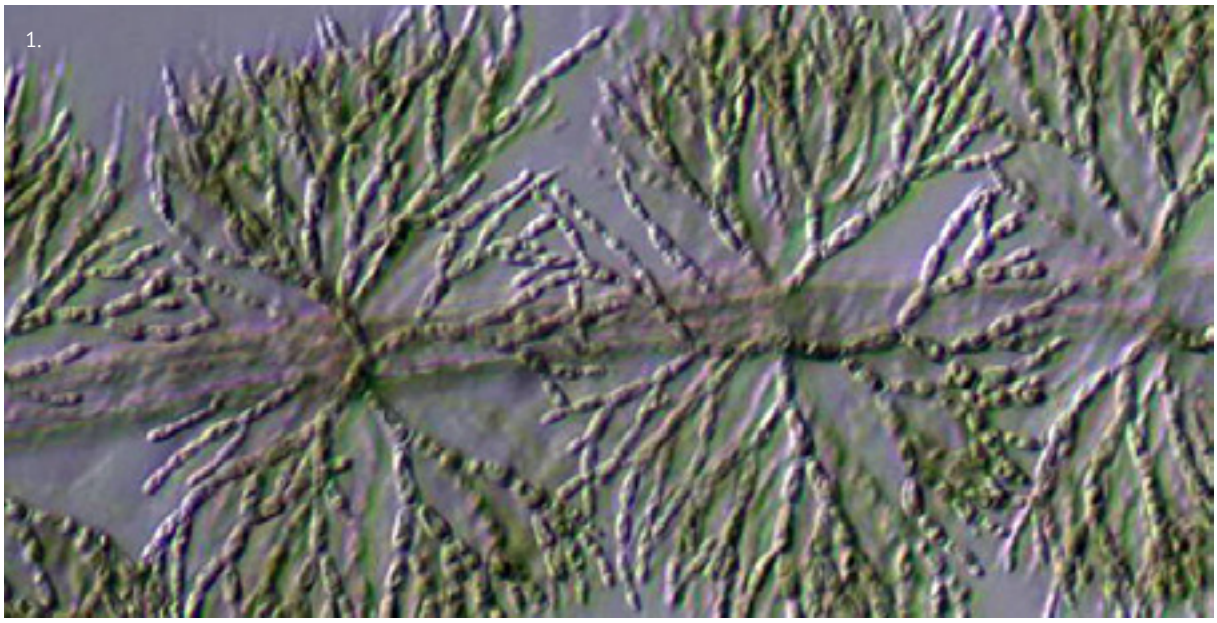
3.



4.

Species identification

Essi Keskinen, Metsähallitus, 10 January 2020


1.

No matter how carefully you look, many of the aquatic flora species can't be identified by naked eyes only. Some of the specific identification characteristics have to be looked at with a microscope. If you want to identify for example a water moss Oxyrrhyncium speciosum, you have to look at the edges of the leaves – are they serrated (saw-like) or not. Or if you want to identify a filamentous algae Ulothrix zonata, you have to look at the cell structure inside the algal filaments.

Some of the characteristics can already be seen with a field magnifying glass (for example the stipuloids in the various species of Charales). If this doesn't work, and the species can't be identified in the field, we take a sample.

Marine biologists at Metsähallitus are a huge user of plastic zip-lock bags. Unfortunately, we can't use anything more environmentally friendly because the bags have to close properly to hold water and the sample and they have to be made of a material, where the sample doesn't stick to. Also, they have to go into a small space (the pockets of the survival suit) when they don't contain a sample yet. This pretty much leaves us to play with different brands of zip-lock bags. So far, the double zip-lock ones that Ikea sells seem the best for the purpose. For field inventories done with scuba diving, we use hard plastic containers with lids, or old-fashioned camera film containers. But the good thing is that we use these plastic bags and containers again and again, Summer after Summer.

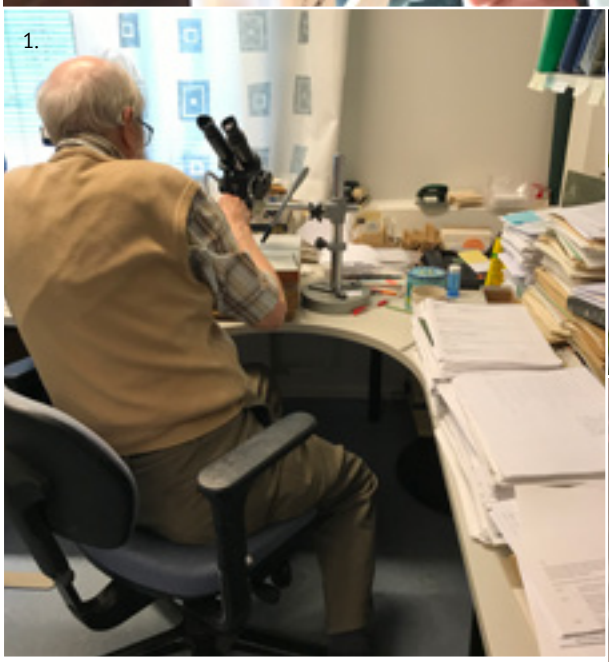
We mark each bag with a number or a letter combination, for example "A1" and then in the field when we're taking the sample, we mark "A1" to the field paper in the correct place to indicate that a sample was taken from this specific point.

Then, back at the office or in the field accommodation, we start the task of microscopying each and every sample taken in the field. We use a dozen or so identification books for different species (one for water mosses, two or three for vascular plants, two for Charales, two for algae) and try to do our best. If our best isn't enough and we can't get the species identification solved, we store the sample and turn to real experts.

The real experts are taxonomists who have been studying various groups of flora, sometimes for decades. We usually find them at the universities and natural history museums. Some of them are emeritus professors, who have been working on taxonomy since the 1960s. One of these specialists in Finland is an emeritus professor Tauno Ulvinen, 90 years old, at the University of Oulu Botanical museum. If we have anything to ask about weird water mosses, we turn to Prof. Ulvinen. When we can't identify a Charophyte, we send it to Senior Museum Technician Marja Koistinen at Natural History Museum. Etc etc. We have different experts for each group of macrophytes.

When the answer gets back to us, it's sometimes very frustrating to find out that it was the same species that we are always unable to identify. Sometimes we get a pleasant or an exciting surprise and find out that we found a species which we haven't found before or which wasn't previously known from the area.

Of course, most of the species can be identified right then and there in the field, underwater or at the shoreline. It's the ones that we have to take a sample of that will consume so much of our time after returning from the field.



1. Emeritus professor Tauno Ulvinen checking our water moss samples. (Photo by Essi Keskinen, Metsähallitus)
2. Chara aspera. (Photo by Essi Keskinen, Metsähallitus)
3. Sample bags drying at the office after use. (Photo by Essi Keskinen, Metsähallitus)

Stories from the Depths – A Brief Guide to Reading Sediment Archives

Aarno Kotilainen, GTK, 31 January 2020

Humans have affected their environment for a long time. The ancient people respected the Earth. However, they already had an impact on the environment and its state. Over the past decades (and even longer) increased anthropogenic activities have altered both marine and terrestrial environments worldwide. Nowadays it is difficult to find a place on Earth where human influence would not be visible. We have even influenced our planet's climate.

How can the changes we make in the marine environment, for example, be studied?

Seabed sediments are one of the archives which can be studied (and read) to obtain information from the past environmental changes. Where, and how, can these past environmental archives, "books" be found? And how to read them?

Deep basins in the open sea, sheltered depressions in the coastal areas, as well as the river estuaries are often suitable places for hunting these treasure chests of environmental change research. These geological records that have accumulated nearly continuously on the seafloor, provide unique information on environmental changes over the past centuries and even millennia. The exact sites, where the best and most representative sediment deposits could be found, need to be surveyed and located by using acoustic-seismic sounding methods, like the sediment echo sounder. The sediment echo sounder provides information e.g. on water depth, and on the thickness and internal structures of soft (mud and clay) sediment units.

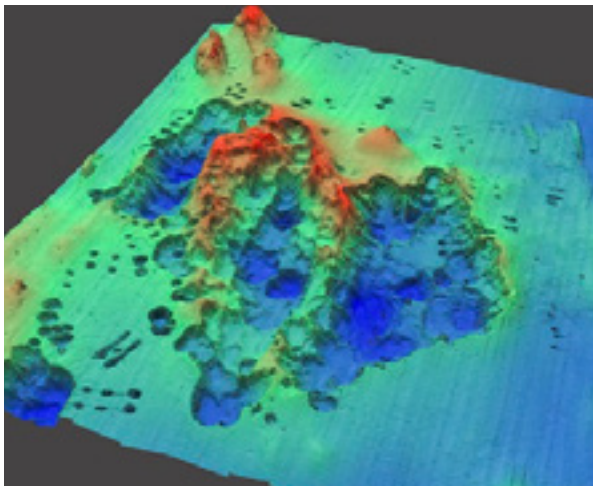
When the exact site is chosen, we need to take a sample from the seabed. Over the years, various methods for seabed sampling have been invented, like grab samplers, box corers, piston corers, vibrohammer corers, and gravity corers. In the SEAmBOTH project we have used GEMAX gravity corer, because it can recover undisturbed samples even from the fluffy, soft mud.

The coring itself is a relatively quick operation, especially in shallow waters. The corer is lowered to the seabed using the crane and wire, and then lifted up.

On the deck, the acrylic sample tubes are removed from the metal corer body. One sample tube immediately leaves to the gentle handling of geologist. Because the acrylic sample tube is transparent, it is possible to make the first observations and descriptions straight through the tube liner. Through the liner it is easy to see the soft surface sediments and their structures.

The next step is to split the description sediment core in half lengthwise, and then to set the splitted core on the operation table like a patient, an unknown patient (suom. tuntematon potilas).

At its best, the splitted sediment core can reveal the detailed sedimentary structures, like sediment layers



Seabed topography after marine sand extraction at an area around 1,5 x 1,5 km2. Geologian tutkimuskeskus (GTK).

deposited in different seasons. The geologist describes all the details and structures seen in the sediment core and then photograph the core. In the past, you had to wait for the photograph, until the film was developed. Sometimes it took weeks until you knew if the picture was successful. Everything is different nowadays in the digital age. Thus, today, we do not run out of the film.

Once the sediment core has been described, the subsampling from the parallel sample tube begins. The sediment core can be sliced e.g. into 1 cm thick subsamples using a slicing device and packed in plastic bags and boxes. The subsample volumes depend on what kind of analyses will be done. And in case more samples are needed from the same site, then new sediment cores will be taken. The packed subsamples will be stored in the vessel's cold store, waiting for landing and laboratory analyses.

Subsamples can be studied in laboratories for virtually anything, like grain size, chemical composition, mineralogy, microfossils, or, for example, microplastics. Analysing the age of the sediment core is essential for studying the changes in the marine environment.

Seabed sediment cores from the Baltic Sea, also from the SEAmBOTH project area in the Bothnian Bay, have revealed the human influence mentioned already in the beginning of this article. Unfortunately, our emissions (e.g. nutrient and heavy metal loading) have also been archived into the seabed. Thus, it is essential to map where the concentrations of harmful substances are most prominent in the bottom sediments. The detailed knowledge can be used to direct seabed construction (e.g. dredging) to the most suitable location and to choose the right method for its safe implementation, while minimizing the environmental risks.

In the SEAmBOTH project we study and provide information on the biology and geology of the seabed as well as changes in the marine environment, including anthropogenic loading.

Final seminar – done!

Essi Keskinen, Metsähallitus, 21 February 2020

The SEAmBOTH final seminar brought about 70 people to Oulu University and about 20 people following the presentations online. (Photo Essi Keskinen, Metsähallitus.)

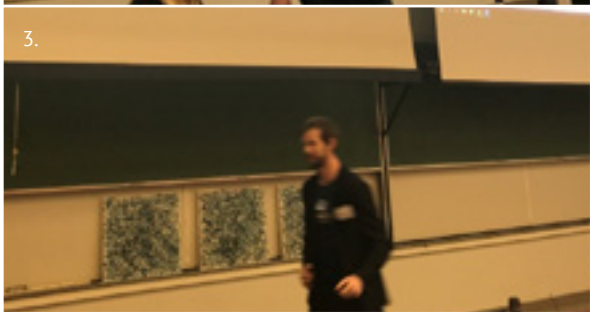
The SEAmBOTH final seminar was held at the University of Oulu yesterday, February 20th, 2020. Almost 70 people from both Finland and Sweden attended us on the spot and we had a two dozen online participants from as far away as Holland.

The presentations varied from the project results, to human pressures in the Baltic Sea, to the history of marine research in the northern Bothnian Bay, to future climate change scenarios of the Baltic Sea, to new funding opportunities with the Interreg Nord, to the end user comments about using our data

The presentations were recorded and will appear at the final seminar webpage when they are ready to be viewed, as well as the presentations that we have the permission to save to the webpage.

We will start to release our great results gradually on a new "Results" page at the SEAmBOTH website when we have recovered from the organization of the final seminar. All publications that were released yesterday at the final seminar (the blog pdf, the species identification pdfs and the video) will be found eventually from the "Results" page.

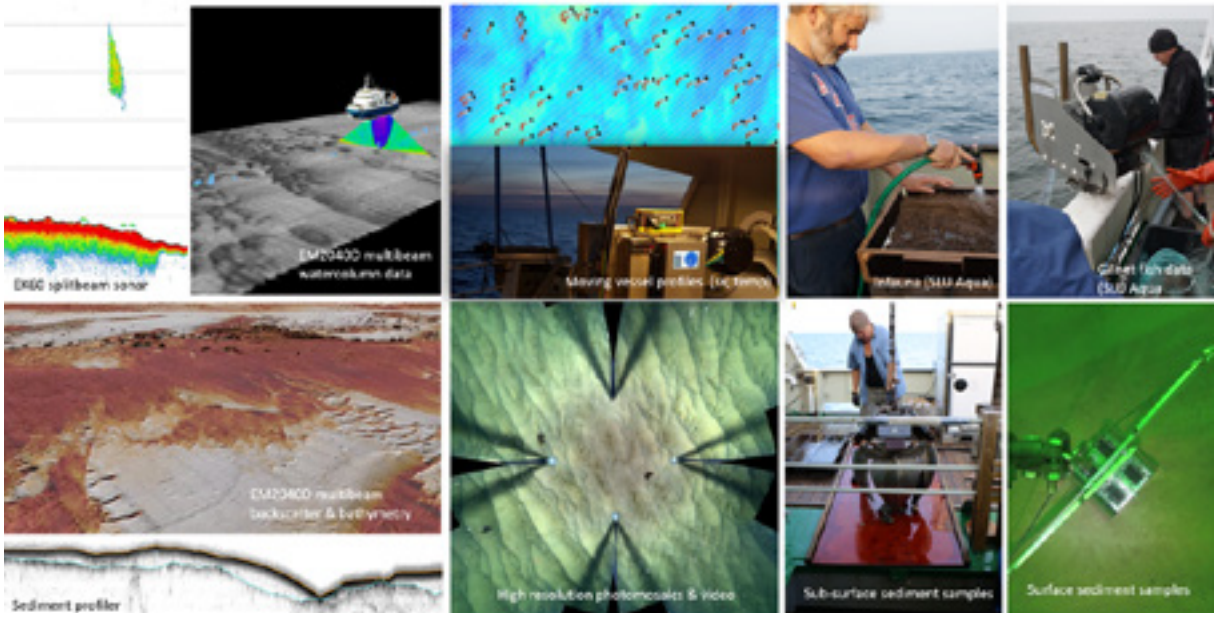
Just stay tuned, watch the webpage, see the video again and watch out for the "Results" blogs which will be appearing in the near future!



1. SEAmBOTH roll-ups and posters were on display probably for the last time.
2. Aarno Kotilainen, GTK, introduced a short geological history of the Baltic Sea.
3. Gustav Kågesten, SGU, presented the existing geological maps and the SEAmBOTH new geological maps. (Photo Essi Keskinen, Metsähallitus)

How we do it: Mapping seafloor habitats

Gustav Kågesten, the Geological Survey of Sweden, 28 February 2020



Many different instruments and methods work together to collect oceanographical, biological, and geophysical information in the survey area when you conduct habitat mapping (the images are from SGUs survey of Hoburgs bank in the Baltic Sea 2016-2017). Sometimes we even work around the clock, surveying at night and taking samples and photos in the day.

Air versus water

On land we are used to observing the landscape and the animals living there in high definition from even great distances. On a good day we can observe objects several kilometres away and from space the entire planet Earth is observed daily! As soon as we put our head under water that changes. A diver can, under exceptional circumstances, see about 100m through the water (Silfra, Iceland), but in the coastal waters of the Baltic sea visibility will often vary between 0.5 – 10 meters. That means that satellites have a very limited view of down into the water and that we can only observe small patches of the seafloor when we send down a diver or a camera. Water absorbs light very quickly and even more so when it contains high levels of plankton and suspended particles. The longer wavelengths (starting with red light in the visible spectrum) are easiest absorbed, while shorter wavelengths (blue light in the visible spectrum) penetrate further. Therefore, everything turns blue or green as you get deeper down. In the coastal areas of the Bothnian Bay high levels of humus substances often tint the water a brownish green, absorbing light even faster. So, if we can only observe very shallow habitats from the air, how do we go about mapping anything deeper down? Fortunately, water has got one advantage to air, the speed of sound. Sound travels more than 4 times faster in water than it does in air – around 1500 m/s (varies depending on temperature and salinity). In the same way as whales, we can send out sound at different frequencies and record the echo as it comes back to us and turn it into an image. This allow us to capture detailed information of both the water, the seabed, the sediments, and the bedrock underneath.

Using sonars to map the ocean - from the water surface into Earth's crust

A ship like SGUs S/V Ocean Surveyor is packed with different acoustic instruments; sonars using high frequency can map at high resolution but do not reach as far, while low frequency sound is used to penetrate down in the seabed. Heavy seismic instrument can penetrate several kilometres into the seabed (for example, for fossil fuel exploration). However, at SGU we normally only use lighter types of seismic instruments (penetrating a few hundred meters into the seabed) and sediment profilers (~1m -100m penetration) to map the sediment and bedrock underneath the seafloor surface. Our workhorse for seabed scanning is a 200-400 kHz multibeam sonar which can hardly penetrate the seafloor at all but can scan a swath of the seafloor covering about 5-10 times the water depth at ~0.1 – 1m resolution. When analysing the signal that comes back from the sonar we can determine the depth (i.e. just like any other echosounder), but we can also determine how much sound that the seafloor reflected and other objects that reflects sound in the water column. So, in addition to depth, we can also get information about seabed substrates (and sometimes organic material that cover the seafloor, like a seagrass meadow). In the water column there are fish and some escaping natural gas which both create air bubbles that can reflect sound very well and can be captured by the signal. In summary, we move like a giant lawnmower and scan the seafloor back and forth running lines about 100m apart at 6-9 knots speed (about 10-15 km/h), scanning both the seafloor surface and the seabed below. It takes a lot of work and dedication to make a detailed map!

Direct observations from the seafloor - Ground truthing
In addition to sonar and the oceanographic instruments that we need to calibrate the sonar (measuring salinity, temperature, and sound velocity), we also take samples and images from the seafloor at selected location.
This is a key part of the map making process. By using the high-resolution images from the seafloor, we can locate not only the most common habitats/seafloor types, but also small reef structures and other seafloor types that can cover very small areas but are important nevertheless. We use a combination of stratified random sampling design and expert interpretation to sample these locations (ensuring we do not have a bias in our selection, but still sample the full variety of seafloor types in the survey area). From samples we can get detailed grain size information about infauna (SGU are not experts on infauna or fish but we collaborate with those who are, such as SLU Aqua) and environmental condition of the sediments. From picture and video, we can capture the patchy nature of the seabed substrates, geological processes (such as sand transport), and the flora and fauna that covers the different substrate types at different locations. Together the combination of geology and biology at the seafloor make up what we typically refer to as "benthic habitats" when we have an ecological perspective of the seafloor.

Making a map out of all of this...
So, how do we make a seafloor map? There are two main ways we go about it.

The manual way: We use expert knowledge to interpret what we see in the sonar data, sediment profilers, the samples, and the images and we draw a map by hand (though in a digital format on the computer). The advantage with this method is that the expert can use all the experience from previous work as well as the new survey to try and make the most accurate map of the geology in an area. It takes quite a lot of hard work, but in the end you get a very useful geological map that's been verified by expert knowledge, samples, and survey data. This is the way SGU used to always go about mapping. However, there are some drawbacks that makes us explore new options. A detailed map drawn by an expert is quite time consuming, but it is also limited by the themes that are feasible to draw this way (and we are mostly limited to a geological perspective). The maps are also subject to the knowledge of different map makers, if two equally knowledgeable experts draw the same map it will still look quite different even if the general trends are the same. Finally, if new information becomes available, we need to redraw the whole map for the map to get an update.

The modelling way: By combining sonar data and information from the direct observations (i.e. camera, samples) we can also use computer algorithms to make a prediction for us. This is commonly referred to as machine learning or modelling. The underlying mechanism is the same for any kind of prediction, we have data that we use for training (i.e. our observations), and some data that we train on (i.e. sonar images or any other environmental data that capture the seafloor). "Computer vision" that can be used to identify your face in an image does a similar thing, as does the prediction for your next search in your preferred search engine. The main advantages with mapping this way is that we can focus on producing good training data and quality sonar data from our survey, then the computer does the map drawing for us. If we have poor data however, the model will also be poor. Once the modelling is set up with all ingredients we can model any themes we have data on with little extra effort this includes geology, substrate grain sizes, environmental condition, biological cover, or any other observational data you have available on the seafloor and which relates to the environmental data you have available (i.e. depth , sonar mosaics, shape of the seafloor, oceanography, etc.). Another advantage is that we can update our maps when new data becomes available with only moderate efforts (and we can repeat making the same map repeatedly, independent of which person is pushing the button).

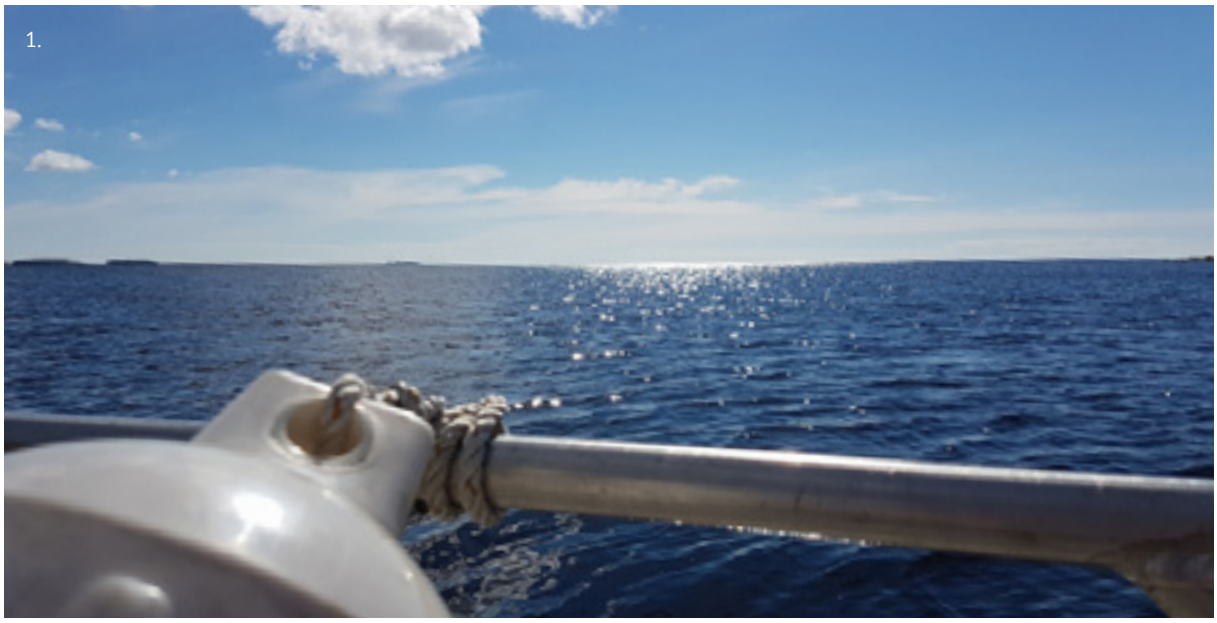
Sounds too good to be true? Well.... There are some things you need to be careful about when using computer algorithms to produce maps: the models only gets as good as the data you have, and expert validation and training is very important part of the process. Also, colourful and highly detailed modelled maps can look great without being very good (this is true for all kinds of maps). Fortunately, we can avoid creating colourful but misleading maps by using test data not included in the models to get some statistics about how good our maps are and even display this in a spatial context. As a rule, when we have a very detailed survey available, our modelled maps can be produced with a high quality and resolution.

Putting the final map together in the SEAmBOTH area
So, how do we create the maps for the SEAmBOTH project? We combined the best of what we know about expert interpretation and modelling. This allows the experts to contribute to the modelling process and generate additional training data to improve the models in areas with lower quality data.

We are also using expert knowledge to interpret the sediment profiles and to draw a geological map (mapping the upper 1m of the seabed substrate) using manual methods. The traditional approach allows us to make seamless maps over the border with Finland and Sweden and connect the data with our older maps made the same way. The geological map also helps the modelling of the even more detailed geological, substrate, and biological components. Due to the low visibility in the Bothnian Bay, the areas mapped in the deeper areas do not have much in terms of flora and fauna attached to the seafloor, so the main product in the survey area are the detailed substrate and geological maps. We are still in the works of finalizing the process. One of the final steps is to get permission from the Swedish military to publish the full resolution of these maps, it is still pending due to the sensitive nature of underwater

Flashbacks to the Summer and Field Surveys of 2017

Linnea Bergdahl, Länsstyrelsen, 12 December 2017

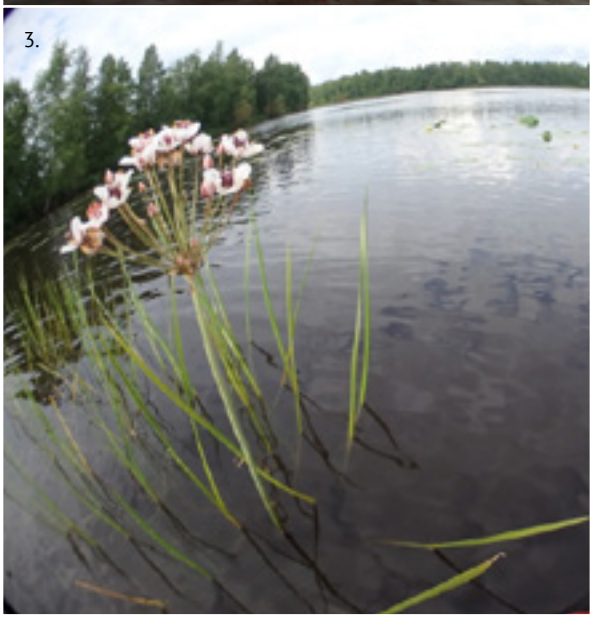


The first year of the SEAmBOTH project is coming to an end. While the days are getting colder and the ice starts covering the waters of Bothnian Bay, we're looking back at the field surveys of 2017 and reminiscing warm, sunny days out at sea (maybe not all the time).

During the summer, staff from Metsähallitus (Finland) and County Administrative Board (Sweden) had their dry suits on and spent the days monitoring underwater vegetation of the shallow areas on their respective side of the bay. From wading to snorkeling, diving and filming with drop-video camera, the different plant species were meticulously identified and their abundance recorded. As an example of good news, it can be mentioned that for example the plant Alisma wahlenbergii (Baltic water-plantain) was found at new sites both along the Swedish and Finnish coast. A. wahlenbergii is endemic to the Baltic sea and some adjoining lakes. It is classified as vulnerable on the IUCN red-list of threatened species and protected by law.

The Geological Survey of Finland (GTK) had one of their ships in the Bothnian Bay and spent time scanning the seafloor to produce maps of the underwater landscape. To do this, they require certain technical equipment, such as multi-beam and side scan sonar, with which they can "see" the seafloor and create a visualization of what it looks like down at the bottom of the sea.

The ELY centres in Finland were recording the water quality with samples taken from monitoring station at sea, both outside of Torneå and Oulu. Data of the water quality play an important role when it comes to analyzing and interpreting the satellite remote sensing data, which will be recorded during the next year.



1. Overlooking the Bothnian Bay around the archipelago of Kalix, Sweden.
2. Going to work.
3. Butomus Umbellatus.

Oh, Monday...

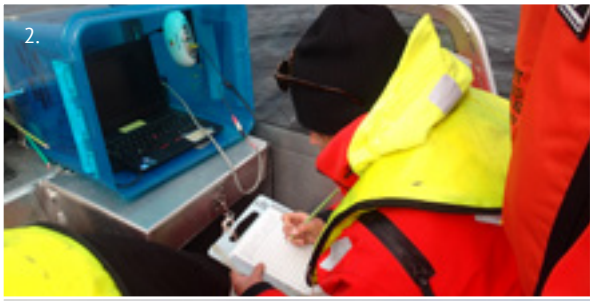
Suvi Saarnio, Metsähallitus, 15 June 2018

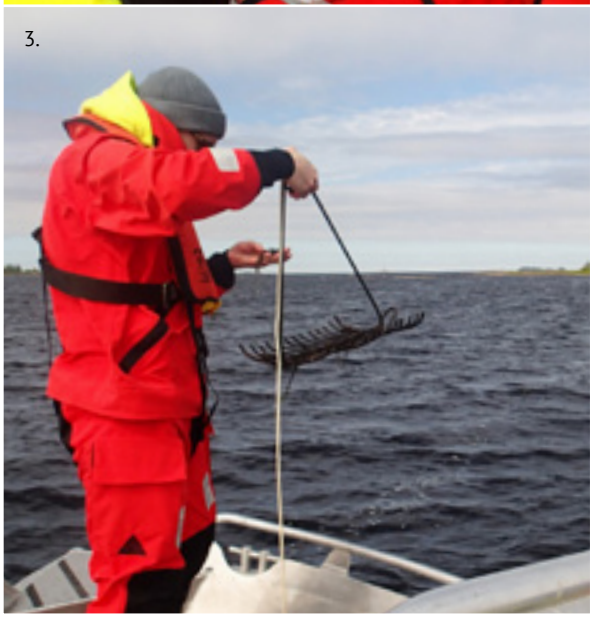
It was just one of those days. Those days when you can just say, "Oh, Monday".

I informed our Metsähallitus marine team that our life vests have arrived to one store in Oulu and I will pick them up early on Monday morning and then we will make the last safety checkup on our boat Inca, and start the actual field work! Well, it didn't go exactly like that. I went to the store early in the morning and I asked about the package. The salesperson said that there is no package for me. I was shocked and asked again and she checked all the packages and said there is nothing for me. I called the delivery company and they said that they have delivered the package to the store already last Saturday. The salesperson said that it is not there, so I gave her my number and went back to the office to do the safety checkup on Inca.

When we were finished with Inca I got a call that the package was, after all, in the store. I went to get them, and I was so angry for the salesperson for wasting our time, but at the same time so happy, because now we were able to start the field work at the sea. When I went back to the office we carried the equipment to our car and started driving, but then we noticed that we didn't have all the maps with us. Then we realized we also missed the field forms. The computers. The sampling bags. Oh my, it was definitely the first field day of the season!!

Finally we had all the necessary equipment with us and we drove to the harbor and put the boat down and loaded everything to the boat. When we got to the sea, the weather was worse then expected. Our boat is quite small, and doesn't take the waves that well, so we had an hour of what can be really called "a bumpy ride". We had a couple of video points that were kind of sheltered, so we were able to take videos from them.





1. Looking out for rocks in shallow waters.
2. Learning how to take drop-videos.
3. Taking samples from the videos point with a rake.

Springtime means eggtime

Linnea Bergdahl, Länsstyrelsen, 22 June 2018

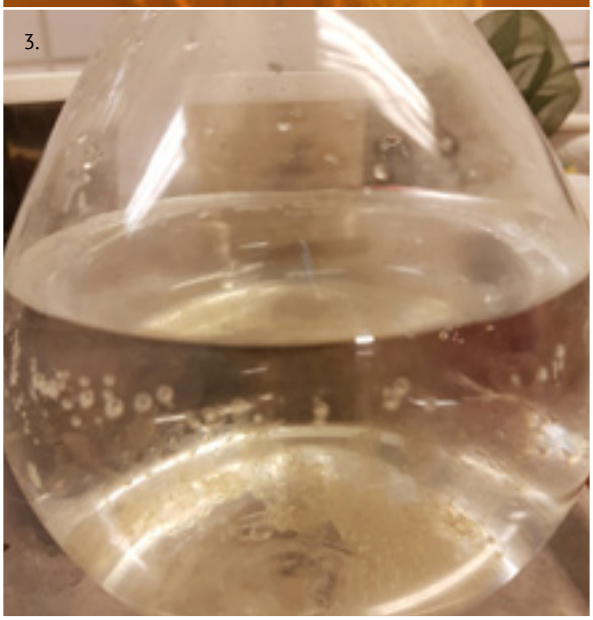
Spring is a truly busy time in the sea. When the ice cover melts in the Bothnian Bay it's time for the fish to spawn and lay their eggs in the shallow bays, creeks and lakes.

The perch (Perca fluviatilis) is one of the most common fishes in and around the Balitc Sea and the Bothnian Bay. It lives both in freshwater lakes and streams as well as in the brackish coastal waters. In spring to early summer it comes to the shallow waters where the female lays her eggs. The eggs are encased in a gelatinous coat, up to one meter long band. To prevent the eggs from drifting away they are attached on vegetation. For example tree branches, stems, and old reed thus become important structures for the survival of the eggs.

After approximately 2-3 weeks the eggs hatch. It depends on the water temperature though, the warmer water the quicker they hatch. The young perch spend their first time in sheltered, shallow areas where they feed on plankton. As they grow bigger they move out to deeper waters. Then they also start feeding on insect larvae, small crustaceans and smaller fish. The perch can become up to 20 years old.

Not all fish roe is as easy to identify as the perch's white "bands". These small, pearl-like eggs were found attached on stalks of various vegetation, but who they come from we have no idea of!

The only way to find out is to collect some of the eggs and let them hatch. The hatchlings can then be identified by specie. Answer to come!



1. The eggs can teach us a lot about the importance of coastal habitats and the lives of fish. Where do they lay their eggs? At what time? At what water temperature? By using snorkelling gear we can easily search and photograph them and the SUP board aids transportation
2. The perch can lay up to 20 000 eggs in one cluster. Here they are firmly wrapped around reed to be held in place.
3. Waiting for eggs to hatch...

Stumbling upon the sheated pondweed

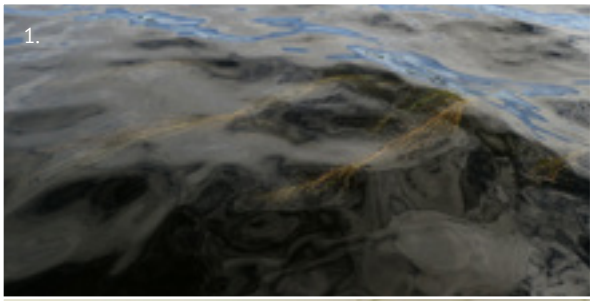
Linnea Bergdahl, Länsstyrelsen, 12 July 2018

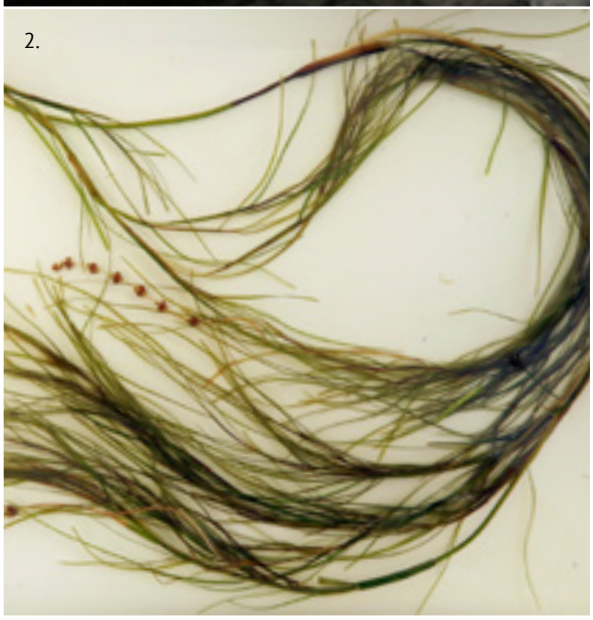
Close up of the flowers.

Most of the time our surveys of vegetation in the Bothnian Bay are planned, foreseeable and follow a systematic routine. But some things you can only stumble upon, such as finding the sheated pondweed (Stuckenia vaginata).

It was during the boat transportation to our intended study site that we earlier this week stumbled upon this magnificent plant. On the surface it may not look too impressive, a green, half meter long plant with many thin leaves floating. But when you consider the depth at which you're at you'll understand that these plants are the giants of the northern Bothnian Bay. In our case the depth showed 2,2 meters, which means the sheated pondweeds had a hight of nearly three meters!

They can be found in freshwater lakes and brackish water, in the northern regions of Siberia, North America, Asia and here in the Bothnian Bay. In Sweden it is listed as "near threatened" on the red list of endangered species. Findings of them are not too common, which may also be due to them being easily overlooked.





1. The sheated pondweed form clones. If you spot one on the surface its likely to be more of them around.
2. Top part of a plant with the very thin and narrow leaves significant for sheated pondweed.
3. The sheated pondweed grows mainly in deeper areas but reaches its stem up to the surface. It is therefore mostly spotted from the boat.

Making new friends

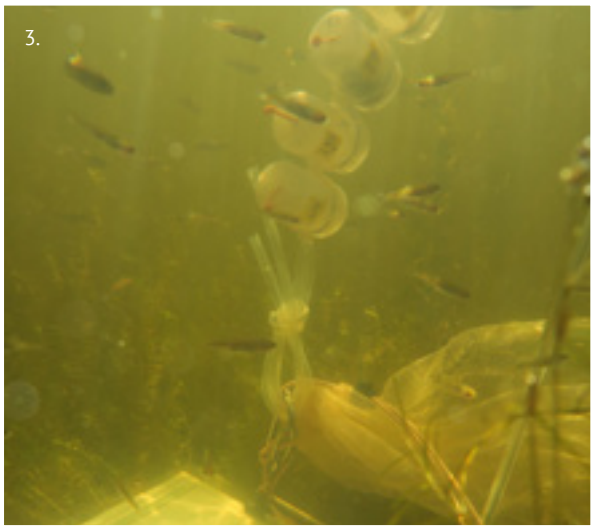
Linnea Bergdahl, Länsstyrelsen, 27 July 2018

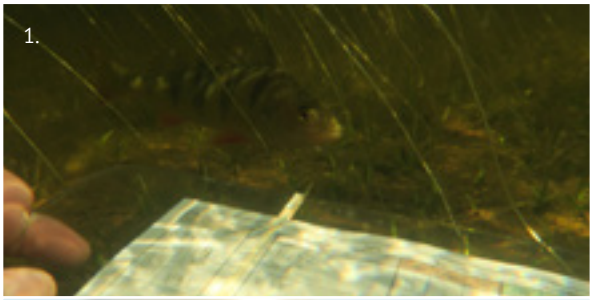
We've been making some new friends during our recent snorkel inventories. Sometimes they have even been giving us a manicure. Curiously they checked whether we were edible, nibbling on our skin.

The fish are mainly juveniles of different species. A common one is for example roach (Rutilus rutilus).

Our inventories are focused on macrophytes, i.e. underwater plants, and not fish. It's hard to ignore the fish though when they come so close up!

The perches (Perca fluviatilis) were quite unafraid and often came very close, seemingly interested in what we were doing. Some of them were more friendly whereas some were more reserved – just like our human friends. The pike (Esox lucius) however tended to keep a safe distance. Nevertheless with an eye constantly watching over us…





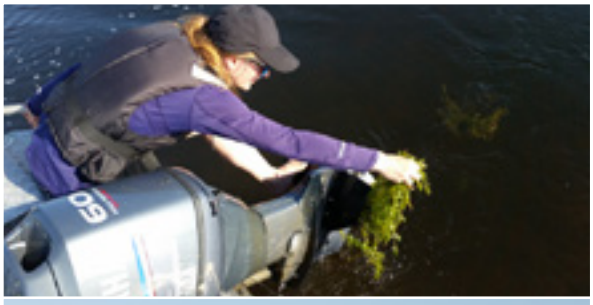
1. The perch sneaking up…
2. Selfie – snorkeler and the fish.
3. Curiously checking out the sample jars.

The sea is not always deep...

Linnea Bergdahl, Länsstyrelsen, 10 August 2018

Dense "forests" of perfoliate pondweed (Potamogeton perfoliatus).

Rather quite shallow, especially around the archipelago of Haparanda and Torneå. In shallow waters like this, at a maximum depth of around one meter, the perfoliate pondweed (Potamogeton perfoliatus) and pond water-crowfoot (Ranunculus peltatus) reach up to the surface and create patches, sometimes impenetrable. We usually keep a look out for rocks whilst driving the boat, here it is rather the vegetation we try to avoid getting too close to.



However much we like the underwater vegetation, there are the moments when the greens are not as appreciated... Regular stops to clean the propeller are frequent...

When working in shallow waters our stand up paddle board is invaluable to transport us longer distances over the water. Sometimes though when it gets too shallow, it is just easier to skip the board and take a good-old walk instead!

And in the end of the day we will have found out that walking – not driving – the boat is by far the best way to get back home.

SGU finally arriving at the scene for our first week of field work!

Gustav Kågesten, SGU, 16 August 2018

10 days ago our research ship Ocean Surveyor left our previous project on a bank in the middle of the Baltic sea where we have been surveying geology and habitats since early summer. After a three-day transit we arrived to the northern most outpost of the Swedish marine waters, Haparanda in the Bothnian Bay. This journey also marked the transition of working on projects related to the national marine spatial planning in the open ocean where much of our mapping have taken place the last few years, to a regional/local and coastal project in an Archipelago Sea with its own set of challenges. It's so fun to finally be here!

We have set up our first basecamp on Seskarö where a currently abandoned sawmill provide a sheltered harbor. Our first impression of Seskarö was welcoming locals (of which two paddled sea kayaks through our catamaran hull one evening:) and a beautiful island. The water also surprised us with good visibility and pleasant swimming in 23 degrees warm water as we took a first dip in the sea.

The unusual warm summer even up in the north have made many of us think more about how climate change will affect us in the future. As the northern outpost of the Swedish marine waters this region could be under even more pressure then other areas. This, along with the always important mission to understand our oceans better for more informed decision making, and to raise awareness and curiosity of the marine environment, make me feel that it is more relevant then ever that we are here and that a interdisciplinary mapping project like SEAmBOTH exists. If we are to have some idea of what the future brings and how we can adapt to those challenges, I believe it to be critical to have basic understanding and good maps of the present situation. I who writes this short blog, Gustav Kågesten, are working with mapping marine habitats and understanding human impacts on marine ecosystems for the Geological Survey of Sweden. I'm also currently starting up our part of the SEAmBOTH project"

So, what are we doing here and what have we done so far?

We work on mapping the Swedish side of the SEAmBOTH area with full coverage depth and geology data (3 - 70 meters depth, shallower areas will be mapped with laser from an airplane at a later time) as well as taking samples and videos/photos of the seabed. We also collect some oceanographic data as part of the survey. With help from the experts at SLU Aqua, we will also take samples of the animals living in the sediments (infauna). By combining the collected information in models, we can make maps of both geology and common organisms living on the seafloor in the area. To our help we use multibeam sonars, sediment profilers and boomers (looking deeper down into the seabed), ctd probes (salinity, temperate, depth), oxygen and current meters (the sensors sit on our UV-cameras together with a ctd), samplers and underwater cameras. Once we have got further along with this work we will post another blog and show you more results of what is down there :) !

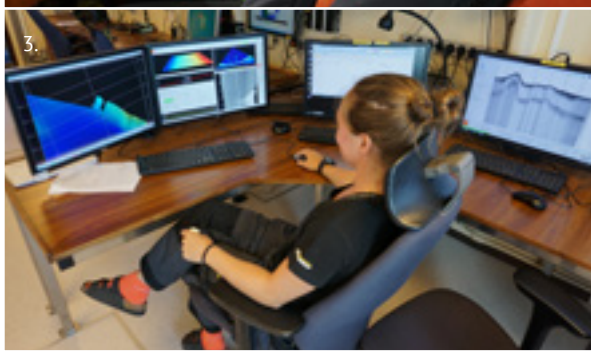
I think the rest of the story from our first week is better told in the images below.

Now pray for good weather so we get as much area surveyed as possible until the 4th of October when we leave the area.

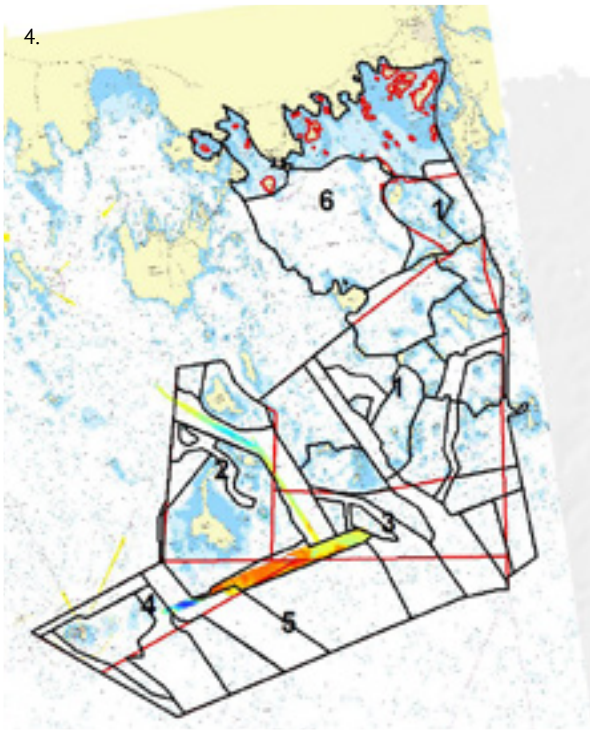
Time to go out for another day of surveying!

1. S/V Ocean Surveyor and our smaller launch "Ugglan" at Seskarö. Ugglan is equipped with similar survey equipment's and sampling capacity as the mother ship but tailored for shallow waters and a small crew of 2-3 people.

S/V Ocean Surveyor and Ugglan on their way home after a long day at sea outside Haparanda/Tornio. We start at 8 am and finish our day at 9 pm, as long as the light is still on our side.



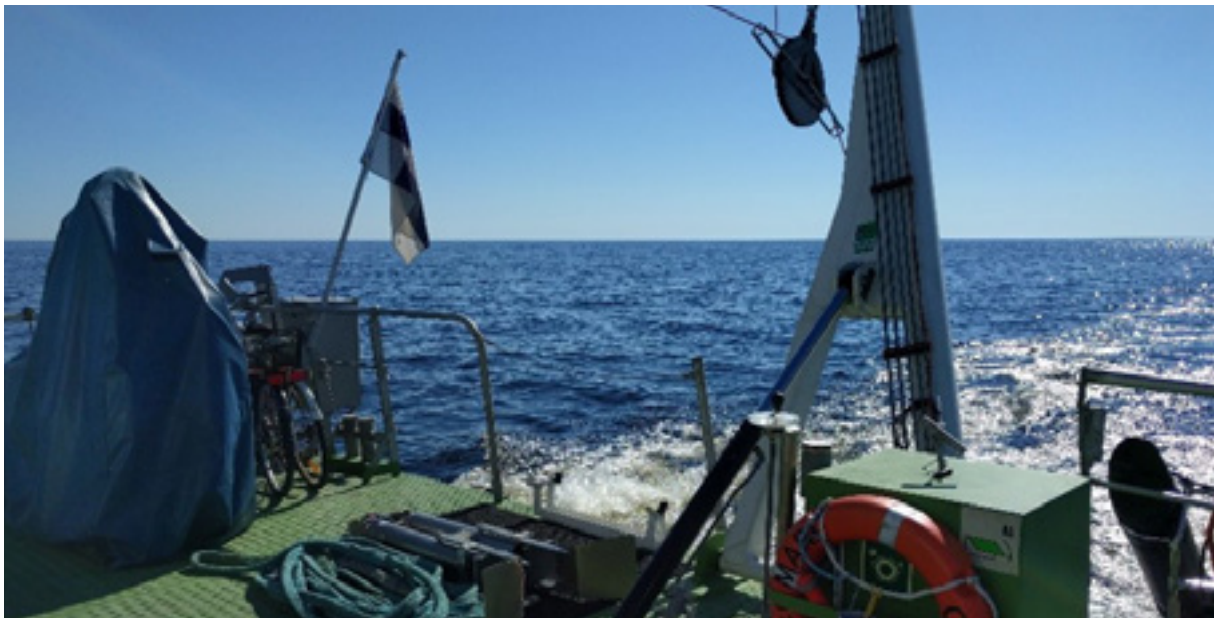
2. Gustav Kågesten (right) and Olof Larsson (left) surveying in the shallow waters outside Haparanda/Tornio with the small research vessel Ugglan.
3. Anna Svensson, SGU, multitasking by keeping an eye on two different sonar systems, talking to the bridge of the next planned line, as well as routinely measuring oceanographic conditions (using a moving vessel profiler) that we use to calculate the speed of sound. She also makes sure our high precision positioning systems are up and running. Enough to keep you busy!



4. A first draft of our adapted survey plan (black lines), which also includes a small overlap into Finland to ensure seamless maps between our two countries - the oceans know no borders as we all know, but sometimes forget. Surveying in coastal areas with complex and partly unknown topography is very challenging for survey planning. We think we have gotten off with a good start though! Some areas are deep enough for S/V Ocean Surveyor, and the shallower areas Ugglan will take care of. Not all areas will be surveyed as time is limited. Which areas we will coved depends both on priorities (see numbers in the image and the red lines) prevailing winds and overall weather conditions during the next six week. We hope the fall storms will wait a bit longer since the outer areas are very exposed.

Offshore again

Outi Hyttinen, GTK, 31 August 2018



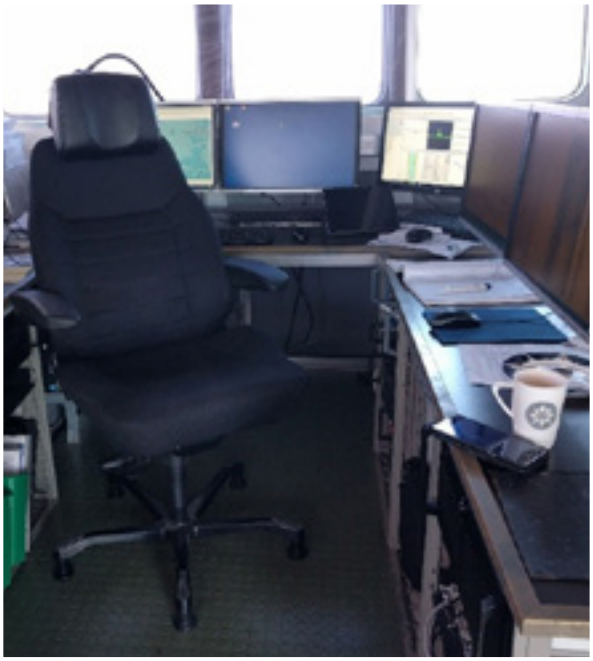
GTK´s Marine Geology unit started Seamboth-field work on early June. First R/V Geomari did acoustic-seismic soundings and then some sampling work in Kemi river estuary. Our smaller vessel Gridi started her work early August, first in Kemi river estuary and the Krunnit area.

After a long transit from the south, work started from Hailuoto region. This is an open sea area and weather conditions need to be very calm to obtain good data. Now it looks nice!

Coffee keeps many of us going. I think the salt-encrusted seadogs are no exception, especially if you have to keep an eye on the sea plus several monitors…

Technical surprises are a constant part of the work: luckily our technical and ship crew routinely perform miracles and this bunch of wires transformed into a functioning hydrophone.

Be prepared, expect worst and after all, you might be positively surprised! This could be an appropriate motto for ship days.



It's not what you know, it's how shallow you can go

Jussi-Tapio Roininen, Latvasilmu osk Ympäristöpalvelut, 21 September 2018

Latvasilmu osk Ympäristöpalvelut worked this summer for Lapland and North Ostrobothnia ELY centres carrying out SEAmBOTH field surveys at Natura2000—reserves in Bothnian bay area. I will remember this years field surveys in Bothnian bay not from the endless heatwave but because all the challenges that we had to conquer resulting from working in shallow areas. I have worked many previous summers in Bothnian Bay and Kvarken, so these problems weren't new to me. New thing was that we worked solely in the littoral zone, and my deepest dive this summer was a bit shy from 5 meters. But also because of that, I had a chance to learn more profoundly the ecosystems and species of river estuaries. And I guess it goes without saying, that Natura2000- reserves are simply great places to spend your summer in!

Our survey areas were mostly shallow, which always gives its own challenges, as you can't always wait for the windless days, nor drive straight from A to B. My small bathtub sized plastic boat (it's more rugged than what it sounds) has top speed of 2.6 knots as its outboard engine has less power than most of the houseware blenders. So it's not a first choice of transportation in large areas. But it does run in less than 30cm of water in comparison to my 5m- aluminum boat that needs at least 35cm (and that's a stretch, to say least). That difference does sound little, but this summer it was remarkable. The advantage to smaller boat increases when the surveyors jump of and start wading, then you can take the vessel to almost anywhere. Especially in comparison to a 500kg motorboat…

Surprisingly, we didn't hit stones not even nearly as often as one would expect. But we had our grim days. One of those days felt like an endless series of hits and groundings. And ended up with propeller being ready to be recycled into pans and pots. On that day water level was extra low, because the long dry season and because

northern winds pushed water to south. Sadly there's no pictures of the propeller, as taking pictures wasn't on my mind when we finally got to the shore after an hour long ride with an engine that was shaking like a crazy weasel on crack.

We were lucky on weather, they were mostly great. There was only couple of windy days that stopped our field work completely. As our survey areas were so shallow, there was also possibility to spend days wading and towing the small boat along as a floating tool shelf. Or row it around, if the wind wasn't too strong. Drought resulting from the endless heatwave brought also an interesting situation, when we went to a small gloe just to find it recently dried up. We didn't let that stop us from looking it up, in a way it was also much easier without the water messing visibility. I just felt myself a bit silly, walking to the shore with my drysuit on.

As mentioned earlier, mostly the weather was great. It also made an positive problem, because work days tended to get quite long, as only limiting factor was to pack enough food and water to fuel surveyors.

After midnight, boat ride to marina was incredibly beautiful with the sun in horizon and sea calm. We had been on boat 14+ hours' straight and done 400-meters of diving line. For me, these moments, and the magnificent places that you wouldn't bother traveling to voluntarily because of all the effort needed, are the reason why I keep doing this work.

Field Season 2018 – SGU

Ola Hallberg, SGU, 28 September 2018

Successful day at sea.

The field season of 2018 is coming to an end for SGU and Ocean Surveyor, which in a couple of days will anchor for the winter in the port of Slagsta, in lake Mälaren in the vicinity of Stockholm. The coast of Haparanda in the Bothnian Bay has presented us with many challenges, with its shallow waters and sometimes harsh winds. However, it has also been an amazing and rewarding environment to work in the archipelago with many warm sunny days and glorious sunsets. One of the main goals of this project has been to create a seamless map and complete geological data with our Finnish equivalent GTK of the seafloor landscape, which hopefully will become reality soon when we bang our wise heads together. This project will not only be able to help better understand the underwater environment and its geology, it will also benefit the understanding of the ecosystems in the area and how it may have been affected by humans, as Photo/video and infauna-sampling (cooperation with SLU) of the seafloor has been part of our daily job. For instance, we´ve found lots of anoxic seabed in more fine grained sediments, which is not very beneficial for most animals. However, the top most 2-5 mm of seabed in these sediments have all through been oxidized.

Our original survey plan has not been completed altogether, due to some technical issues and more hard winds at the end of the season than we had expected. This however should not affect the original plan with a perfectly seamless map to the Finnish measured area, which is located at the east of our area. This is also the area which have been our highest priority, and south/southwestern area haven´t been prioritized as high. We will soon step in to the warm and cozy office to do the exciting finalizing all the work we´ve done this season on the SEAmBOTH project.

For me that's writing, additional geologist Jesper Moberg (rookie). It has been a turbulent first season, with lots of confusion and a lot to learn. Before I started I couldn´t even imaging working on a boat, and my opinion didn´t change after many hours of seasickness throughout the two first weeks. Now however, it feels much more comfortable bumping around on the seas knowing (sort of) what you do. Not to mention the great crew of Ocean Surveyor I got to know during this season, that always has an easy going atmosphere and progressive state of mind.

I will know leave you with a short gallery of our season. Until next time…

Linnea and Petra from the Norrbotten county in the middle of infauna sampling, catching interesting seafloor animals for analysis.

Working close to human pressures

Suvi Saarnio, Metsähallitus, 9 November 2018

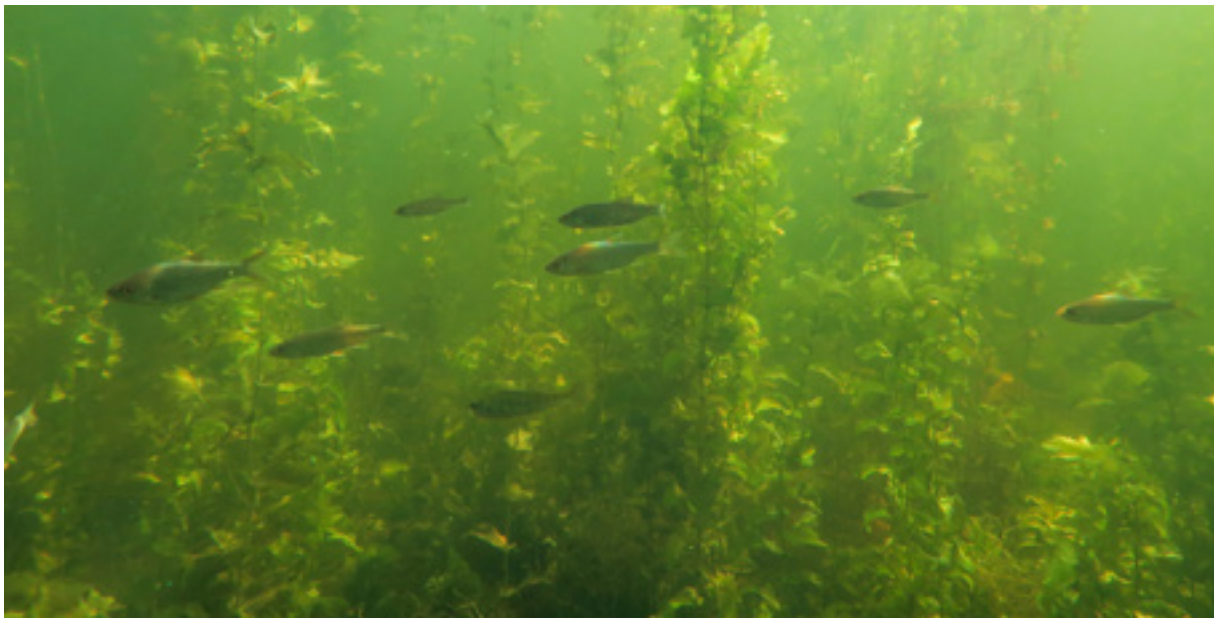
We started the field work from Oulu, leaving every day from the harbour right next to Oulu city. (Photo by Noora Kantola, Metsähallitus)

This Summer the Metsähallitus marine team was working quite close to different kinds of human pressures. We worked most of the time close to the mainland, so we saw a lot more human activities then we normally do, from farther out at sea. In the earlier blogs there has been information about estimating human pressures and about the different kinds of trash we have found from the Bothnian Bay.

1. We encountered many big ships heading towards the harbour of Kemi and the harbour of Oulu. There is quite a lot of traffic in the Bothnian Bay. (Photo by Noora Kantola, Metsähallitus)
2. With SUP-board we could even do this! (Photo by Nikolas Sanila, Metsähallitus)
3. This Summer we found a lot of timber logs, both in the sea and on the islands. (Photo by Suvi Saarnio, Metsähallitus)
4. Small boat harbours can be found on many islands in the Bothnian Bay. (Photo by Essi Keskinen, Metsähallitus)

Underwater in the shallow bays

Linnea Bergdahl, Länsstyrelsen, 30 November 2018



The days are getting darker and colder and Christmas is just around the corner. In Finland and Sweden SEAmBOTH teams are working frenetically to compile and analyze data from this year's field surveys in the northern Bothnian Bay.

From the snorkel surveys in shallow areas in Sweden we have been going through vast amounts of photos and videos. Some of them we've compiled into a video. It brings back memories of the extremely warm and sunny summer we had, and reminds us how important the shallow areas are for inhabitants in the sea.

The vegetation offers protection, a place to find food in, and nursery for many species of fish and invertebrates, e.g the tiny mysids (a kind of shrimp) seen in the video.

Memories from summer

Essi Keskinen, Metsähallitus, 11 January 2019

When you work hard, you also play hard. Metsähallitus SEAmBOTH marine team's summer 2018 looks like this if you compress it into three minutes. The summer was great, the stake holder events grand and our own recreational parties relaxing. Ashley Gipson made it into a video.

Sit back, relax and enjoy a bit of fun from Metsähallitus team work from last summer. And don't take it too seriously.

Windy June

Suvi Saarnio, Metsähallitus, 5 July 2019

Pond Water-crowfoot (Ranunculus peltatus). (Photo by Suvi Saarnio, Metsähallitus)

This year Metsähallitus started the field work on the Finnish side from Oulu and are moving northwards every week or every second week. At the moment, we are working in Simo and Kuivaniemi area, and next week we move to Tornio.

It seems to be a rule, that June is always windy. And this year is not different.. We can only do wading points if the wind is more than 6 m/s, and it has been like that almost every day. So, we have been doing wading points, every day. It's not a problem to SEAmBOTH project, because we are interested in the shallow areas. But for us, the field workers, it would be nice to do more dives and take some drop videos for a change.

This Summer we had to buy a new rubber boat, because our old boat Bella retired at the end of last field season, after serving us for about six years in all the different weather conditions and in all the shallow muddy and rocky places we could find. But now we have a new boat called Halli (the name comes from the Finnish name for the grey seal), and it has an electric engine. It is amazing to work with the silent engine, but we do hope that the engine would take us to places a bit faster..

We put our hope to July, and are really waiting for the windless and sunny days at the sea.

Sea water has been unusually warm since the beginning of June, about 10-16 degrees Celsius on every dive (compared to the usual less than 10 degrees). Divers are happy about this! (Photo by Suvi Saarnio, Metsähallitus)

One beautiful, sunny day in June with no wind. (Photo by Teemu Uutela, Metsähallitus)

Heat wave

Suvi Saarnio, Metsähallitus, 26 July 2019

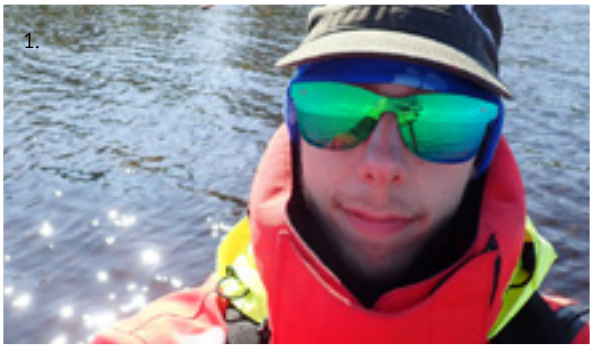
Rocky shore of Iso-Huituri and calm sea. (Photo by Teemu Uutela, Metsähallitus)

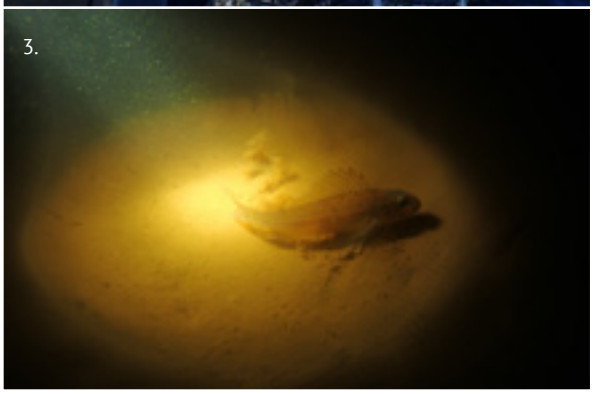
We have been experiencing a heat wave in the Bothnian Bay this week. On Monday we moved to the Bothnian Bay National Park and it was 27 degrees Celsius at the sea! We were so happy about the warmth, the sun and the calm sea. But we were not as happy when we had to put on the survival suit, or the dry suit for diving. Or when we had to go to sleep in the cabin with has extremely hot after the hot day. So on Tuesday morning when the wind was a bit stronger for a couple of hours in the morning, we all enjoyed the boat ride to the mapping points in the tiny islands of the National Park.

The days have been quite rough with the heat wave and the not being able to sleep in the hot cabin. But because the sea has been so calm, we have already almost finished all the work that I had planned for us for the next two weeks! So next week we can do some extra mapping and focus on getting the data to Excels.

Hopefully the sunny days continue, but our team would not mind if the temperatures would drop under 25 degrees…

Ps. On today's morning dive it was 20 degrees Celsius on a depth of 4 meters, it really is Summer now!





1. No matter how warm it is, we need to cover ourselves from the sun and the water. (Photo by Sjef Heijnen, Metsähallitus)
2. With this weather is good to avoid exercising too much, so we towed the SUPs from one island to another, and took videos with MAIA-boat while the girls were doing wading points with SUPs. (Photo by Teemu Uutela, Metsähallitus)
3. The Eurasian ruffe (Gymnocephalus cernua) in the spotlight at a depth of 10 meters. (Photo by Suvi Saarnio, Metsähallitus)

Metsähallitus and Geological Survey of Finland mapping the clay canyon together

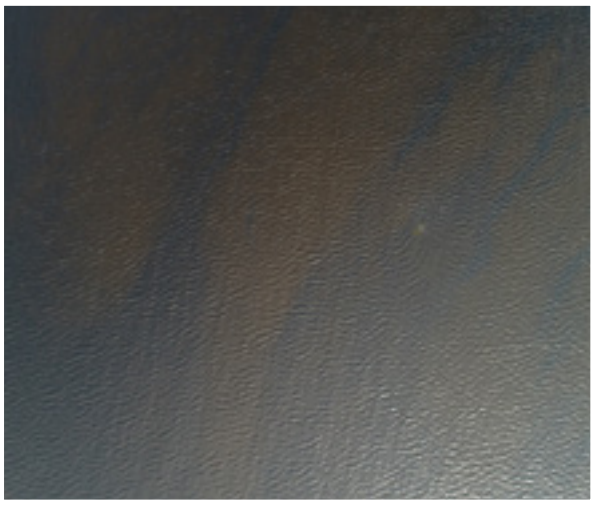
Suvi Saarnio, Metsähallitus, 9 August 2019

Maia and Geomari ready for mapping. (Photo by Jaakko Haapamäki, Metsähallitus)

This week Metsähallitus and Geological Survey of Finland worked together in order to take samples and do mapping on a clay labyrinth found in 2014 from Simo.

On Thursday morning Metsähallitus and GTK field workers put their heads together and made a plan for taking samples from a clay area in Simo which might be very old, and very interesting. The place was originally found in 2014 and now we finally had the chance to take samples of the clay for dating.

The weather was quite cloudy, but otherwise the conditions were perfect for diving because the water was very clear and visibility was good. We got samples from four different places, and now we just wait to hear how old this clay is! Stay tuned for more information on this beautiful clay labyrinth!



Clay labyrinth from above the surface and diver's bubbles.
(Photo by Jaakko Haapamäki, Metsähallitus)

1. Clay labyrinth. (Photo by Janni Ketola, Metsähallitus)
2. Old anchor found from the clay labyrinth.
(Photo by Janni Ketola, Metsähallitus)

Mud on the deck – and in my mouth

Aarno Kotilainen, GTK, 23 August 2019

Early in the morning we leave from the Marjaniemi harbour, in Hailuoto, towards west, to Swedish border. We are at the southern edge of the SEAmBOTH project area. Today we were aiming to recover short sediment cores from the deep waters. Why bother, someone could ask? – To understand how the sediment is moving and what kind of material there is in the dark bottoms of these northern Baltic Sea waters.

This morning sea is calm and so beautiful. RV Geomari is speeding up towards west, with her maximum speed, 20 knots.

Time flies, and suddenly we are approaching the first sampling site. We selected this site according to acoustic-seismic profiles that were surveyed last year. Echo sounder profiles indicated a nice sediment drifts, contourites, in this area. We approach the site slowly using an echo sounder just to check that seabed at the site looks OK. After confirmed that, we stop at the site, and let a dynamic position (DP) system to keep Geomari still.

Mud pants, safety wellies, helmets and life vests on, and we are ready to rock, meaning to mud (?).

Work at the site, or at the station as we sometimes call it, starts with recording underwater video from the seafloor. Drop camera goes down in to the deeps……and since the video also confirmed that the seabed is suitable for sediment coring, we started coring with our GEMAX corer.

Mud on the deck. It is always exciting, still after all of these years, to receive the first sediment cores on the deck. This core is the first sediment core this summer.

After describing the core through plastic core liner, core will be splitted for closer inspection. We geologists are a pit strange species, as we love to look, sniff, touch and even taste the sediment.

A splitted sediment core provide useful information on sedimentary environment and changes in it. Sometimes these changes are visible in the sediment.

After photographing and describing of the splitted sediment core, the other core(s) from this site were sliced into e.g. 1 cm slices. And those sediment slices were bagged into sample bags, and put in the fridge to wait transport to shore and laboratories.

From the sediment analysis, we will receive a lot of information, like; on the age of the sediment, on sedimentation and erosion processes, and on geochemistry of the sediment including anthropogenic loading.

Scientists around the world are currently defining timing of the new geological era, Antropocene, the era when we humans have left a distinctive set of marks preserved in rocks, seafloor mud or glacial ice, which

Geomari in Marjaniemi harbour.

indicates a fundamental change in our planet. Is it the beginning of the atom bomb test for example? Those signs can be seen probably also in these Bothnian Bay sediment. Similarly, the traces of the unlucky Chernobyl nuclear power plant accident in April 1986 can still be seen in these sediments as increased e.g. cesium 137 concentrations.

Maybe it is not so healthy to taste those younger sediments and test the sediment grain size between teeth's, as we geologist normally do. But it is difficult as we just love mud. By the way, mud reminds me mudcake that was baked today, as quite often when we have these mud sampling campaigns. So maybe a piece of sweet and soft mudcake and a cup of coffee, but just after washing mud away from the deck. And then towards the next site. Sea is still so calm. Hopefully it stays like this.

After several successful stations we headed to Marjaniemi harbour for the night. To make dinner, and have a sauna, hopefully. This day was good. It is not always that way. But these good days and peaceful evenings give us strength to continue, and to wait even better tomorrow.

Preparation for the core splitting.

The end is near

Suvi Saarnio, Metsähallitus, 30 August 2019

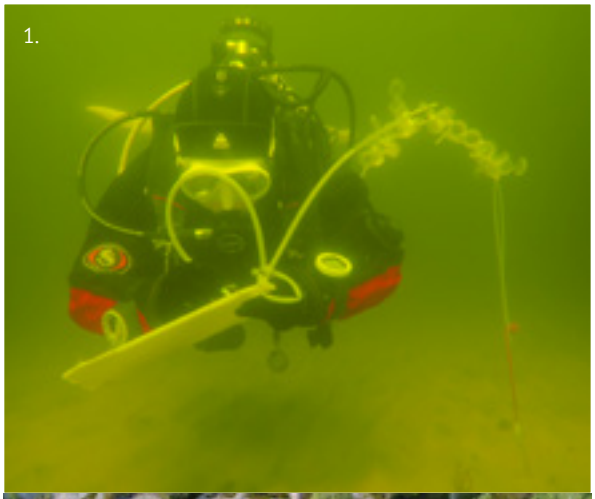
We had quite high winds this Summer and had to struggle with waves. (Photo by Petra Saari, Metsähallitus)

The past few weeks the Metsähallitus SEAmBOTH-team has been experiencing all kinds of things for the last time. Some of our team members have already finished working and this week was the last field work week for Eveliina, Teemu and me. On Wednesday I did my last wading point and on Thursday I did my last dive. And I just realized that they were both the last field data that I collected for SEAmBOTH, because this is our last field Summer.

The end of Summer is always full of "lasts". Last drive with Maia-boat, last meal on the field, last drop-video point taken, last time carrying the dive tanks.. It always feels like the end comes too soon, because the end of the field work means the end of Summer.

When the winds get high and the sun starts to set early, it is good to continue working in the office. After August our team will concentrate on putting all the data into Excels, so that our GIS-planners can start making maps and other end products in October. We might still do one field day in September, if the weather allows us to do some wading in one interesting bay north of Oulu. But it might be so that we have just finished collecting the data for SEAmBOTH-project. And I think we did quite well, because for the first time we broke the amount of 1000 wading points collected in one Summer!

This Autumn and Winter we are doing very interesting work with writing the end report for our project, and I am looking forward to that.



1. Second to last dive with 100 % sand for 200 meters. (Photo by Essi Keskinen, Metsähallitus)
2. Metsähallitus SEAmBOTH-team in Ulkokrunni, Ii. (Photo by Suvi Saarnio, Metsähallitus)

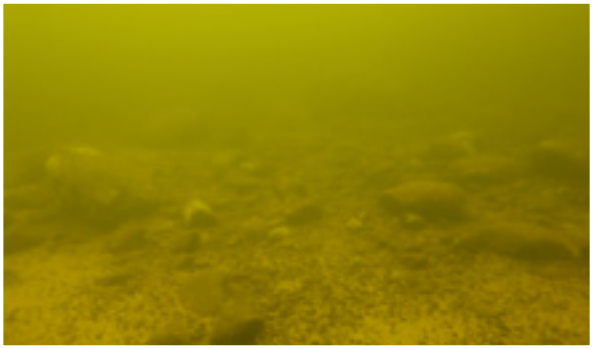
SV Ocean Surveyor Reporting From the Bothnian Bay

Ola Hallberg, SGU, 13 September 2019

The crew posing on the bridge of S/V Ocean Surveyor. (Photo by Geological Survey of Sweden)

S/V Ocean Surveyor with crew arrived at the old industry port at Seskarö, an island not far from Haparanda, in the beginning of August. New for this year's field work is that the launch vessel Ugglan have been equipped with a multibeam echosounder, the EM2040C. After some initial testing and calibration the echosounder proved to produce excellent data that will greatly contribute in the creation of accurate models for the project, to great delight for all the crew members.

Ocean Surveyor will stay for another week in the survey area returning south at the end of August. When the survey vessel turns its stern southward for the journey back for new adventures, Ocean Surveyor and its launch vessel Ugglan will this year have produced a total of 35 square kilometres of full coverage multibeam data and collected around 100 sediment samples along with numerous subbottom sediment profiles, seafloor images and video photage from the seafloor. This year's data combined with data collected the previous field season will provide excellent preconditions for the habitat modelling in the next phase of the SEAmBoth project.



A common sight of the sea floor: residual material from washed out till. (Photo by Geological Survey of Sweden)

Weather conditions are always a delimiting factor in offshore surveying, and so was also the case this year. We are happy to say that although we have had some weather standbys due to heavy winds we were still able to fulfill what we set out to achieve when we arrived at the far north of the Bothnian Bay in the beginning of August.

It is a delight to work in this beautiful setting. On a sunny day the archipelago is stunning with its desolate wilderness. Not seldom seals are observed on isolated rocks and fish will often swim by our submerged camera. An environment well worth preserving for coming generations. Knowledge of the environment and habitats in these hard-to-reach areas are very important in order to understand the full complexity and values of the Bothnian Bay.

Sediment sampler, Oragnge Peel Bucket (OPB), being retrieved back on deck. (Photo by Geological Survey of Sweden)

Project coordinator, marine biologist Essi Keskinen

Essi Keskinen, Metsähallitus, 5 March 2018

I am a marine biologist, Essi. I have been working in Metsähallitus since 2006 and done field work every summer since then. Now I'm the project coordinator for SEAmBOTH and it's a very new challenge for me.

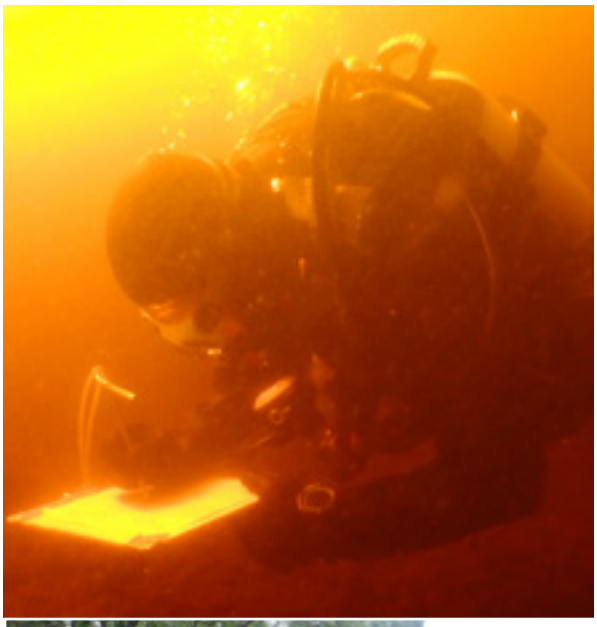
I started diving when I was in senior high school and I did an advanced European scientific diving course while I studied biology at the University of Oulu, Finland. When I was little, I used to watch The silent world by Jacques Yves Cousteau from TV with my Grandmother, and I thought that when I grow up, I want to be like Cousteau.

Right now I'm working in my dream job. I have a feeling that I can make a difference in the conservation of the Baltic Sea and that the information that I collect every summer is valuable and helps us better understand, how to manage our joined home sea.

In SEAmBOTH, I'm working both in the field during the summer and in the office during the winter. My job is to try to coordinate all six partners in Finland and Sweden, try to tell the public why we are doing what we are doing and in the end, try to make the project end products so good that we can all be proud of them and that they would be useful in future management of the Bothnian Bay.

Right now I am concentrating on planning the summer 2018 field season and recruiting people for the field team and a GIS specialist in Metsähallitus.

If you happen to be around the project area in the summer, please come and find me and my team in the field and come see what we are doing!



Marine biologist Linnea Bergdahl

Linnea Bergdahl, Länsstyrelsen, 6 April 2018

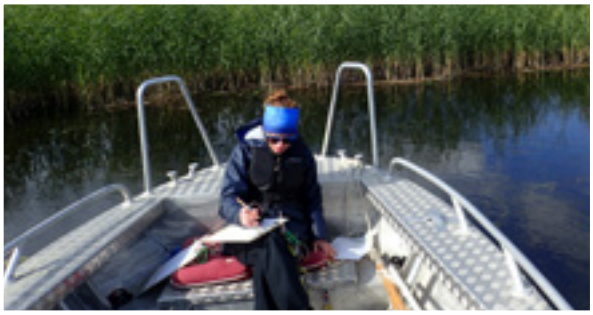
In order to get to know what lives in the sea we have to take a look beneath the surface. One way to do it is to snorkel. Sometimes cold but always exciting! (Photo by Aimi Hamberg, County Administrative Board of Norrbotten)

I work at the County Administrative Board of Norrbotten in the coastal town of Luleå. The main focus of my job is marine protected areas in Bottenviken. My collegues and I oversee the the whole process of creating protected areas. From the start with inventories of the marine environment to the actual implementation of the protected areas.

Within the SEAmBOTH project I participate in marine surveys of coastal shallow areas. We want to find out what species of plants grows where on the bottom, where you have different types of habitats and the overall condition of the underwater area. This knowledge is crucial in order to make wise decisions regarding the marine environment. The data we collect, together with the data from the Finnish side, will be used to produce the habitat maps of Bottenviken.

During the field season, which for us runs between July and September, my colleagues and I are out at sea. We collect information about the underwater vegetation by snorkeling and using a drop-video camera from the boat. It's not always the easiest places to get to those that we visit. It can be very shallow, muddy, far from nearest harbour etc. This requires specific equipment and a large part of our days is dedicated to preparation before going out as well as gear maintenance at the end of the day.

I'm educated as a marine biologist and environmental scientist. Before I used to teach scuba diving in tropical waters, so coming to Bottenviken was a bit cold for me in the beginning. However I find that every day here is a possibility of discovering something new. There's so little we know of this place, there are fantastic places under water where no one's been before. Sharing and spreading that new knowledge to others becomes crucial for keeping a sustainable sea in the future.

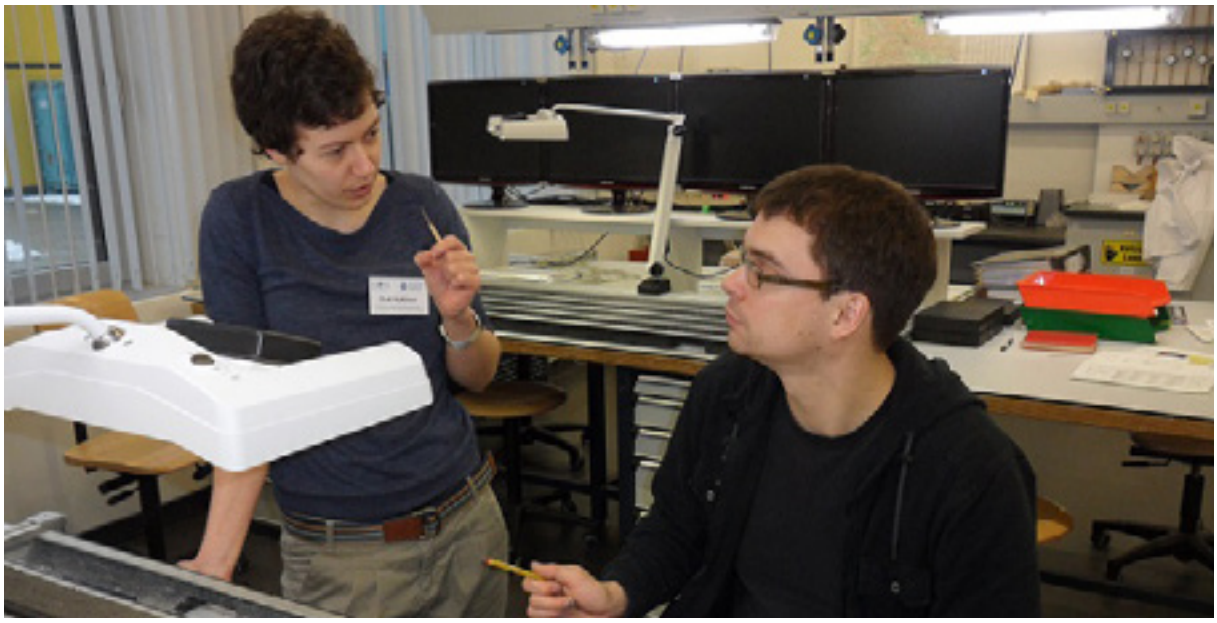


Having correct data is important. We note our observations into a protocol, which we bring with us in the water. The paper is a special underwater paper which you can write on with a pencil, even when it's wet.
(Photo by Aimi Hamberg, County Administrative Board of Norrbotten)

A favourite place of mine to snorkel; a shallow, sheltered bay with a high diversity of underwater plants. This photo is taken in Råneфjärden, one of the SEAmBOTH pilot areas on the Swedish side of Bottenviken.

Marine geologist Outi Hyttinen

Outi Hyttinen, GTK, 21 May 2018



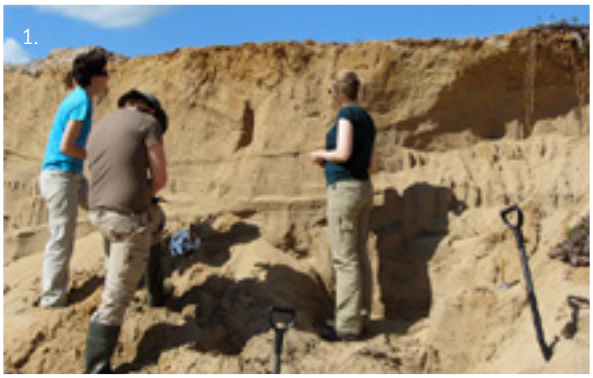
One of expedition drillcores and serious sedimentologists. (Photo by ECORD)

Hello, I work as a marine geologist at the Geological Survey of Finland, in Espoo. Within the SEAmBOTH project I have interpreted sidescan sonar and seismic reflection data, in order to know what type of sediments the study area seafloor consists of. During the field season, my collegues collect information onboard, which we during the winter will process and interpret. Northern Bothnian Bay was a new geological environment to me, and it is really an interesting place!

Previously I have worked e.g. with Baltic Sea Basin deglaciation history and with laminated clays in southern Finland. This involved e.g. digging deep into clay or spending time on a research vessel. Sometimes you could end up in a sand pit. As you can see, fieldwork is always a good fun!

Marine geology has always interested me. The final push towards watery direction from more terrestrial activities was participating an International Ocean Discovery Program (IODP) expedition at the Baltic Sea in 2013.

After almost two months onboard, the world of research never looked the same. Maybe it was a lure of Neptune.



1. Visiting a sand pit. (Photo by Veli-Pekka Salonen)
2. Our IODP expedition drillship, Greatship Manisha. (Photo by ECORD)
3. The one who digs holes in a clay pit... might end up in one herself. (Photo by Veli-Pekka Salonen)

Researcher Waltteri Niemelä

Waltteri Niemelä, SYKE, 18 October 2018

In order to get to know what lives in the sea we have to take a look beneath the surface. One way to do it is to snorkel. Sometimes cold but always exciting! (Photo by Aimi Hamberg, County Administrative Board of Norrbotten)

Hey, I'm Waltteri! I work in the Marine Research Centre for the Finnish Environment Institute SYKE, where I have worked for about 2.5 years as a researcher. I am involved in many different projects, and in SEAmBOTH, I have been involved in data collation (which means gathering a list of available data with as much information of it as possible) and communication activities from SYKE's part. I have a background in both Marine Biology and Environmental Management. Interestingly enough, I got my leg in the door of Finnish marine research with the help of none other than SEAmBOTH's project coordinator Essi! I was an intern in her field team in the summer of 2014 in the Bay of Bothnia, one of the best summers of my life!

A large proportion of a researchers time is spent in meetings and conferences, discussing, presenting and learning.

Nowadays I largely work from my computer, in an office in Helsinki. Funnily I have worked a lot with the exact data I spent a summer collecting. With my background knowledge and skills, a lot of my work is to do with both data relating to what is under the sea, as well as how that data is or should be used. For a long time I have been interested in the cross-section of science, governance, and society. Basically how does the research us scientists do in the field and on our computers relate to the people that it directly connects to.

My work at this exact moment is researching the Finnish marine protected area network, building and editing a couple of different databases, and coordinating some projects with their communication. I guess such is the life of a young researcher!

Driving the boats was probably my favourite thing to do during that great summer.

Terrestrial biologist Tupuna Kovanen

Tupuna Kovanen, ELY, 21 December 2018

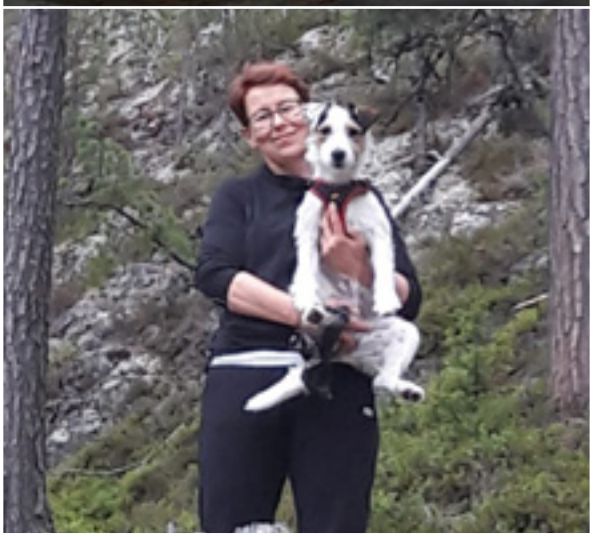
There are boring and even more boring places, and then there's a bureau. That is, however, where I have landed and spent most of my working days. I'm Tupuna, senior adviser, working at the Centre for Economic Development, Transport and the Environment (ELY) of North Ostrobothnia in Oulu. My professional background is that of a terrestrial biologist (botanist) from Oulu University. After a few years doing different kinds of field and project work all around Northern Finland, I ended up in environmental administration, where I've had a twenty-year long career. Mainly, I work with issues concerning species and habitat protection, managing and supervising of Natura 2000 network and other protected areas, and all kinds of projects and administrative work concerning nature conservation. My main task is to be an advocate for nature values, since as you know, they cannot protect themselves.

Even though a bureau is a dull place, a work of a bureaucrat is not dull at all. When I was a young biologist, I thought working in the office is sooo boring: computers, regulations and acts. Oh no, not for me! But years in administration have taught me that laws and regulations are part of our everyday life. Whatever happens out there in the nature is a matter for a nature conservation bureaucrat. Sometimes, I even get out of the office for short field trips, but mostly my work is done on computer and in the meeting rooms. The best and worst of this job is that there are always dozens of matters, both small and large, going on at the same time. Seldomly, is there a peaceful working day when you can concentrate on one matter. Our clients vary from old ladies worried about starving hedgehogs to experts, directors and politicians preparing strategies and regulations. Sometimes, I feel I should be an expert in all fields of biology as well as an engineer, geologist, forester, director, lawyer, social worker, psychologist and even a priest.

This is a never-ending story of learning, which I enjoy. One of my latest learning processes have been that of sea inventories. As a terrestrial biologist, it has been absolutely fascinating to see what the marine biologists and geologists find and do, and that's even without mentioning our modelling specialists. (I confess, I only use computers like I use cars. It's enough that they are quick enough and do their job.)

In my spare time you can find me walking or training our dog, doing volunteer work for my dog club, horseback riding, or just in the city enjoying different happenings. I have many interests. The only thing is that there is too little time to do all the things I would like to. Piles of books are just waiting to be read, movies to be watched, records to be listened to and courses to attend.

However, sometimes life does calm down. Last summer, I took part in the SEAmBOTH project group excursion to the Perämeri national park. I had an astonishing moment standing in the rain in still water in an orange rescue suit, trying to identify species with water binoculars.



In that short moment, I left the busy world behind and started to understand why it is so enchanting to be under the water. Maybe, some day, I will do my diving course.

Season's greetings to all!

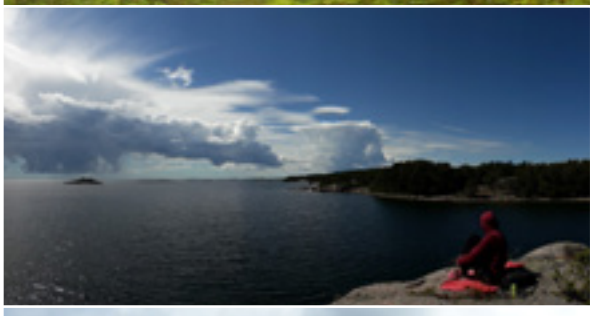
Marine (bio)geographer Elina Virtanen

Elina Virtanen, SYKE, 18 January 2019

I´m a marine (bio)geographer and I have a background in physical geography. When I usually mention that I´m a geographer, people instantly think of me being someone who colours maps (for instance my friends and parents) and knows all the capital cities of the world. While that stereotype might hold true for some part, being a geographer is mostly about seeing the bigger picture and thinking about stuff with a spatial twist. As clichéd as it sounds, everything is geographical. We are all geographers in a sense. Just think of route optimization (am I able to catch the bus and does it go to the right direction), climate modelling (what are the chances of raining today where I´m heading, should I take my umbrella with me?) and landscape ecology (why did my neighbor cut off that tree, now they can see straight to my living room?).

The kick-start to my career in science began in Kenya, where my research focused on tropical montane cloud forests. Five years ago I started my path in marine sciences at the Marine Research Centre (at SYKE), with the change of scenery from the Kenyan cloud forests to the Baltic Sea. Methodologies and theories apply, only the environment is different. My work concentrates on modelling that addresses spatial environmental and ecological questions. I try to relate the environment where species are found to similar environments, where no one has yet visited. We need to know where important species worth conserving are located, in order to protect them, and not to mess up everything completely.

That is not a trivial task, but we are getting there. Apart from SEAmBOTH and various other projects I´m involved in, I started doing my PhD last July. Marine spatial planning, marine protected areas, spatial ecology, sustainable use of the sea areas and changing climate are all key words that will become more or less familiar during my PhD. After completing, I won´t know all the capital cities of the world, but I´ll have a bunch of lovely, coloured maps to show.



Physical geographer Suvi Saarnio

Suvi Saarnio, Metsähallitus, 8 February 2019

Hi everybody! I'm Suvi and I'm a physical geographer working for Metsähallitus. I think Elina explained quite well the background of a geographer and how we view the world and our work (https://seamboth.com/2019/01/18/people-behind-the-scenes-elina-virtanen/). I also studied quite a bit of biology (mostly ecology) in the University of Oulu, but most of my knowledge on the biology of the Bothnian Bay I have gained at work. I started as a trainee in 2013 and every year since I have worked for Metsähallitus marine team. In addition to my knowledge on geography and biology, my contribution for the team comes from the knowledge of the Bothnian Bay area (I could claim to know most of the islands and waterways in the area), my skills in handling our boats and our equipment and of course the fact that I love planning and keeping things (and people) organized!

My Summers are always busy with work, but I try to use part of my free time with Search and Rescue in Oulu, so I'm hardly ever on land. Another hobby keeping me off the land is scuba diving. I started diving in 2015 and left a part of my heart to Koh Tao (small island in Thailand) in 2016-2017 when I did my first professional diving courses there and lived there for four months.

I work as a planner in SEAmBOTH-project and I just realized that it doesn't really tell you readers that much about what I actually do. My father just asked me that question last week and tried to explain and this is what I said:

The Spring part of my work year is mostly about planning the field work for the next Summer. I must go through old data to see which places need to be mapped and from which areas or habitats we need more information. I also need to consider the endangered species and try to focus some of the mappings to areas where they are possibly growing. After deciding the areas, I need to think how much time we will spend on each of them and at which part of the Summer we will work there. Next step is to book accommodation and dock places for our boat.

Before field work all the equipment needs to be checked, fixed and prepared for the Summer. Also, all the field forms, Excels, time managements sheets etc. need to be updated and fixed so that everything is ready when our seasonal workers start. The first days of field work are spent on introduction which includes burocracy, boat safety, method training, learning the species and so on.

During the field work I'm the team leader and in charge of the biological mappings done in the SEAmBOTH-project on the Finnish side of the Bothnian Bay. After the field season the data collected must be analyzed and saved into Excels, and this usually takes a big part of the Autumn. We are usually in a bit of a hurry with the data so that we can get it to our GIS-planners as soon as possible, so most of the maintenance work with our equipment is done after the data is finished. Winter (and the end of Autumn) is spend on maintenance work

and checking our gear to see what needs to be bought for the next field season, going through the best photos from Summer, organizing everything at the office and our storage, reporting and using the holidays gained.

Environmental planner Jaakko Haapamäki

Jaakko Haapamäki, Metsähallitus, 8 March 2019

(Photo by Roosa Mikkola, Metsähallitus)

When working in the field of marine conservation, at some point someone usually ask you is if you are a biologist or a geographer. I'm neither as I am an environmental planner, which means that I know a bit about both fields.

I first started by doing marine field work for Centre for Economic Development, Transport and the Environment of Southwest Finland in 2013 in the VELMU -project and then have gradually been doing more and more office work mostly involving progressively expanding excel sheets and maps.

In SEAmBoth I mainly do data management, meaning that I mostly try to combine the compatible excel data sheets and map layers I get my hands on and then try put them somewhere where people can find them. Sometimes I even remember to tell the afore mentioned people that the files exist. Every now and then I do the odd model or plot field plans on maps and generally just help a bit here and there. Luckily, I've still been able to do a little field work in my other project Kvarken Flada, so I'm not completely locked indoors yet. In the field I get to paddle around on a SUP -board and fly a quadcopter. Not too bad!

In other sea – related activities, I'm also a semi-active captain for a sea scout training vessel S/y Henrika, situated in my hometown of Turku. You can usually see the vessel during weekends in the archipelago of Turku, but next summer my troop is planning to sail up north, so you might be able to spot her in the bay of Bothnia -area.

Marine geologist Peter Slagbrand

Peter Slagbrand, SGU, 12 April 2019

I'm a marine geologist with the Geological Survey of Sweden in Gothenburg.

At the moment I go through the data we collected last year to see what remains to be done this field season. We plan to spend four weeks in the Swedish pilot areas surveying with multibeam and sub-bottom profiler and sampling the seabed. The data will be interpreted and classified into various substrate types and used for habitat modelling.

Before joining the Geological Survey I worked for an offshore consultant firm in different parts of the world, from the Black sea to the Caribbean. It was edifying to work in so many different geological environments and working with people from all over the world. The scope of work could be anything from route surveys for pipelines or cables to geological mapping of the seabed.

Power station for a wind farm in the North Sea

Geographer Leena Laamanen

Leena Laamanen, SYKE, 31 May 2019

Sometimes my work contains travelling to nice places but sometimes I get buried behind my desk. Here my work took me to Venice, 1/2018. (Photo by Lena Bergström)

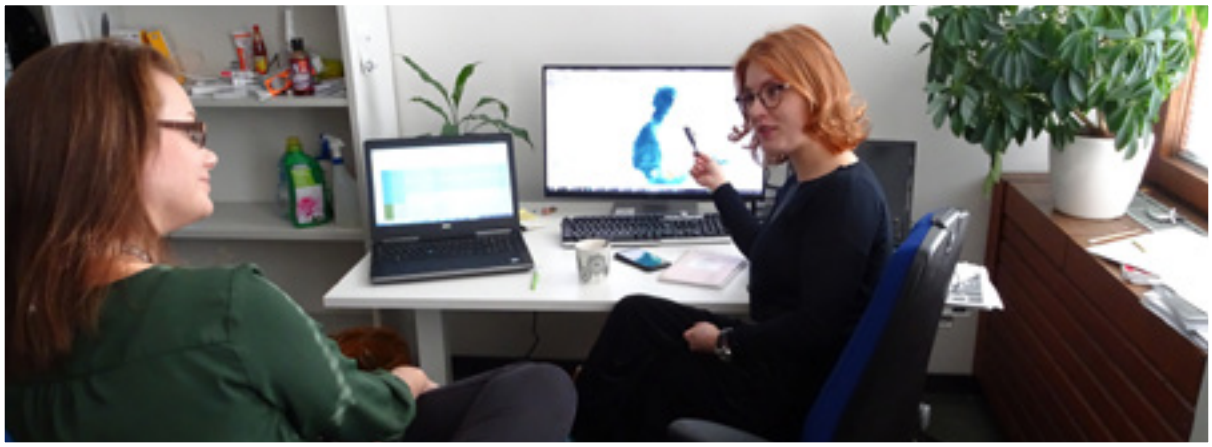
"Trust me, I'm a geographer." – The phrase I use quite a lot. It mainly refers to having an internal compass and finding a way around big cities, just because the maps burn easily to my mind. But the second part works also in my work, I'm a geographer. Hi, I'm Leena.

I work as a researcher in the Marine Research Center in Finnish Environment Institute (SYKE). In my work I study the anthropological pressures and impacts in the marine environment. So, in a nutshell, looking for ways to assess how the human's using the sea effects on the marine life and ecosystems.

Working with transboundary issues fascinates me, because nature follows no borders. And pressures from human activities do not stop at the borders. Coherent way of assessing anthropogenic pressures and impacts creates both challenges and opportunities for innovative thinking.

My work in SEAmBOTH includes coordinating the data collation of the spatial data for human activities and pressures – and developing cumulative pressure and impact assessments.

My path to work with sustainable use of the seas started upstream of the catchment area of the Arctic Ocean. I used to do fluvial research in a research group in the University of Turku, focusing on the relationship of flowing water and river bed changes in in the northern most Finland. From there my working topic flowed downstream and southward to supporting Baltic wide Marine Spatial Planning work and developing the spatial data products for assessing cumulative pressures and impacts from the human activities. The flow continues, and now I look into the issue on several different scales: local, regional and pan-european. As that is what is natural for a geographer ;-)



Even though I work a lot on the computer, I also get to communicate and discuss a lot with experts and stakeholders.

Marine biologist Petra Pohjola

Petra Pohjola, Länsstyrelsen, 11 October 2019

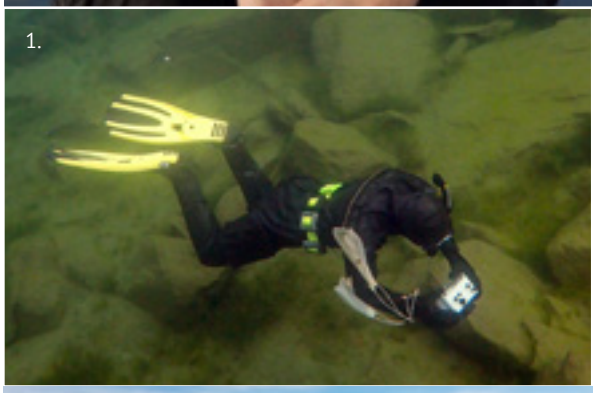
Hi, I'm Petra. I'm an adventurer and nature lover. I'm also a Finnish marine biologist working in Sweden. How did I end up in Sweden? We can start with where I came from.

8 years I worked for Metsähallitus, most of that time in the eastern Gulf of Finland. I was a field worker and planner and did pretty much anything that involved underwater marine inventories and processing inventory data. As I'm enthusiastic about nature exploration, especially so in the sea where so little is explored, I have been somewhat non-compliant to shift to a pure desk job, as so many in my field of work do with time. One spring I was looking for a job, as you often are forced to do if you want to work on the field. I felt I wanted a change in scenery. So, I just started to look for jobs on the other side of the Baltic sea. Then I ended up in Luleå, to work for the County Administrative Board. It has ended up being one of my best adventures so far.

As a Swedish speaker, luckily language has not been a barrier, only a small obstacle as the language is somewhat different in our countries. Also, because my working language in the past years has been Finnish. I have made use of my bilingual upbringing, as Finnish is a surprisingly common language in these parts of Sweden and of course also because of the collaboration that we do with our Finnish colleagues. I can be a better translator than google. I have also had a few laughs over all the ways my surname can be spelled.

My work here is quite similar to what I did in Finland, only more. It's amazing how many different projects I have had the possibility to take part of and how many different work tasks I have had. I have found myself snorkeling in the crystal clear fell lakes and I have done fish inventories of many different forms. The most satisfactory part of my work here has been taking part in projects from the start until the end. I have not only done and planned field inventories, I have also taken part in the initiation of projects and seen and prepared the results of projects, both large and small, and reached out to people and presented results. The only thing I miss is scuba diving, which we here hire consultants to do for us. Still I have probably spent more time in water than I have ever before during our field seasons, free of bulk and with a snorkel in my mouth.

As for the underwater nature in the Bothnian bay versus the Gulf of Finland, I never thought I would say this, but I love both equally. There is something ruggedly beautiful with the Baltic sea and specially so in the north. Here the water has an uninviting brown tint, but the visibility is often surprisingly good, especially in the inner archipelago as some of the huge rivers that run out here clearly have their source in fells and forests. Some of the best visibilities I have experienced in the Baltic sea have been here. I hold a special place in my heart for sheltered bays and I have years ago learned that the harder it is to get there, the more the place holds. Some of the bays I have visited here have been like huge diverse aquariums, only you can swim in them… or then drag your stomach



across their muddy shallow floors. I seldom go anywhere without a camera and I have done my best to capture what I have seen, so I can show these amazing places to you.

1. On a special mission after the charophyte Tolypella canadensis we marine biologists got the chance to take a dip into fell lakes. The visibility was unbelievable! (Photo by: Linnea Bergdahl, County Administrative Board of Norrbotten)
2. As a part of our communication, me and my colleague Kajsa reach out to the public in Piteå during sea festivities. We understand each other surprisingly well, considering I come from Finland and she comes from Skåne. (Photo by: Linnea Bergdahl, County Administrative Board of Norrbotten)

Marine geologist Aarno Kotilainen

Aarno Kotilainen, GTK, 22 November 2019

A small blond boy ran down to the beach as soon as he got his eyes open. The beach was in his opinion the most wonderful place in the world. It was so lovely to jump in the cool water. And just as great it was to sit on the beach and dig golden, soft sand from the bottom, and to look how sand (grains) flowed from his palm back to the water. That little boy wouldn't have guessed, that 50 years later the same "boy", with less hair, digs sand and mud from the seabed equally enthusiastic, and even gets a living from it.

I am that small blond boy. My name is Aarno Kotilainen. My friends call me Ale. I am a marine geologist and work as a research professor at the Geological Survey of Finland, in Marine Geology unit. I studied geology at the University of Helsinki, and did my PhD thesis "Late Pliocene and Pleistocene sedimentation in the North Pacific Ocean" at the University of Cambridge, England.

The geological expeditions have taken me to magnificent and interesting landscapes around the world, like to the Weddell Sea in Antarctica and the Pacific Ocean, and around the Baltic Sea. With the SEAmBOTH project, I have been given a wonderful opportunity to explore the northernmost underwater landscapes of the Baltic Sea.

At present my research interests include paleo-oceanography, sedimentology, stratigraphy, marine geological habitat mapping, and sedimentation processes.

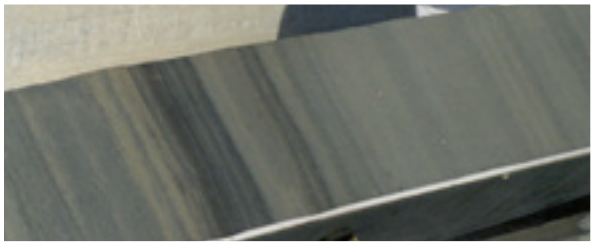
Methods are the key element in the marine geological mapping and research, as getting information from the seabed is a bit trickier than on dry land. Over the years, development of the methods has been dizzying. When I started my own career in marine geology, positioning at sea was made in some places with sextant. Today, satellite positioning is available to everyone. Similarly, the different acoustic-seismic sounding methods have evolved rapidly. Currently widely used modern equipment like multibeam echosounder, sediment echosounder, side-scan sonar and seismic sounding have been used also in the SEAmBOTH project to survey seabed in the SEAmBOTH areas of the Bothnian Sea.

We marine geologists provide SEAmBOTH information e.g. on bathymetry, seabed geomorphology and seabed substrates. In addition to that we study also sediment archives, i.e. geologic records. Particularly those muddy, organic-rich sediments that have accumulated nearly continuously on the seabed, provide unique information on past environmental changes.

Multidisciplinary cooperation is crucial for providing reliable and sufficient information about the marine environment. In the SEAmBOTH project we have biologists, geologists, geographers and modellers from Finland and Sweden working together. In my opinion, that interdisciplinary cooperation is good fun and more over – also very educational.

Positioning with sextant onboard the research vessel Geola in the late 1980's. (Photo by GTK)

Outi Hyttinen and me onboard the drilling vessel Greatship Manisha during the IODP Expedition 347 Baltic Sea Paleoenvironment, 12 September-1 November 2013. (Photo: ©ECORD_IODP)



The Kastenlot core 211660-6 from the Gotland Deep, showing nicely laminated sediments that were accumulated during the Medieval Climate Anomaly around 1000 years ago. (Photo: GTK)

Winter is dark and long, but the expectation of the next summer will give us strength to endure over the dark winter. I am already looking forward to seeing, smelling and feeling the seabed mud and sand again. And not forgetting "Huuhkajat" and the UEFA Euro 2020 final tournament.

Ecologist Merja Lipponen

Merja Lipponen, ELY, 13 December 2019

I work as a senior adviser in the Centre for economic development, transport and environment of Lapland (ELY-centre of Lapland). I'm an ecologist by training, and like ecologists usually, I've found myself working in the most varied environments from southern Finland up to North. During the last years I've done research and surveys in boreal forests, mires, inland waterways and cultural habitats like meadows and traditionally treated pastures.

To me the past year has included learning of new things in many ways. Since having a permanent post I've got used to sitting at a bureau almost all year round, not surveying on a field. On the same time, as an ecologist I got also an opportunity to dive in to totally new environment; into the Bothnian Bay as part of the SEAmBOTH-project, at least in theory. The most wonderful blog writings and especially the fascinating pictures have helped me a lot in the middle of everyday statement writing when missing days on the field. So Big thanks to everyone who has already shared the atmosphere and feelings from the field.

My earlier work with meadows in Lapland has been more or less working with ecotone biotopes. On flood meadows of the river banks or on the coastal meadows the outermost vegetation zones are constantly affected by flood or sea water. This means that work we do ashore may also have effect on underwater biodiversity. Limosella aquatica (water mudwort) obviously gets benefit from pasturing at least in river ecosystems and Alisma wahlenbergii (the Baltic water-plantain) grows generally on outermost vegetation zones (e.g. Eleocharis type) of the coastal meadows even tough it seems that Alisma wahlenbergii can also be found in environment that is not traditionally treated, if other requirements for survival are fulfilled. It would be great to learn more about Alisma and other species that are in one way or another dependent on some kind of disturbance in their environment. Also the threats and for example the effects of eutrophication and overgrowth are much the same both on terrestrial and marine habitats.

At my current post I'm responsible for issues concerning biodiversity in Sea Lapland area (Kemi, Tornio, Simo) on the subject of planning or impact assessments of plans or projects, e.g. wind power, power lines, exploration, plans and new bioproduct factories. Within the EIA's (environmental impact assessments) the effects on water quality are usually quite extensively assessed but lesser efforts have been usually put in to the assessment of the effects on underwater biodiversity or monitoring. "It's challenging", is usually said on reports. Luckily, we have data from the field and models of species and nature types produced which can be utilized as a background knowledge in the EIA–process. More accurate surveys, or monitoring of the projects can be asked as part of the EIA on the basis of field data and models. I'm really looking forward to future projects and cooperation with EIA's and monitoring issues.

1. Working outside the office!
   (Photo by Marjut Kokko, Centre for Economic Development, Transport and the Environment of Lapland)
2. Limosella aquatica. (Photo by Lari Pihlanjärvi, Metsähallitus)
3. Free time in the snowy forest. (Photo by Maija Mussaari)

And maybe during our next project I 'm able to get in touch with underwater nature in practice as well. And what I'm doing when not giving statements. Well, at the moment I enjoy both cross- country skiing and telemark, when the winter has come.

Wish You all Merry Christmas!

Marine geologist Gustav Kågesten

Gustav Kågesten, Geological Survey of Sweden, 24 January 2020

Reading the SEAmBOTH "People behind the scene" blogs before attempting my own, I find I'm not alone to struggle with simplifying the interdisciplinary nature of my profession in one title, which tend to poorly reflect the full scope of work we do. In my case, I work as a marine geologist at the Swedish Geological Survey, should be quite simple you may think (he works with geology on and under the seafloor, got it!). The reality though is quite different; I'm not a geologist by training but an environmental engineer with a focus on marine science (oceanography, geology and biology).

My interest in the marine science field as a career path started when I mixed my engineering skills with marine biology during an exchange year in Canada, Vancouver Island and a few years later as oceanographer on the East Indiaman replica Gothenburg in the South Indian Ocean. I was hooked on one of the last frontiers for exploration. For the last 10 something years I have worked in a variety of environments from the Baltic sea to deep waters of the Mexican gulf to the shallow coral reefs of the Caribbean (for the National Oceanographic and Atmospheric Administration (NOAA, United States), mostly work related to mapping and modelling marine benthic habitats, barely getting my head above the water surface. Lately my focus has grown to include mapping human impact on the ocean environment, combining seafloor maps and other ecosystem related information with human activities (I even get to work with land now!), to try and spatially map the cumulative impact we humans have on the marine ecosystem. Just like the SEAmBOTH project, which has a diversity of partners and people, I have found that the most productive groups I have worked in have done so with a healthy mix of professions and experiences, whether the work title is related to any of our natural sciences, computer science, or social science.

But what do I actually do at work? Though I'd like to say its exemplified in the image above, or when we go out to sea with our research ship Ocean Surveyor to collect seafloor information with advanced instruments (and yes, some of them are borderline toys such as ROVs and AUVs), I'm most days just another person stuck at an ordinary desk, tethered to a computer. The marine field like many other fields are adjusting to a world with increased computing power, artificial intelligence, and "big data", which brings great possibilities to quickly improve our seafloor maps, hence the need for a desk. Although wrangling data all day can sometimes be frustrating it is also very gratifying work when you see the resulting maps and can communicate what is "down there" to others.

Speaking of maps… No computing magic can bridge the gap of poor data and reliable maps. We still need to have high quality seafloor measurements to make them in a reliable and useful manner. You will be surprised to learn what a poor state the most basic information, like seafloor geology, is in and that it is one of the main challenges for effective ocean stewardship today.

An ideal place for an office – monitoring Caribbean coral reefs with scuba gear together with a curious box-fish.

Though maps can be used both for exploiting a resource and for protecting it, information is key to manage the environment in a sustainable way (we have managed to overfish the ocean quite well even in the absence of high-resolution maps). For those curious how we do go about mapping the seafloor through the light absorbing water column there will be a post about mapping in the SEAmBOTH study area a-z at high resolution in a few weeks.

Growing up on sailing the Baltic Sea (my dad put me on our boat at two weeks old), my connection to the Baltic and the life under the surface has always been there. Now I'm taking my own two-year-old son out sailing (he doesn't know you need a hook to fish yet…). Though vulnerable and degraded I am certain that we can turn the tide on the Baltic sea and get a rebound of large fish and reverse the growing anoxic areas and over-nutrification. We have much to fight for, and there are still many beautiful places out there!

Fourleaf mare's tail (Hippuris tetraphylla)

Essi Keskinen & Linnea Bergdahl, 3 April 2018

Fourleaf mare's tail (Hippuris tetraphylla) in Ulkokrunni. (Photo by Alejandra Parra, Metsähallitus)

Fourleaf mare's tail is an interesting plant species. Although it's distribution is circumpolar (around the world), at the same time it's very spotty. You can find it here and there in small populations but for one reason or another, it's missing from the areas between the populations. It prefers brackish water and very shallow depth of 10–20 cm with quite soft and muddy bottom. With these requirements, one would think that there are plenty of habitats for the fourleaf mare's tail in the Bothnian Bay.

There are many species of mare's tails – the name means female horse's tail, which comes from the looks of the plant, especially under water. The Finnish name "nelilehtivesikuusi" points to the woods and the spruce three, which is what the species looks above water. As the English name suggests, fourleaf mare's tail has rows of four leaves surrounding the stem. The Swedish name of the fourleaf mare's tail is "ishavshästsvans". It means the horse's tail from the arctic or glacial sea. What's difficult about the mare's tails is that they seem to crossbreed easily, and the hybrids are very strong competitors and may push the original parent species near endangerment. The whole taxonomy of the mare's tails is still very confusing, and the latest opinion is that the hybrid is so well established and common that it can be considered a species of its own. The whole genus needs more DNA testing and studying.

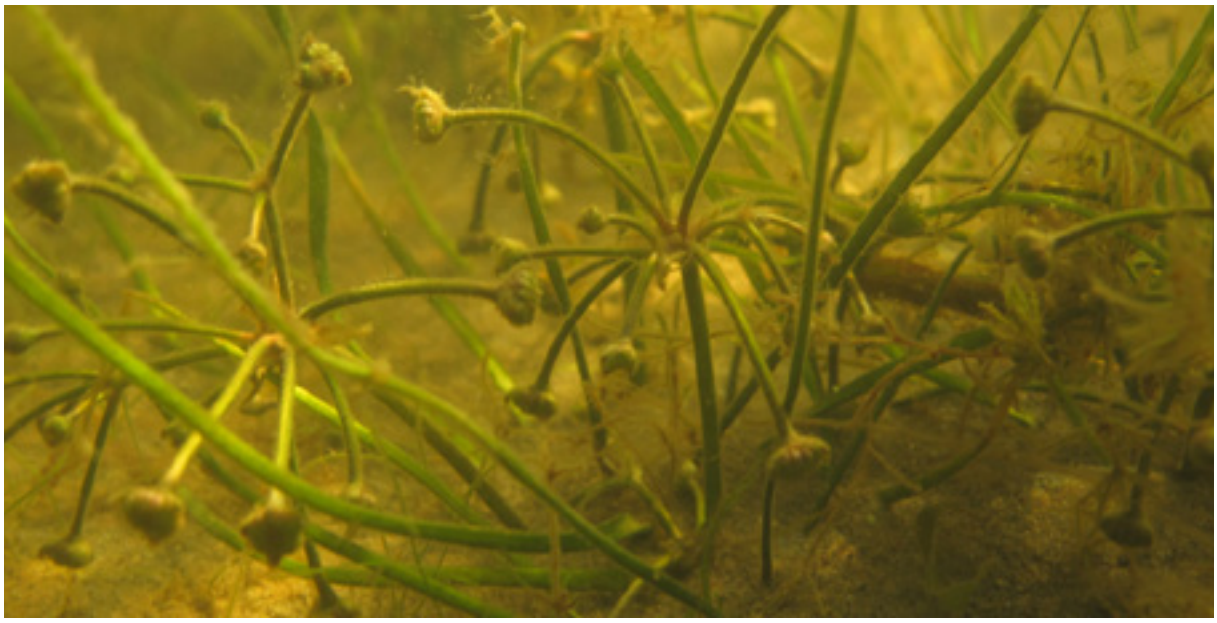
Fourleaf mare's tail is endangered (EN) in Finland and protected under the Nature Conservation Decree and critically endangered (CR) in Sweden and protected by law. The species used to grow all around the coast of the Baltic Sea, but with anthropogenic eutrophication, the coastal shallows started to overgrow by common reed Phragmites australis. This was one of the reasons why the fourleaf mare's tail has declined. At the same time, grazing of coastal meadows by cattle has decreased, and since the fourleaf mare's tail is not a strong competitor, its populations are getting wiped out everywhere in the Baltic Sea, except one or two tiny spots in Sweden and in the Northern coast of the Finnish Bothnian Bay. In the future, the climate change may affect the fourleaf mare's tail negatively by decreasing ice-scouring on shallow landupheaval muddy coasts which the species prefers. Ice-scouring helps keep these areas free of other vegetation, much like grazing used to do back in the 1950–1960s.

In the SEAmBOTH project area, the fourleaf mare's tail can be found in large populations in the Krunnit archipelago and around Hailuoto island in Finland. There are similar habitats on the Swedish side of the study area, but for some reason the plant doesn't exist there. In Sweden it can today only be found around Kronören, an area along the coast of Västerbotten, approximately 300 km south of the SEAmBOTH project area. Before it also used to exist at a location outside of Umeå but since about 30 years ago it disappeared from there. One theory is that the populations on the Swedish coast originate from seeds and/or plant parts that have drifted from Finland across the Gulf of Bothnia. Once arriving at the Swedish coast, they settled down where a shallow, sheltered and suitable piece of coastline was available.

The fourleaf mare's tail is an intriguing example of an endangered species which grows in one country and not the next one, despite of, at least superficially, similar habitats and physical environmental variables in both countries.

The Baltic water-plantain, Alisma wahlenbergii

Linnea Bergdahl & Essi Keskinen, 4 May 2018



The flowers of the Baltic water-plantain extends from a stalk from the center of the plant. The flowers are kleistogamous, which means they are always closed, like a bud. (Photo by Anna Engdahl, County Administrative Board of Norrbotten)

It may be the most iconic plant species for the northern Bothnian Bay, but only few people have ever seen it. The Baltic water-plantain only exists in areas within the Baltic sea, it is listed as vulnerable (VU) on the international IUCN red list of threatened species and is listed as a priority species on Annex II of the EU Habitats Directive. In both Sweden and Finland it is also protected by law.

But who is this Baltic water-plantain, and what does it look like? The plant is perennial and grows to around 10–45 cm in height. Its leaves are extremely long and slender, extending out from the center point of the plant. The flowers are found on top of stalks, which are shorter than the leaves. It grows underwater at depths from 0,1 meter to approximately 2 meters, but is most commonly found at the shallowest areas of the beach. It favors relatively calm waters with a sandy bottom with some clay and mud mixed in it. If it's only sand or the bottom is too muddy, you don't seem to find it there. These very specific environmental conditions may be one of the reasons why it is so rare and only found at certain places around the Baltic Sea.

One of the intriguing things about the water-plantain is that it is definitely not a brackish water species which would tolerate a high dose of salinity, but at the same time, it is not a freshwater species either. It does not tolerate estuaries well, either because of too fresh water, or nutrient discharge, or water movement, or who knows what. You can never find Baltic water-plantain in the river estuary itself, but just outside it.

In Sweden it is known from some localities within the lake Mälaren (which was part of the Baltic Sea long back in history) and from places within Råneфjärden and the archipelago of Haparanda, which are part of the pilot study areas of the SEAmBOTH project. Almost 80 % of the world population, however, can be found on the northern Finnish side of the Bothnian Bay, right in the project area. The plant has been of interest for botanists for a while. In Norrbotten, Sweden, the populations have been monitored since at least around the 1990's and in Finland, even longer. However, there are still many things we don't know about the plant, and many places where it might be growing which we still haven't been able to identify. For example, it was found in a completely new area in the Bothnian Bay national park in Finland, on the main island, where underwater inventories have been carried out since 2007.

We need to hurry up and learn more about them as well, since they are currently thought to be decreasing in numbers. Increased load of nutrients in the water (so called eutrophication) decreases the water quality and may make other plants, e.g. reed, on the beaches grow faster and outcompete the water-plantain. The fact that humans are extending their housing areas and other activities onto the beaches and into the water, causes living environments for the water-plantain to disappear.

The peculiar moss ball

Linnea Bergdahl, Länsstyrelsen, 11 May 2018

Moss ball (Aegagropila linnaei). (Photo by Linnea Bergdahl, County Administrative Board of Norrbotten)

An algae, a pet, a home decoration, a companion in the fish tank – the moss ball (Aegagropila linnaei) may be described in many different ways. And it can be found right here in the northern Bothnian Bay.

This peculiar looking algae may also be called marimo, which is a japanese word that literally translates to "ball seaweed". The moss balls are no alien eggs but rather a specie of filamentous green algae (Cladophora) that grows into the shape of round balls. They may be found in lakes in for example Iceland, Scotland and Japan. Today they have become popular in fish tanks and you can order your very own moss ball online if you'd like to have one at home.

The moss balls may sometimes be living free floating, and can then be found drifting around in the water column. (Photo by Lari Järvinen, Metsähallitus)

During inventories within the SEAmBOTH project area, divers have found the moss balls at deeper bottoms constisting of hard surfaces such as rocks and stones. It is difficult for other plants to grow in the deeper, darker waters on hard surfaces where they have difficulties attaching themselves to the bottom. The moss ball on the other hand favours these conditions and is often the dominating specie in these areas.

The thin filamentous threads of the algae are shaped into a solid ball. The ones found in the northern Bothnian Bay usually range in the size from a pea to a golfball. (Photo by Manuel Deinhardt, Metsähallitus)

Indicators

Essi Keskinen, Metsähallitus, 23 November 2018

All the small green plants in this photo are Crassula aquatica. (Photo by Suvi Saarnio, Metsähallitus)

Indicator species means a species which tells something important about its environment or the environmental conditions where it thrives. Bladder wrack Fucus vesiculosus deteriorates in turbid water and the plants move towards the surface to catch more light, blue mussels need at least 4-5 per mill salinity to survive, and Vaucheria sp filamentous algae grow well in eutrophicated sheltered areas.

Water framework directive WFD aims to good ecological water quality and one of the indicators in Finland is the bladder wrack. It's depth zone is monitored, and it seems to correlate quite well with water turbidity (or the lack of it), which correlates quite well with the amount of planktonic algae in the water column, which correlates quite well with the nutrient load in the water, which correlates quite well with the water quality. But there's always a But. Bladder wrack depth preference doesn't really correlate that well with anything in the Archipelago Sea. The reasons are not well understood, but in this area, the species is not as strong an indicator as elsewhere. And another But: Bladder wrack doesn't exist in the Bothnian Bay and in the SEAmBOTH area at all so we can't use that species to indicate anything, besides the lack of it indicating too low salinity for its growth.

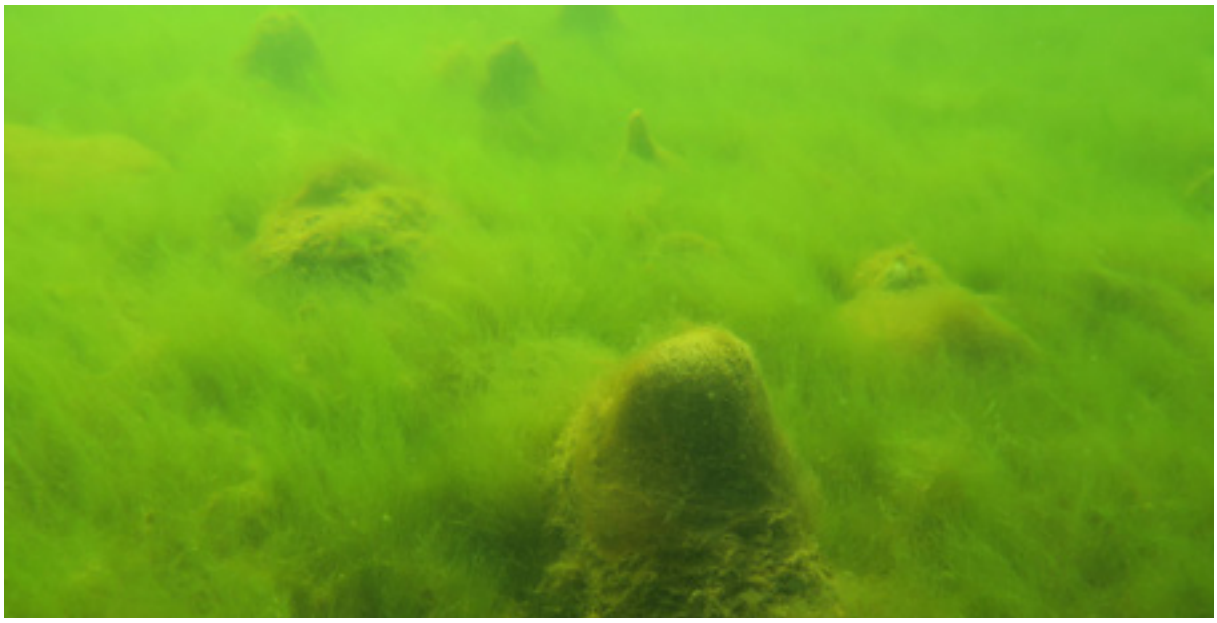
It's been a long and rocky road looking for environmental indicator species in the Bothnian Bay. One Master's Thesis (Takalo, 2005) came to the conclusion that the vascular plants are not very useful indicators (of anything) in the Northern Bothnian Bay because of the special environmental and geographical circumstances (constant and fast land-uplift, abundance of river water, long ice cover and the low number of vascular plant species due to the aforementioned facts). Takalo does mention that epiphytic algae or Diatoms might be used as indicators of eutrophication. Another Master's Thesis (Lantto, 2016) looked into the possibility of using filamentous algae to indicate eutrophication in the Northern Baltic Sea. Lantto did find a correlation between the two, but warns us not to interpret the correlation too lightly – it could be caused by other environmental factors (for example temperature) and not eutrophication alone. Diatoms form a large biomass in the Northern Bothnian Bay, but studying them requires special identification skills and special microscopes and hasn't been studied yet.

One thing we can say for sure: there are some species even in the SEAmBOTH area that indicate something. Nitella wahlenbergiana most definitely indicates a river estuary, while Crassula aquatica indicates a mud flat or some other very shallow area where water level fluctuates, and Chara aspera might indicate a sand bank. What is still problematic with these indicator relationships is that for example Chara aspera might also grow in other environments as well, and for example Potamogeton friesii seems to prefer two very opposite habitats – muddy and sheltered black water ponds with soft bottom on the other hand, and clear water pebbly or sandy bottom, quite exposed areas in the outer archipelago on the other.

Trying to make indicator species out of any species is like trying to categorize every patch of nature into nature types. All of them just don't fit in to the special little niches we try to push them into. Regardless of the difficulty of categorizing them, the species will keep growing and leave us wondering what they tell us about their surrounding nature, if anything.

Vaucheria

Petra Pohjola, Länsstyrelsen, 14 December 2018



Vaucheria covering the bottom, giving it a green "fur". (Photo by Petra Pohjola, County Administrative Board of Norrbotten)

Filamentous algae are those thin fussy-looking, sometimes slimy, algae may find growing on hard substrates where they cover rocks and stones.

Some of them though grow on soft bottoms. Examples of these algae that specialize in growing on soft sediments are species of the genus Vaucheria. Vaucheria are yellow-green algae that grow long, tube formed and unbranched filaments that often can be seen growing straight up from the soft sea bottom like green spiky hair.

In some places the algae grow so abundantly that it looks like a green mat covering the whole sea floor. There gas can accumulate underneath the dense vegetation, forming gas pillars in the Vaucheria-mat, as seen in the video.

The video is taken during a free dive to a depth of about 2,5m, in a shallow bay where the bottom at the deepest part was covered by these algae.

Nuttall's waterweed – an invasive species

Petra Pohjola, Länsstyrelsen, 25 January 2019

Canadian waterweed is bright green in color and has tongue-formed leaves. (Photo by Petra Pohjola, County Administrative Board of Norrbotten)

Waterweeds (Elodea spp.) are species of aquatic plants that originate in North America. Now, because of human interference, two different waterweed species are spreading globally, causing havoc as they outcompete local flora. Canadian waterweed, Elodea canadensis, is no new acquaintance here, as this species was first found in both Finland and Sweden in the 1870s. Since then it has become an established (although unwanted) part of the local flora and is found in both freshwater and brackish water systems throughout the countries. Another newer alien species is Nuttall's waterweed, or western waterweed, Elodea nuttallii, that was found in Sweden for the first time in 1991, but still has not been found in Finland.

The two species of waterweed can be difficult to tell apart, at least for the untrained eye. Both species build dense green stands of upright stems with whorls of leaves. These leaves are the best way of telling these species apart. Canadian waterweed has leaves with a rounded tip and arching downward, resembling a tongue. Nuttall's waterweed has thinner leaves with a sharp tip and can be twisted along its center. Also, the color of the plants can differ, as Canadian waterweed is often a deeper and cleaner shade of green. These species live in similar habitats, in shallow soft bottoms, and thrive in nutrient rich waters with a salinity under 2,5psu. Out of these invasive species, Nuttall's waterweed has been seen to outcompete its relative and proven to be a better competitor, making it an even more threatening newcomer. This new waterweed now threatens local biodiversity through shading and outcompeting local plants as well as potentially changing its surroundings nutrient cycle and water quality.

The origin of these species is uncertain, but they are believed to have been spread from aquariums and botanical gardens. Once introduced to a new environment, the plants can spread shorter distances with currents, aquatic birds, and boat traffic. Only a small piece of the plants stem is enough for a successful invasion in a new environment. In Sweden Nuttall's waterweed has already spread from fresh water systems in the south to the brackish water seashore in the Bothnian bay. The SEAmBOTH – area is now the center of attention as this is where the eastern edge of the distribution of Nuttall's waterweed is situated. During field work last summer the species was commonly found in dense stands in the western end of the SEAmBOTH-area, with fewer findings to the east. Here the most eastern sighting of this species was made in Haparanda, just 5 km from the border to Finland! According to a recently published risk classification of invasive species in Sweden, both waterweed species can have a severe impact on local biodiversity as they both have the potential to have a large ecological effect and can colonize over large areas. They belong to the same risk class as Lupinus polyphyllus, the large-leaved lupine.

Now, as Nuttall's waterweed is spread all the way to the Finnish border, is it just a matter of time before this invasive species is found on the other side? A possible explanation to why the species has not yet spread to the east is that the paths of migratory birds mostly follow a south-northerly line and so do not transport any plants eastward. Also boat traffic across the border is minimal and large-scale currents flow westward in the northern Bothnian Bay. Still these explanations seem like something that would slow down the spreading, not stop it. In a recently published action plan regarding invasive species in Finland it is stated that there is no natural barrier to stop the spreading of Nuttall's waterweed. The spreading should be monitored, so that appropriate actions can be made to stop the invasion, when needed. Still, no effective way to stop this waterweed has yet been found.

Braun's stonewort (Chara braunii)

Petra Pohjola, Länsstyrelsen, 22 February 2019

Chara braunii can be identified through its transparent cortex-less stem and branches, its spines and unbranched branchlets. Photo by Petra Pohjola, County Administrative Board of Norrbotten)

The northern Bothnian Bay is shared by Finland and Sweden, and in many ways the sea is the same. In other ways, differences occur in underwater nature between both sides of the border, although this border only is a human concept and does not affect marine life. One thing that has puzzled our colleagues on the Finnish side is our stories about this mystical charophyte, Chara braunii, that we have often seen in the waters on the Swedish side of the SEAmBOTH area. Sometimes it grows so densely that it forms lush green meadows in our shallow bays. However, on the Finnish side, this species has not been encountered in SEAmBOTH investigations, all until last summer.

Chara braunii is a charophyte, which is a green algae that resembles a plant. Charophytes attach to soft bottoms in fresh and brackish waters often forming charophyte meadows. Chara meadows are a valuable but declining nature type, as these algae commonly are susceptible to eutrophication. Chara braunii is a special charophyte species because, from a national perspective, it is very uncommon and defined as vulnerable (VU) in the red list of threatened species in both Finland and in Sweden. In Sweden, it is currently known to exist only in the northern Bothnian bay. In Finland it has previously been found in a total of 15 sites in the whole country: in the Bothnian Bay and a few freshwater sites in Southern Finland.

This species is quite easy to recognize, as far as charophytes go. Unlike other species of Chara, it has no bark cells (cortex), which means that its branches are formed of single elongated transparent cells. From other cortex-less genera (eg. Nitella and Tolypella), it can be differentiated by its unbranched branchlets and the presence of spines.

Once seen, it is easy to recognize just by a glance, as it is amazingly attractive, with its bright green color, regular build and striking and numerous reproductive organs.

When the conditions are just right, Chara braunii (like other charophytes) can grow so densely that they form meadows. (Photo by Petra Pohjola, County Administrative Board of Norrbotten)

So Chara braunii has become very familiar to us marine biologists on the Swedish side of the SEAmBOTH-area. It prefers sheltered bays in and around estuaries, and since we have studied a lot of sheltered bays this last year, our number of observation sites has also grown. Most of these places have never been mapped before, so this species has shown itself to be a lot more common in this area than thought before. In the meantime, many years of underwater mapping went by on the Finnish side before the first sample was found. Then, we hit the jackpot on the islands in the Kemi River estuary. Just last year, the observation sites doubled in Finland. Still these observations include only occasional individuals, not larger occurrences. Perhaps this is due to the straighter shoreline in Finland, as the species prefers sheltered sites that are more numerous on the western side of the border. Either way, we are happy for every new finding of this pretty but vulnerable charophyte.

We have it, you don't

Essi Keskinen, Metsähallitus, 22 March 2019

You need to know what to look for to be able to find the aquatic beetle Macroplea pubipennis.
(Photo by Petra Pohjola, County Administrative Board of Norrbotten)

The nature in the northern Bothnian Bay in the SEAmBOTH area is in many ways similar on the Swedish and on the Finnish side. Sure, the Finnish side is more flat and the shores do not slope as fast as on the Swedish side, but both have large river estuaries, many lagoons and bays, with some islands too.

Yet, there are some differences between the species that can be found in the neighboring countries. Hippuris tetraphylla can be found in large numbers in Krunnit archipelago on the Finnish side. It only exists in some areas far away from the SEAmBOTH area in Sweden. It is possible that the right kind of habitat, mudflats and coastal meadows that are sometimes covered by water, sometimes not, can only be found in abundance in Finland. Or is it just a matter of finding it in Sweden as well?

An alien species, Elodea canadensis, is found in both countries, but it's cousin, equally aggressively spreading Elodea nuttallii, can only be found in Sweden, and only a few kilometers from the border. Again, it's probably just a matter of time when it arrives in Finland, but so far that hasn't happened.

There are some differences between the number of water mosses found in Finland and Sweden. The species list for the area in Finland is a lot longer, but this does not necessarily reflect the reality in nature. Oulu University happens to have one of the leading authors of mosses in Finland, and it's easy for the Finnish team to take all suspicious water mosses to be properly identified. Three species, Fissidens adianthoides, osmundoides and pusillus look exactly the same underwater and also with our field microscope. They can only be identified with a proper microscope that can be found at the University.

If the Swedish colleagues don't have the same handy access to a water moss expert, differentiating with all the dozen or so species of them becomes much trickier.

One Chara species is still a mystery. Chara braunii occurs as lush meadows in Sweden and as lonely individuals in Finland. And we just started finding it on the Finnish side as well. For some reason, it never occurred in our previous mapping areas before, and it's not an identification error either, because the species is very easy to distinguish, even with a naked eye. Another question mark is Chara baltica. Old reference books say it can be found in Sweden, all the way to the border, and then it abruptly stops and can't be found in Finland at all. In recent years though there have only been the odd sighting of it on within the SEAmBOTH area on the Swedish side. So questions arise: Has the distribution of the species changed over the years or has species identification changed?

Quite often it's also a matter of finding something if you know where to look for it. The small beetle, Macroplea pubipennis, had never been found in Sweden before. Petra, who has been successfully looking for them in Finland, joined the team in Sweden last year and soon enough she started finding them in Sweden and in the SEAmBOTH area as well.

One thing is for sure – the more data we collect from both sides of the border, the more common ground we find. Some differences will remain, but mostly they seem to be just artefacts caused by more mapping effort put into the Finnish side. This is exactly why we need cross-border projects like SEAmBOTH.

Seabirds – a part of the sea

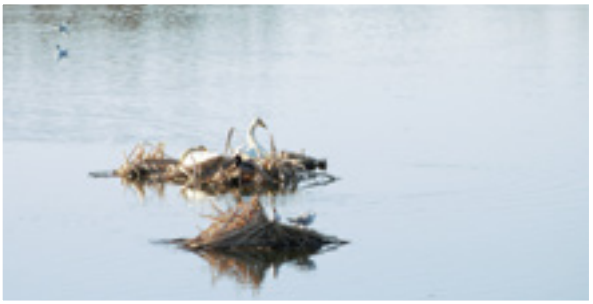
Petra Pohjola, Länsstyrelsen, 3 May 2019

Seabirds colonize small treeless islands to avoid predation. The great cormorants seen on the photo are not as common in the northern Bothnian Bay as in other parts of the Baltic Sea but do also breed here. (Photo by Petra Pohjola, County Administrative Board of Norrbotten)

When thinking about the sea one probably first thinks about the sound of waves and after that, the calls of seabirds. Birds are a large part of the nature at sea, but seldom a thought is given to how they are a part of the underwater ecology. So, let's give some thought to how birds might affect and are affected by what happens under the water in the northern Bothnian bay.

A lot of seabirds nest on small and isolated islands, because of the low level of predation here. In our area for instance razorbills, black guillemots and different seagulls and terns can be found nesting on barren islands in the outer archipelago. Other seabirds prefer to nest in reed-rich bays, also because of low levels of predation here. Species that we can find nesting in our shallow bays are ducks, swans, mergansers and grebes. Busy nesting sites can have an effect on underwater nature, as nutrients are accumulated around these sites. The nesting birds not only rely on the sea for its sheltering qualities, but also for feeding, and for that they themselves venture under the surface.

An obvious way that seabirds affect underwater ecology is by feeding on fish, bottom fauna and underwater vegetation. By specializing on specific prey, birds can influence the whole food chain. For instance, feeding on small fish can lessen the feeding pressure on animal plankton, which in turn feed on algae. Grazing by birds can influence the composition and height of plant species in shallow bays. Grazing at these shallow sites can also momentarily affect the visibility, as the birds cause resuspension of soft sediments. The birds themselves are affected by visibility, as fishing birds that rely on vision have a lot harder time finding food in blurry water, or as food can become sparse for grazing birds as the water becomes too murky for plants to grow. This species is quite easy to recognize, as far as charophytes go. Unlike other species of Chara, it has



The whooper swan breeds in sheltered bays and grazes on underwater vegetation. In other parts of the Baltic Sea the mute swan is more typical for sea habitats but in our waters the whooper swan is more common. (Photo by Petra Pohjola, County Administrative Board of Norrbotten)

no bark cells (cortex), which means that its branches are formed of single elongated transparent cells. From other cortex-less genera (eg. Nitella and Tolypella), it can be differentiated by its unbranched branchlets and the presence of spines.

By moving from one spot to the next, birds are important for many underwater species in the dispersal to new habitats. This has both negative and positive effects on underwater nature as birds can transport both invasive species as well as threatened ones. This transportation can occur through the consumption of spores and later releasing them through defecation, or involuntarily as plant parts temporarily tangle on the birds. For instance, oospores of charophytes can survive through the digestion tract of birds and hence birds can be valuable in the dispersal of charophytes. The invasive waterweeds spread through loose plant parts, which can tangle on the feet of birds and so invade new areas.

Although we seldom see marine birds as a part of underwater nature, they very much are so.

Water mosses

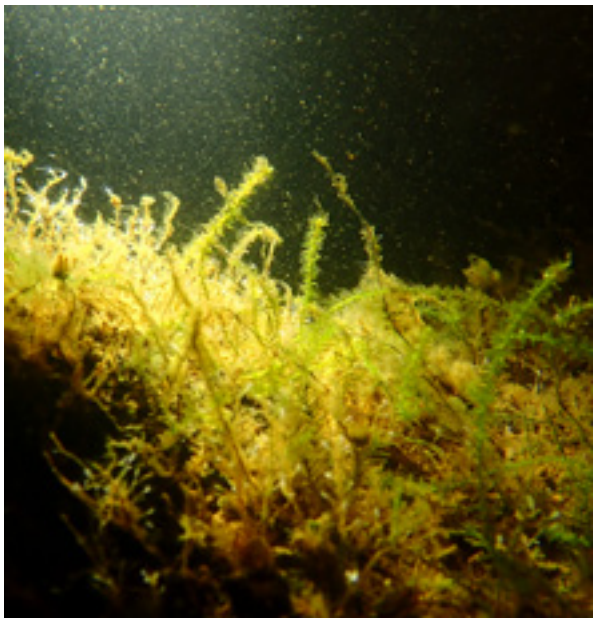
Essi Keskinen, Metsähallitus, 28 June 2019

Mosses are funny macrophytes. Most often people think of Sphagnum bogs with cloudberries or swamps of some kind when talking about mosses, or beautiful green and soft Boreal forest floor cover with blueberries growing all over them. Or if you mention aquatic or water mosses, people will think of running waters, rivers and streams.

There are, however, many species of water mosses in the northern Bothnian Bay. A few species like Fontinalis antipyretica can be found across most of the coastal areas of the Baltic Sea in Sweden and Finland. It looks quite different across the sea being large, dark green and lush in the SEAmBOTH area but smaller, thinner and lighter green, like it wouldn't really be doing too well, in the Kvarken area. It is, after all, a freshwater species that just happens to tolerate brackish water to some extent, so it's not a big surprise that it fairs better in the north were the water is almost fresh.

Since bladderwrack Fucus species are missing from the northern Baltic Sea due to the low salinity conditions, water mosses have taken their place on rocky reefs. Water mosses are the larger macrophytes, which grown on hard substrates and they are the only larger macrophytes on reefs around these areas. In the early years of Metsähallitus underwater inventories in the north Bothnian Bay on the Finnish side we found approximately 4-5 water mosses that we were able to identify. The University of Oulu helped us a lot since our microscope was not, and still isn't, adequate enough to reveal the tiniest identification clues from the water moss leaves. It seemed that we could never get the species right and at some point we acquired the university, whether they would like to organize us a species identification course on water mosses. That was a mistake since it turned out, that there might be as many as 20 different aquatic mosses to be found in the northern Bothnian Bay. It had been better living in a blissed ignorance than to wait for completely new species to appear on every dive. The same thing happened on the Swedish side – last year they sent 19 samples of water mosses for identification and they turned out to be samples of as many as 8 different species!

Some of the species have eluded the science for the longest time. When I started as a marine biologist in 2006 in Metsähallitus, a water moss called Rhyncostegium riparioides was found everywhere. This common water moss looked exactly like another one, called Leptodictyum riparium, and I confused the two all the time in the beginning. I took our samples to the University of Oulu every time we encountered this species and every single time it came back as Rhyncostegium riparioides. Someone else had obviously mistaken it to Leptodictyum before since that was apparently the only species found in the Bothnian Bay National park during the 1990s. In a few years, Rhyncostegium turned into Platyhypnidium as the scientists learned more about it and the species skipped genuses. About 10 years



went with this identification until someone started to suspect something and Turku University started to do DNA sampling on the moss. It turned out that the species was something else altogether, a new species for the Finnish side of the northern Bothnian Bay even though it was already previously identified from the Swedish side. Oxyrrhyncium speciosum found its way to the northern Bothnian Bay. You can read more about this in Finnish metsahallitusmerella.blogspot.com/2019/04/eraan-vesisammalen-tarina.html or from a scientific paper: Huttunen, S. & Ignatov, M.S. 2010: Evolution and taxonomy of aquatic species in the genus Rhynchostegium (Brachytheciaceae, Bryophyta). Taxon 59: 791-808. A new publication will come out about the DNA identification of this species in the new future.

There are some success stories with the aquatic mosses from the SEAmBOTH area as well. A tiny Fissidens fontanus was previously regarded as being regionally threatened even though it could be found everywhere. If you dived to a dept of 1-6 meters to a bottom with at least a few rocks and the place wasn't too sheltered, you were bound to find Fissidens fontanus (and Oxyrrhyncium speciosum as well) with a certainty of about 90 %. The reason why this small water moss was thought threatened was that it was almost only by diving that you could get hold of it. It grows deeper than one can wade and it won't really come up in a rake sample, and it won't show or be identifiable in a video, and our team was really the first one that started scientific diving around these waters in 2006. We reported every finding dutifully and were very happy to see the species dropped from the Red species list of Finland in March 2019. Now we have enough data to say that Fissidens fontanus is not regionally threatened, it was just thought so because it was small and elusive. If you want to know more about the water mosses and their habitats, reefs, you can read through the SEAmBOTH blog about reefs https://seamboth.com/2018/06/08/unique-habitats-reefs/

Fish that can be seen

Essi Keskinen, Metsähallitus, 2 August 2019

Most of the fish in the Bothnian Bay are terrified of divers. As soon as they either hear or feel the diver's air bubbles, they swim away as fast as possible. To most fish, a diver represents either a potential predator or at least a completely new and unknown danger and is worth a quick escape.

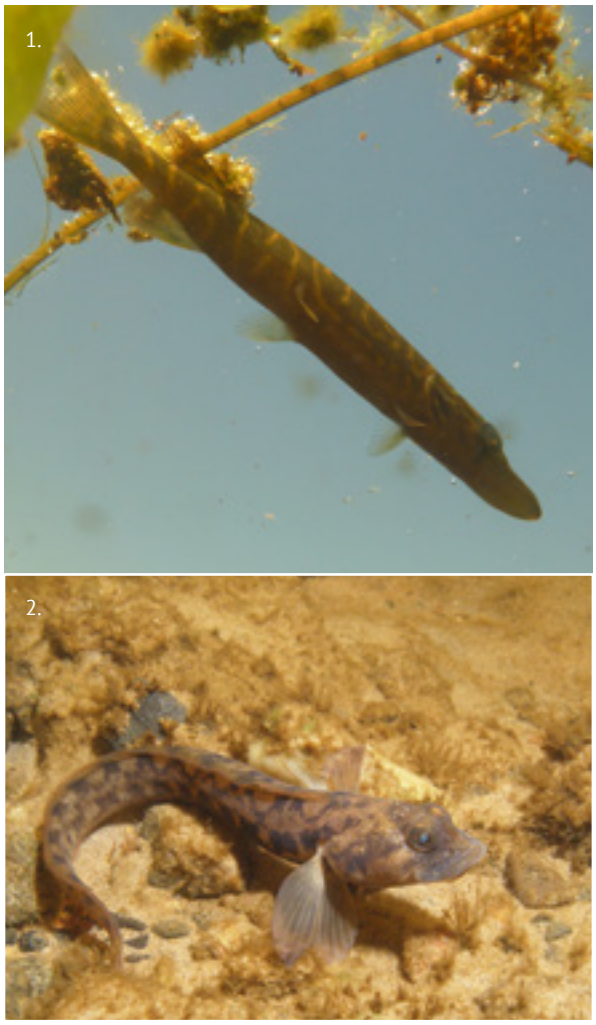
Some fish, however, can sometimes be seen by divers or people wading in the water with a water binocular. These species are either too small to flee quickly (three-spined stickleback Gasterosteus aculeatus, ninespined stickleback Pungitius pungitius, which in Finnish is curiously named as a ten-spined stickleback, and fish larvae, which means fish babies and youngsters), ro they rely on their camouflage (European bullhead Cottus gobio, pike Esox lucius) or they are ill equipped for fast swimming (European eelpout Zoarces viviparus). Some species are really curious (perch Perca fluviatilis, Eurasian ruffe Gymnocephalus cernua) and they might even come and see, what a fellow diver looks like.

One time I was taking a grain size sample of the sand. I was in the middle of shoveling sand into a bucket when I realized that a school of Eurasian ruffes were trying to get into the bucket! There were maybe five or six of them and they were dashing in and out of the bucket. It took me a while to realize that they were trying to catch invertebrate animals that might have been hiding at the top layer of the sand which I was shoveling. I had to shoo them away to get back to my work.

The ruffe's cousin perch is also a very curious fish. Quite often they come to check out the diver or a drop video camera and try to look directly into the "eyes" of the diver or the camera – either to see, what's inside the mask or the camera lens or because they see their own reflection there.

Pike is a successful ambush predator which waits for its prey to come within a striking distance before making a dash for it. Quite often it can be found waiting in ambush between the reeds in the shallow water. A pike also relies on its camouflage to confuse both their prey and potential predators. You can quite often approach a pike if you just move slowly enough. Just be careful – when you're close enough, or too close for the pike's liking, the fish will very quickly make a run for it and you're left with a nasty adrenaline rush.

Some of the smaller or benthic (bottom dwelling) fish are poor swimmers. Sticklebacks and European eelpout, as well as the tiny European bullhead, are not great swimmers. If encountered by a diver, the sticklebacks try to swim away, except when they are mating or guarding their nest. Then a courageous beast (The Daddy) will take over the small and normally so shy fish and they will come chasing even a diver off their property. The benthic fish, which usually have a flatter belly and larger pectoral fins compared to free swimming (pelagic) fish, are well equipped for resting on the bottom but not for swimming. The eelpout and the bullhead don't want to waste extra energy by swimming clumsily away if they are not sure that the threat is for real.



1. Pike is an ambush predator who counts on its camouflage colors for safety. If you approach slowly, they will let you get quite close before darting quickly away. (Photo Manuel Deinhardt, Metsähallitus)
2. An eelpout is a poor swimmer which won't use extra energy by darting away from a diver until at the very last minute. (Photo Essi Keskinen, Metsähallitus)

The fish larvae obviously try to swim away as fast as possible because anything bigger than them is a threat to them but compared to a diver or even a wading human being in a survival suit, they are slow swimmers.
Some fish, such as shoals with small Cyprinidae, enjoy human company and like to eat dead skin and resuspended material that the marine team leaves behind when we snorkel. This is like one of those "fish massage" tourist attractions in Southeast Asia.

If you want to see fish underwater, snorkeling very quietly along the reed belt or in an underwater meadow will do the trick. You just have to move very quietly and not splash around and scare the fish away.

Searching for Macroplea pubipennis

Petra Pohjola, Länsstyrelsen, 16 August 2019

The mysterious aquatic leaf beetle Macroplea pubipennis has become quite familiar to us these last two summers. Not a lot is known about these beetles. Two years ago, we didn't even know they existed in Sweden and they were known to occur only in Finland and China (of all places).

As observation sites in the Swedish Bothnian Bay have now added up to a total of 7, and we have seen hundreds of individual beetles, we have learned a lot about where they thrive. We have also learned a bit about other species of Macroplea. We would like to share to others what we have learned. So this is how you can find Macroplea pubipennis in the Bothnian Bay: (video)

How to find macroplea pubipennis!

1.What we have learned about this beetle is that it likes semi-sheltered bays and rarely ventures far from the reed edge. Almost all our observations have been just within a few metres from the reed edge, as other species of Macroplea (M. appendiculata and mutica) also can be found deeper and in the middle of bays. For some reason bulrush (Schoenoplectus sp.) will not do and it has to be common reed (Phragmites australis).

2. Most of the beetleshave been found on perfoliate pondweed (Potamogeton perfoliatus), which is odd because it has before been known to prefer sago pondweed (Stuckenia pectinata) or watermilfoils (Myriophyllum sp.). These beetles live their larvae and pupa stages in the roots of aquatic plants and in july-august emerge to the open as adults. Perfoliate pondweed are hard to yank up with their roots intact so the easiest way to find these beetles is to snorkel and calmly look around for the grown individuals looking for mates and host plants.

3. You have to be extra calm and careful when looking for these animals. Their color is often similar to the background (as on the video) and the small hairs all over their bodies collect sediment, making them blend in even better. The best place to find them are places with only a little of vegetation, preferably perfoliate pondweed. Look for small dark or light dots (depending on if you see their back or stomach), tiny details or small movement. If you are lucky enough to see one Macroplea pubipennis, you are likely to see many.

Good luck!

Phragmites australis

Sjef Heijnen, Metsähallitus, 6 September 2019

Phragmites australis. (Photo by Sjef Heijnen, Metsähallitus)

What does your own lawn or the park downtown most likely have in common with the Bothnian Bay? That there is Grass, lots and lots of grass. Strictly speaking only the family Poaceae can be called grasses with around 12.000 different species. However, other families such as Cyperaceae (sedges) and Juncaceae (rushes) have species that resemble grass.

Poaceae is an important plant family for humans and animals alike. For humans it has a economical value as food (wheat, rice, corn), construction material (floormats, weaving, paper) or cultural value like a botanical garden or sports turf. It also has some aesthetic value through the use of grasses in lawns and garden design. For animals, grasses provide food or shelter from weather conditions or predators.

But grasses also have important ecological roles. The roots of grass keep the substrate together and can significantly slow down erosion. The roots also move the substrate around and prevents it from becoming too dense, providing a better habitat for creatures living in the substrate. However, grasses can also have severe negative effects on their surroundings. Grasses are usually not picky about their habitats and can settle quickly in a new habitat. Grasses also grow relatively quick compared to other non-grass species. This results in grasses usually outcompeting the other non-grass species.

Reeds are grass-like plants that grow in wetlands. In the grass family Poaceae, Phragmites australis is the most common reed found in the Bothnian Bay. While blooming it is easy to spot with the dark purple plumage that sits on top of the plant. While P. australis shares the same benefits as other grasses, it is considered a threat to most other native plants in the Bothnian Bay. P. australis forms dense reed-beds that is unsuitable as a habitat for other plants. Due to the length of P. australis, which can reach about 2-3 meters, it blocks light for other smaller plants. Dead reed will also cover up the substrate after a period of time, making it almost impossible for other plants to grow.

Nature surveyor and a thick reed bed.
(Photo by Sjef Heijnen, Metsähallitus)

Luckily reeds can be kept in check by allowing grazing along the shores. Preventing reeds from growing to big and creating dense reed-beds. This in turn allows other native plants to grow again and creates a higher biodiversity in the area.

Pygmy waterweed Crassula aquatica

Essi Keskinen, Metsähallitus, 27 September 2019

(Photo by Manuel Deinhardt, Metsähallitus)

Pygmy waterweed is true to its name: it's tiny. It is a teeny weeny annual succulent semiaquatic or aquatic plant that only grows to about 1-5 cm tall.

You can find this small and inconspicuous vascular plant from the water's edge at ponds, lakes, rivers and also brackish water seas like the Bothnian Bay. Its distribution is very wide from North America to Europe to who knows where else since this species is so small and doesn't really look like anything that would jump out from the ground that it's probably very often overlooked. In Europe, International Union for Conservation of Nature IUCN, has labelled it as DD – data deficient (2011). HELCOM gave it a status of NT (nearly threatened) in 2013. In Finland, it got the same status in 2000 but then in a more recent estimations in 2010 and 2019 it was found VU (vulnerable) in Finland.

Pygmy waterweed used to be more common, or so it is thought, when there was more grazing on the coastal meadows and the strong competitors to pygmy waterweed, for example reed Phragmites australis, were kept in check by cows and sheep. Another factor driving pygmy waterweed towards extinction is eutrophication, which also gives an advantage to reeds. Coastal construction and dredging contribute to habitat loss and thus to less pygmy waterweeds.

Pygmy waterweed is quite common in the Finnish side of the SEAmBOTH area. It can most often be found in river estuaries and river banks in very shallow (down to 0,5 m) water, or on dry or moist land, depending on the water level. Pygmy waterweed grows on silty or muddy shallow banks and shores that are sometimes under water, sometimes above. If the plant is found underwater, it's most often beautifully light green, but if it's been on dry land for a longer time, it may be reddish or purplish. The seeds are dispersed by water and that's how this annual plant can show up in different areas depending on year and wind direction.

(Photo by Suvi Saarnio, Metsähallitus)

Pygmy waterweed often forms large meadowlike areas of thickly growing individuals so if you stumble upon one of them, you're most likely to find plenty more around the corner.

Pygmy waterweed is one of those modest little species that doesn't make a fuss of itself but wither away without notice due to eutrophication and other human activities. One way to help this pretty little plant is to try to find out its true distribution. Even though it's small, it doesn't mean that it wouldn't be important for the aquatic biodiversity.

Fresh water species in the Bothnian Bay

Essi Keskinen, Metsähallitus, 25 October 2019

Water lily, Nymphaea alba ssp. candida. (Photo by Ville Savilampi, Metsähallitus)

Some species of vascular plants and other macrophytes (the plants, water mosses and algae that we can see) are adapted to marine water. This means, that the lower salinity level will limit their distribution. They also have a maximum salinity level where the environmental stress from the salty water will get too high and they can't survive in the high salinity conditions any longer. These species will also get stressed, if the salinity is too low for them.

Freshwater species are adapted to low salinity or fresh water (the stuff that comes out of your tap when you turn the knob, your well when you take out a bucket of water or where you swim when you go to a lake or a river). If the salinity gets too high, the spices will get stressed, don't cope well and their distribution can be limited by the water salinity.

Most of the species that we find in the Baltic Sea are somehow tolerating the low salinity conditions of the brackish water (mixture of fresh and marine water). In the Baltic Proper the salinity may be as high as 9 ‰ when the northern Bothnian Bay salinity is as low as 1-3 ‰. Quite many of the Baltic Sea species are marine species that just tolerate low salinity brackish water. Most of these species find it difficult to survive north of the Kvarken area and east of, say, Kotka. A few examples of these species would be the blue mussel Mytilus trossulus, barnacle Amphibalanus improvisus and a red algae Furcellaria lubmricalis. Only a very few species are truly brackish water species. One of them is a relict crustacean species Saduria entomon, which was trapped in the Baltic Sea less than 10 000 years ago after the last ice age.

Many of the vascular plants that can be found in the SEAmBOTH area would ordinarily be labelled as fresh water species but they can still be found in the Bothnian Bay. Of course, there are also people who think that the whole Baltic Sea is nothing but a huge river estuary and not a sea at all, but most of us still think it's a proper sea, although it freezes in the winter and the water is very low in salinity, and there is no tide.

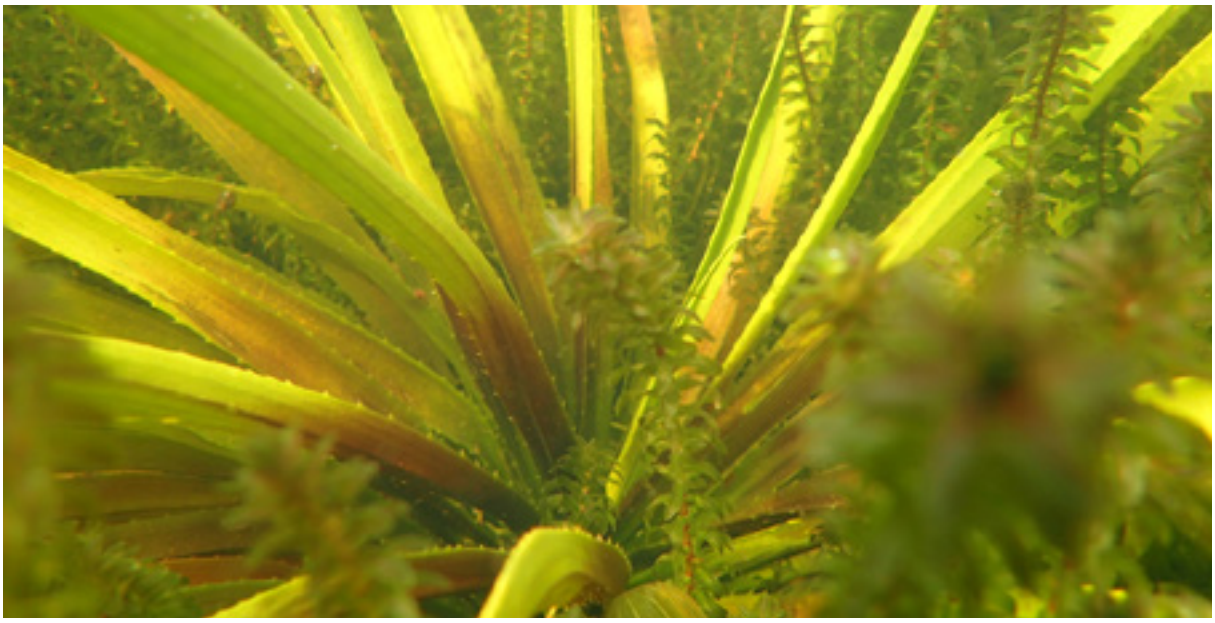
Salinity is especially low in the huge river estuaries of Tornio, Kemi, Kalix and Råneå rivers which discharge huge amounts of fresh water every second. Many of the fresh water vascular plants (see the photos) can be found in the river estuaries. Marine species are not found in these areas and the extent of fresh water can be seen from the species composition – where the fresh water species occur and none of the brackish water species can be found, the area can still be considered a river estuary and not yet the sea.

Many of the freshwater vascular plants can be found in shallow and sheltered bays and lagoons by the continental coast. Great meadows of broad-leaved pondweed Potamogeton natans, pond water crow foot Ranunculus peltatus ssp peltatus and an alien species pondweed Elodea canadensis can be found in low salinity fresh water. As the English name suggests, all of these species like pond water (pond is a small lake with fresh water). These species don't venture to the outer islands and one of the reasons is the limiting factor of higher salinity. Another example of a freshwater species that can be found a bit further out in the Bothnian Bay is the large duck mussel Anodonta anatina. It can be found in the national parks and around Hailuoto island, as well as in many large and shallow bays.

Although brackish water is a harsh environment to thrive, it also makes it interesting for marine biologist to sort through the species list where marine, brackish and freshwater species exist side by side. There are not many places like this in the world.

Water soldier Stratiotes aloides

Essi Keskinen, Metsähallitus, 15 November 2019



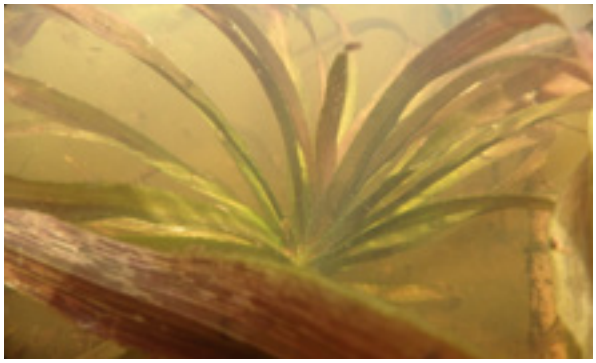
(Photo by Essi Keskinen, Metsähallitus)

Water soldier, or water pineapple, is a weird relict species of aquatic plant in Finland and in Sweden. The English name is easy to understand from the appearance of the species. It looks like a pineapple, and its leaves are sharply serrated like soldiers' swords.

It was left here in the lakes during the warmer period after the last Ice age 10 000 years ago and has struggled in shallow lakes and ponds in central Finland, south Sweden and Lapland ever since. In the SEAmBOTH area it is found in the river estuary of Kemijoki River in Finland. In Sweden it exists mainly in the south, but also all the way north, but mainly in fresh water ponds. The plant has been classified NT (nearly threatened) in Sweden since 2000, due to the same overall decline as in Finland. In Sweden it has gathered the most observations in rock pools on the west coast, but it is found in both lakes and estuaries in the rest of Sweden. In the SEAmBOTH area in Finland it has mostly been found in estuaries but also on shore meadows in the archipelago. Here in the north, the plant grows much smaller than in other parts of its vast distribution area of Europe and northwestern Asia.

Water soldier is a strange species in many ways. It grows as unattached and floats near the bottom or is slightly attached to the bottom until it starts to flower, when it suddenly rises to the surface where its leaves and flowers stick out of the water. The species is dioecious, meaning that there are male and female flowers which are both needed for pollination. In Finland, only male flowers have been found, so the plant reproduces from overwintering rosettes which develop at short runners at the end of the summer. The flowers smell like decomposing flesh in order to attract pollinators, which will never find the female flowers to pollinate in Finland.

Another strange thing is the family tree of this species. The plant belongs to the Hydrocharitaeae family where its relatives are an invasive species pondweed Elodea canadensis and naiad Najas spp. Water soldier is found to be an invasive alien species in Ontario, Canada, where it has escaped to natural waters from ponds and aquariums. It is now prohibited in Canada under the Invasive Species Act.



(Photo by Essi Keskinen, Metsähallitus)

One more weird fact about this interesting species – it provides an egg laying place for the rarest Finnish dragonfly (Aeshna viridis) (VU). This choosy dragonfly is not found anywhere else in Finland except in waters with the water soldier.

Wikipedia tells us that "The herb has had a high reputation for treating wounds, especially when these are made by an iron implement. It is applied externally. The plant is also said to be of use in the treatment of St. Anthony's fire and also of bruised kidneys."

Whether the healing powers of water soldier are true or heresy, this is an interesting water plant that can be found in small pockets of fresh or almost fresh water here and there in Finland and Sweden.

Pretty flowers

Essi Keskinen, Metsähallitus, 27 December 2019

Buttercups have cute little white flowers in a dramatic backdrop of Simo River estuary, Finland. (Photo by Suvi Saarnio, Metsähallitus)

When you think of a flower, you most probably think of something big and colorful. Maybe a rose or a sunflower, or a tulip. You probably wouldn't think of any aquatic flowers first, even though some of them are very pretty and even colorful.

Water lilies and pond lilies are probably the biggest and most conspicuous of water flowers. Huge white water lilies are more familiar from lakes and other fresh water bodies but they can be found in river estuaries, shallow bays near the coastline and other low salinity habitats at the sea as well. Yellow pond lilies are pretty, almost round and ball-like flowers that can be found in similar habitats with the water lilies.

Some of the flowers reach to the surface of the water, like buttercups (Ranunculus ssp) or European water-plantain (Alisma plantago-aquatica). They have small but beautiful little flowers that either float at the surface of the water (Ranunculus) or are erect above the water (Alisma).

Some of the flowers are very modest. Claspingleaf pondweed (Potamogeton perfoliatus) flowers reach the surface but they are like brown little pine cones and don't really resemble flowers that much. Some of the humble flowers can be found underwater – Baltic water-plantain (Alisma wahlenbergii) flowers never really open. They can be found underwater and they always look like tightly closed little fists.

Many of the aquatic vascular plants don't always do that much with their flowers. They might spread from broken pieces of the plant or from their roots. Some flowers serve a purpose, though. Some are pollinated by flying insects above water and some might get pollinated by water, like wind for the terrestrial plants.

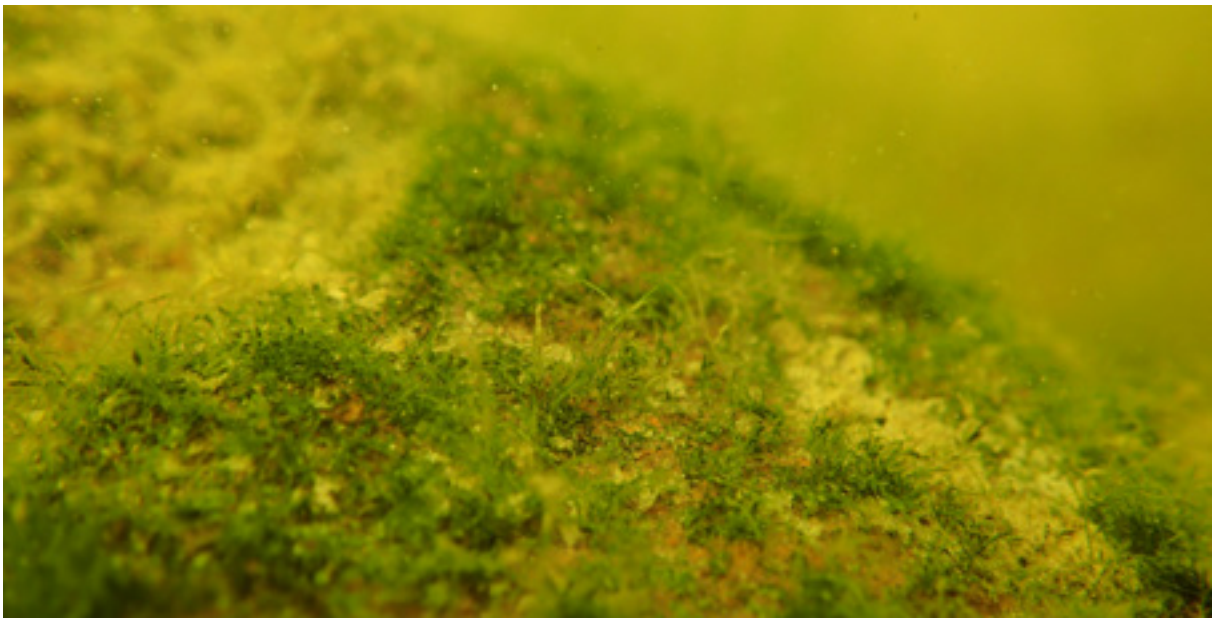
Arrowhead Sagittaria sagittifolia has a showy white and purple flower. (Photo by Suvi Saarnio, Metsähallitus)

Claspingleaf pondweed Potamogeton perfoliatus has a very modest brown flower above the surface. (Photo by Suvi Saarnio, Metsähallitus)

Next time when you go to the sea shore, look around and try to spot some aquatic plant flowers.

Algae and diatoms

Essi Keskinen, Metsähallitus, 3 January 2020



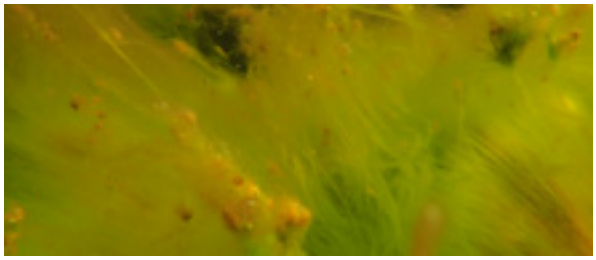
Aegagrophila linnaei. (Photo by Niina Syrjälä, Metsähallitus)

We all know that increased amounts of filamentous and blue green algae mean eutrophication. This much is clear. All kinds of algae grow much faster than vascular plants and because of that, algae can make use of the excess amounts of nutrients available during the growth season. Algae are tough competitors because they are such fast growers and during competition, they can grow on top of other species (epiphytes) or in open water (blue green bacteria). They easily outcompete many other species in a growth competition.

This, however, is only one part of the truth. All algae that can be found in the Bothnian Bay right now seem to be native species to the area. This means that they belong here (for example the exciting species Aegagrophila linnaei), and they are meant to be here and when they exist, the nature is in its current balance.

The issue is not the existence but the amount of algae that grows in the Bothnian Bay. If the area is getting excess nutrients and nice warm temperatures and eutrophication kicks in, some species of algae start growing more than others and at the expense of others. Poor competitors can't utilize nutrients or growth space as efficiently as algae and so their biomass grows. In the end, thick layers of green filamentous algal mass can cover everything else and suppress the growth of other species (for example Vaucheria sp).

There is one group of algae which we usually don't think when we are talking about algae – diatoms, or Bacillariophyceae, tiny microalgae that can mostly be seen by microscope. No, wait, now I'm lying – they CAN be seen by naked eye, but only as brown bits or sludge on top of everything and covering everything under the surface of the Bothnian Bay sea. They can be identified with a good microscope only, and their taxonomy is a special field of algal biology.



Ulothrix zonata (Photo by Eveliina Lampinen, Metsähallitus)

Diatoms can be found almost everywhere – from oceans to brackish water seas to fresh water bodies to sea ice to even damp soil. Some of them might even thrive in atmospheric moisture only. Diatoms are part of the world's oceans' phytoplankton (approximately 45 % of the oceanic primary production comes from diatoms) so they contribute much even though they are so small.

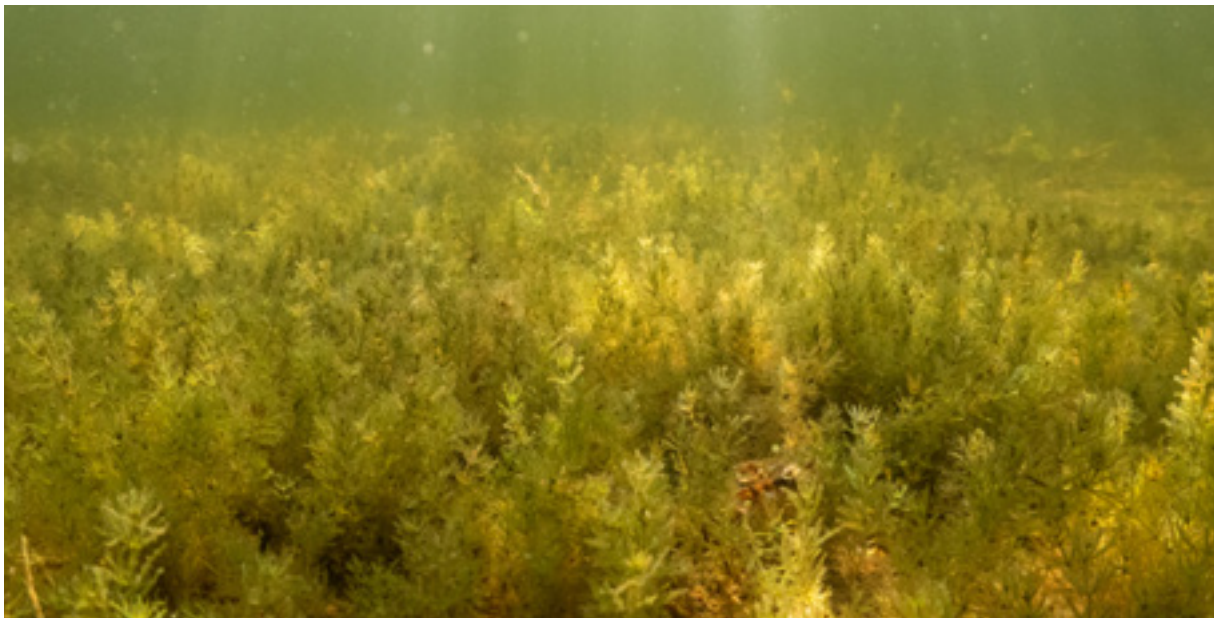
In the Bothnian Bay, a scuba diver notices early that everything underwater is covered by brown sludge, or a slick layer of brown stuff. This is all diatoms. They can be either pelagic (freely floating in the water column) or attached or resting on surfaces like rocks, other vegetation or any other structure under water.

Bothnian Bay has a smaller number of other algal species compared to other sea areas around the Finnish and Swedish coasts, but that only highlights the importance of the vast amount of diatoms in the Bothnian Bay. So far, no indicator species have been identified among the species of diatoms in the Bothnian Bay, but that is probably only due to lack of resources – time, money and research.

When we are looking for indicator species for the Bothnian Bay in the future, one possibility would be to look at the vast number of diatom species.

Stoneworts of the northern Bothnian Bay

Linnea Bergdahl, Länsstyrelsen, 17 March 2020



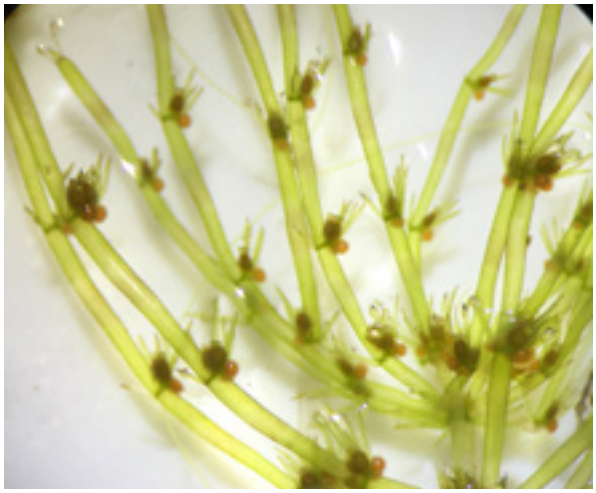
A field of Chara aspera (Rough stonewort) growing at a depth of half a meter. (Photo by Petra Pohjola, County Administrative Board of Norrbotten)

Stoneworts, or Charales in scientific terms, is an order of green algae that is commonly found in the northern Bothnian Bay. They may look like ordinary vascular plants with stems and branches but are in fact algae. They can be found in freshwater, such as lakes, ponds, and rivers, as well as in brackish waters worldwide. Their looks are certainly a bit special and could be likened to a very small and thin "Christmas tree". They consist of a stem divided into segments of internodes with branches organized in a ring between the internodes, some species have a layer of bark on the stem and branches. Spines, short to long and/or in the papilla form, may also be occurring along the stem, under the branches between the internodes (stipules), and along the branches (bracteoles). Another often visible feature of the Charales are their sex organs located on the branches. The female oogonium are usually oval and slightly larger than the male, circular antheridium. The species of Charales may either be monoecious, meaning they have both male and female sex organs on the same plant, or dioecious when sex organs are on separate plants.

In the northern Bothnian Bay, ten species of Charales have been found so far. They belong to three genera, namely Chara, Nitella and Tolypella.

The species of the Chara genus most often have bark (the exception is Chara braunii (Braun's stonewort) and more or less of spines, depending upon species. Chara aspera (Rough stonewort) is the most commonly occurring species. It may be found in a wide range of different habitats and often form extensive "lawns" on the bottom of the bay.

The genus of Nitella is distinguished by species having no bark, they all have a transparent appearance. Nitella flexilis (Smooth stonewort) and Nitella opaca (Dark stonewort) are probably the most commonly occurring



Close-up picture of the Chara braunii. The smaller orange antheridia are located just below the dark brown oogonia along the branches of the plant. Around them the short spines, bracteoles, can be seen and on the main stem the larger spines, the stipules. (Photo by Petra Pohjola, County Administrative Board of Norrbotten)

Nitella species within the northern Bothnian Bay. The two species can be very difficult to differentiate and are usually reported as a pair.

Another Nitella species occurring in the northern Bothnian Bay is the Nitella wahlenbergiana. It has a very delicate and beautiful appearance, and often appear in places with freshwater conditions, such as estuaries.

The last genus is the Tolypella. One species of this genus may be found in the northern Bothnian Bay is the Tolypella nidifica (Bird's nest stonewort). It certainly lives up to its common name. If you look at it, you can easily see the messy "heads" of the plant resembling bird's nests. The species is often found in more exposed areas, where wind and waves may be slightly stronger.

Round goby

Essi Keskinen, Metsähallitus, 7 April 2020

Round goby can be almost any color – from light sandy color to striped to almost black. (Picture by Pekka Tuuri)

June 6th, 2019 was the date when a fisherman north of Oulu, Finland, brought a strange fish to the Metsähallitus SEAmBOTH team. The fish was identified as a round goby, Neogobius melanostomus. It was the northernmost finding of this invasive species in Finland, probably in the world. The species has started to spread from the Caspian and the Black Sea regions in the 1990s and has now reached the Baltic Sea, many of the rivers in central Europe, and the Great Lakes in North America.

In Finland, the species has spread fast around the Archipelago Sea and the Gulf of Finland. The previous northernmost finding was in Raahe, about an hour south of Oulu. Metsähallitus marine team did an official round goby count there, the way it's done by the alien species specialists around the Baltic Sea and found 12 round gobies on a half hour observation period. On a one-hour dive about 20 individuals were found, between a few cm long juveniles to almost 20 cm long adults.

In Sweden, the species has not spread north from the very southern Sweden. Yet. So, the round goby has yet to be found in the Swedish SEAmBOTH area. It might just be a matter of time, so quickly has this aggressive invasive species spread around the world.

What makes this species so fast to spread then? It's a very strong competitor, it tolerates a wide variety of temperatures and salinities, it doesn't really care whether the water is a little low on oxygen or if there are pollutants like oil in the water or not, it eats almost anything and loves other fish species eggs. At least in Finland it competes for food with the flat fish. During their breeding season round gobies can be very aggressive towards all other fish.

The parasites don't bother them as much in their new adopted surroundings because they didn't bring their native parasites with them, and the local parasites and diseases haven't really caught up with them yet.

Native inhabitant black goby (left) looks eye to eye to alien species round goby (right). (Picture by Pekka Tuuri)

All in all, it's a success story. Except for the local fish, which are sometimes outcompeted by the bold and capable round goby.

The round goby is here to stay, that's for sure, now we just have to learn to live with it. One option would be to start eating it like the local people do in its native countries around the Caspian and the Black Sea. It's a delicious fish when canned or smoked and it's fished in its new homeland of Poland and exported canned.

If you see a goby-like robust fish with a black spot and a white round ring around it on its dorsal fin, you've found a round goby and you should inform the national alien species specialists, who want to monitor the spread of this species.

Duck mussel Anodonta anatina

Anna Antinoja, Metsähallitus, 28 April 2020

Duck mussel have a breathing and a discard holes for air and food. (Photo by Pauliina Ahti, Metsähallitus)

Several species of mussel live in the Baltic Sea. They all have a flat body covered by two calcium carbonate shells, which are attached together by a hinge. Mussel's gills have evolved into ctenidia, specialized organs which they use for feeding and breathing. They also have a leg, which they use for moving.

The duck mussel is yellowish-brown, and the largest of the bivalve mollusks found in the Bothnian Bay. It can grow up to 10 cm wide. It is a freshwater species, and the most common freshwater mussel in the sea. It tolerates some salinity, and it can be found in the river estuaries along the coast. It is also found in the archipelago in the northern Bothnian Bay. Duck mussel occur widely in northern and central Europe and its IUCN status is least concerned.

Duck mussels live on soft-bottomed sea shores where they get their leg pushed inside the bottom substrate. They move up to several meters per day with their leg and form grooves as they travel across the bottom.

When young, the duck mussel is hermaphrodite, meaning it has both sexes. In small water bodies, duck mussels remain hermaphrodite, which ensures reproduction as they can fertilize themselves if necessary. In larger water bodies, duck mussels evolve into either males or females as they grow older. At the time of reproduction, the male pours his milt into water, where the female sucks it through her ctenidia.

The duck mussel's mouth is in the inside cavity, it eats plankton and organic matter that floats inside with the water. The food particles attach to the surface of the gills and small lashes, that are covering the gills, move them towards the mouth. By eating the floating matter, the mussels are cleaning the water. The mussels' work is really important, and it is calculated that blue mussels

Blue mussels attach themselves to rocks and form dense blue mussel beds. There are no blue mussels in the Bothnian Bay. (Photo by Essi Keskinen, Metsähallitus)

(Mytilus trossulus) can go through entire mass of water in Baltic Sea once a year. However, in the Bothnian Bay, there aren't any blue mussels, because the salinity of the water is too low. Duck mussels are doing the same job here, their efforts just haven't been calculated.

The name "duck mussel" comes from a habit of people to feed this mussel to ducks. There used to be such large and widespread populations of this mussel that it was commonly used. Finnish name "pikkujärvisimpukka" = "small lake mussel" indicates that the mussel likes fresh waters and that there are also bigger mussels in lakes. Swedish name "vanlig dammussla" = "common dame mussel" tells that it's a common mussel in Sweden.

Endangered species

Essi Keskinen, Metsähallitus, 28 April 2020

Most of the existing populations of the threatened species of macrophytes in the Baltic Sea can be found in the SEAmBOTH area. There are a lot of populations from before 1995 in the southern Finland, Sweden, and south of the Baltic Sea which have now vanished. Whether this is due to lack of recent knowledge or that the populations have really disappeared, is not clear in every case, but most of the time it's the sad fact that these populations are no longer there. This is most probably due to heavier human pressures and more altered or overgrown habitats in the south.

The SEAmBOTH area seems to be a haven for threatened and endangered macrophytes. Of the Species and Habitats directive Annex IV, we have Alisma wahlenbergii growing as wide underwater meadows both in Finland and Sweden and Hippuris tetraphylla forming meadows at the water's edge in Finland. The beetle Macroplea pubipennis is not a macrophyte but it is also an Annex IV species and can be found in both countries in the SEAmBOTH area, it was also found in Sweden for the first time during the project!

Why Sweden doesn't have Hippuris tetraphylla in the SEAmBOTH area beats us. The models tell us that the species could or should easily be found in the project area, but it just doesn't exist there, only in one confirmed place south of Umeå. In the Finnish SEAmBOTH area, it's sometimes found as thousands or tens of thousands of individuals forming large meadows in the mudflats of Hailuoto and Krunnit islands.

Another mystery species is the Charophyte Chara braunii. In Sweden it forms underwater meadows but in Finland, despite really searching for it, we can only find individuals here and there. On the other hand, the SEAmBOTH inventories more than doubled the known number of Chara braunii findings in the national species database in Finland.

Some of the species are a bit baffling - for example, in Finland Crassula aquatica is considered as vulnerable (VU) and in Sweden "only" near threatened or NT. A shore macrophyte Primula nutans seems to be endangered (EN) in Finland and not the least bit endangered or "least concerned" (LC) in Sweden.

In the biological field inventories during the SEAmBOTH project we especially concentrated on very shallow coastal waters and river estuaries. This is one of the reasons why we did many hundreds of sightings of various threatened macrophytes, more than half of the findings being new to each country. Somehow for a marine biologist like me, who is working in her dream job in practical marine nature conservation, it is always uplifting to find a new population of endangered species.

Even though it inevitably leads to a long bureaucratic trail of papers to be filled (read a blog about that in Finnish here). And every now and then you can see the fruits of your labour when a new status for each

HELCOM map of endangered macrophyte species in the Baltic Sea. Orange dots tell us where these species have occurred before 1995, green dots represent the ones present after 1995 and blue dots before and after 1995. You want to concentrate on green and blue dots to get a picture of where the endangered species can be found right now.

Hippuris tetraphylla was found in Kempeleenlahti, Finland, and Suvi is writing down information of the metapopulation. Later the handwritten data is moved to a species database. Photo Jalmari Laurila, Metsähallitus. ALT: A woman is holding a plant and a cutting board with the data sheet taped to it.

macrophyte is decided every ten years and some of the species might go "down the list" from a more threatened status to a less threatened status (read a blog about that in Finnish here and here). Then it's time for celebration and you know that you've done something right - even if you wouldn't have been able to make the Baltic Sea a better place for the species, at least you've done enough research to prove that the species is doing better than expected and can be lowered to a less threatened category.

Mudflats and estuaries

Suvi Saarnio, Metsähallitus, 22 March 2018

Different natural habitats are defined in the Natura 2000 to create a network of special areas that are under conservation to maintain and restore the natural habitats and species. Natura 2000 is a network of both terrestrial and marine nature protection areas in the European Union. Many of the natural habitats defined in Natura 2000 can be found in the SEAmBOTH-project area. One of these unique marine habitats in Natura 2000 is called tidal mudflats (more correctly "Mudflats and sandflats not covered by seawater at low tide"). These tidal mudflats don't exist in the Bothnian Bay area per se (because of the absence of tides), but we have other ecologically similar areas.

One of the aims in SEAmBOTH-project is to harmonize the definitions of nature types between Finland and Sweden. This is not an easy task, because there is a lot of variation between different areas, and many times the definitions are either very broad, or very narrow. So, we aim to find similarities between the habitats and species in Finland and Sweden to make the harmonization possible.

All the people living on the shores of Bothnian Bay know the fact that water level can change dramatically in a short period of time. Many beaches on the mainland and on the islands have very shallow areas, which are sometimes under the water surface and sometimes above it. Usually these changes in water level are due to strong winds from either south or north. Even though the change is not due to tides, the ecological effect is quite similar. The plants growing on the shallow beaches must adapt to the reality, that sometimes they find themselves on a dry land. The difference is, that tides are predictable, but the changes in water level due to winds are unpredictable.

The strong winds can have a dramatic change in the landscape of the Bothnian Bay. The beach can grow tens of meters longer when wind is from north, or the seawater can reach the steps of your summer cabin or sauna when wind is blowing from south. So, in reality, these shallow beach areas can form one kind of a mudflat -habitat, if the bottom sediments of the beach consist of fine materials.

Delta formed in an estuary is a good example of mudflats in Northern Bothnian Bay. An estuary is the area where the river meets the sea, where the fine sediments carried by the river are deposited creating vast, shallow banks of sand and clay. The current is usually strong right by the river outflow but it slows down as it enters the sea and here a delta can be formed. Characteristic for the estuaries is the large input of fresh water, which makes it a very special environment. Plants that otherwise only live in fresh water may also be found in here.

Water lilies (e.g. Nuphar lutea and Nymphaea alba) and broad-leaved pondweed (Potamogeton natans) are examples of characteristic plants of the estuaries. Due to the shallow water, sheltered location and presence of nutrient rich sediments carried out by the river, estuaries are important for many species of fish and birds. Wading birds walk around in the shallow water foraging for food, e.g. small insects and molluscs, living in and on the bottom. In the delta area where sediments are deposited, mudflats can form. These mudflats can be from time to time above or below surface, and as the sediments keep depositing and land keeps uplifting, these areas can start forming small islands.

One Natura 2000 habitat is coastal lagoon, and in Baltic Sea flads belong to this habitat. Flads are greatly affected by the changes in water level. A blog about flads in particular will be coming later! (Photo by Essi Keskinen, Metsähallitus)

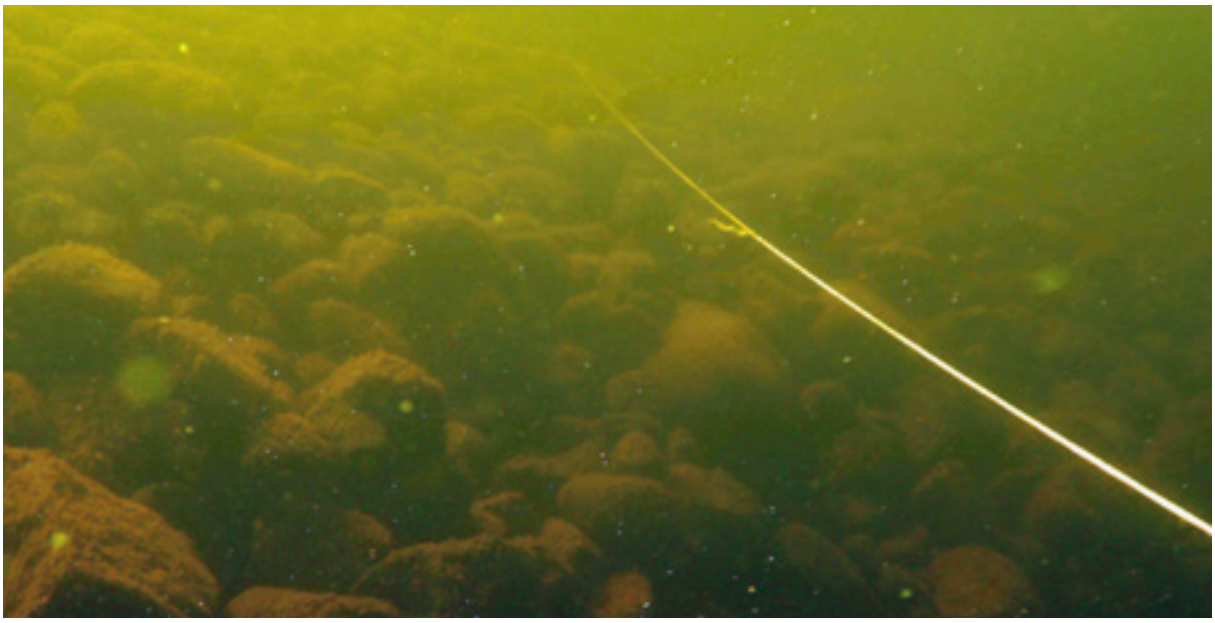
Water level minus one meter in Ulkokrunni (Photo by Essi Keskinen, Metsähallitus).

Torne river is a 522 km long river that runs along the border between Finland and Sweden. By the towns of Haparanda and Torneå it enters the Bothnian Bay. Here an estuary is formed with a delta of several small islands with narrow passages in between.

In the sheltered areas of the Torne river estuary one can for example find the flowering plant arrowhead (Sagittaria sp.), grassy pondweed (Potamogeton gramineus) and water horsetail (Equisetum fluviatile).

Reefs

Essi Keskinen, Metsähallitus, 8 June 2018



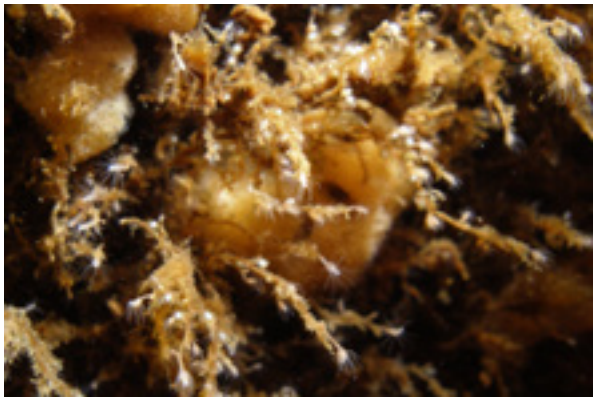
Reef rising up from the flat sandy bottom. (Photo by Linda Jokinen, Metsähallitus)

When you think of reefs, you most probably think of tropical coral reefs with lots of colourful fish and clear blue water. Maybe some turtles and sharks as well.

Reefs in the Northern Bothnian Bay are nothing like this. The reefs we have are basically just piles of rock. The bedrock is under much too thick a layer of moraine (till) to be exposed from underneath the many meters of sand and rocks. If you ask someone to define the Natura 2000 nature type "reef – 1170", the person or a handbook would say that the reef is composed of either rock, boulders, stones or of biogenic concretions (corals or tube worms or something like that). It should rise from the bottom (a simple flat rocky bottom won't do) and it should be permanently under water as well. The vegetation can be in layers, with the green filamentous algae at the surface, with a layer of Fucus species and then a layer of red algae, or it can be almost completely covered in blue mussels and all other invertebrates, which are often associated with the blue mussel beds.

If you now look at the reefs we have up here in the SEAmBOTH project area, you'll notice first that we completely lack both the blue mussels and the Fucus. We are almost devoid of red algae as well, and that leaves our reefs with some filamentous algae, water mosses, polyp animals and a sponge animal, Ephydatia fluviatilis. Mostly the reefs in the Northern Bothnian Bay have just a few bushes of water mosses and a few small invertebrates here and there with a layer of 1 cm long filamentous algae on the rocks.

Our reefs may not rival those of the tropics and the coral reefs in color, but they still form an important habitat for many species. Since the definition of a reef is that it rises from the seabed, it usually means that everywhere around the reef, there is mostly just flat sand or mud, which is not at the top on the list of underwater marine species hotspots. But the reef then – it offers a growing platform for water mosses and algae, which need a hard bottom to attach themselves, and so do the polyps and the sponge animal as well. The vegetation then attracts other invertebrates, for example snails, that graze on the algae, or fish, which lay their eggs on the water mosses, or invertebrates and fish which come to feed on the grazers or eggs and so on.



Close up of a reef with polyp animals and sponge animals, Ephydatia fluviatili. (Photo by Essi Keskinen, Metsähallitus)

The reef forms an oasis in the desert of muddy sea bottom.

Sea ice

Linnea Bergdahl, Länsstyrelsen, 4 January 2019

Sunny day on the ice in late march. (Photo by Linnea Bergdahl, County Administrative Board of Norrbotten)

Around November the northern Bothnian Bay starts to transform. From a warm, blue sea with a temperature of up to 20 degrees, to a solid, cold, white plain of ice.

The ice starts to form when the temperature of the water reaches below zero degrees. The more salt in the water, the lower the temperature needs to be. On lakes a clear, hard ice can be formed whereas ice in the salty oceans is more porous and soft. As the water of the Bothnian Bay is almost freshwater its sea ice is similar to the ice on a lake.

As the temperature continues to stay below zero, ice forms further and further off from the coasts. For the shipping traffic out at sea it is crucial to know where the sea ice currently is. The Swedish Meteorological and Hydrological Institute (SMHI) monitors the sea ice and publish daily maps of its extent. On today's sea ice map you can see that the ice extends out to the archipelago islands on either side of the northern Bothnian Bay, but most of the bay still remains open. The maximum extent of the ice varies every year due to current weather situation. Last year the whole Bothnina Bay was frozen and in march the sea ice could be found all the way past the Quark area.

The se ice may seem lifeless and dark but truth is, it's a basis for much of the life here. The scraping of the ice on the shores provides growth opportunities for plant species which wouldn't be able to live there otherwise. For the ringed seal the ice provide both a home and safe place for new born pups. In february the female seal builds a "cave" on top of the ice in which she gives birth to one pup. The pup then grows up on the ice. Between april and may the adults change their fur and they are also then dependent upon the ice to rest on to stay warm.

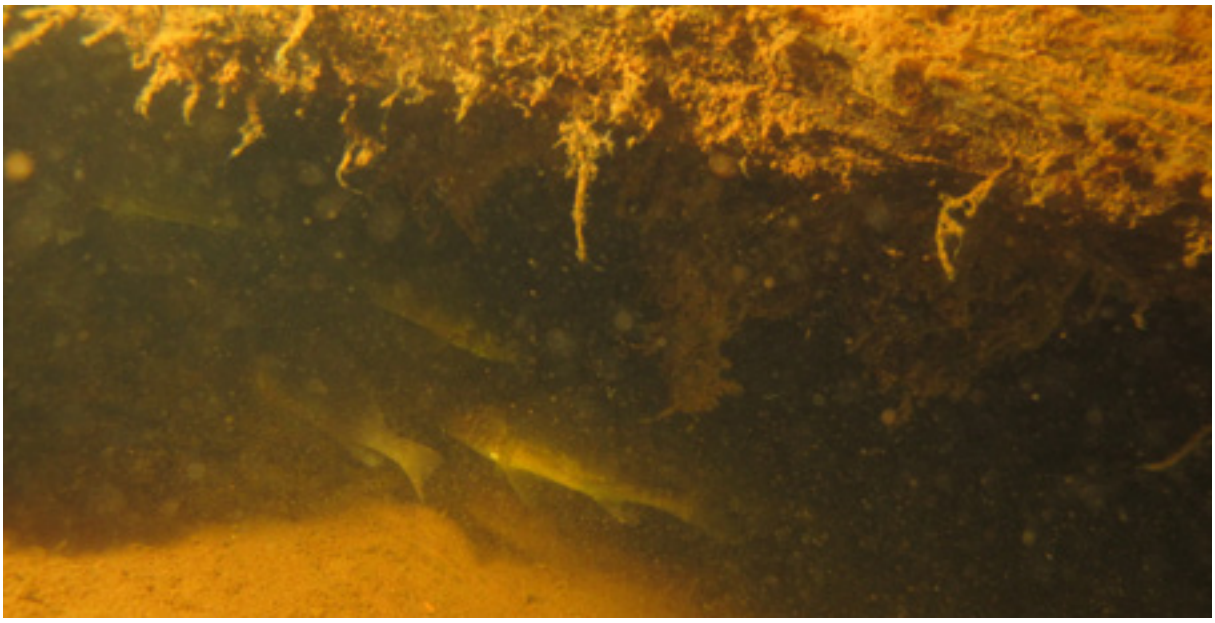
The new ice has a shiny, dark black colour. It first appears in sheltered, shallow bays and inlets along the coasts. The ice on the picture froze on an inlet in the town of Luleå, Sweden.
(Photo by Linnea Bergdahl, County Administrative Board of Norrbotten)

Climate change pose a real threat to sea ice, being such a highly temperature-dependent habitat. In a recently publish assessment of threatened habitats in Finland the sea ice in the Baltic Sea was listed as one of the threatened habitats. The diminishing extent, duration and quality of the sea ice will in turn make it harder for the ringed seal, and change life conditions of the Bothnian Bay.

Send a thankful thought to the sea ice this winter, and remember to appreciate and enjoy it for what it brings!

Artificial reefs

Ashley Gipson, Metsähallitus, 1 March 2019



Part of a ship wreck in the National Park of the Bothnian Bay. (Photo by Janos Honkonen, Metsähallitus)

An artificial reef by definition is a man-made underwater structure usually built for a purpose of promoting marine life. It is widely accepted in the scientific community that artificial reefs are very beneficial. They can increase local populations such as algal growth, coral reefs and fish. They also can prevent coastal erosion and force waves to deposit energy away from the coastline. In addition, they can promote natural reef restoration by attracting attention away from suffering populations, allowing time for the natural populations to revive and thrive.

Artificial reefs are often built using objects meant for other purposes such as old ships or construction debris, while other artificial reefs are designed and manufactured specifically for creating new reefs. These artificial reefs are usually made of PVC, concrete or any other material that creates a hard surface for marine life such as algae and invertebrates to grow. Some new techniques are using 3D printing for artificial reef fabrication to restore the declining coral reefs communities. Additionally, many popular diving sites in the world are methodically placed around shipwrecks that were purposefully sunk as artificial reefs. This promotes tourism and can also boost the economy.

Now this does not mean we can just go around throwing any unused object into the sea. See 'Trash Talk' blog! Most artificial reefs are created purposefully, but without careful planning and monitoring of artificial reefs, natural habitats can be damaged or dramatically changed, creating an unbalanced natural environment that can attract unwanted species and be a catalyst for invasive species as well. Furthermore, it is important to be aware of what materials are being released when creating artificial reefs. For example, if not prepared properly, various chemicals, toxins and even plastics can be released into the seas, further damaging the marine ecosystem.

So, what about in the Bothnian Bay? Species in the Bothnian Bay are well adapted to this unique environment with its low salinity and brackish waters, so how these artificial reefs impact the biological diversity of the Bothnian Bay is unknown. At least in other parts of the Baltic Sea, artificial reef balls have previously been deployed and resulted in an immediate and noticeable growth in species occurring in or around the balls.

In the SEAmBOTH area, where a lot of the bottom substrate is either sand or other soft material, artificial reefs like wind mill bases (concrete blocks) or ship wrecks can create a new surface for organisms to grow on. For example, filamentous algae, water mosses, hydra and the sponge animal Ephydatia fluviatilis can't grow on soft substrates. Adding hard substrates to areas of mostly soft substrates will increase the heterogeneity of the area and create more habitats for various kinds of organisms. Water mosses and algae in the area attract invertebrates for feeding and the artificial reef itself creates hiding places and shelter which all attract fish to the area to feed, hide, rest or spawn. This way both accidental and planned artificial reefs, no matter if they were meant to be artificial reefs or serve some other purpose, may increase the biodiversity of the area.

Though there are few intentional reefs in the Bothnian Bay, many accidental reefs have been created and many plans for off shore wind mill areas are in the works. The SEAmBOTH team and other Metsähallitus teams have experienced just how everyday materials can create an unintentional home for marine species. We just have to wait and see how these reefs will grow and impact the biological status of this area.

Sandbanks

Essi Keskinen, Metsähallitus, 26 April 2019

Sandbank above water in Perämeri. (Photo by Essi Keskinen, Metsähallitus)

If you ever stand on a shallow sand deposit and try to determine, whether it's a sandbank or not, you're not the only one wondering about it. The EU habitats directive tells us that the Natura 2000 habitat 1110 sandbank is predominantly shallower than 20 m and is always covered by water, and it may or may not have unique or not so unique vegetation. They should also be mostly surrounded by deeper water.

If you look at these conditions, they are very vague and easy to interpret any way one likes. In the northern Bothnian Bay, sandbanks have historically been interpreted from aerial photos and they are mostly extensions of sandy beaches. A sandy beach is a Natura 2000 habitat as well, and the beach ends at the water. According to the description, a sandbank will start only after the lowest low water but not from the beach directly.

In southern Finland and Sweden, sandbanks often have a lush vegetation. For example, Zostera marina, the eel grass, can indicate a sandbank, even though eel grass meadows mostly grow on flat sandy bottoms and not on elevated banks. In the northern Finland and especially in the SEAmBOTH area, sandbanks often have no vegetation at all. They are either too deep for any green flora or they are too exposed and thus too movable for any rooted vegetation to stay put. The sand is constantly moving with the wave action in the shallow areas and that makes it difficult for plants to take root.

Sandbanks have been modelled because we still don't know enough of them to put them on the map from the field observations only. The problem with this is, again, determining what is a sandbank and what is not. I was once looking at a map of modelled sandbanks in the northern Bothnian Bay and was wondering where some of the largest sandbanks on the Finnish side had disappeared. It turned out, that for the modelling purposes, a diameter of 5 km or less was used, and for example Pitkämatala and Suurhiekka are larger than that. They didn't get modelled as sandbanks just because of their enormous size.

Also, consider the description "slightly elevated". What does that even mean? Especially if Zostera meadows count as sandbanks, regardless of elevation from the surrounding area. Merikalla is a large sandbank and a Natura 2000 area at the border of the EEZ of Finland. It rises ever so slightly from the surrounding sandy bottom and sometimes you find it modelled as a sandbank and sometimes not. The area is designated as a Natura 2000 area for protecting the sandbank, though.

If you find a shallower sandbank in the SEAmBOTH area, you might find typical vegetation to be tiny little Charales algae or mini-Potamogeton perfoliatus. If the plants grow very large, the chances are, that you're not looking at a sandbank at all but a shallow bay or a lagoon with a sandy bottom. The exposed sandbanks rarely have any larger vegetation on them because of the harsh conditions of rolling sand grains and wave action.

In the north, sandbanks are mostly geological features. Sure, there might be a lot of micro and nanobenthos, tiny little creatures and critters that can not really be identified with a regular microscope, but anything bigger than that is susceptible to the wave action.

As a diver, I still enjoy diving on a bit deeper sandbank, with or without the vegetation. The wave action creates beautiful waves to the sand and if you catch the sun's rays playing on the sand with them, it's pure magic.

Who lives at the bottom of the sea?

Linnea Bergdahl, Länsstyrelsen, 10 May 2019

The deep sea floors are in constant darkness which means no plants can grow there. But that doesn't mean it's a place empty of life.

During the autumn of 2018 SGU (the Geological Survey of Sweden) and partner in the SEAmBTOH project, conducted a survey cruise in the archipelago of Haparanda to map the depths and substrate of the sea floor (i.e sand, mud or rocks). During their time there they also took samples to investigate what animals that lives in and on the bottom. And now we have the answer!

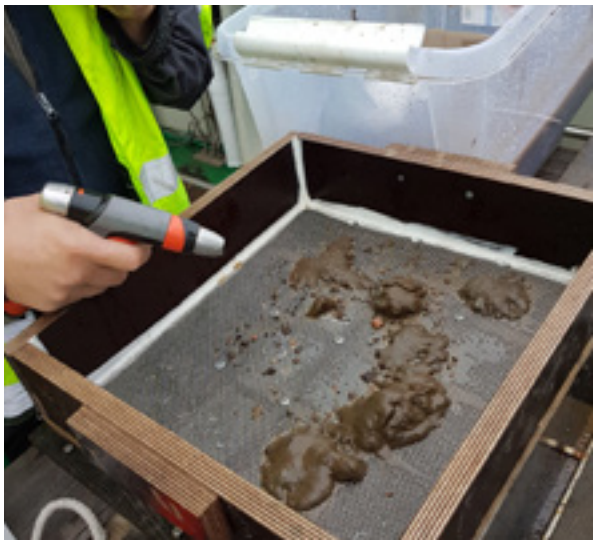
By a large "grabber" lowered down from the boat a piece of the bottom is scooped up. This large clump of "mud" then has to be carefully washed under a sieve which catches the small animals living in it. The animals are then transferred to jars for conservation. In the lab, and often under microscope, all the animals are identified and counted in number of speices. They are also weighed to get the so called biomass of the living organisms within each sample.

Saduria entomon
skorv, ishavsgråsugga or kilkki, as called in swedish and finnish

The Saduria was found mainly in samples taken at the deeper locations, down to sea bottoms at 50 meters depth. Other animals found was mainly species from the group of bristle worms Marenzelleria, Oligochate (worms similar to the earth worms) and the shrimp-like Monoporeia affinis.

All these animals live buried down in the bottom where they feed of detritus (decaying organic material falling down to the bottom). The shrimp-like Monoporeia affinis is sensitive to pollutions and can't live on anoxic (oxygen depleted) bottoms.

Overall there were few species and few individuals found within the sampled area in the archipelago of Haparanda. And those that are there do an important job as feeding on decaying material and themselves turning into food for e.g. fish. Thereby they ensure energy and nutrients of the ecosystems of the sea keeps flowing.



Washing away the mud from the sea floor to find the animals (bottom fauna) living in there. (Photo by Linnea Bergdahl, County Administrative Board of Norrbotten)

Under the surface: Videoblog

Suvi Saarnio, Metsähallitus, 24 May 2019

Here you can see some nice videos under the surface of the Bothnian Bay! The videos are from Summer 2018 and they have been recorded in both Sweden and Finland.

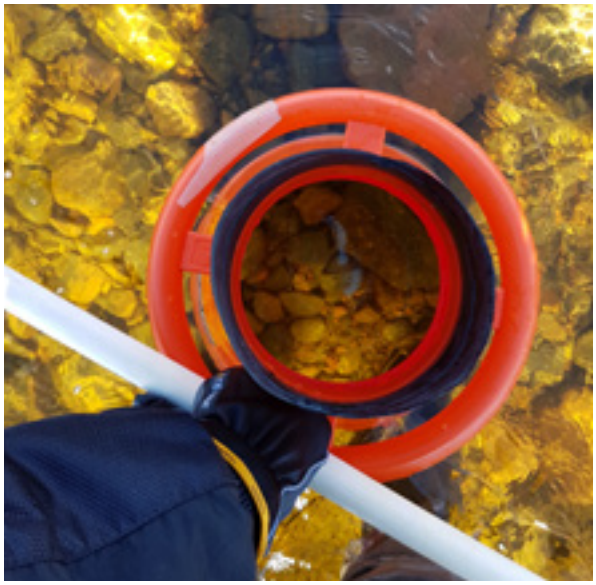
Exposed rocky shorelines – a grayling favourite

Linnea Bergdahl, Länsstyrelsen, 21 June 2019

During a couple of sunny days in spring we had the opportunity to go out and learn more about one of the most iconic fish species of the Bothnian Bay – the grayling – and it's favourite habitat on the exposed, rocky shores. Together with our fish expert collegues we searched for grayling eggs along the rocky shores in order to gather data on what type of habitat they prefer for spawning. How exciting for us, who mostly concern about underwater vegetation during our SEAmBOTH inventories, to see the value of these exposed, low-vegetation shorelines for spawning fish.

The grayling (Thymallus thymallus) is a fish species belonging to the group of salmon fishes. It normally lives in freshwater lakes and streams, but in the northern Gulf of Bothnia you may find it in the sea. Some of the sea-living graylings spend time in the sea and when it's time to spawn they swim upstreams into rivers. Others spend their whole lives in the sea, and as recently found out, spawning there as well.

The number of graylings have been declining overall. More so on the finnish side of the Baltic Sea where it is today classified as critically endangered. In the northern Sweden, the project "Skydd av harren i Bottenviken och Norra Kvarken" financed by the Swedish Agency for Marine and Water Management has since last year been investigating the occurence of sea-spawning grayling and mapping the habitats they use. By understanding better where these populations are, and what type of places they require for reproduction, we have a better chance to protect such places and ensure a bright future for the graylings within the northern Bothnian Bay and whole Baltic Sea.



By the use of water binoculars and a large strainer, grayling eggs were located and identified. (Photo by Linnea Bergdahl, County Administrative Board of Norrbotten)

Close up of grayling eggs settled between small rocks on the shallow bottom. (Photo by Petra Pohjola, County Administrative Board of Norrbotten)

Flads, lagoons

Essi Keskinen, Metsähallitus, 11 July 2019

Water temperature is often higher in the lagoons because water exchange between the sea and the lagoon is restricted, like here on the north side of Hailuoto island. (Photo Metsähallitus)

Have you ever heard of land uplift or land upheaval phenomenon? Or more correctly "post-glacial rebound"? It means that when the 2-3 km thick Ice age glacier was pressing the Scandinavia, it was so heavy that the ground was actually pushed downwards and it's still bouncing back, after 10 000 years since the ice melted. If you want to brush up your knowledge about the geological history of the northern Bothnian Bay, read the blog from last year.

Because of this phenomenon, new land is constantly rising from the sea. Flads, or small lagoons, are bays which are forming by land uplift. They are small lagoons which are almost completely cut off from the sea. There is a threshold between the sea and the flad and this threshold suppresses the exchange of water between the lagoon and the sea. This is why the temperature is usually higher in the flads in early spring.

In the Kvarken area and in the SEAmBOTH project area, the land uplift is especially fast, and since the shores are really shallow, new land is forming very quickly. When the land uplift succession continues, the flad will become a glo lake when it's completely cut off from the sea. Since the land uplift is so fast in this area of the Baltic Sea, the flads are a short-lived habitat which come and go in the history of the landscape.

Flads are nurseries and spawning grounds of many fish. The fish larvae, or baby fish, are in a safe place in the lagoons, where the temperature is nice and warm and which are quite sheltered from direct wave action. This is a reason why so many vascular plants and Charophytes can also be found in flads, and they are a heaven for many species of water fowl as well. Birds find nesting in or around the lagoons safe with plentiful buffet table under their beaks and many threatened species also thrive in the lagoons.

Small flads are a specially protected nature type in Finland, and they are also considered as an important Natura 2000 nature type around the shores of the Baltic Sea.

Many of the flads are not in their natural state any more because people find them attractive as well. Lagoons offer safe harbors for small recreational boats and nice swimming places for holidaymakers with their summer cottages next to the flads. The threshold is often a burden for a recreational boater, so it's dredged away and the water exchange with the sea is enhanced. This alters the ecology of the whole lagoon and the ecosystem services it provides. Often diches from the surrounding fields are lead to flads, and this will bring more freshwater, nutrients and solids into the lagoon.

Keeping some of the flads in their original state is important so that we will ensure that fish spawning grounds will exist in the future as well.

Lack of Sea ice 2019-2020

Essi Keskinen, Metsähallitus, 17 January 2020

Winter 2019-2020 has so far been very unpredictable and unusual. Most of the time in the whole of SEAmBOTH area the weather has been very mild and rainy. Hailuoto island in the middle of January is one of the northernmost snowless places on the planet – only some fjords in western Norway lack snow higher up north.

Usually this time of year the whole northern Bothnian Bay is frozen solid – only navigational ship ways are kept open with ice breakers. This year the ice barely covers the shores and we don't need icebreakers. The annual winter ice road to Hailuoto island (about 8 km long) seems like a distant dream right now when the temperatures soar around 0-3 C. The longest ice road in Finland, Hailuoto ice road is 10 km long and is usually open to regular cars between February and April. Even though the winters might be getting milder and the ice road disappearing because of that, it would soon be history even without the climate change – building of Hailuoto bridge will start 2020.

With the advancing climate change, extreme weather conditions, like winters 2019-2020, will become more frequent. Global warming doesn't mean that every winter would be snowless and iceless like this year, but it means that we'll get winters like this more often in the north as well.

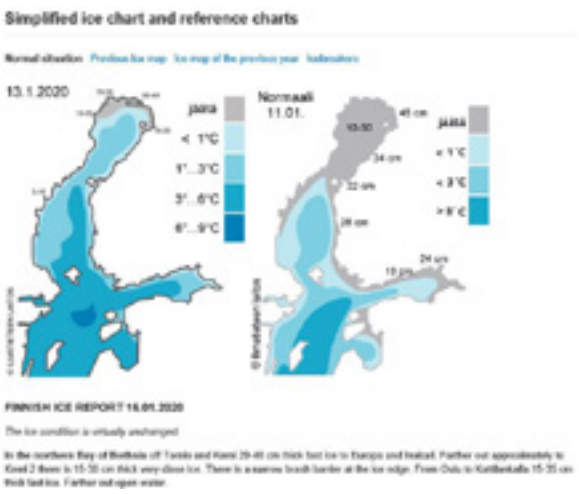
This year will be difficult for Bothnian Bay ringed seals, which normally give birth to their pups on ice. This spring they will most likely have to raise their pups on land, which is what the other Baltic Sea seal species, grey seal, usually does. The difference is that ringed seals are adapted to pup on ice, and their future doesn't look too bright right now.

During the past hundred years, the Bothnian Bay has apparently not frozen solid on only two other occasions – at some point in the 1930s and in 2014-2015. This year might get to the statistics as the third in a century, unless the temperatures start dropping soon. And the fact is that Baltic Sea ice is disappearing as the climate gets warmer and the sea warms up.

Amazing pancace ice at Hailuoto island January 10th 2020. Video Mika Kastell.

Other than denying ringed seals their breeding ice, lack of ice affects the nature in many other ecological ways as well. If we don't get a thick layer of ice, the spring ice erosion and scraping, which keeps some of the shallow shores without vegetation and so helps vascular plants which are poor competitors, will not happen. Also, thick ice that reaches the shallow bottoms in bays and near shores, yanks plants and sometimes seeds from the bottom and helps them migrate, frozen in the ice. There are myriad of algae and plankton living in the sea ice, or rather in the tiny tube-like salt water canals inside the ice, and quite a surprising amount of species under the ice as well. If the sea lacks the ice, then a complete nature type (sea ice) is lost for that year, and we have

Pack ice west of Hailuoto island in March 2008. Photo Pekka Lehtonen.



Ice chart from Jan 13th 2020 with the current ice cover on left and the statistical "normal" situation on the left. (Capture from web page of Finnish Meteorological Institute)

pelagic habitat instead. And we don't get to go ice fishing.

Jan 10th 2020 saw Hailuoto island mostly surrounded by water, even though usually this time of year the island should be icebound. Video Mika Kastell.

The next few weeks will show if we'll get any kind of sea ice this year, or if the sea ice habitat will be replaced by a pelagic habitat this year.

Pelagic Habitat

Essi Keskinen, Metsähallitus, 7 February 2020

The baltic herring (Clupea harengus membras) swimming in the pelagic habitat. (Photo by Pekka Tuuri)

When I think of "a habitat", the first thing that comes to mind from underwater is the benthic substrate – is it sand, is it rock, is it mud? Because that pretty much determines what can and cannot grow, borrow, or attach there.

With the pelagic habitat, it's different. There is no bottom. It's the water column between the surface and the bottom which makes the habitat. Of course, there are differences between pelagic habitat, different environmental factors that make every pelagic habitat unique (salinity, temperature, amount of light, amount of nutrients etc.) but it's still all liquid and far away from the bottom.

The pelagic area is the vast amount of sea water which is far enough from the macrophyte communities near the shore and above the benthic habitats at the bottom. It is somewhat interlinked with another habitat, the sea ice, where the sea ice occurs at the open sea and not near the shore.

In the last Finnish habitat type assessment 2018 the Bothnian Bay open sea was considered DD – data deficient. Sea ice in overall was considered VU, vulnerable, in Finland. It can be thought that during the winter, the uppermost part of the pelagic habitat turns into another habitat, the sea ice, but the part of the open sea that doesn't freeze will still stay as the pelagic habitat. This year it seems that unless the weather takes a sudden turn to very cold, we are not going to have the pelagic habitat turned into the sea ice habitat.

Who lives in the pelagic habitat then? It's many of the fish (Baltic herring, vendace, white fish, to mention just a few), the plankton (once-celled algal plankton as well as the zooplankton) and also the Baltic Sea ringed seal, especially when the pelagic habitat turns into sea ice

Calm sea close to Krunnit Nature Reserve.
(Photo by Suvi Saarnio, Metsähallitus)

and the seals give birth to their pups there. What we're lacking in the Bothnian Bay is for example the largest zooplankton in the Baltic Sea, the common or moon jellyfish Aurelia aurita. The salinity in the Bothnian Bay is not enough for the jellyfish, which is a conspicuous pelagic species that you can see with a naked eye and is not fast enough to swim away like most fishes.

The pelagic habitat of the Bothnian Bay differs from the rest of the Baltic Sea by being less salty and the primary production levels are not as high as elsewhere. Another special feature is that the sea freezes over most winters, this year being an exception.

Clay canyons

Essi Keskinen, Metsähallitus, 13 March 2020

Clay wall in the clay labyrinth. (Photo by Janni Ketola, Metsähallitus)

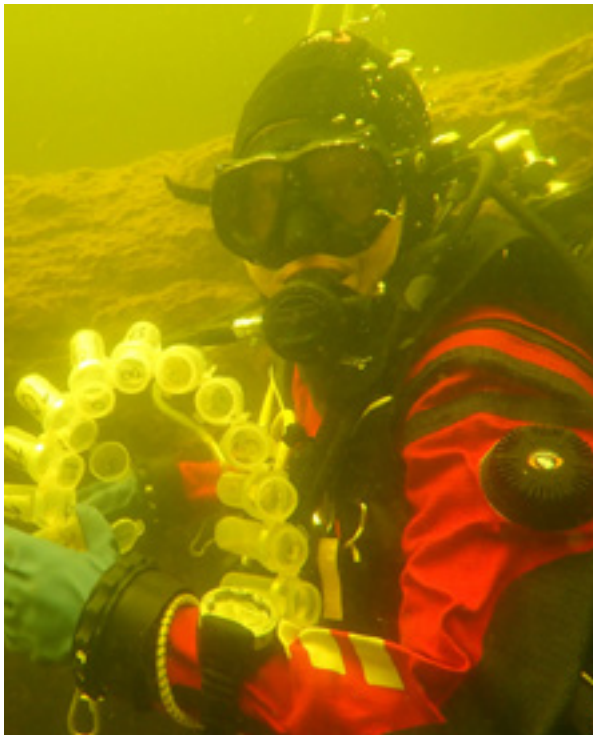
I have dived in six continents and have done about 1030 dives. One of the best ones ever was a dive I did in August 2014 when we first found the clay labyrinth from Simo with my colleagues from Metsähallitus.

It was a late afternoon or early evening on an extremely beautiful summer day, calm and warm, almost tropical. Me and Niina were in one boat and we'd just send a text message to the other boat that we would just do a couple of drop videos more and then drive back to Ulkokrunni island to stay for the night.

Niina was driving, I was watching the water from the bow when suddenly I saw these dark features under the calm surface. They looked like canyons of bedrock, but in the northern Bothnian Bay, the bedrock is almost always under meters thick layer of till (moraine). It had to be something else. We lowered a video camera and looked in amazement when canyons and labyrinths of clay unfolded on the screen, under us.

We put down a 100 m transect line and I prepared to go for a dive (at that time, we could still dive in two persons teams, later it was decided that at least 3 people are needed on a dive team). I went to the bottom and couldn't believe my eyes! I arrived in a middle of a labyrinth of clay canyons, gorges, craters and walls. There was a 1-1,5 m thick layer of hard clay on top of a beautiful wavy sandy bottom at about 4-4,5 m of water, and I spent the first half of the dive just exploring this weird and alien landscape. I had never seen anything like that before, and I just didn't want to get out and back to the surface.

It was amazing how the underwater nature was taking the hard clay. There were vascular plants like Potamogeton perfoliatus and green algae like Charales which attached to the clay with their roots and rhitzoids



Diver with clay on the background. (Photo by Janni Ketola, Metsähallitus)

like it was soft bottom. On the other hand, there were creatures like the sponge animal Ephydatia fluviatilis, which took the clay to be hard bottom and happily grew there.

For me, it was probably the highlight of my dives as a Metsähallitus marine biologist.

Large shallow bays

Essi Keskinen, Metsähallitus, 20 March 2020

Very shallow coast in Halosenlahti Bay, Haukipudas, Finland. (Photo by Ashley Gipson)

Large shallow inlets and bays are a Natura 2000 habitat that can be found all around the Baltic Sea. There are several large shallow bays in the SEAmBOTH area as well, for example, the Liminganlahti Bay in Finland and Råneå Bay in Sweden.

If you read the Natura 2000 habitat description for the large shallow bays, it says that the freshwater influence is usually limited. This means that if you have trouble trying to separate large bays and river estuaries from each other (because sometimes the river estuaries can be shaped like large shallow bays), one way to do this is to see if there are large rivers discharging their water to the area. Flads and lagoons, on the other hand, are smaller than large bays and they have a threshold, a shallower area, between the lagoon and the sea, which restricts the water exchange between the sea and the lagoon. Bays don't have a threshold like this.

Large shallow bays are one of the most important and valuable habitats both in the SEAmBOTH area and in the Baltic Sea marine nature, according to Zonation analysis and Elina Virtanen from SYKE.

What makes the large shallow bays so valuable then? There are a myriad of fish species that use these areas as their spawning grounds and many of the bays are important resting, feeding, and nesting grounds for migrant and domestic bird species; the macrophyte species diversity is often very high in large shallow bays. In the SEAmBOTH area many of the threatened aquatic plants can be found in the large shallow bays, for example Alisma wahlenbergii and Hippuris tetraphylla, as well as the directive species beetle Macroplea pubipennis.

And why are all these things concentrated in the large shallow bays? Some of the reasons are that even

Diver and ranunculus. (Photo by Eveliina Lampinen)

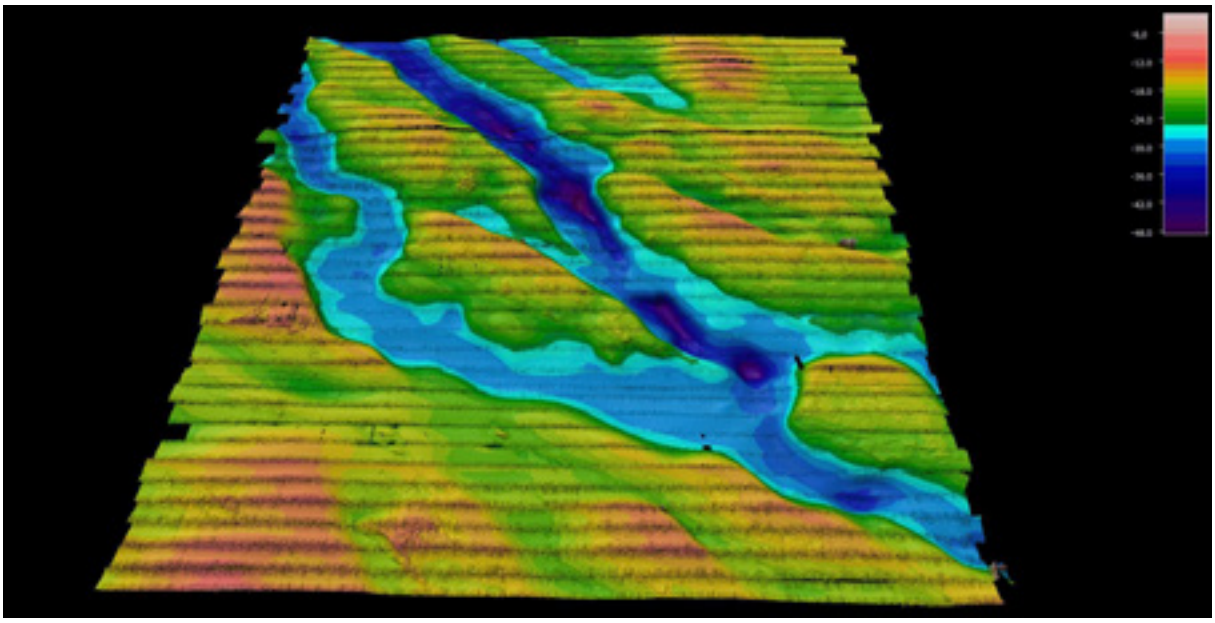
though the bays are directly connected with the sea and the water flow is not restricted like with the lagoons, the bays are still often somewhat sheltered from the strongest winds and wave action. Also, like the name suggests, shallow bays are SHALLOW and that invites a higher biodiversity compared to many deeper areas where the light just doesn't reach all the way to the bottom and enable photosynthetic plants to grow there. In addition to lush vegetation, many bays have a rich benthic fauna. Birds are also attracted to the shallow areas and the wetlands around the bays.

The unfortunate thing is that most of the bays are already altered by man and there are a lot of different human pressures that can limit the marine biodiversity, such as dredging, coastal building, harbours, and recreational boating. Not to mention the eutrophication development in the whole of the Baltic Sea. In addition to flads, lagoons, and river estuaries, large shallow bays are the most threatened and most valuable of all marine habitats.

Despite all the threats, large bays still host a beautiful underwater nature, as can be seen in this video from Swedish bays.

Canyons – fast food available

Aarno Kotilainen, GTK, 3 April 2020



The multibeam echosounder image illustrates seafloor topography of the canyon in the SEAmBOTH area of the Bothnian Bay.
Source: Geologian tutkimuskeskus (GTK).

By first thought, one might think that the Grand Canyon in the United States and the Bothnian Bay have nothing in common. But – surprise, surprise!- also at the bottom of the Bothnian Bay, there are canyons or canyon-like seabed features. The Grand Canyon, not to mention the deepest canyon on earth, which stretches to a depth of 3.5 km below the sea level, found in Antarctica, are, of course, huge compared to the canyons in the Bothnian Bay. But the Canyons of the Bothnian Bay aren't exactly tiny. They are often tens of meters deep, hundreds of meters wide and kilometers, up to tens of kilometers long depressions at the seabed.

Official definition for a canyon says that it is a relatively narrow, deep depression with steep sides, the bottom of which generally has a continuous slope, developed characteristically on some continental slopes. But as we know, canyons occur also in the continental shelf, like here in the Baltic Sea.

The development of canyons, both on land and on the seabed, is accompanied by flowing water. The flow of water can erode deep canyons even on the seabed over time. Canyons may develop (also) during tectonic processes in tectonic lineaments and fracture zones of the bedrock. These zones can be eroded more easily than the surrounding rock. Over time, deep channels can be eroded, as the bottom currents are directed to the depressions and erode them deeper and deeper. Ice ages may also play a role in the birth of these canyons.

Another type of canyon is the submarine extension of the terrestrial river valleys. Some of these submarine "rived beds" may have originally been born on dry land. They are the channels of ancient rivers from a time when the sea level was much lower than at present. The canyons of the Bothnian Bay are most likely developed in this way.

Canyons play a big role in the sea. They control the bottom currents and can transport oxygenated and nutrient-rich water from one sea area to another. For example, canyons that split the Archipelago Sea take care of the exchange of water between the Baltic Proper and the Gulf of Bothnia. Currents in canyons can also transport mineral and organic material from the coasts deeper into the sea.

The SEAmBOTH project studied several canyons in the Bothnian Bay, for example, a canyon north-west of Hailuoto Island. We've named it Hailuoto Subway Canyon. That is a relatively large, tens of kilometers in length, a kilometer wide in some places, and more than 20 meters in depth. The canyon extends from the coastal area to almost in the middle of the Botnian Bay deep.

The Hailuoto Subway Canyon was surveyed with acoustic-seismic sounding methods, and a large number of seabed sediment samples were also taken from the area. The results indicate that at least occasionally sediment transport occur at the bottom of the canyon. The currents transport mineral and organic matter both in suspension and along the bottom. Canyons can probably offer the sea dwellers a great place to eat, where plenty of fast food is available.

And yes, Hailuoto Subway Canyon, a submarine "fast food" place, fits somehow in our present situation as well, where fast food restaurants (like Subway) and other places offer takeaway food to citizens exhausted by the corona situation, around the Baltic Sea, and around the world. Fortunately, in those submarine fast-food places they don't have to keep that one meter distance from each other. At least not yet :)

The Archipelago of Krunnit

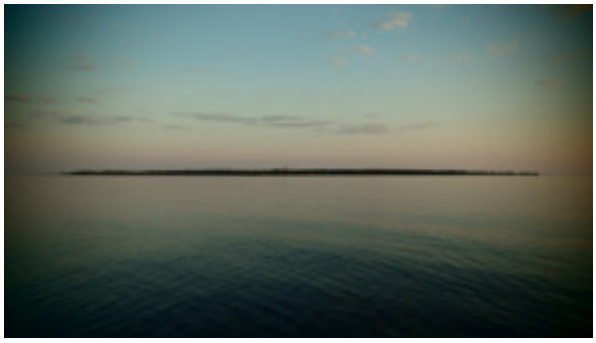
Suvi Saarnio, Metsähallitus, 9 March 2018

Moving to Krunnit in 2013, carrying all our equipment towards the research station. (Photo by Metsähallitus)

Krunnit. Just saying the word makes me smile. It takes me back to my childhood when my grandfather used to tell stories about Krunnit, because he was a fisherman in addition to his main work, and used to go there with a small and slow fishing boat from time to time, when the weather was good enough. The area was protected already since 1937, but it was officially protected from 1956. I remember thinking that Krunnit must be a magical place, when listening to the stories and looking at different rocks that my grandfather had brought from the area before it was protected.

The archipelago of Krunnit was formed after the last ice sheet melted and land started to uplift (more info about the geological history of the Bothnian Bay: seamboth.com/2018/02/28/looking-back-in-time/). The landscape has been and still is constantly changing, because new land area is revealed every year under water. The main reason for protecting the area was birds, but the area is also valuable due to plants (both above and under the surface). The area can only be reached by boat and there is no safe harbor for landing, waters are shallow and rocky. Pihlajakari is the only place where it is allowed to land in Ulkokrunni, and during 15.7. – 31.8. the island can be visited following restrictions.

In 2013, I was the luckiest girl, because I got to do an internship for Metsähallitus and one of the places where we would go during the field season was Krunnit! I could see the Pooki's (pooki is a day beacon build to help in navigating during day time) from faraway as we travelled towards the Ulkokrunni island. We were coming with our biggest boat, Maia, and we had to leave it quite far from the shore, because the beach around the Ulkokrunni -island is veeeeery shallow. And at the time of our arrival, the water level was almost minus one meter. So, we couldn't even use our smallest boat with engine to carry our stuff, but we had to load everything to our small



View towards Ulkokrunni-island from north.
(Photo by Elina Keskitalo, Metsähallitus)

rubber boat and paddle and tow it to the shore. I will never forget that day, it was such a beautiful and hot Summer day and we were sweating a lot while carrying all our equipment from Maia to the research station.

The beaches of Ulkokrunni are mostly extremely shallow and sandy, but there are big rocks and boulders here and they're making it difficult to go to the shore by boat. The shallow bays are covered with different plants, small fish and benthic animals. There are tens of waders walking in the mud and sand, searching for food. On the sky, you can see seagulls and the great cormorants (Phalacrocorax carbo), who have one of their northernmost breeding areas close to Krunnit. There are plenty of other birds also and once on the yard of the research station I was able to catch a photo of the common kestrel (Falco tinnunculus).

Here you can find old photos telling about the history of the Krunnit in Youtube: https://www.youtube.com/watch?v=AH0yE4gHyz0 Pictures from below the surface from the archipelago of Krunnit can be found in the end of this blog text.

Ånefjärden

Linnea Bergdahl, Länsstyrelsen, 13 April 2018

The harbour in Jämtön on the east side of Råneå fjärden, an entrypoint to visit the bay.
(Photo by Linnea Bergdahl, County Administrative Board of Norrbotten)

A couple of kilometers north of Luleå along the coast lies the small town of Råneå with approximately 2000 inhabitants. This is where you find the bay of Råneå – Råneå fjärden – one of the pilot study areas of SEAmBOTH.

On the west side of the bay the river of Råneå enters the sea and on the east side the river of Jämtön. The river of Råneå runs from inland for about 210 km through forest and agriculture landscapes until it reaches the bay. It is one of the few rivers in Sweden that is not regulated for hydroelectric purposes. The river is particular important as spawning grounds for fish such as salmon, brown trout, grayling and lavaret.

The bay itself is shallow with an average depth of 3 meters and several islands scattered around the area. Due to its calm waters and high abundance of vegetation the bay is an important place for fish, as nursing and feeding grounds for example.

Since 2005 the bay is protected as Natura 2000 area. Apart from plentiful of fish you can also find seals and several species of coastal birds feeding in the area. Råneå fjärden also harbours populations of the Baltic water-plantain (Alisma wahlebergii), endemic to the Baltic Sea.

In the deeper parts of the bay you may find sheathed pondweed (Stuckenia vaginata). It is a beautiful tall plant, several of them growing together may look alomost like a forest when viewed from underwater.

Råneå fjärden is well worth a visit at any time of the year. On a warm sunny day in the summer it's nice taking a kayaking trip around the islands. In wintertime bring your skis as the whole bay will be frozen and you can ski across it. Ice fishing is another popular activity to do.

The bay is perfect for a snorkel trip with its abundance of plants and fish to look at. But be prepared, it may be very shallow even far out from the shore! (Photo by Aimi Hamberg, County Administrative Board of Norrbotten)

Map of Råneå fjärden. The red line indicate the border of the Natura 2000 area. (Map Lantmäteriet, Sweden)

National Parks of the Bothnian Bay

Linnea Bergdahl & Suvi Saarnio, 25 May 2018

Nature trail in Sandskär. (Photo by Alejandra Parra, Metsähallitus)

Want to discover the beautiful northern Bothnian Bay this summer? Take a trip and visit the two national parks in the area – Haparanda Skärgård National Park and the Bothnian Bay National Park (Perämeren kansallispuisto). They have been awarded the status of national parks because they represent some of the finest nature areas within the countries, with unique landscapes, animals and plants we want to keep intact for future generations.

HAPARANDA SKÄRGÅRD NATIONAL PARK

Haparanda Skärgård NP was formed in 1995. It lies in the outer archipelago of the municipality of Haparanda. It consists of two larger islands – Sandskär and Seskar-Furö – and several smaller islands. Sandskär is famous for its long shallow, sandy beaches and rich birdlife. The islands of the archipelago are young, it's only about 1500 years ago since they started to emerge from the sea due to the land uplift. On the island of Sandskär humans have had settlements since the early times to hunt seal and to fish.

The National Park is home to a rich flora and fauna. Here you can find for example the pink Siberian primrose (Primula nutans), field wormwood (Artemisia campestris ssp. bottnica) and sea buckthorn growing along the beaches. It's also home to ringed seals, and large numbers of birds stopping by during their yearly migrations.

The nearest harbor on mainland is Haparanda hamn in Nikkala. During the summer, scheduled boat trips leave from here to Sandskär. On Sandskär you can either bring your tent to stay in or rent one of the small cabins available on the island. The midnight sun is particularly beautiful to watch at such location far out at sea.

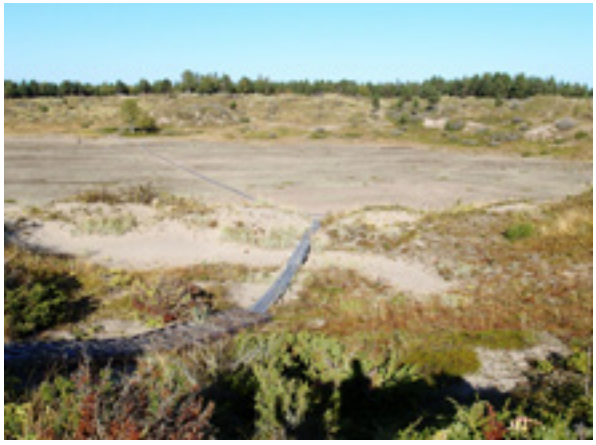
Church in Sandskär. (Photo by Alejandra Parra, Metsähallitus)

BOTHNIAN BAY NATIONAL PARK

The Bothnian Bay National Park (formed in 1991) is located almost right next to the Haparanda Skärgård National Park, close to the border of Finland and Sweden, in the outer archipelago of towns Tornio and Kemi. The National Park is made up of about 30 moraine islands and islets. The shores of the islands are rocky and the waters are shallow in the National Park area. In the island of Vähä-Huituri a nice sandy beach can be found. The youngest islands are actually reefs with no vegetation and the oldest ones even have small forests. Maybe the most well-known island is Selkä-Sarvi, where there is a harbor and open sauna in the northern end and old fishing base in the southern end of the island.

The most typical landscapes on these islands are meadows and dry heaths. The coastal meadows have been created by land uplift and the grazing of livestock. During the past decades the meadows and heaths have been managed and preserved to stop overgrowing by other vegetation. One of the nicest examples of these traditional landscapes can be found from Selkä-Sarvi, where sheep can be seen grazing every Summer. People have also left their mark in the scenery, and it could be

View towards south from the tower in Selkä-Sarvi. (Photo by Lari Pihlanjärvi, Metsähallitus)



Sandskär is well-known of its huge sandy areas...
(Photo by Essi Keskinen, Metsähallitus)

Rocky shore and a flada in Selkä-Sarvi.
(Photo by Linda Jokinen, Metsähallitus)

so, that people have already had temporary settlement on the islands at the end of 16th century! On many islands visitors can see bases of old buildings and supporting stones for seamarks.

Bothnian Bay National Park is also a dream for bird watchers. There are about 60 different species nesting in the area, including the Arctic Tern (Sterna paradisaea), the Velvet Scoter (Melanitta fusca) and the Temminck's Stint (Calidris temminckii). There are several plants that can only be found in the land uplift area, for example Primula nutans var. jokelae. When looking under the water surface, endangered species like Baltic water-plantain (Alisma wahlenbergii) and Water Pygmyweed (Crassula aquatica) can be found. There are also many beautiful flads on the islands, full of vegetation.

Take your own boat or rent a taxi boat and come visit both of these parks during the same day next summer!

Rainbow over Maasarvi-island.
(Photo by Lari Pihlanjärvi, Metsähallitus)

Simo, Finland

Essi Keskinen, Metsähallitus, 6 August 2018

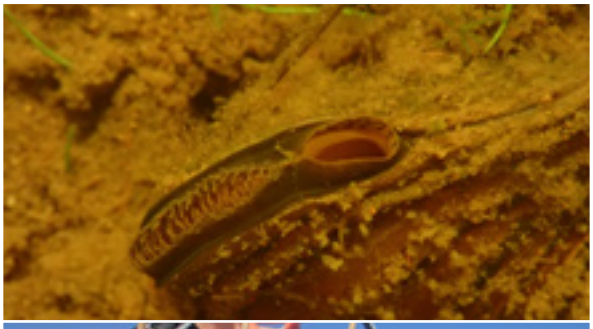
Metsähallitus marine team has just found a hidden underwater gem: Simo, Finland. We have been roaming the river estuary and the islands near the shore, the inland lagoons and the island flads, for two weeks now, and been astonished.

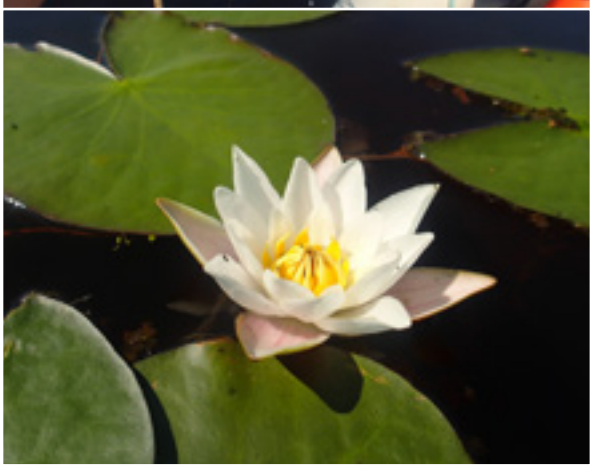
Regardless of the method – scuba diving, wading, SUP-boarding, drone, video, rake or snorkeling – we stumbled upon endangered species, fields of them. We found more species of water mosses than anywhere else, we found aquarium-like lagoons with hundreds of endangered individuals of water pygmyweed, Crassula aquatica, and dozens of other species which we rarely see, and we found completely new populations of endangered Persicaria foliosa. If we have never encountered an underwater species in the Northern Bothnian Bay, we were sure to see it here in Simo.

We drop down the video camera, see water mosses on the computer screen, throw the rake and the catch of the day is one or two species of regionally threatened water mosses. Night after night we fill in paperwork for endangered species, compress samples to be saved at the Botanical museum of Oulu university, grumble about the hard work that the endangered species have caused us, but at the same time are happy about finding new populations of rare species.

We spend an hour after hour at the microscope identifying species, and the samples keep piling up from new inventory places in Simo. We complain about the amount of samples, but at the same time are happy about the versatility of the underwater nature here in Simo.

This is why we are in the business of nature conservation. To find places like this.





Hailuoto island

Essi Keskinen, Metsähallitus, 7 June 2019

Hailuoto Island has always lured fishermen, who take shelter in the small cabins. The lighthouse is sometimes open to public.

Hailuoto is by far the largest island in the Bothnian Bay, and it's the third largest island in the sea areas of Finland. The island started to rise from the sea by post glacial land uplift about two thousand years ago, but the first inhabitants didn't find Hailuoto before around 1100. If the land uplift would proceed with the current speed, Hailuoto would be connected with the mainland in a few hundred years. The island is separated from the continent by a shallow water area of about 7 km wide.

There are about one thousand year round inhabitants in Hailuoto island, but many more tourists and summer vacationers come flocking during the summer months. There's still a ferry connection with the mainland but that is about to change in the near future, when a causeway and two bridges will be built between the mainland and the island. This is a concern for nature conservation people who fear, for example, that the possible reduction of ice erosion on the flat and sandy or muddy areas will affect the competition between the different vascular plant species and that the most endangered ones will suffer. Some of these species are Primula nutans and Puccinellia phryganodes. There are also many new findings of a directive species Macroplea pubipennis aquatic beetle from the eastern shores of Hailuoto island, where the new road will be built. At least the road will bring many more visitors to the island since the ferry has limited the number of cars and busses arriving to the island.

The nature on the shores and at the shallow waters around the Hailuoto island is very unique. Since the shores are very shallow and slope very gently to deeper water, there are large areas where endangered aquatic (or semiaquatic, if you don't consider 5-70 cm as really aquatic) macrophytes can be found. Alisma wahlenbergii and Hippuris tetraphylla form large meadows at the water's edge. There are vast mudflats with short lush vegetation where migrating birds stop for resting and feeding. On the north side of the island, there are long succession series of lagoons – from fladas to glo-lakes. These represent some of the best examples of land uplift lagoon series in the world and have been vastly studied.

For a marine biologist, Hailuoto represents a challenge when it comes to underwater inventories. Deeper areas are mainly sandy with some occasional rocks and very scarce vegetation or fauna while the extremely shallow shore areas are densely vegetated with many different species. The trouble is getting there. The shores are so shallow that approaching from the sea with even a small boat is nearly impossible, and trying to get to the area from land takes a lot of effort and walking.

The island's name, Hailuoto, is literally translated "A Shark skerry" but of course, Finland doesn't have any sharks in her waters. The word "hai" is a short version of "haili", which has previously meant a fresh Baltic herring. The island was first inhabited by fishermen who fished for Baltic herrings and thus the name.

If you want to know more about the Natura 2000 areas of Hailuoto, you can visit HELCOM marine protected areas database. The North Shore natura area is located within the SEAmBOTH project borders but the two others lie on the southern side of the island and thus outside the project boundaries. If you want to visit the island, better do it before the bridge turns it into a peninsula from the mainland.

Flads of Salmisudden

Petra Pohjola, Länsstyrelsen, 19 July 2019

In our last week's blog you could read about flads; how they are formed, why they are so valuable and a bit about the challenges that concern conserving these important habitats. Now we want to introduce you to a specific flad that we have discovered in our underwater nature inventories and discuss its future.

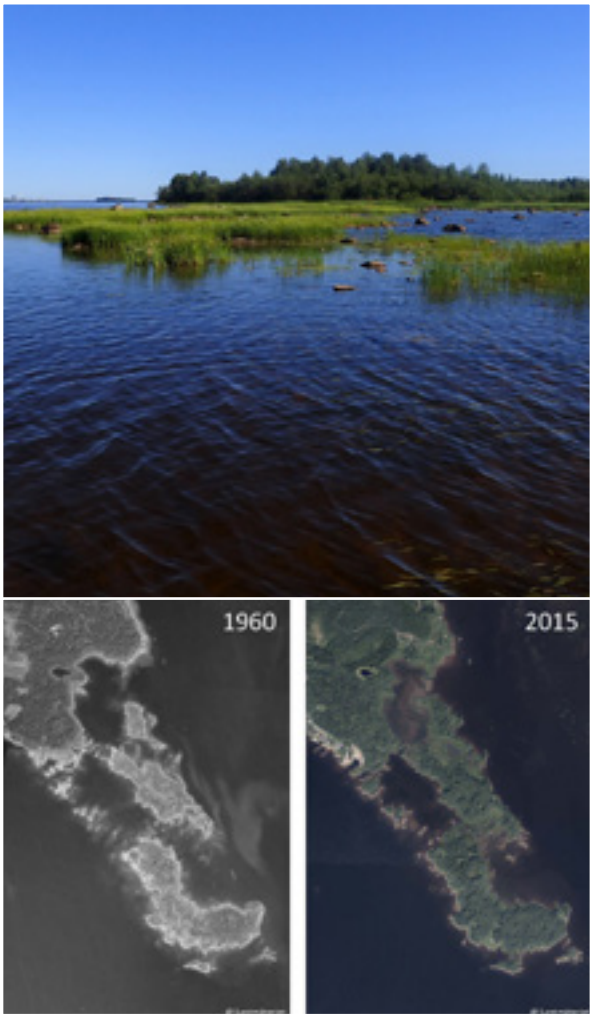
Although the title indicates that there are many flads around the headland of Salmisudden (Haparanda) at the moment there is only one flad. On top of that there are smaller gloe lakes and two bays. These bays and flad are influenced by different degrees of exposure, but they are all slightly connected to each other with small trenches. The most southern bay is open to the east and has no threshold. The one north of it is partially isolated from the sea with a threshold and is on its way to form into a flad. North of this sheltered bay is the flad, which happens to be one of the most interesting and special places we have discovered on the Swedish side of the SEAmBOTH-area.

We have shown a peek of this flad in an earlier blog , as it has by far the highest abundance of Chara braunii of the sites we have visited. Not only is this flad rich on this threatened charophyte but it also has a very high number of aquatic plants. Other threatened species that the flad shelters are Persicaria foliosa, Limosella aquatica, Potamogeton friesii and Elatine orthosperma. Besides being rich on vegetation this flad is an important nursing ground for fishes and is also rich on evertebrates, like freshwater sponges. With all this said, the flad is not only beautiful, but also very valuable for its ecological qualities.

The flad is around 500 x 250 m in size and very shallow; with an average depth of 0,35 m and maximum depth of 0,8 m. It is connected to the nearest semi-enclosed bay in the south and to the sea in the northeast. This inlet is dredged and even though this dredging would not be repeated, the flad is so shallow that it is unlikely that it will form into a gloe lake but will mostly dry out due to post-glacial rebound. With a mean depth of 0,35 m and a yearly land uplift of almost 9 mm per year, most of this flad will disappear in 40 years. Even with conservation measures we may lose this valuable habitat within a human lifetime.

This realization forces us conservationists to widen our focus area and also try to look into the future. Flads are per definition short lived and especially so in the northern Baltic Sea. Flads will evetually evolve into gloe lakes, which is a different habitat. To conserve the flads, new flads must continue to form. With all logic we must shift our focus from presently valuable flads to evolving flads and also conserve them. Human impact along the coastline, for example dredging, may change the coastal habitats and there is a risk that fewer and fewer natural flads will evolve from the current bays.

In the case of the present and future flads around Salmisudden, the current hotspot for biodiversity, as well as Chara braunii, will disappear but there is hope that new ones will form at the same time. The forming flad just south of the present one is at the moment too deep for the threatened charophyte, but Chara braunii is already present along some shores. Will this be our future Chara braunii – hotspot? We should certainly keep this possiblity in mind.



From historical photos it is apparent that the bays and seashore line are constantly altered. Pictured is Salmisudden with adjacent islands and bays formed between them, 55 years apart. The northernmost bay has formed into a shallow flad within this time. The question is, what will this picture look like in another 55 years?

An underwater landscape from the flad at Salmisviken. In this picture you can see freshwater sponges and Braun's stonewort (Chara braunii) (Photo by Petra Pohjola, County Administrative Board of Norrbotten)

Kuusiluoto sawmill island

Essi Keskinen, Metsähallitus, 10 February 2020

Some parts of Kuusiluoto are full of planks also on the shores, especially during low water. (Photo by Sjef Heijnen, Metsähallitus)

Imagine a dive where the bottom is not sand, mud, or rock – it's wood. And you're not diving on a shipwreck either. On the north side of a small Kuusiluoto island outside Tornio city there is a place like this. The bay opening to the north is supposedly covered in sand but, in reality, it's pieces of wood.

The first time I dived there in 2013 we placed a 100 m transect line from the beach facing north. We threw the transect line with a weight from the boat to the shore, so I didn't see what was at the bottom at the end of the bay. We started the dive from the deep end and worked our way towards the beach on a nice sandy bottom. At some point, the sand turned into pieces of wood. I had no idea what was going on, until I later found out that there had been a sawmill on the island between 1901-1944. These were the leftovers, so to speak.

"In Summer 2019 me and our trainee Eveliina did a 200-meter dive transect on the west side of Kuusiluoto island. I knew that there had been a sawmill on the island and I had been expecting to find some wood from the area. We started the dive from the shore and snorkeled our way there. We already noticed some planks and pieces of wood before starting the dive." -*Suvi Saarnio*

"In the beginning of the dive transect there was about 5-10 % coverage of wood but as we moved a bit deeper (starting from about 1.5 meters deep) there were planks everywhere! It was as if we had moved to another world, a world where the bottom all around you was wood instead of rocks, sand, etc. We are not sure, but we estimated that in some places there was up to two meters of planks lying on top of each other, creating a unique habitat especially for polyps and water mosses. As we reached the end of the dive transect all the wood was suddenly gone and the bottom was 100 % mud. After the dive I heard that many years ago they had built "new land" around the Kuusiluoto island using planks. So that is why a huge area around the island (at least west, north, and NE sides) is now full of planks under the surface. If you are a diver, I really recommend you to go and check this place out!" -*Suvi Saarnio*

A hundred years ago there were about 450 households and about 1000 year-round residents (double during the summer) on the island of Kuusiluoto. There were more than one hundred kids at the local school, they had a shop, a bakery, fire brigade, police, and a midwife on the island. The community did sports in the sports arena, they had various societies, a theater, an orchestra, and many different religious communities, as well as a worker's association. It was a thriving community, almost like a mini colony on the island.

Then came the Second World War and the hostilities that it brought to Lapland, and on Oct 1st 1944 the Germans bombed the island's buildings which were blocking their view to the German's battery position. The houses caught fire and the wind blew from the direction to set the whole island ablaze.

That was the end of the entire sawmill community on the island. Nowadays one can visit there on a taxi boat or one's own boat and see the ruins of the buildings from a hundred years back.

"Our field team visited Kuusiluoto island again on another day in Summer 2019 and we had a lunch break and a nice walk around the island. There is still a lot to see from the old times, a lot of buildings and such, but it is clearly visible that the nature is slowly taking back what is hers." -*Suvi Saarnio*

Kemi archipelago

Essi Keskinen, Metsähallitus, 6 March 2020

Kemi is an industrial town in northern Finland, right by the sea. The town was born in 1869 with a lot of wood processing industry. There were sawmills in the town and later pulp mills. There are still a lot of logs underwater outside the town of Kemi, not least because Stora Enso lost a shipload of logs in the fall 2017 just outside of Kemi harbour and there is still a lot of wood processing industry in the area. Nowadays Kemi has a large industrial harbour. International relations already started more than 150 years ago when the town got a permission for overseas trading.

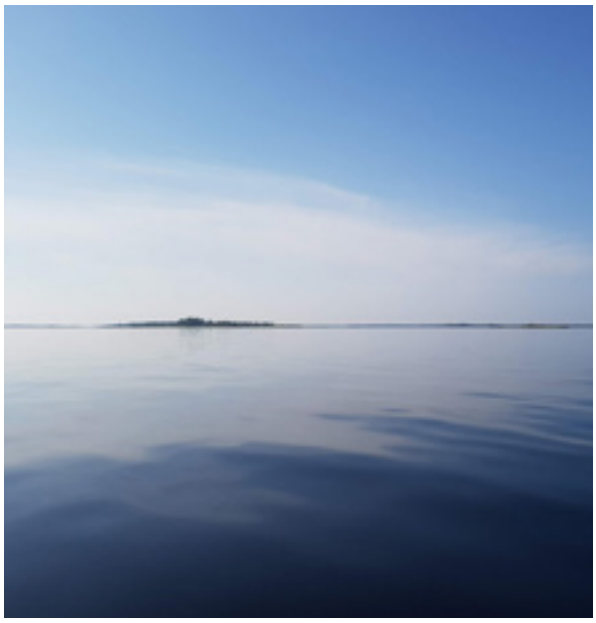
What makes Kemi a unique town in the northern Bothnian Bay is that it has a large archipelago mixing with the Kemijoki River estuary. Many of the islands are used year-round, with small recreational boats in the summertime when local residents go to their summer cottages and with skis and walking during wintertime, when people take to the solid sea ice for skiing, ice-fishing, and leisurely walks.

Kemi archipelago islands have been used for leisure for more than a hundred years. In the beginning of the 20th century, malnourished and skinny kids from poor families were taken to Selkäsaari island for a few weeks "fattening camps" where they were properly fed while they had time to get fresh air and exercise as well. In the 1930s prohibition time, there were camps for kids and youths organized by the local temperance movement organization. In contrary to the temperance movement, booze was smuggled to Selkä-Sarvi island in the Bothnian Bay national park from where it was distributed through Kemi to the whole of northern Scandinavia.

Nowadays the underwater nature of Kemi archipelago is mostly influenced by the large freshwater river runoff and the estuary but also by the surrounding factories. Of course, the worst discharges of the factories were cut off already decades ago, when everything that the pulp mills produced were pumped right into the sea. Now we are wondering what the new Chinese-Finnish bioproduct mill by Metsäfibre will do to the surrounding sea area. At least they will produce a lot of warm water year-round and some people are concerned about the extent of sea ice in the future winters in the Kemi archipelago.

Right now, the underwater nature in the archipelago is a unique estuarine mixture of freshwater species (many species of water mosses, lilies, duck mussels, etc.) and more marine species (Charales, filamentous algae, etc.). A peculiar and quite rare water soldier can be found in the lower reaches of the Kemijoki River and the invasive alien species Canadian waterweed (cousin of Nuttal's water weed which has still not yet spread to Finland from Haparanda area) can be found in some ponds, lakes and river areas at Kemi shore.

In the future, when the Bothnian Bay is getting less and less saline, the freshwater species might spread even further from the archipelago and the river estuary.



Calm sea in front of Kemi. (Photo by Suvi Saarnio, Metsähallitus)

Perca fluviatilis

Nymphaea alba ssp. candida

Törefjärden

Andrew Holmes, Länsstyrelsen, 27 March 2020

A map at the Töre harbour showing the most northern point in the Bothnian Bay. The map also shows the whole SEAmBOTH project area. (Photo by County Administrative Board of Norrbotten)

One of the great things about working in the field during the summer is that you get to see many interesting places that you wouldn't generally get the chance to.

Törefjärden is the northern most point in the Baltic sea. At the end of the bay you find the outlet of Töre river and next to it Töre harbour is located. By Töre harbour sits a yellow buoy, which is a landmark pointing out the northern most point of the sea.

Törefjärden is located just 2 km south of Töre. The area is known for being a beautiful location with only a small town and the famous yellow buoy in the harbour. There is a club boat house, a museum, and places for camping in the summer. During winter, when the sea freezes, many people choose to ski, snowmobile, and ice skate on the water.

However, in older times this place was a centre of lively industry and commerce.

The town was born in the early 1800s after a mill was constructed in the area. Samuel Gustav Hermelin constructed the mill which included sawmills, forges, and mills! He also built houses and schools for all his employees, which created the town we have today.

Samuel Gustav Hermelin built the mill here due to its good location, the town is also the location of the first iron ore rail in Norrbotten and was the largest blast furnace in Norrbotten. Samuel Gustav Hermelin once famously said "I've got a few barrels of gold in cash to use in Lappmarken" and was briefly known as the king of Lapland!

Of the original mill, 7 of the buildings still existent in their original condition. The Törefors furnace/iron works closed in the 1890s. Now the town has gained a bit of a boost as more companies and houses have begun to get more established in the area.

At Töre harbour next to the yellow buoy marking the northern most point of the Baltic Sea. (Photo by Linnea Bergdahl, County Administrative Board of Norrbotten)

As the most northern part of the Bothnian Bay it has the same unique ecosystem and mixture of freshwater and marine species as the rest of the Bothnian Bay. However, as the most northern area it is even more at risk than the rest of it. The land in Bothnian Bay is raising by around 8 mm per year and Törefjärden will slowly shrink in size as time goes on.

Liminganlahti Bay wetland area

Essi Keskinen, Metsähallitus, 14 April 2020

Liminka Bay, or Liminganlahti in Finnish, is one of the most important bird wetland areas in Europe. That's why it has also been designated as a RAMSAR site. RAMSAR sites, which can be found all around the world, are designated wetland and water areas which are especially important to birds, but also to other flora and fauna. Liminganlahti Bay got it's RAMSAR designation in 2002 because it is one of the most important bird migration, resting, nesting, and feeding areas in Finland. The shore areas of Liminganlahti Bay are also important habitats in many respects, representing, for example, primary succession forests of the land uplift areas, mudflats, and coastal meadows. That's why Liminganlahti Bay was also designated as a Natura 2000 site (in Finnish http://paikkatieto.ymparisto.fi/natura/2018/tiivistelmat/FI1102200.pdf)

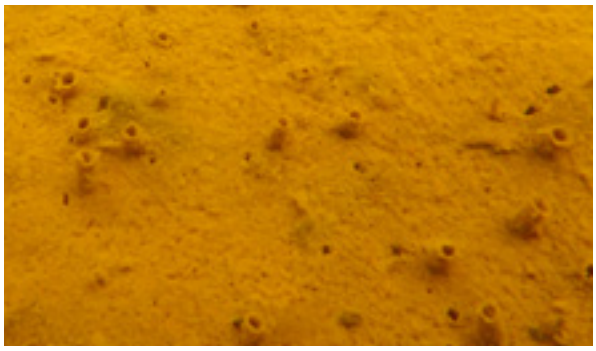
The area used to be grazed by sheep and cows but that stopped in the 1960s and the extremely shallow shores and coastal meadows started to be overgrown by reeds Phragmites australis. This was bad news for many of the wetlands ground breeding birds which need open coastal meadows. Some of the endangered aquatic plant species, which are poor competitors to reeds and need open water areas for growth, were also beneficiaries to the grazing. To keep the bay shores more open, grazing is practiced in the area again.

Liminganlahti Bay is not only valuable above surface and on the shores and coastal meadows. There are plenty of endangered aquatic species that call Liminganlahti Bay their home. For example, threatened and directive species Alisma wahlenbergii and Hippuris tetraphylla can be found around the shallow coastal waters of the bay. These species benefit from grazing to keep the reeds at bay as they can't compete with overgrowth by themselves.

Liminganlahti Bay is also important for fish spawning. There used to be many fishermen fishing around the bay but with the land uplift of almost 9 mm per year, the bay has gotten so shallow and overgrown with vegetation that it is not as important as a fishing area anymore. At least perch, pikeperch, and vendace spawn in the area in the spring and many more species of fish larvae can be found in the bay.

A small Temmesjoki River reaches the Liminganlahti Bay at its eastern shore and discharges fresh water to this 15 km long and at the widest 10 km wide bay. Water in the bay is almost fresh and so the flora and fauna that exist there are adapted to either fresh or low salinity brackish water. Even the large freshwater mussel Anodonta anatina can be found here. The shores of the bay are very shallow and so are the middle parts of the bay as well, but the mouth to the sea is little deeper. Shores are mostly silty and muddy and the middle of the bay is soft sediments. The visibility is often very poor because the winds stir the bottom sediments and resuspends fine clay and mud particles from the bottom to the water column.

Liminganlahti is very popular bird watching place.



Chironomidae larvae on muddy bottom. They have made their pupas from the soft sediments.

One of the most important results of the SEAmBOTH project was the Zonation analysis of the most valuable marine areas. Liminganlahti Bay was clearly identified as one of the gems of the SEAmBOTH area. Also United Nations recognized the area as one of the most ecologically significant in the Baltic Sea (EBSA) and nationally in Finland. Liminganlahti Bay was designated one of the EMMA - or ecologically most significant marine areas - areas around the Finnish coast.

No matter how you look at this bay - from the air, from the shores, or from under water, it is definitely one of the most valuable marine areas that can be found in the Finnish coast and in the SEAmBOTH area.

You can visit Liminganlahti Bay and learn a lot about the area's birds in the Visitor center's exhibition. There are also bird observation towers where you can go see the scenery from an elevation as they are just about the only higher places in the extremely flat shores of the Ostrobothnia.

Trash Talk

Ashley Gipson, Metsähallitus, 1 November 2018

It is common knowledge that the world has a pollution problem and more specifically pollution in our oceans. It seems that every day there are more and more posts in the news and on social media about how trash is accumulating in our oceans and how that is affecting climate change, sea life, and marine habitats. Unless you have been living under a rock, you have heard about the Great Pacific garbage patch in the Pacific Ocean and the decline of our coral reefs. Ocean pollution has many devastating effects such as the decline of marine species, hormone changes and reproductive failure of marine animals, changes in water acidity, contamination of the food chain, and possible negative effects on human health.

The majority of trash in oceans is plastics and single-use items such as plastic bags, cigarette butts, straws, drink stirrers and bottles. By 2050, the United Nations estimates that the oceans will contain more plastics than fish. This is a problem in that many marine animals mistake plastics for food and die because they are unable to digest the plastic. Just last summer a pilot whale washed up in southern Thailand having ingested 80 plastic bags. While plastics in the ocean have a direct effect on marine life, plastics are also becoming a problem for people. Since plastics are so highly concentrated in fish in the form of microplastics and other marine species, they can make their way up the food chain and be present in the seafood that we eat. Other less publicized forms of ocean pollution come from oil spills, factory run-off, agricultural run-off, water treatment sewage, and burning fossil fuels that create a toxic environment for marine life. For example chemicals released into the ocean can cause an increase of pH in a process called ocean acidification. More acidic oceans lead to coral bleaching and higher mortality of mussel species.

Although Finland does not seem to have the same problems with waste disposal as the rest of the world, issues with pollution in the Baltic Sea do exist. An estimated 80% of trash gets in oceans by means of land based sources. This is important in Finland and especially in the northern Bothnian Bay in which large rivers run into the sea and carry trash with it. This past summer, the SEAmBOTH team saw first-hand how normal, everyday items made their way to the sea. We gathered the usual bottles, aluminum cans, milk cartons, plastic bags, juice boxes and various plastic containers, but more surprising, we found tires, entire bicycles and street signs.

More disappointing was one event that took place last May in Oulu. The whole event was to promote and teach students sustainable development goals. However, various organizations at the event were giving out plastic balloons attached to plastic sticks. As soon as students left the event, many balloons flew away and into the water. The SEAmBOTH table was set up right in front of the water and Suvi Saarnio (Metsähallitus) spent much of the time in the water removing the balloons. Yes, children like balloons, but this was not an appropriate souvenir for this type of event, and we should try harder to teach the next generation better.

This could have been recycled! (Photo by Suvi Saarnio, Metsähallitus)

Other items found in the water. (Photos by Suvi Saarnio, Metsähallitus)

As a whole, Finland is one of the top countries for recycling and waste management, but a major problem is the availability of single-use plastics. However, there are on-going efforts to fix this problem. Some companies in Finland have begun to reduce or completely eliminate single-use items. For example, the restaurant chain, Hesburger, stopped using plastic straws and hotel chains such as Scandic and Radison Blu are no longer using plastic straws or stirring sticks. Hopefully, more companies will follow this example. Furthermore, the Blastic Project is monitoring sea pollution in the Baltic Sea and working with organizations to do clean up in Finland, Sweden, Latvia, and Estonia.

Unfortunately, it is unlikely that all trash in the sea will just disappear. However, if every person does their part, no matter how small, maybe we can make a difference. 'Reduce, reuse, recycle' is a common phrase we are always taught, but maybe just being more aware and observant of how trash has an impact after we dispose of it is just as important.

Energy from thin air

Essi Keskinen, Metsähallitus, 20 September 2019

The renewable energy sources are more important than ever before. Wave or tidal energy hasn't really been available in the Bothnian Bay, so we are looking at a possible future with a lot of offshore windmill parks in the SEAmBOTH area.

Wind energy is a renewable and an infinite form of energy, but as green as it may sound, we still need to consider the consequences. Without going to the technology of producing the windmills or to the battery technology and the rare metals that they use, the effects that the offshore windmill parks have on marine nature can be both positive and negative. Some of the effects are still at guess work stage. We don't, for example, know for sure, how the electromagnetic fields of the underwater cables affect the fish (Marcus C. Öhman, Peter Sigray and Håkan Westerberg, Offshore Windmills and the Effects of Electromagnetic Fields on Fish, Ambio Vol. 36, No. 8, December 2007). Or, to be more precise, we do know that the electromagnetic fields have an effect on fish, but we don't know how the fish react to the growing number of cables at the bottom.

Large offshore windmill parks will, of course, have a large effect on the scenery. The horizon will be dotted with white windmills and some will find this a hugely negative issue while others may see it as a green energy scenery from the future.

Some of the effects that the windmills will have are bringing new habitats to monotonous sea bottoms. Right now, the wind energy field is focusing their planning to deep offshore areas which will, at least in the SEAmBOTH area, most probably be muddy bottoms. Bringing new structures to this kind of area will bring a new hard habitat to the world of only soft and pelagic habitats. This will enable fauna like the sponge animal Ephydatia fluviatilis or flora like water mosses or algae to attach to the new surface. This, in turn, will attract invertebrates to feed or hide in the vegetation and they will lure fish to the area to feed on the invertebrates. Windmill structures will also provide hiding places for fish, and many species of fish are generally attracted to large objects in the otherwise featureless soft sea bottom.

On the other hand, the windmill structure will destroy all benthic flora and fauna under the foundation, and the vibration of the windmill tower might drive away fish and seals.

The good thing about offshore windmill planning is that at least on the Finnish side, the companies have moved their focus from the shallow areas to deeper areas further away from the shore. With this move, the shallow areas, which are the ones with the most nature values like fish spawning grounds and underwater vegetation, will be spared from dredging and building. The scenery handicap will be the same, but there are remarkably less nature values in the deep offshore areas compared to the shallow nearshore areas.

Now that the marine spatial planning (MSP) is under way in both Sweden and Finland, offshore windfarm areas are also put on maps. On the Swedish marine spatial plan, the windmill areas exist mostly south from the SEAmBOTH area. On the Finnish side of the SEAmBOTH project area, there are many opportunities for windmill park development. So many windmills have already been built on land and at least Finland is moving to the sea.

Looking back in time

Outi Hyttinen, GTK, 28 February 2018

Geologists like to look back in time. The SEAmBOTH study area underwent dramatic changes ca. 10 300 years ago, as the Fennoscandian Ice Sheet retreated from the area. The enormous weight of the ice sheet had pushed the Earth´s crust downwards creating a huge depression. The crust still balances itself, in the process called land uplift. Current land uplift rate is 8-10 mm in coastal area in Bothnian Bay in comparison to 3-4 mm/year in Helsinki region.

Northern Bothnian Bay is closer to the former ice sheet center where the ice burden was heavier than in the Helsinki region. Geological formations indicating previous shoreline positions can be found inland some tens to hundred kilometers from the current coast. For example, shoreline deposits that formed some 9500 years ago are currently located 60 km from the current coast, ca. 100 meters above the current sea level. This gives some idea of the land uplift magnitude.

Because of this isostatic depression, deglaciated study area was submerged right from the start. First water came from the melting ice sheet, later saline water started to flow into the area. These changes are related to the whole Baltic Sea Basin connections to the ocean and saline inflow patterns via Danish straits.

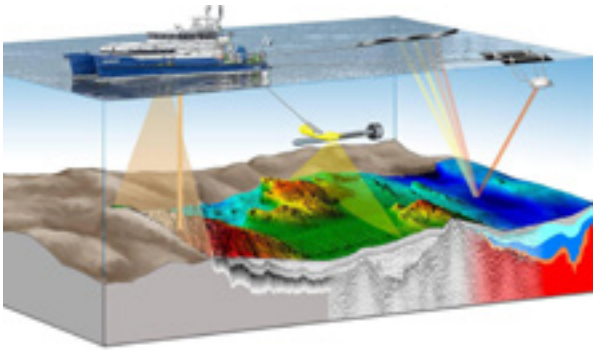
Currently salinity is very low, as large rivers bring lots of fresh water into the northern Bothnian Bay and saline water inflows nowadays rarely reach the northernmost Baltic Sea. As different environments produce different kinds of sediments, this information can be used in reconstructing past/present conditions. In favorable circumstances, a single sediment core may reflect deglaciation time, different stages of the Baltic Sea development and modern sedimentation processes.

More often sediment record is not complete. One reason is that in shallow sea areas, storms and currents can very effectively erode, transport and re-deposit sediment. A good example of this from the SEAmBOTH area is a thin layer (1-10 cm) of redeposited sand covering older deposits in many places. Therefore, the geological interpretation is built from several pieces, as a single source of information usually yields just a part of the story.

How do you study underwater geology? The answer is in geophysics: different acoustic-seismic devices transmitting sound pulses towards the sea bottom. These pulses behave differently in different types of sediments. Reflected pulses are collected by receivers and processed by a suitable software. End product is detailed information on bathymetry, sea-bottom morphology, sediment type and sediment thickness.

To run this kind of geological survey, you need a research vessel with all the necessary equipment (e.g. multibeam, side scan sonar), experienced ship crew and at least relatively good weather. Data interpretation requires geological knowledge and it is not always a straightforward task. Therefore, underwater videos and samples from the sea bottom are extremely useful in validating the results.

Map of the maximum extent of the Veiksel-ice sheet in Northern Europe. (Picture: Harri Kutvonen, Geological Survey of Finland, adapted from Lundqvist & Saarnion ja Andersen et al., small changes done by Suvi Saarnio)



An example of acoustic-seismic research setup: Geological survey of Finland´s R/V Geomari. 1: multibeam echo-sounder, 2: sediment (single beam) echosounder, 3: side-scan sonar and 4: seismic reflection device. (Illustration by: Harri Kutvonen, Geological Survey of Finland)

Bathymetry and seabed substrate information can be further used in geodiversity and habitat models, i.e. models describing geomorphological and soil features and systems that have created these features, and different natural environments for plants and animals. These two underwater kingdoms – geology and biology –function together in many ways. That connection of kingdoms we, Geological Survey of Finland and Geological Survey of Sweden, and the biologists, are looking for in the SEAmBOTH project.

Filling gaps with making maps!

Essi Keskinen, Metsähallitus, 27 April 2018

Project group members who took part in the meeting. Presenting our beautiful tube scarfs!

Can there be such a thing as a great and motivating workshop or an invigorating and positive meeting? Apparently yes, because that is exactly what we just experienced in the second SEAmBOTH project group meeting in Haparanda, Sweden.

I am a person who deeply despises all kinds of workshops. I am not a person who enjoys brainstorming together with others (or, as the politically correct term goes nowadays, thought showering), and I don't usually like to write my suggestions on differently colored post-its and put them in differently labeled papers taped to the wall.

This time, everything was different. We were giving nature a value, using MOSAIC-tool, developed by my Swedish colleagues. This time I was excited, motivated, full of ideas and expert opinions, and it was great to be in a company where you can admit, that something is just a species with a protection status and it doesn't really do that much more for the whole ecosystem, or that my favorite species are water mosses.

The same thing with a project meeting – they can be boring, slow, uninteresting, full of people who couldn't care less and are just going through their Facebooks. Not this time. The project meeting was full of people with new ideas, with good news and results, with great and ambitious plans for the summer field season and with Excel sheets full of already gathered information that is actually useful for something. A lot had happened during the winter, and we even managed to squeeze in a stakeholder analysis.

Three full days of workshops and meetings and I left with an energized feeling, with full confidence that we are doing a great job creating useful habitat maps across the border between Finland and Sweden, and an itch to get to the field and to underwater inventory work already!

Starting the project group meeting. (Photo by Suvi Saarnio, Metsähallitus)

Results from nature values workshop.
(Photo by Suvi Saarnio, Metsähallitus)

Go away from the Bothnian Bay, Ice, SEAmBOTH is ready to tackle another field season!

SEAmBOTH in SDBday -satellite derived bathymetry technology and user forum

Jaakko Haapamäki, Metsähallitus, 14 September 2018

(©EOMAP GmbH & Co. KG 2018)

Even with 'traditional' mapping methods maintaining a crucial role in biological conservation, emerging new technologies enable us to work to a larger degree behind a computer screen. The increased quality and availability of satellite images is something that we are interested to utilize in SEAmBOTH.

The plus side for satellite images is that they are updated regularly, so even if you must skip some that have clouds obstructing the view, you can usually get recent images. And you can always get a timeline of images to track changes over time. They also cover huge areas, so a large amount of data can be extracted if the images can be classified.

The quality of satellite images enables researchers to determine for example water depth from the images and ecological information about underwater vegetation. The method is based on the way the sea bottom reflects different band widths of light. This information can then be used with algorithms to measure water column depth. The challenge in the Bothnian Bay is water turbidity. If the light doesn't penetrate to the bottom, you can't get any information on it. The good news is that the water is very shallow, so the penetration doesn't have to reach all that far and the deeper areas can be covered by sonar.

Why we need accurate and comprehensive depth data? Depth is the base for a lot of modelling that we are doing in SEAmBOTH. The better the data, the better the models will be. Now this isn't to say that we are dependent on satellite based depth, but it helps.

Satellite derived bathymetry and user conference was held in Herrsching, Germany in the beginning of June. We attended to see what is going on in the field of satellite based research, what kind of images are available and maybe get some ideas about how to use satellite images in our project. The presentations were mostly in the field of maritime industries, navigation and dredging, but some also focused on ecology. The conference was mainly spent making contacts with the experts of the field and getting a grip on the scale and possibilities of the usage of satellite images in our project.

Rare aquatic beetle found for first time in Sweden

Linnea Bergdahl, Länsstyrelsen, 5 October 2018

The M. pubipennis is covered in hair which may collect sediment and make the beetle look a bit fury and dirty. On the picture the male sits on top of the female, caught in the middle of a love act. (Photo by Petra Pohjola, County Administrative Board of Norrbotten)

The leaf beetle (Macroplea pubipennis) is an aquatic beetle which has only been known to exist in Finland and China – until now! During the SEAmBOTH inventories of shallow coastal areas, it was finally found here on the northern swedish coast as well. In Finland it has been categorized as "vulnerable" and listed as a specie under strict protection in the Nature Conservation Degree.

SEAmBOTH project partners and biologists in Finland have been talking about this beetle since we first met them at the start of the project. For us from Sweden it was totally new knowledge – an aquatic beetle which lives in shallow bays and has hairy legs – never heard of that before. Of course we got interested! As the marine environment and the coastal areas are very similar on either side of the Bothnian Bay, we were all convinced that the beetle must be living in Sweden as well. We just hadn't searched enough for it.

The beetle is not the easiest to find. We found it when we were snorkeling collecting data within the pilot areas of the project. It sits on plants, we've found it on perfoliated pondweed (Potamogeton perfoliatus) at depth down to one meter, but it has been reported to be living on other pondweeds as well as watermilfoils and horned pondweed.

In Sweden researchers have been looking for the beetle along the coast north of Stockholm, but without finding any of them. We therefore feel extra proud to be hosting it here in the northern Bothnian Bay. And it's thanks to our collaboration with biologists in Finland, made possible by the SEAmBOTH project, that we had the opportunity to search for it and knowledge to find it.

The beetle grows to around 1 cm in length. They live their whole lives under water, mainly clinging to underwater plants, which they also feed from. (Photo by Petra Pohjola, County Administrative Board of Norrbotten)

Viewed from above water, a typical habitat for the beetle is a semi-sheltered shallow bay surrounded by reed. (Photo by Kajsa Johansson, County Administrative Board of Norrbotten)

Identified as a significant marine area by UN convention

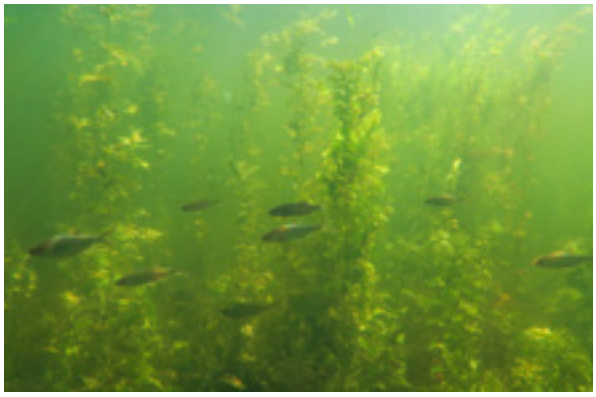
Linnea Bergdahl, Länsstyrelsen, 1 February 2019

What does the northern Bothnian Bay have in common with for example the Sulu-Sulawesi Marine Ecoregion on the Indonesian archipelago? Not the corals, sharks or sea turtles but well enough the identification as EBSA areas (Ecologically or Biologically Significant Marine Areas). Or as stated on the EBSA website.

It is the United Nations Convention on Biological Diversity (CBD) which appoints the EBSA. In order to get identified as an EBSA the marine area has to fulfill the following criteria:

- Uniqueness or rarity
- Special importance for life-history stages of species
- Importance for threatened, endangered or declining species and/or habitats
- Vulnerability, fragility, sensitivity, or slow recovery
- Biological productivity
- Biological diversity
- Naturalness

To identify new EBSAs scientific and technological information, together with knowledge of indigenous and local communities is collected about the marine areas. National experts, scientists and organisations gather to review the information and propose a selection of marine areas that fulfill the criteria as EBSA. In February last year a workshop was held in Helsinki to describe ecologically and biologically significant marine areas in the Baltic Sea. In November the parties of the convention met in Sharm-el Sheik in Egypt for the UN Biodiversity Conference. There nine marine areas within the Baltic Sea were appointed and added to the list of worldwide EBSA (read the news here!).



In addition to the northern Bothnian Bay, the Kvarken Archipelago, the Eastern Gulf of Finland and the Southern Gotland Harbour Porpoise Area are three examples of areas also identified as significant marine areas in the Baltic Sea.

Some of the reasons why the northern Bothnian Bay fulfill the critera of being an EBSA (as reported in the assessment):

- A uniqueness due to several marine Natura 2000 habitats and home to sea-spawning grayling (Thymallus thymallus) and the leaf beetle Macroplea pubipennis.
- Highly important area for critical stages in the life of several anadromous fish, e.g salmon, the ringed seal (Pusa hispida) and migrating birds.
- It hosts several threatened species such as the plants Hippuris tetraphylla and the Baltica water-plantain (Alisma wahlenbergii

From the SEAmBOTH project we can't agree more, and feel very blessed to be able to work in, with and for such a special place in the world's oceans.

Is our most valuable nature also our most endangered?

Essi Keskinen, Metsähallitus, 15 February 2019

We did two exercises in the SEAmBOTH project.

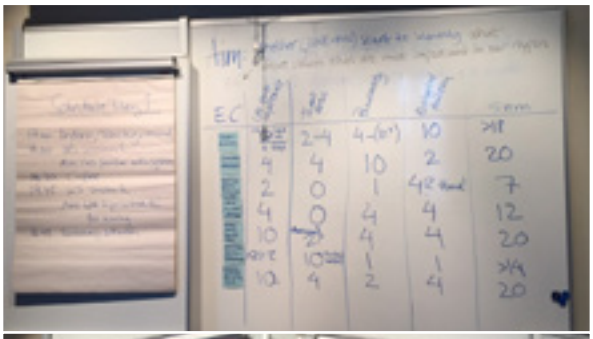
First, we used the MOSAIC tool to determine how valuable certain nature types or habitats are. The tool lets experts consider different aspects of the nature type, for example, how critical this environment is to a certain species' specific events of life, like spawning, or if this environment is interchangeable with some other nature type etc. The MOSAIC tool gave us scores for each habitat or nature type, which can be taken as the value of the nature. The higher the score, the more important this habitat or nature type is to the functioning of a healthy marine environment.

Then we did another exercise. In this one, the experts decided, which of the MOSAIC nature types or habitats were the most vulnerable to human pressures.

Alarmingly, it turned out that the most vulnerable ones were the most valuable as well.

Then we looked at the official records of the IUCN (International Union for Conservation of Nature) Red List of Threatened Nature Types. The Finnish one was just updated and published Dec 18th 2018. There, at the top of the most vulnerable or endangered list of nature types in the Baltic Sea, were all the most valuable nature types that we had come up with using the MOSAIC tool.

To a person working in the field of nature conservation, it is quite alarming that the nature types that are the most valuable to a healthy marine environment and the ecosystem services are also the most threatened. Especially now, when the climate change is changing the marine nature at the same time in sometimes predictable, sometimes not so predictable, ways.



The only consolation in the situation is that the more we know of the underwater nature and the more we understand it, the more we can actually do to change the way things are right now. We can't affect all things, but some we can. For example, in the future, we might see more marine nature restoration.

Let's hope we still have time to react with all the new data we are gathering in the SEAmBOTH project and in all the other efforts around the Baltic Sea.

Low water & no water

Essi Keskinen, Metsähallitus, 4 October 2019

Low water level in Isonkivenletto-island near Ulkokrunni. (Photo by Suvi Saarnio, Metsähallitus)

Summer 2019 field season brought a strange and new problem for marine biologists and boaters alike. Usually the wind is blowing from southwest, but during the summer months of 2019, most of the wind blew from the north. This meant that water was running towards south and the water level was more than half a meter lower than the mean water level for many weeks. The lowest water levels were approximately -65 cm during the low waters of July and August, which means many hundreds of meters of escaping sea at shallow shores.

Some of the docks were left on dry land and Metsähallitus marine team could do wading points in places where you usually have to snorkel or use a drop video.

This wading point was supposed to be in water. (Photo by Teemu Uutela, Metsähallitus)

Water level decline started only after aquatic macrophytes had already started their growing season. This meant, that for many weeks of low water level aquatic plants were stranded on dry land and started dying. Some smaller and more rigid plants like Subularia aquatica and Limosella aquatica struggled for a long time before succumbing to the dry environment but some died earlier, for example Stuckenia pectinata and Stuckenia filiformis. They have no rigid stem or leaves and are only kept upright with the surrounding water.

Mudwort (Limosella aquatica) on dry land.
(Photo by Suvi Saarnio, Metsähallitus)

The most striking change happened in green algae Charales. They turned completely white and were obviously dead. When the water level rose again close to normal level, these ghostly white Chara meadows could be seen from the boat at the bottom of shallow bays.

It is difficult to know for sure what this low water summer meant for the underwater nature of the Bothnian Bay in general but at least locally this lowered the macrophyte biomass significantly. Some of the species might have had time to migrate deeper but especially the ones which were already forming meadows by the time the water level went down, faced an unpredictable and bleak future.

"Would you be my work-Valentine?" The importance of a friend in the field

Essi Keskinen, Metsähallitus, 4 February 2020

Expert work is often lonely – you read reports or scientific papers and write some of your own. Every now and then you get to attend a meeting, sometimes even face-to-face and not only through the Skype.

In the field it's different. We work as a team and very often in pairs. You have your dive buddy and the third person in the boat is your dive assistant. You and your partner-for-the-day go together, you do the wading point and your partner writes the information down. You drive the boat and your colleague takes the drop videos.

For the Valentine's Day blog, we asked some colleagues and former field team members, what does it mean to you to have colleagues, co-workers, a partner for a field day, a dive buddy, a friend at work? I once wrote a blog (in Finnish) about how intimate it sometimes feels to dive with a dive buddy. You communicate mostly by looking into your dive buddy's eyes and by touching the buddy if they don't notice you otherwise, and you help each other to dress in all the dive gear and so on. Even if you never met the person before, you'll soon form a strong bond with them, at least for the dive. Same thing with your team members – they might be just colleagues, but they might easily become friends and at least you often depend on them in the field. When one of my former colleagues left work to have a baby, she wrote a blog (in Finnish) named "My marine family".

Here are some of the answers we got from our and Länsstyrelsen team members:
"My colleagues are the people who have the same goals as mine. They help to find solutions and I try to do the same for them." *Rahmona, France, intern, volunteer worker*

"Many of my team members have first turned into my dive buddies at work or my field partners for the day and then from my co-workers and colleagues into my friends." *Essi, marine biologist, project coordinator*

"As a foreigner, my colleagues and field partners in SEAmBOTH were very important to me. Not only were they very patient when teaching me the job tasks, as well as the Finnish language, they helped me feel comfortable and at peace on sometimes long and stressful days. The members of the team made the work fun and memorable. One of the most memorable summers I have ever had!" *Ashley, USA/Finland, nature surveyor, volunteer*

"Your colleagues are there, with and for you, at any time. They are there offering a helping hand for many practical problems. They help you to push the boat forward when it's too shallow to use the engine. They help you unzip your drysuit when you can't reach the zipper. When too much vegetation is stuck on the propeller, they don't hesitate to jump in and remove it, and if you're legs are tired after a snorkel, they offer a ride. But most of all, they share the sun and the rain with you and everything in between. They offer support in hard times, making a rainy day happy with their positive attitude and share a big laugh whenever they can." *Linnea, marine biologist*

Helping each other clean the survival suits after a long day..

"First of all, colleagues mean safety to me, since when working at the field, especially underwater, it's always better to have your partner(s) there if something happens. Secondly, and maybe as importantly, colleagues make the sometimes long hours way more fun!" *Eveliina, intern*

"Colleague gives you support, both mental and often physical when working on the field. Team spirit and humour makes work fun and invigorating. Your colleague is often teaching you in a way, and expands your point of views & perspectives," *Noora, intern*

"During the field season the team members are together 24 hours a day 4-5 days in a week. Every summer new members that you have never met join the team and you start to build the connection since the first day. Sooner than you realize, this group of people becomes your second family. You sleep in the same cabin with them, you go to sauna together, you eat together, you work together, you share your thoughts with them, you laugh together, you get frustrated together when something doesn't go as planned. For the three to four months that you work in the field, you spend more time with your colleagues than you do with your family or friends. And lastly, we even want to sometimes spend free time together and do something fun after the hard work! No wonder that every summer our team has become super important to me and I still consider most of my field colleagues as my friends." –*Suvi, Metsähallitus SEAmBOTH field team leader*

School kids out of class rooms

Essi Keskinen, Metsähallitus, 1 June 2018

Suvi jumping into the water so that the pupils can rescue her. (Photo by Essi Keskinen, Metsähallitus)

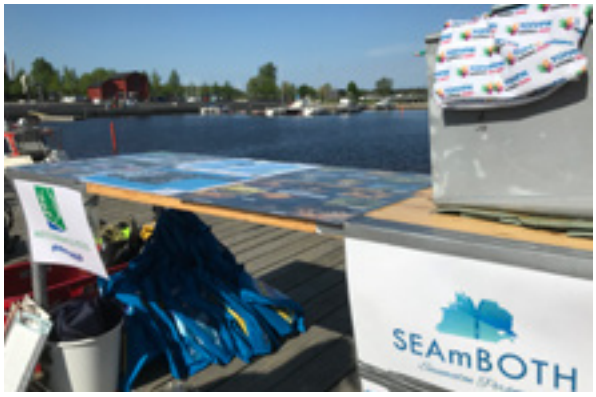
The youth are the future. This is so true, especially in the field of marine conservation. And how best to tell kids how to protect our native Bothnian Bay, than to drag them out of their classrooms and off of their smart phones, and take them into nature and show what marine biologists really do.

Metsähallitus was contacted by Myllytulli school and asked, if we could tell them what Marine biologist do at Metsähallitus, and give a bit of information about the state and conservation of the Bothnian Bay. We invited them to join us on an island near Oulu City Center, Finland, and come see for themselves, what we do.

Four classes of seventh-graders and a class of ninth-graders joined us along with Oulu Marine Search and Rescue for a day by the sea. We told them that we study the underwater nature so that we would know better, how to protect the sea and its species and nature types, as well as, how to do marine spatial planning together with our Swedish partners. We showed them our scuba diving equipment. They got to put the video camera into the brown river delta water and see for themselves, what it looks like on the computer. They even got to practice what to do if someone falls into water and they'd have to perform a rescue.

We also attended a youth day, Toivon Agenda 2030, which was part of a European sustainable development week. Approximately 1500 school kids and teachers attended the event, and many of them wanted to see our equipment and hear about the work we do.

At the same time, we promoted the European Maritime Day #EMD2018. EMD is celebrated annually across Europe to raise awareness of maritime sectors and support an integrated approach to maritime affairs.



Toivon Agensa 2030 event in Oulu. (Photo by Essi Keskinen, Metsähallitus)

What better way to celebrate this day than to talk about the SEAmBOTH project and our co-operation between the two countries and different maritime sectors!

The week climaxed with a school visit to Ritaharju school in Oulu, where more than a hundred seventh-graders had taken water samples from local lakes, rivers and the Bothnian Bay in the fall and spring and analyzed the water. They invited a Metsähallitus marine biologist to tell them more about the Bothnian Bay, its species and conservation status, and what they personally could do to protect the sea better. They asked a lot of questions, and the school was interested in further project work with our neighboring country colleagues from Sweden. We do, after all, share the same volume of water in the Northern Bothnian Bay.

Pooki Flakkaa – Raahe Maritime Festival 2018

Suvi Saarnio, Metsähallitus, 19 July 2018

(Photo by Noora Kantola, Metsähallitus)

The Metsähallitus SEAmBOTH-team took part in the Raahe Maritime Festival 14th to 15th of July. The event was organized for the fourth time and thousands of visitors attended, the official estimate was 19 500 visitors!

The weather was absolutely beautiful during the whole Festival! Sun was shining, there was hardly any wind and people were in a good mood. During the weekend we told about the marine nature and our project. We showed samples of different plant species and visitors got to see some species under the microscope, see how the sea bottom looks through the underwater video camera, and could look through the water binocular. We had interesting conversations with local people, fishermen, cabin owners, divers and people who had come to Raahe from far away.

There were different happenings around the market square and in Pikkulahti -area. There was a fair reminiscing the golden old times of sailing ships, there were different kinds of food, music events, cruises to the archipelago and so on!

On Saturday a National Search and Rescue competition was organized in Raahe. The competition track was about 3 km long and it circled around the city right next to the Festival area. I took part in the competition in the Oulu SAR -team and it was so much fun and a great way to test our skills!

See you in July 2019 in Pooki Flakkaa – Raahe Maritime Festival 2019!

The marine life of Bothnian Bay met the people of Bothnian Bay – Skärgårdsfesten in Piteå 2018

Linnea Bergdahl, Länsstyrelsen, 24 August 2018

Last Saturday a day to celebrate the archipelago was hosted at the beautiful harbour Västra Kajen in Piteå . We marine biologists from the County Administrative Board of Norrbotten, were there to bring SEAmBOTH and the marine life to the visitors.

No doubt the Bothnian Bay interests' people in Norrbotten. There was a high curiosity along with plenty of questions and local knowledge about the marine life.

We learnt many new interesting things about our sea and highly enjoyed the day. Just as much as the visitors seemed to be doing on this sunny, late summer day. Thanks to everyone whom we met and got to share experiences with, and to PiteUnika for hosting the event!

Teaching the teachers

Essi Keskinen, Metsähallitus, 7 September 2018

Every year the teachers of Finland gather for the Environmental Education days. The aim of the event is to bring new ideas to daily teaching of environmental education to kindergarten kids, elementary school children, high school teenagers or any other group of people they might be teaching.

The event takes place in different localities every time, and in 2018 it happened to be located on Hailuoto Island, off the coast of Oulu city, which just happens to fall in the SEAmBOTH project area. Metsähallitus SEAmBOTH team was asked to participate with a Bothnian Bay underwater workshop at this two-day event with approximately 70 participants from all over Finland, and we jumped at the chance to take our message forward with people who have access to tens of thousands of youth!

We set our workshop at the marina while workshops for drama, music from nature, how to make a game of environmental education, recycling and all the other workshops took a more mobile view to their tasks.

In the SEAmBOTH workshop, we showed the teachers all the equipment which is used in underwater habitat and species mapping in the project. The teachers got to try to throw the rake or take a video, a few of the teachers put on a survival suit and helped us gather actual information from the shore ("99 % silt, 1 % 10-60 cm stones, Stuckenia filiformis, Stuckenia pectinata, Cladophora glomerata – dead – Tolypella nidifica, 0,65 cm, +15,1°C, salinity 2,32 ppt"). Some of them just wanted to jump in the sea in the survival suit and float at the surface.

It is always highly inspiring to teach the kids about the wonders of the underwater natures of the Bothnian Bay, but it is even more inspiring to teach the teachers, who are the professionals of teaching. I hope they got something from our workshop that they can incorporate into their teaching about the Baltic Sea and other environmental education.

Nature values

Elina Virtanen, SYKE, 31 march 2020

SEAmBOTH project is nearing its end and with that comes the final results. One of the main tasks of SEAmBOTH has been the identification of the most valuable areas. In order to protect nature, we first need to know where valuable features are.

The analysis flow of how nature values can be defined, can look something like this: 1) Define what nature values are, i.e. what do we want to conserve, 2) collect relevant data for the estimation, such as species distribution and corresponding environmental data where species is dwelling, 3) approximate the distribution of species (or habitat) in your analysis area with ways of, for instance, statistical modelling, 4) estimate potential threats facing nature, such as human activities leading to habitat destruction 5) integrate all developed data into a map representing nature values, with suitable methods, such as spatial conservation prioritization.

In SEAmBOTH we have followed this path, and now the results are ready.

1. DEFINE "NATURE VALUES"

First, marine biologists defined what valuable nature is with the MOSAIC tool (see details here and here). Habitats, nature types, and species were given scores from an ecological point of view. The higher the score, the more relevant it was considered for the whole marine ecosystem. Elevated scores were given, for instance, to species or habitats known to contribute to overall biodiversity or functioning of the whole marine ecosystem. For instance, fish reproduction areas and fourleaf mare´s tail (Hippuris tetraphylla) meadows.

2. COLLECT DATA ON SPECIES AND ENVIRONMENTS

SEAmBOTH has collected data for the past years using various methods, such as diving, wading, and dropvideos, and results from the biological inventories are presented here. If combined, all the data we have from the whole SEAmBOTH area, around 23,000 sites have been visited. That has been a huge effort!

Moreover, environmental data has been developed, which describe the environment where species are living and covers factors such as salinity, seafloor substrate, depth, and turbidity. Data for this has been gathered through remote sensing and by the means of geological surveys.

3. ECOLOGICAL MODELLING

Combining the information from the field (species data) and developed environmental data, statistical modelling can be used to draw correlative conclusions about species and their habitat and use that information to predict species distribution patterns across the seascape.

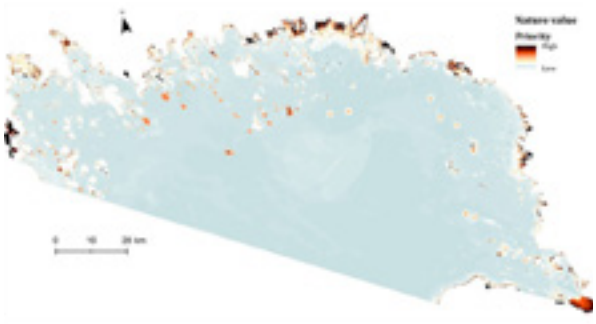
All in all, ecological models were built for 112 species, including water mosses, charales, macrophytes, and threatened species, such as Baltic water-plantain (Alisma wahlenbergii).

4. THREATS FACING NATURE VALUES

Human activities can have a profound effect on the marine environment. Habitats can be degraded due to resuspension of sediments from marine traffic, or totally lost due to dredging activities. Estimation of human activities causing pressures to nature values were based on expert judgement of the severity and intensity of the effect each activity is causing, in a MOSAIC-like fashion. Moreover, extents of activities were estimated.

5. SPATIAL CONSERVATION PRIORITIZATION

Finally, all the developed ecological and marine threat models were integrated with a spatial prioritization tool Zonation, developed for ecologically-informed land use planning. As an output, user gets a balanced ranking across the seascape, by iteratively removing cells that can be lost with smallest aggregate loss for biodiversity. Areas receiving high rank values are key areas from conservation point of view – species-rich areas, hosting various highly weighted species and habitats – and lowest degraded, pressurized areas, holding less ecological value. In SEAmBOTH area, high nature values are located for instance in shallow bays and river estuaries, which are home to juvenile fish and various threatened and rarely occurring species. In addition, valuable areas are also located in the outer archipelago, in exposed islands with less human disturbance. Let´s also keep it that way in the future.

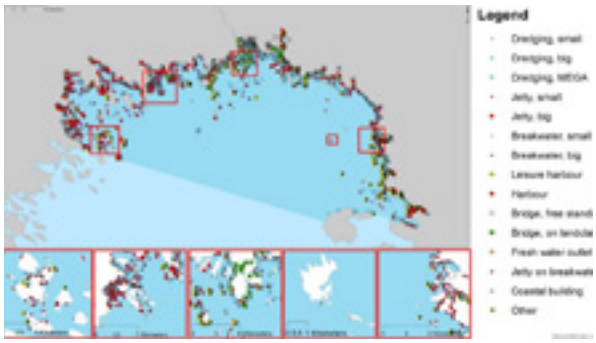


Nature values in the SEAmBOTH area, as defined by MOSAIC and Zonation. (Map by Elina Virtanen, SYKE)

Human pressures

Marco Nurmi, SYKE, 10 April 2020

We gathered data on 14 different human activities and, via expert opinion and discussion, assessed the extent and strength of the pressures caused by said activities. Though eutrophication and climate change have a strong impact on the Bothnian bay, when analyzing human pressures in SEAmBOTH we chose to focus on local human pressures as they are easier to mitigate. The data was gathered from a wide variety of sources: orthophotos, HELCOM, Finnish Transport Infrastructure Agency, Swedish National Land Survey, Swedish Maritime Administration, Vahti (Compliance monitoring system), and EMODnet.



The map of human pressures digitized from the aerial photos. (Map Metsähallitus)

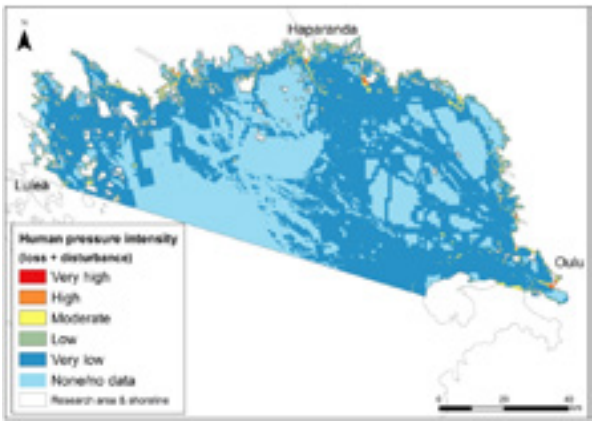
The 14 human activities were:

- Bridges
- Coastal defense and flood protection
- Deposition of dredged material
- Dredging
- Finfish mariculture
- Harbours
- Jetties (brygga/ laituri)
- Land claim (excluding harbours, oil terminals)
- Marinas and leisure harbours
- Recreational boating and sports
- Shipping density
- Wind farms (operational)
- Anchorage sites
- Fishing effort (all gear types)

Each human activity was assessed regarding two separate effects on the marine nature: physical loss of nature values and disturbance to nature values. Here loss is defined as areas were either a total or partial destruction of nature values has occurred due to direct physical action, such as a site that has just been dredged.

Disturbance is defined as areas where nature values have been affected and are under pressure from human activities but are not necessarily physically destroyed or removed, such as areas near or around dredging sites.

We created separate spatial layers for both loss and disturbance, estimating the areas affected. A so-called weight table which estimates how strongly the different pressures affect nature values was also created. By combining the weight values with the spatial layers, we



Here both maps shown above (i.e. the aggregated loss and disturbance maps) have been aggregated into a single map showing the total effects. (Map by Marco Nurmi, SYKE)

were able to create maps that estimate the extent and intensity of human pressures in the SEAmBOTH area.

Results show that a large part of the shoreline has been affected by human activity to at least some degree in the recent past. A significant contributor to pressure near the coast is dredging. Shipping effects a very large part of the SEAmBOTH area, though the effects are more diffuse than most activities and the activity is mostly relegated to deep areas. The analysis indicates that areas near Oulu, Kemi, Haparanda, and Karlsborg are most affected by human activities. As stated previously, eutrophication and climate change were not considered in the human pressure analysis.

Unfortunately, both human activities and nature values tend to accumulate at the same area; near the shoreline. Fortunately, steps can be taken to reduce the impact our activities have so that we can ensure a healthy marine nature for the future.

Earth Observation for monitoring our aquatic environment

April 2020

The SEAmBOTH project is coming to an end and it is time to look back and see what we have accomplished in the field of Earth Observation (EO). In a previous blog the basics of aquatic Earth Observation were already explained. Here, we can concentrate on what were our main results and take-home messages.

EO can strongly support modelling efforts in Bothnian Bay

The SEAmBOTH project wanted to map the spatial and temporal characteristics of water quality in the Bothnian Bay area. For this, EO is a superior tool. In particular, the project found these spatially and temporally comprehensive observations are useful in modelling of the habitats. The project concluded that monthly composites of turbidity observed in different times of the ice-free period are most beneficial support for the models, instead of trying to utilize all individual daily – and sometimes partially cloudy – satellite observations. This compresses the necessary information and reduces artifacts present in daily images generated e.g. by clouds. An example of this is shown in Figure 1. Locations where elevated values of turbidity are consistently found are visible as yellow and red areas. These include e.g. river estuaries and areas where dredging is taking place, leading to a strong resuspension of sediments.
For more details on ecological modelling and its results, there is a specific blog available also.

How can we know that the observations provided by the satellites are reliable?

The answer is validation. It is a process where EO estimates are compared to values measured in-situ, that is in the water at specific station sites. An example of this is shown in Figure 2. These two types of turbidity observations correspond very well. The station in question is visited by boat about 10 times per year. EO can provide more estimates during the same time period. Furthermore, there are elevated values in the EO data during August 2018. These observations are from a time period affected by resuspension, presumably due to wind-wave stirring, which causes bottom sediments to become resuspended in the water column. This effect is strongest in shallow waters, but the suspended material can drift over long distances along currents. Station samples were not taken during this resuspension event and thus the traditional sampling method by boat completely missed the increased values in suspended particulate matter.

Importance of high-quality station observations

The reliability of the in-situ data is essential for the validation and development of EO methods. It is therefore very important that these measurements are done with care and with correct protocols in all parts of the Bothnian Bay. The high-quality field sample observations collected during the SEAmBOTH project have been a valuable resource for the algorithm testing and development. However, development of water quality algorithms over dark water types requires long time series before a sufficient level of confidence in the results can be reached. For future work, we recommend that water quality sampling is kept at high level in this region and that the sampling follows the optical protocols defined in SEAmBOTH.

What did we learn?

The turbidity and CDOM can be estimated well in the Bothnian Bay using Earth observations. In coastal regions high resolution instruments are especially valuable, whereas the open sea areas can be well covered with moderate resolution instruments that provide more frequent observations. For Sentinel-3 OLCI data, there were many stations with good correspondence between field samples and EO values for chlorophyll-a – a quantity that is used to define the amount of algae in the water. One example of this is shown in Figure 4. The station in question was one of the stations sampled within the SEAmBOTH project. There were however, also areas where the EO methods must still be improved, in particular the areas with high amounts of humic substances. We look forward to seeing how the ongoing development of EO algorithms will solve these remaining problems.

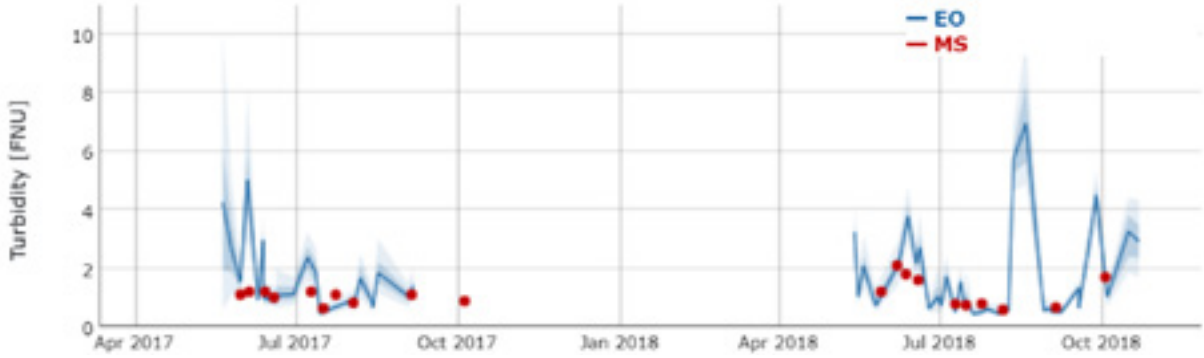
SEAmBOTH put a lot of effort in solving problems related to sampling the water quality at field and ensuring that this important work will be done with as few errors as possible. This work involved writing dedicated optical protocols and training of monitoring groups. This will serve as basis for the future high-quality field work in the Bothnian Bay and was a huge joint effort of both participating countries.

About the EO team

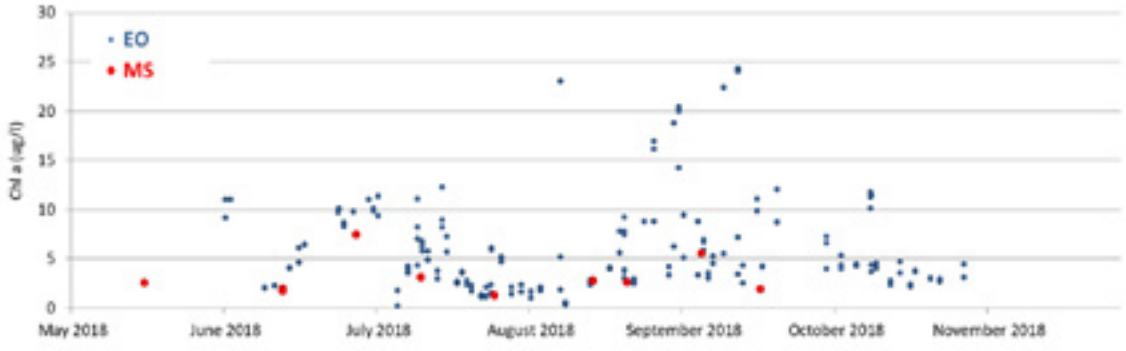
This work has been based on collaboration between three partners:

- The Finnish Environment Institute (SYKE) was responsible mainly for the development and processing related to Sentinel-2 data and the publication of results in TARKKA. For any EO related questions you can contact us through eotuki.syke@ymparisto.fi.
- Brockmann Geomatics Sweden AB (BG) was responsible for the development and processing of Sentinel-3 data.
- Stockholm University (SU) was responsible for providing in-situ measurement protocols and performing measurements in the study area. Stockholm University also measured absorption and scattering properties of the Baltic Sea which were used by SYKE to develop an improved radiative transfer model for the Bothnian Sea.

This collaboration allowed each partner to concentrate on their strengths while also learning from others by sharing data and experience.



Turbidity time series at Hailuoto intensive station measured from station samples (MS) and with Sentine2-satellite observations (EO) using the SYKE algorithm (C2RCC processor and calibration based on samples collected at station sites.



Chlorophyll a time series at station RÅNEÅ 2R sampled by SU for the SEAmBOTH project in 2018 (MS) and observed by EO instrument OLCI using the currently best model, C2RCC.

Further reading

- You can find more information about EO in here: www.syke.fi/EOstorymap.
- SU have recently published a popular science article in Swedish on how to use Sentinel-3 data to derive inorganic matter in the coastal zone from scatter. The data from SEAmBOTH was included in the algorithm development for this article: Kratzer, S. Havet från rymden - satelliter berättar, Havsutsikt, Om Havsmiljö och Svensk havsforskning, 2/2019, s. 9-11.
- A recent PhD thesis from SU gives more insight on how to use remote sensing for research and management: 'Baltic Sea from Space - The use of ocean color data to improve our understanding of ecological drivers across the Baltic Sea basin - algorithm development, validation and ecological applications'.

The thesis can be downloaded here: http://www.diva-portal.org/smash/get/diva2:1341999/FULLTEXT01.pdf

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Marine vegetation inventories

Linnea Bergdahl, Länsstyrelsen, 24 April 2020

To make maps of the marine environment, the plants, and connected nature values, one of the basic pieces of information you need is marine biological data. Not only can this data be used for making models and maps, it also tells us a lot about the underwater landscape and provides knowledge about the existence of species, how common they are, and where you may find them. For three summers during the SEAmBOTH project, field teams in Sweden and Finland collected numerous amounts of data about the plants and animals in the northern Bothnian Bay. Want to know what we found and how we found it? Scroll down and you will find our results below!

Marine biological data was collected using different methods. For collecting data on macrophytes (underwater plants) we used methods such as drop-video, wading, and scuba diving.

The common thing with these methods is that they give you information about the number of species and the extent of each species (percentage of cover for plants, for example) at the investigated point, the so-called data point. This data point has a defined area, for example 4 m2. At that point you often also collect additional information about the surrounding conditions, for example the type of bottom, the depth, the temperature, the salinity, and the visibility of the water.

During the project we collected information on macrophytes from a total of 23 661 data points located all around the northern Bothnian Bay.

In the graph above you can see that the amount of data collected on the Finnish side was substantially larger than on the Swedish side even before the start of the project. In Sweden, the SEAmBOTH project formed the first ever large-scale inventory over the marine area of northern Bothnian Bay.

In total, 167 species of underwater plants were found. Even though over a hundred underwater plant species were found, there were some species that were more common than others. The collected data shows the following top-five for most common species, which together quite well illustrate the plant life of the northern Bothnian Bay.

In total, 167 species of underwater plants were found. The findings of type of plant per country is summarized in the table below.

	FIN	SWE	Total
Charophytes (species)	10	10	10
Water mosses (species)	20	17	23
Water mosses (genera)	12	9	14
Algae (species)	15	10	16
Algae (genera)	28	20	32
Vascular plants (species)	114	113	118
Vascular plants (genera)	76	74	76
Species	159	150	167
Genera	126	113	132

Overall the species, and number of species, found in Sweden and Finland are relatively similar. The main differences in number of species can be found amongst the water mosses and algae. This may be due to slightly different environmental conditions. In Finland the shores are longer and shallower and the water is slightly saltier than in Sweden. It may also be due to the simple reason that almost four times more data points have been collected in Finland than in Sweden. As they say: the more you search the more you'll find.

The number of vascular plants species were almost identical between the two countries. Three species appeared only in Finland (or has not been found in the marine environment on the Swedish side yet); Hippuris tetraphylla (four-leaf mare's tale), Stratoites aloides (Water soldier) and Hydrocharis morsus-ranae (Common frogbit). One species was only found on the Swedish side of the Bothnian Bay and that was the invasive alien species Elodea nuttallii (Nuttall's waterweed). For more interesting information, check out the blog about the similarities and differences of species of the Swedish and Finnish side of the bay.

The water mosses are rather special to the northern Bothnian Bay. Normally such species are mainly found in lakes and streams but here they appear in the sea due to the low salinity of the sea water. In total 23 species have been identified from the area and that may not be the final number. After 12 years of intensive inventories of the marine area on the Finnish side, six new species of water mosses were found in the year of 2019. In Sweden, a limited number of water moss species were known of in the area before the start of the project.

Apart from collecting data on underwater plants, we also did some new findings of animals within the northern Bothnian Bay. On the Finnish side a round goby (Neogobius melanostomus) was observed outside of Oulu, which is the first time it has been seen that far north along the coast. The round goby is an alien species in the Baltic Sea and has mostly been seen in the southern parts, not as far north as in the SEAmBOTH area before. So this is not such a good piece of news.

It was also during a SEAmBOTH field trip that the first individual of the leaf beetle species Macroplea pubipennis was found in Sweden. It had never before been observed within Sweden but was known for existing on the opposite side of the Bothnian Bay around Oulu. Read more about the finding of the beetle and how you search for it.

The Times They Are A Changin' – and the landscape too

Aarno Kotilainen, GTK, 30 April 2020

"The Times They Are A Changin'", wrote Bob Dylan a song once, a long time ago. But it is very true still today, when the current coronavirus situation is changing the world and our societal behaviour. Also, the environment is changing, partly due to our own activities, partly by natural forces.

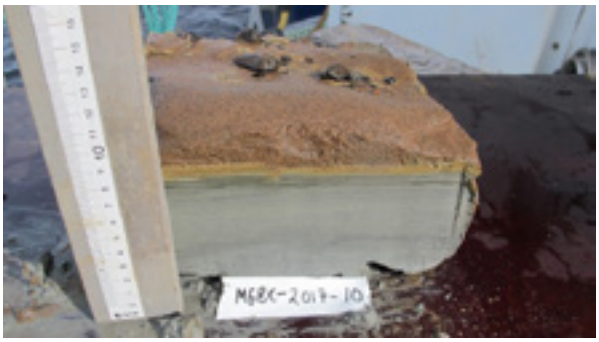
SEAmBOTH project started three years ago, and today it will end. In three years so many things happened, but somehow those years went quickly. And in geological timescales it is a very short time indeed. SEAmBOTH project provided a huge amount of new information on the northern Bothnian Bay environment, its biology and geology.

Geological Survey of Sweden (SGU) and Geological Survey of Finland (GTK) collected together 5000 km of survey line data from the seafloor with acoustic-seismic methods and seabed sampling. The produced new geological maps cover approximately 500 km2 of the seabed. SGU produced also the seabed substrate models for the whole SEAmBOTH area. The results of the project more than doubled the amount of existing geological map data of the area.

How does the seabed look like? The geological maps from the pilot areas show that the seafloor consists mainly of soft sediments, mud and silty clay. However, modern accumulation areas, areas where soft muddy sediments are deposited at the seabed, cover only small areas of the seafloor. Till material, those substrates that ice ages left us, cover around one third of the seabed. Bedrock outcrops exist very seldom in the area. However, the seabed substrate types are very unevenly distributed in different areas, e.g. in some pilot areas sand covers around 20% of the seabed, but in some areas not at all. In the shallow areas, which are not sheltered, seabed substrates are dominated by the hard substrates. In those large areas, forces like ice and wave action erode the seabed, and the eroded and resuspended material will be transported (by currents and ice), and finally accumulated in more sheltered and deeper areas.

In the broad scale, the most striking morphological features at the seafloor are canyons or canyon-like seabed features. Those probably ancient river channels cover large areas of the SEAmBOTH area. The power of the high-resolution survey is that many fine scale seabed features can be discovered, features which are not visible in coarser data. One of those fine scale features are erosional hard clay structures. In these features the clay is very compact, and it can create complex reef like structures. These features are very similar to "clay labyrinth" feature found earlier in the Finnish coastal areas by Metsähallitus, and discussed also in the earlier SEAmBOTH blogs.

The influence of human activities can be seen underwater and also under the seafloor, in this area too. Geochemical analysis of soft muddy sediment indicate, that concentrations of some harmful substances of anthropogenic origin, like cadmium, lead, zinc and mercury are recorded in the seabed sediments. The concentrations of these heavy metals in the surface sediments have generally declined over the last decades. However, in some areas, concentrations of cadmium and zinc in the subsurface sediments are still relatively high.



Seabed sediment sample from the erosional seabed area. The sample reveals that clay is covered with a thin residual sediment (mainly sand). Geologian tutkimuskeskus (GTK).

The Gulf of Bothnia, circa 2,000 years in the future. Harri Kutvonen, Geologian tutkimuskeskus (GTK).

SEAmBOTH area, and the whole Bothnian Bay, is an area of rapid land uplift, which leads to the continuous erosion of seafloor. It exposes new seafloor regimes (i.e. older deposits to seafloor) and gradually brings these to shallower depths and finally to shore. The land uplift will shape slowly but surely the coast and the seabed.

In the long run, in approximately 2,000 years, the land uplift continues and if the sea level does not rise significantly, the water connection between the Bothnian Sea and Bothnian Bay will close, and the Bothnian Bay will become the largest inland lake in Europe, i.e. the Bothnian Lake. So, this unique and beautiful area in under a constant change. We can't help the change, but we can, and we must make sure, that our seas remain in a good health for the future generations. The SEAmBOTH project ends, but the journey continues. No matter what, there's nothing permanent, except the change, even underwater.

Oodi vapaudelle

Essi Keskinen, Metsähallitus, 4. kesäkuuta 2017

Tämä kevät on ollut poikkeuksellisen raskasta aikaa töissä. Töitä on ollut liikaa, on tullut kaikenlaista sanomista, en ole ehtinyt käydä kotona kuin kääntymässä ja kertomassa miehelleni, mitä pitää pistää pyykkikoneeseen ensi viikkoa varten ja pahoitella sitä, että en ole koskaan kotona. En ole ehtinyt nautiskella töistä vaan puurtanut niska limassa. Toimistossa olen ollut yksin ja usein olen tuntenut oloni nurkkaan ahdistetuksi ja häkkiin suljetuksi, yltä, päältä, sivulta ja kaikkialta johdetuksi. Aina välillähän kaikista tuntuu töissä tältä. Nyt on tuntunut jo muutaman kuukauden ajan ja alkoi jo käydä raskaaksi.

Perjantaina Perämeren kansallispuistossa tuuli 13 m/s pohjoisesta, jäät olivat lähteneet muutamaa päivää aiemmin ja ilma oli n. +4 C ”lämmintä”. Töihin lähtiessä perjantaiaamuna tuli taivaan täydeltä räntää ja lunta.

Iltasella lähdettiin kuitenkin ensimmäistä kertaa maastoon. Mukavat sidorsyhmät mukana, paikallinen matkailuyrittäjä, sukellusseura ja meripelastajat. Kamalasti vaatetta päälle, pelastautumispuku ja paukkuliivit, huppu, lapaset. Veneeseen, ja alajuoksua ja merta kohti Torniojoen yhtä uomaa pitkin.

Torniojoen suiston kosteikolta löytyi kymmenittäin joutsenia. Merellä oli kova aallokko, mutta aurinko pääsi pilkistelemään pilvien välistä ja kultasi tien kohti horisonttia. Istuin keulassa ja katselin vuorotellen rakasta merta ja rakkaita sidosryhmäläisiä ja ystäviä. Tippa pyrki silmäkulmaan ja lähes kirjaimellisesti tunsin, kuinka kaikki toimiston murheet ja kiireet valuivat harteilta jokiveden muuttuessa mereksi. Tunsin jo luonnon parantavan, rentouttavan ja eheyttävän voiman.

Illalla matkailuyrittäjä korkkasi pullon espanjalaista kuohuviiniä. Cavan nimi oli ”Oodi vapaudelle”. Hän ehdotti maljaa ”Perämeren vapautumisesta jäiden puristuksista” ja myös osuvasti SEAmBOTH-hankkeelle, Rajaton Perämeri -yhteistyölle. ”Rajoista vapautumiselle.”

Mielessäni lisäsin vielä yhden vapautumisen - työhuoneeseen puristuneen stressaantuneen työminän vapautumisen rannattomalle merelle, kesän maastotyökentille, horisonttiin asti jatkuvalle työmaalle, rakkaiden kollegoiden ja vuosien varrella tutuiksi tulleiden sidosryhmäystävien seuralle.

Luontopalvelujen slogan on ”Teemme ilolla merkittäviä asioita”. Tämän kevään aikana olen kyllä tiennyt tekeväni paljon ja merkittävää, mutta ilo on jäänyt.

Viikonlopun sukelluksella, vedenalaisella luontopolulla, Perämeren kansallispuistossa, saunassa sidosryhmien kanssa talkooviikonlopuista keskustellen, paikallisen matkailuyrittäjän kanssa SEAmBOTH-hankkeen hyödyistä jutustellen, pelastautumispuvussa grillaten ja 0,5 m näkyvyydessä +4-asteisessa vedessä kasvilinjaa tehdessä tunsin taas löytäväni myös ilon tekemääni merkittävään työhön.

Oodi vapaudelle - rajattomalle merelle ja horisontille ja työmaalle, joka jatkuu työhuoneen ovelta meren yli Ruotsin rannikolle asti.

Sukeltaminen on seksikästä

Essi Keskinen, Metsähallitus, 14. heinäkuuta 2017

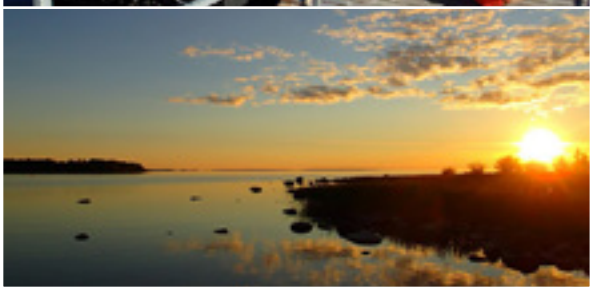
Nyt tunkee meribiologi Essi Keskistä joka tuutista! Ensin pääsin kansalliseen telkkariin Hossan kansallispuiston siivellä esittelemään sukellusta ja hämmentävästi myös suppilautailua. Satuin vain olemaan oikeassa paikassa oikeaan aikaan eli hoitamassa BioBlitzin eli lajirallin vedenalaisosuuksia kansallispuiston avajaisviikon juhlahumussa.

Viime viikonloppuna Perämeren kansallispuistossa järjestettiin sukellustalkoot, joihin osallistui paikallisia sukeltajia. Vedenalainen luontopolku laitettiin paikoilleen ja YLEn toimittaja ehätti paikalle. Pääsin ensin suoraan radiolähetykseen aallonmurtajan nokasta ja illalla lähetys vielä toistettiin.

Kun toimittaja nyt kerran pääsi kansallispuistoon asti, tehtiin samalla juttu SEAmBOTHista eli rajat ylittävästä vedenalaiskartoitushankkeesta, jonka Interreg Nord rahoitti. Sovittiin, että koska tämä on seuraavan kolmen vuoden asia eikä sinänsä päivän päälle ajankohtainen, jutun voi lähettää sopivassa välissä joskus myöhemmin että kansa ei saa ähkyä sukelluksesta.

Yllätys oli suuri kun pari päivää sitten alkoi tulla tekstiviestejä sukulaisilta, jotka olivat bonganneet minut YLE Lapin uutisissa.

Sukellus ja vedenalaiset kartoitukset on edelleen mediaseksikäs aihe. Se on laji, jota suurin osa ei ole koskaan kokeillut, joka vaatii erityistaitoja ja -koulutusta, ei ole erityisen halpaa ja vaatii panostusta. Monella ei ole mitään käsitystä siitä, miltä meren pinnan alla Itämerellä näyttää - moni on nähnyt vain BBC:n ja muiden ulkomaisten dokumentintekijöiden kuvauksia koralliriutoilta ja muista eksoottisista paikoista.



Itämerellä ja erityisesti Perämerellä on erilaista, ja ehkä sukellus on siksikin jännittävä aihe. Ja kun kerran olen ryhtynyt olemaan meribiologin kasvot täällä Perämerellä, anti mennä sitten vaan! Nettiuutisen kuvaan päädyin sukellukseen tarkoitetussa aluspaidassa kun kuvittelin jutun olevan menossa radioon.

Jos jo kyllästyit meribiologi Keskisen ainaiseen sukeltamiseen, ei tarvitse odottaa kuin talveen - kyllä minä taas häviän eetteristä kun jää peittää työpaikan.

Tietoa kansalle

Essi Keskinen, Metsähallitus, 21. heinäkuuta 2017

Ennen juhannusta työsähköpostiin kilahti heinäkuuksi kahden päivän kutsu Krunniin. Kutsun oli lähettänyt Maakrunnin säätiön hallituksen puheenjohtaja. Tarkoituksena oli ”tavata jälleen Krunnien kivikoissa” ja keskustella, mitä vuodessa on tapahtunut, jutella suojelualueen tulevaisuudesta ja yleensäkin tutustuttaa sidosryhmät Ulkokrunnin upeaan luontoon.

Minä kerroin, että tiimini on joka tapauksessa tekemässä maastotöitä Ulkokrunnissa ja että tulisimme mielellämme esittelemään tekemäämme työtä ja vasta alkanutta Interreg Nordin rahoittamaa Rajaton Perämeri – SEAmBOTH –hanketta. Säätiöstä ilahduttiin ja otettiin tarjous vastaan.

Sateisena ja tuulisena heinäkuun päivänä Iin meripelastusseura kuljetti kutsun vastaanottaneet Pihlajakariin, Ulkokrunnin eteläpuolelle. Kutsuttujen sidosryhmien listalta löytyivät Metsähallituksen lisäksi mm. Oulun yliopisto, Perämeren tutkimusasema, Iin kaupunki, Meripelastajat, Meritaito, ELY-keskus jne. Bunuksena saimme vielä SUP-laudalla Virolahdelta kesäkuun alussa lähteneen nuoren miehen, jonka määränpää oli Tornio (https://www.facebook.com/rannikko2017/)

Kerroin porukalle siitä, mitä minä teen työkseni, mitä tiimini tekee kesäisin, miksi keräämme meriluontotietoa ja mitä uutta SEAmBOTH-hanke tuo tullessaan. Näytimme Johannan aikanaan tekemiä hienoja maastokelpoisia, laminoituja esittelytauluja ja laitoimme vasta tehtyjen kahlauslinjojen muistiinpanot kiertämään. Lopuksi sain aplodit ja ison määrän mielenkiintoisia kysymyksiä vastattavakseni.

Seuraavana päivänä delegaatio kävi vielä tutustumassa tiimin laitteisiin Perämeren tutkimusasemalla, missä olemme pitäneet maastotukikohtaa pian neljä viikkoa. Esittelimme HD-kameraa, sukellusvarusteita, mikroskopointia ja Maia-veneen.

Väki vaikutti kiinnostuneelta ja kyseli lisää. Kertoi että teemme hyvää ja mielenkiintoista työtä. Kiitteli kovasti.

Tällaiset sidosryhmätapaamiset ovat omasta mielestäni äärimmäisen tärkeitä. Työskentelemme yksityisellä suojelualueella säätiön hallituksen luvalla, yövymme Oulun yliopiston Perämeren tutkimusasemalla, teemme yhteistyötä Meripelastusseuran kanssa, olemme kollegoja ELY-keskuksen työntekijöiden kanssa, käytämme Meritaidon tietoja ja välillä heidän apuaankin ja Iin kaupunki käyttää keräämiämme tietoja suoraan merialuesuunnitteluun. Minun on hyvä tietää, kuinka muut voivat hyötyä keräämistämme datoista, ja muiden on hyvä tietää, millaista dataa me keräämme. Luontopalvelujen slogan on ”Teemme ilolla merkittäviä asioita”. Tämän kevään aikana olen kyllä tiennyt tekeväni paljon ja merkittävää, mutta ilo on jäänyt.

Toivon jokaisen Krunnilla vierailleen menevän illalla tyytyväisenä kotiinsa, kertovan puolisolleen ja perheelleen SEAmBOTH-hankkeesta ja Metsähallituksen meritiimistä, kertovan huomenna tai loman jälkeen töissä kollegoilleen, ja kollegoiden taas kertovan meriluonnon kartoituksen ilosanomaa vielä eteenpäin. Kun sana leviää, yhä useampi meriluontotietoa tarvitseva tietää, mistä sitä löytyy tai keneltä kysyä, ja me tekijät puolestaan opimme, millaista tietoa tarvitaan ja missä muodossa.

Tieto on kaksisuuntaisen moottoritien keskellä oleva tietulli - kummastakin suunnasta täytyy päästä suoraan tullille ja kaistojen johtaa samoihin päämääriin.

Tuulisena päivänä meritiimi marssii metsän halki Ulkokrunnin eteläpäätyyn tekemään kahlauslinjoja.

Metsähallituksen SEAmBOTH-tiimi, Maakrunnin säätiön hallituksen väkeä, Perämeren tutkimusaseman avustajia ja SUP-laudalla Virolahdelta meloskellut seikkailija.

Vironlahdelta puoltatoista kuukautta aiemmin lähtenyt SUP-lauta, joka jo edellispäivänä pääsi perille Tornioon.

Ihanat kaivosmiehet

Essi Keskinen, Metsähallitus, 7. elokuuta 2017

Lauantaina 5.8 Tornion Leton satamassa pidettiin Päivä merellä -tapahtuma, jo kolmatta kertaa. Myös jo kolmatta kertaa Metsähallituksen meritiimi osallitui tapahtumaan, tänä vuonna erityisesti SEAmBOTH-hankkeen esittelyn kautta.

Olin vielä aiempiakin vuosia kiireisempi koko neljän tunnin ajan, jolloin tapahtuma oli avoinna yleisölle. Kymmeneen minuuttiin minulla ei ollut asiakkaita ja ehdin tilata itselleni letun ja käydä vessassa. Muutoin pisteeni ympärillä pörräsi koko ajan joukko kiinnostuneita veneilijöitä, paikallisia, mökkeilijöitä, aikuisia, lapsia, vanhuksia, eläkeläisiä, kauempaa ja lähempää tulleita, meren kanssa tekemisissä olevia ja maakrapuja. Sisäänheittotuotteina toimivat tietokoneella pyörivät videot, joita otamme merenpohjasta ja pöydällä lojuvat A4-kokoon tulostetut laminoidut valouvat Perämeren pohjan lajistosta.

Kaksi vierailijaa jäi erityisen positiivisesti mieleen. Paikalle pölähti ikäiseni nuorimies aina Kolarista asti, ja rupesi heti kyselemään videoista. Kerroin. Hän jatkoi kyselyään, katsoimme SEAmBOTH-kartat tarkkaan, hän kyseli lisää. Erityisen kiinnostunut hän oli pohjanlaatukartoista, koska oli kaivoksella kairaajana. Juttelimme hyvinkin yli kymmenen minuuttia, ja sitten hän sanoi hakevansa kaverinsakin.

Hetken päästä mies palasi kaverinsa kanssa ja pyysi minua selittämään kaiken uudelleen, ”kun se on niin mielenkiintoista”. Kävimme samat asiat läpi uudelleen ja ensimmäinen mies selitti vielä lisää kaverilleen, jos olin hypännyt jonkun kohdan yli. Kaverikin oli kiinnostunut, kyseli paljon. Juttu ajautui ympäristönsuojeluun ja siihen, että Perämeri on aina loppupeleissä se kaiken maalta valuvan veden vastaanottaja. Pääsimme kaivosasioihin, ja ilmeni, että kaverikin oli kaivosmies. Olivat yhdessä kiertäneet rakentamassa kaivoksia ympäri Pohjois-Skandinaviaa.

Talvivaarassakin olivat olleet rakentamassa. Siitä kuuluisasta vuotavasta altaasta oli paljon puhetta. Miehet sanoivat että näkiväthän kaikki rakennusmiehet jo silloin, että ”ei tämä pressu tule pitämään, mutta mitäpä me raksanmiehet siinä voitiin tehdä”. Kaveri oli ollut enemmän töissä Ruotsissa ja kertoi, että siellä tehtaan tai kaivoksen ympäristöosasto on kingi ja sen sanaa kuunnellaan. Kaikki pyritään tekemään niin ympäristöystävällisesti kuin mahdollista, vaikka se maksaisi enemmän, mutta ympäristöystävällisyys on myyntivaltti. Tulevat kuulemma Suomeenkin tarkastamaan kaivoksiensa tuotteiden tehtaita ja niiden kierrätysjärjestelmiä ja muuta. ”Milloin Suomessa opitaan että kerralla se pitää tehdä kuntoon, ei ympäristöä sitten enää jälkikäteen voi korjata?” Molemmat kehuivat että me meritiimiläiset teemme hyvää ja tärkeää työtä. Kummankin mielestä oli erinomainen ajatus aloittaa SEAmBOTH-hankkeen rajat ylittävien karttojen luominen, koska ”yhteinen vesihän siinä velloo”.

En voinut kuin myötäillä näitä kahta viisasta

Kymmenet ihmiset kävivät tutustumassa SEAmBOTH-hankkeeseen ja Perämeren meritiimin toimintaa.

kaivosmiestä. Vaikka heidän ammattikunnassaan ehkä ylpeys saattaa olla kiinni ympäristöasioiden hoitamisesta, varsinainen tuote eli louhittavat metallit tai raaka-aineet eivät välitä siitä, missä kunnossa ympäristö toimenpiteen jälkeen on. Maaperän mineraalit pysyvät vaikka ympäristö tuhoutuisikin.

Sitten keskusteluun liittyi paikallinen kalastaja. Hän taas oli sitä mieltä että Keski-Euroopassa pellotkin äestetään suoraan jokiin ilman minkäänlaista suojavyöhykettä ja lanta ja muut ravinteet ajetaan pelloille missä vain säässä niin että erityisesti sateella ne huuhtoutuvat suoraan jokiin. ”Täällä Suomessa taas täytyy kysyä kaikkeen lupa ja mihinkään ei saa lupaa ja ollaan niin niuhoja että!” Kuitenkin tämän miehen elinkeino eli kalastus on täysin riippuvaista siitä, missä kunnossa Perämeri ja sen kalakannat ovat. Luulisi siis, että ympäristönsuojelu kiinnostaisi jo hiukan noin niin kuin ammatinkin puolesta. Mutta ei.

Näin me olemme erilaisia ja näemme ja koemme ympäristöasiat ja erityisesti luonnonsuojelulliset näkökulmat eri tavoilla. Toivottavasti viisaiden kaivosmiesten näkökulma tulevaisuudessa voittaa alaa.

Sukellus erilaiseen pohjaan

Essi Keskinen, Metsähallitus, 11. elokuuta 2017

SEAmBOTH-tiimin toinen Essi täällä hei!

Kartoitustyöt Perämeren kansallispuistossa ovat olleet tämän kesän osalta käynnissä nyt kaksi viikkoa ja olemme ehtineet tekemään merellä jo vaikka mitä! Sekä Maia että pieni peltipurkkimme Pirkka-vene ovat kiitäneet tuulen lailla videokuvaamassa merenpohjaa, uhanalaisia lajeja Alisma wahlenbergii eli upossarpio sekä Crassula aquatica eli paunikko on etsitty niiden aikaisemmilta vuoden 1991 esiintymispaikoilta, rantoja on kartoitettu vesikiikarein Selkä-Sarvessa, Maa-Sarvessa, Tornionjoen sekä Kemijoen suistoissa ja sukelluskartoituksia on päästy tekemään Herakarin krunnilla sekä Linnanklupulla.

Yksi harvinaisen erikoinen sukellus koettiin Essin kanssa Herakarin krunnilla. Ilma sukelluspäivänä oli huikea: lämmin aurinko porotti kirkkaalta taivaalta ja tuultakin oli vain 5 m/s. Kuivapuvut vedettiin niskaan hien virratessa (veden alle on pakko laittaa hyvin vaatetta pitkillä sukelluksilla Suomen olosuhteissa, mutta kamppeita pukiessa pinnalla tulee aina kuuma!) ja Essi totesi, että sukelluslamput on hyvä laittaa jo pinnalla päälle, sillä tuulet ovat saattaneet sekoittaa vettä niin että näkyvyys on huono.

Hieman skeptisenä laitoin lampun jo pinnalla päälle. Olihan syvyys vain vaivaiset 4 metriä, kyllähän siellä nyt edes hieman jotain pitäisi nähdä! Lamput päällä ja näytepatterit ja -pussit sekä kirjoitusalustat tasapainoliiveissä kiinni lähdimme laskeutumaan kohti sukelluslinjan päätä. Maailma pimeni ensimmäisen puolimetrisen jälkeen. Pimeyden läpitunkevuus oli täysin häkellyttävää. Pohjaa en nähnyt laskeutuessa lainkaan, ainoastaan tunsin, kun räpylä sinne osui. Onneksi olimme laskeutuneet Essin kanssa aivan vieretysten, joten sukelluslamppujen valoilla, joiden valaistus ylsi noin puoleen metriin, pystyimme näkemään toisemme. Korjasin pohjan tuntumassa näytepussien ja kameran asentoa, sillä niillä on tapana aina takertua johonkin. Taisin ottaa tavaroita siirrellessä epähuomiossa muutaman potkun sivuun ja kun käännyin takaisin katsomaan Essiä ja linjan päätä, ympärillä oli vain mustaa. Etäisyys meidän välillä ei varmastikaan ollut edes kahta metriä, mutta sukelluslamppujen valo ei riittänyt mihinkään. Hetken toisiamme pilkkopimeässä pohjassa etsittyämme nousimme molemmat pintaan ja teimme suunnitelman pysyä toisissamme lähes kiinni.

Kartoitus päästiin aloittamaan, mutta harvoinpa se sukeltamalla on niin kökköä kuin tuolla kertaa tuntui. Pohja oli kokonaan mutaa ja pienikin räpylän tai käden hipaisu nosti vesipatsaaseen valtavan tomupilven. Näkyvyys siis vaihteli välillä puoli metriä - oma nenän pää. Mudassa viihtyi ainoastaan paikoitellen pikkujärvisimpukka Anodonta anatina, muuten oli tyhjänlaista.

Tällä kertaa kuitenkin odottavan aika palkittiin ja sukelluksen kökkö alku muuttui linjan loppua kohden mentäessä aivan mahtavaksi! Pohja vaihtui

hiekaksi saaren läheisyydessä ja matalammalle syvyydelle valo tunkeutui jo hienosti. Mutta kaiken kruunasi valtoimenaan ja korkeana kasvavat erilaiset vesisammalet. Ahvenen mötikät kävivät ihmettelemässä touhujamme ja pohja oli täynnä elämää. Pysähdyimme molemmat vain ihmettelemään pohjan kauneutta. Näytepatterit saatiin täytettyä lukuisilla lajeilla ja lopulta pintaan nousi kaksi hyvin iloista Essiä.

PS. Taisit jäädä miettimään miten jännitysnäytelmä "uhareiden etsintä" upossarpion ja paunikon osalta päättyi. Upossarpiota Maa-Sarvesta edelleen löytyy, mutta valitettavasti paunikko ei osunut kartoittajien silmiin. Kartoitushan suoritetaan sahaamalla pikku tarkasti vesikiikarein kartoitettavaa rantaviivaa. Paunikko on hyvin pieni vesikasvi, joten työ on kuin neulaa heinäsuovasta etsisi. Toivotaan siis, että edelleen siellä muutamia pieniä yksilöitä onnellisesti kasvaisi ja ne vaan pienuutensa vuoksi jäivät muun kasvillisuuden piiloon.

Suomen luonnon päivänä

Essi Keskinen, Metsähallitus, 27. elokuuta 2017

Kemin kuoro esiintyy Kemin sisäsatamassa Katariina-laivan kannella Suomen luonnon päivänä 26.8.2017

Jokainen on varmaan jo havahtunut huomaamaan, että Suomi täyttää tänä vuonna 100 vuotta. Suomen luontoa on juhlittu neljänä eri vuodenaikana #luonnonpäivät -tapahtumilla, ja luonnon juhlavuosi huipentui eliseen Suomen luonnon päivään. Liput nousivat salkoon ja lähes jokaisessa Suomen kansallispuistossa lauloi kuoro. (Suomi on muuten ensimmäinen maa maailmassa, jolla on nyt virallinen liputuspäivä luontonsa kunniaksi. Jo yksi sitä sietäisi juhlia! http://metsahallitusmerella.blogspot.fi/2016/12/liputuksen-arvoinen.html)

Suomen luonnon päivänä lauantaina 26.8.2017 Suomi täyttyi erilaisista tapahtumista. Oli illallista tähtitaivaan alla, perhetapahtumia, tansseja, markkinoita ja tietysti ne kuorot.

Yllättävän moni huomasi saaneensa roskan silmäänsä kun kuoro kajautti viimeisenä Finlandia-hymnin.

Yhdistetty Perämeren ja SEAmBOTH -hanketiimi eli minä ja työharjoittelija Mikko esittelimme Kemin sisäsatamassa Metsähallituksen meribiologista toimintaa, SEAmBOTH-hanketta ja Perämeren kansallispuiston vedenalaista luontoa. Jälleen kerran yllätti positiivisesti, kuinka monet pysähtyivät juttelemaan, katsomaan kuvia ja kyselemään, joskus pitkäksikin aikaa. Lopuksi moni toivotti ”Teette hyvää työtä, hieno juttu!” Saumaton Perämeri -hankkeeseen todettiin aina että ”kuulostaa järkevältä tehdä yhtenäisiä karttoja Perämerestä yhdessä ruotsalaisten kanssa, ihme ettei sitä ole tehty jo aiemmin”. Kaikki eilen liikekannalla olleet ihmiset ymmärsivät luonnon arvon ja olivat yhtä mieltä siitä että sitä pitää suojella tulevaisuutta varten.

Kiitän koko sydämeni pohjasta kaikkia vierailijoita, kuoroja, veneilijöitä, Pohjanmaan luontokuvaajia, Katariina-alusta ja koko Kemin satamaa hienosta ja lämminhenkisestä tapahtumasta eilen. Huolimatta

Suomen kesän heittämästä haasteesta (+7 astetta lämmintä, kova tuuli ja tihkusadetta eli päällä oli pitkien kalsareiden lisäksi pipo, fleece ja sormikkaat) kiitän kaikkein eniten Suomen luontoa, joka on antanut syyn näin hienojen tapahtumien järjestämiseen.

Onnea Suomi 100 v ja onnea Suomen luonto!

Koululaiset mereen

Essi Keskinen, Metsähallitus, 6. lokakuuta 2017

Mikäs sen parempi kohderyhmä Itämeren suojelusta kertomiselle kuin koululaiset? Nuorissa on tulevaisuus ja nuoret sitä merta suojelevat sitten kun meistä tämänhetkisistä meribiologeista aika jättää. Tämän hetken nuoret ovat niitä, jotka käyttävät Itämeren ekosysteemipalveluja tulevaisuudessa ja pääsevät hyötymään nykyisestä sini(vihreästä) kasvusta.

Kukaan ei osaa suojella sellaista mitä ei ymmärrä ja mistä ei tiedä mitään. Tällä ajatuksella Perämeren meritiimi on jo monena kesänä tehnyt yhteistyötä Perämeren rannikon koulujen kanssa ja vienyt koululaisia joko rannalle tai kirjaimellisesti Perämereen.

http://metsahallitusmerella.blogspot.fi/2015/09/perameri-road-show-eli-koululaiset.html
http://metsahallitusmerella.blogspot.fi/2014/08/paivani-murmelina-ei-vaan-opettajana.html

Tämänvuotisetkaan yläkoululaiset eivät pettäneet - ”Onks mun meikit levinneet?” ja ”Yök! Tän hihat on jo märät!” -huudoista huolimatta nuoret eivät jättäneet käyttämättä tilaisuutta käydä pelastautumispuvussa meressä tiirailemassa vesikiikarin läpi hiekkarannan kasvillisuutta (ahvenvitoja, hentovitoja, letkuleviä, rihmaleviä).

Moni halusi kokeilla päälleen sukellusliiviä ja -pulloa ja hengittää regulaattorista. Kaikille oli yllätys, että sukeltajan varustus painaa niin paljon.

Omakohtaiset elämykset ovat aina niitä, jotka jäävät parhaiten mieleen. Se, että pääsee itse kahlaamaan mereen ja katsomaan vesikiikarilla, voi hengittää regusta ja kokeilla sukeltajan kirjoituslevylle kirjoittamista. Siinä sivussa saa nuoren päähän ujutettua edes hiukan tietoa - Perämeressäkin on paljon lajeja, mutta sieltä puuttuvat mereiset eteläsuomalaiset lajit kuten rakkohauru, sinisimpukka ja merirokko, meren vedenalaista luontoa kartoitetaan jotta sitä pystyttäisiin paremmin suojelemaan ja Itämeren suojelu on jo lähtenyt tehoamaan - meri ei enää ole samanlainen läpinäkymätön leväpuuro kuin vielä viisitoista vuotta sitten.

Samalla päästiin kertomaan merialuesuunnittelusta ja sen kansainvälisistä ulottuvuuksista. Perämeri on suhteellisen pieni merialue ja Suomi jakaa sen Ruotsin kanssa. Vesi ja lajit eivät kuitenkaan ymmärrä pysähtyä rajalla, vaan jatkavat vellomistaan valtioista välittämättä. Interreg Nord -rahoitteisessa SEAmBOTH - Saumaton Perämeri -hankkeessa Ruotsin kanssa tehdään yhteistyötä ja luodaan rajat ylittäviä karttoja tulevaisuuden merialuesuunnittelun tueksi. Koululaisia naurattivat nykyiset kartat, joissa jopa vesi loppui Ruotsin rajaan.

Parhaimman kiitoksen sain kasiluokkalaiselta tytöltä. Hän huikkasi lähtiessä ”Kiitti, oli tosi mielenkiintoinen päivä! Edes mun isoveli ei ole saanut kokeilla mitään tällaista!”

Paperilta maastoon ja takaisin

Essi Keskinen, Metsähallitus, 14. marraskuuta 2017

SEAmBOTH-hankkeen projektiryhmä kokoontui Haaparannassa upean Stads Hotellin tiloissa. Haparanda-Tornio on niin lähellä neutraalia maaperää ja hankerajaa kuin on mahdollista.

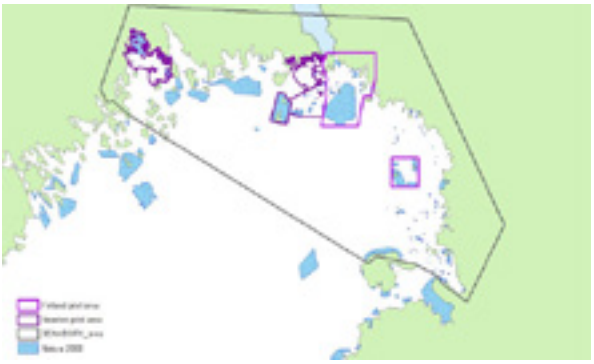
Välillä tuntuu, että meribiologin työ on kokouksia toistensa perään ja väliajat kuluvat organisaatiokaavioiden ja työpakettien suunnittelusta. Viimeisin kokous oli kaksipäiväinen SEAmBOTH -Interreg -hankkeen rutistus Haaparannassa Ruotsissa.

SEAmBOTH eli Rajaton Perämeri -hanke aloitti toukokuusta ja porskutti iloisesti kuuden partnerin voimin kesän maastokauden halki. Oli riemullista kuunnella partnereiden selostuksia Haaparannassa - GTK on luodannut Perämeren kansallispuistossa, ELY on ottanut vesinäytteitä, Norbottenin lääninhallitus on tehnyt kasvillisuuskartoituksia, Metsähallitus on sukeltanut, videokuvannut ja kahlannut, SGU (Ruotsin geologian tutkimuskeskus) on miettinyt uusia menetelmiä, joita hankkeessa voisi hyödyntää ja SYKE on aloittanut jo olemassaolevan datan keräämisen ja kaukokartoitusmenetelmien hyödyntämisen.

Hankepartnerit olivat innostuneita, kaikki olivat aloittaneet työt, työpakettien vetäjät ovat pohtineet omien töidensä haasteita. Ilmapiiri oli kannustava, innovatiivinen, positiivinen. Tällaista luonnonsuojelu ja hanketyöskentely parhaimmillaan on!

Vaikka työ välillä tuntuukin hieman paperinmakuiselta ja tomuiselta toimistolta, innostuksen tuulet puhaltavat kuitenkin näköjään koko ajan. Ja tulevathan lopputuotteet olemaan konkreettisia karttoja, jolle meriluonto toivottavasti saadaan siirrettyä sekä kansalaisia että päättäjiä palveleviksi havainnollisiksi painotuotteiksi.

Seuraava kokousmatka on Helsinkiin merialuesuunnittelun työpajaan, ja sen jälkeen SEAmBOTH pyrkii suuntaamaan ulkomaille aina Kaliforniaan GEOHAB-kokoukseen asti.



SEAmBOTH-hankealue kattaa pohjoisimman Perämeren. Pilottialueilta on tarkoitus saada aikaiseksi peittävät tiedot, muualta hankealueelta mahdollisimman kattavat vedenalaisen luonnon karttatuotteet.

Tämän kesän maastokartoitusten tulokset on jo analysoitu ja naputeltu tietokoneelle, mutta tietojen tarkistus kestää vielä tovin. Sitten onkin jo aika ryhtyä rekrytoimaan SEAmBOTH-hankkeeseen suunnittelijaa. Koko ajan tuntuu tapahtuvan jotain ja asiat rullaavat eteenpäin. Ja vanhasta kokemuksesta tiedän jo, että eipä aikaakaan, niin ensi kesän maastokartoitukset ovat ovella.

Odotan innolla, mitä kaikkea tämä hanke vielä saakaan aikaiseksi!

Kuva kertoo enemmän kuin tuhat sanaa?

Essi Keskinen, Metsähallitus, 17. marraskuuta 2017

Interreg Nord -hanke SEAmBOTH sai juuri oman logon! Omasta mielestäni logo on rauhallinen ja kaunis, sen väritys vie ajatukset mereen, ja logo kertoo sen mitä yritämme koko hankkeella ajaa takaa - Suomen ja Ruotsin rajaviivan häivytystä, tietojen yhdistämistä, saumattomien karttojen luomista.

Logoja voi kuitenkin lukea niin monella tavalla. Koska olen hankkeen koordinaattori, oletan heti, että vetoketjua ollaan vetämässä kiinni. Moni tietysti näkee aukeavan vetoketjun ja rajalta halkeavan Perämeren. Näkökulmaero.

Hankerajaa (tummemmalla sinisellä värjätty pohjoisin osa) ei välttämättä näe jollei tiedä sen olemassaolosta, mutta hankkeeseen perehtyneille rajaus kertoo kaiken oleellisen.

Logossa yritettiin käyttää myös neulaa, joka olisi ”saumattomuuden” kanssa sopinut paremmin kuin vetoketju (vetoketjuhan ei tee saumaa, se vain sulkee kaksi kappaletta yhdeksi). Neulalla kokoon kursittu raja näytti kuitenkin melko lailla korsetilta, ja Ruotsia kohti sojottava terävä neula vaikutti jokseenkin aggressiiviselta.

Englanninkielinen slogan ”seamless Bothnian Bay” syntyi helposti, kun sanaa saumaton eli seamless käytetään englanniksi samoin kuin Suomen sanaa saumaton - kertomaan siitä että asia on yhtenäinen, yhteensopiva, se ei ratkea ainakaan tästä kohtaa koska siinä ei ole saumaa. Myös ajatukset voivat osua saumattomasti yhteen, ja #SEAmBOTH -hankkeessa pyritäänkin juuri siihen, että tulevaisuudessa ympäristöviranomaiset ja muut asioista päättävät tai niihin vaikuttavat pystyisivät hoitamaan pohjoisinta Perämerta saumattoman suunnitelman avulla - ilman, että ajatukset ja käytännöt muuttuvat rajaviivan toisella puolella yhtäkkiä toisiksi.

Ruotsiksi saumaton Perämeri olikin sitten hankalampi kääntää. Ruotsia taitamattomana olin ajatellut yksinkertaisesti, että saumaton, seamless, on tietysti sömlöss ruotsiksi. Ruotsalaiset partnerit kertoivat kuitenkin, että ei se ihan noin helposti mene. Ruotsiksi sanaa ei kuulemma käytetä samassa merkityksessä eikä ainakaan kuvaannollisesti saumattomuudesta kertomaan.

Ruotsiksi Perämerestä tuli siis ”rajaton”, ”gränslösa”. Käännöksenä tämän merkitys on mielestäni hieman eri. Minulle tulee mieleen rannaton ulappa ja pikemminkin maa-alueet häviävät ympäriltä kuin sauma Suomen ja Ruotsin väliltä. Toisaalta, rajaton tarkoittaa kirjaimellisesti rajatonta - ei valtioiden rajaa. Käännös on siis kuitenkin osuva.

Myös SEAmBOTHin nimestä väännettiin aikanaan kättä. Monen mielestä hankkeen nimi on hankala eivätkä he tiedä, miten lausua se. Hankkeen virallinen kieli on englanti eli hankenimikin äännetään englanniksi [siimboth], mutta ei se suomeksikaan hankala ole ääntää.

Englanniksi koko hankkeen nimi kuuluu juhlavasti ”Seamless Maps and Management of the northern BOTHnian Bay” eli ”Saumattomia karttoja ja hallinnointia pohjoisella Perämerellä”. Minusta akronyymi SEAmBOTH sanoo sen kaiken - SEA, kuten meri, SEAm kuten sauma, BOTH kuten molemmat (Ruotsi ja Suomi) ja samalla BOTH viittaa Perämereen eli Bothnian Bayhin. Nerokasta, eikö totta?

Nyt kun meillä on uusi upea logo, sitä pitää päästä käyttämään! Kaikilla kielillä ja kielimuureista ja -rajoista huolimatta.

SEAmBOTH
Seamless Bothnian Bay

SEAmBOTH
Saumaton Perämeri

SEAmBOTH
Gränslösa Bottenviken

Toimistopäiviä ja toimistopäiviä

Essi Keskinen, Metsähallitus, 23. marraskuuta 2017

Kesälläkin joudutaan joskus jumittamaan toimistoon. Silloin tässä kolmen hengen huoneessa saattaa parhaimmillaan työskennellä lähes kymmenen henkeä.

Istun toimistossa. Työpisteitä on kolme mutta olen täällä yksin. Ulkoa näkyy parkkipaikka, pyöräkatos, tupakointipiste ja sen jälkeen Destian toimistorakennus.

Ilmastointi humisee, tietokone humisee, yläkerrasta kuuluu korkojen kopinaa, autot rullaavat edestakaisin, käytävästä kuuluu kun joku kailottaa Skype-kokouksessa ilman kuulokkeita ja mikrofonia.

Vessa on käytävän päässä ja toimii juoksevalla vedellä. Yläkerran keittiön kraanasta tulee vettä, jonka voi lämmittää teeksi vedenkeittimellä. Sähkö tulee seinästä. Sinne se tulee Oulun sähköverkosta.

Keittiössä on jääkaappi ja siellä minun evääni, jotka lämmitän mikrossa lounaaksi.

Lounaan jälkeen täytän vielä kaksi uhanalaiskorttia tietokoneella ja tulostan ne valmiiksi ennen kuin naputan ne Hertta-tietokantaan netissä. SEAmBOTH-hanke löysi lähes neljäkymmentä esiintymää uhanalaisia, vaarantuneita tai alueellisesti uhanalaisia kasvi- tai sammallajeja tämän kesän kartoituksissa, ja nyt tiedot pitää taltioida.

Kesällä toimistotyö oli toista. Sähkö tuli polttoainekäyttöisestä aggregaatista, jota piti silloin tällöin käydä ruokkimassa. Polttoaine tuotiin jerrykannuissa mantereelta. Vessa oli ulkohuussi pihan perällä. Mukava jaloittelutauko, paitsi kaatosateella. Ja Krunneilla tietysti hyttysten syötävänä.

Ikkunasta näkyi kesällä merenrantaniitty ja sitten meri, perinnebiotooppeja hoitavat lampaat ja huviveneilijöitä, tai Krunneilla ei koskaan ketään, koska saarella ei saa liikkua kuin tutkimusluvalla. Äänimaailmana oli kohiseva meri ja rantaan kaatuvat aallot, lokin kirkaisut ja puiden suhina.

Krunnien maastotukikohta Perämeren tutkimusasema ja tuulipäivän toimisto ruokapöydällä.

Netti toimi yleensä todella huonosti, välillä tekstiviestitkään eivät meinanneet päästä mantereelle asti. Uhanalaiskortit kirjoitettiin käsin ja paperille. Jääkaappi oli maakellari tai varastossa kaasulla tai akulla toimiva pieni matkajääkaappi.

Krunneilla riitti tilaa - suuren olohuoneen ruokapöydän ääreen mahtuu vaikka kymmenen työskentelijää, ja sohvalla oli mukava loikoilla videoita analysoidessa. Sarven pienen neljän hengen mökin pöydän ääreen mahtui hädin tuskin neljä henkeä, ja viides joutui työskentelemään kerrossängyllä maaten tai istuen.

Lounas lämmitettiin kaasuhellalla ja syötiin sylissä tai ulkona, jos toimistopöydän raivaaminen mikroskoopeista ja näytteistä oli liian työlästä. Sopu antoi kuitenkin aina tilaa. Täällä kaupungissa olen toimistossa usein yksin.

Toimistopäivissä on eroa. Maastossa ne eivät tunnu toimistopäiviltä lainkaan.

Vuoden lyhin päivä

Essi Keskinen, Metsähallitus, 21. joulukuuta 2017

Tänään on vuoden lyhin päivä. Täällä Oulussa aurinko on noussut klo 10.29 ja laskee jo klo 14.03. Laskennallista ”auringonpaistetta” saadaan siis kolme ja puoli tuntia.

Tänään taivas on kuitenkin paksun harmaan pilviverhon peittämä ja välillä sataa räntää, välillä vettä. Tänään on ollut hyvä päivä tallentaa kesän SEAmBOTH-hankkeen maastokartoitusten uhanalaishavaintoja Eliölajit-tietokantaan. Vaikka ”uhanalaisen lajin maastolomake” on täytetty jo kesällä, on joitakin tietoja pitänyt kaivaa sukelluspöytäkirjoista ja maastolomakkeista ja samalla on tullut muisteltua kesää.

Kesän pisin työpäivä oli pitkä sekä tuntimäärällisesti että auringonkierron kannalta. Päivä osui heti juhannuksen jälkeen ja tiimini muutti Krunneille viisi päivää kesäpäivänseisauksen jälkeen. Aurinko laski sinä ”iltana” kello 00.24 ja nousi seuraavana ”aamuna” klo 2.19.

Pääsimme lähtemään maastoon vasta myöhään, kaikki meni pieleen, linkutimme Ulkokrunniin ja saimme tavarat Maiasta maastotukikohtaan sillä aikaa kun aurinko ensin laski ja sitten nousi. Päivällinen oli syöty kun aurinko kipusi taivaankantta kohti hieman ennen kolmea aamuyöstä.

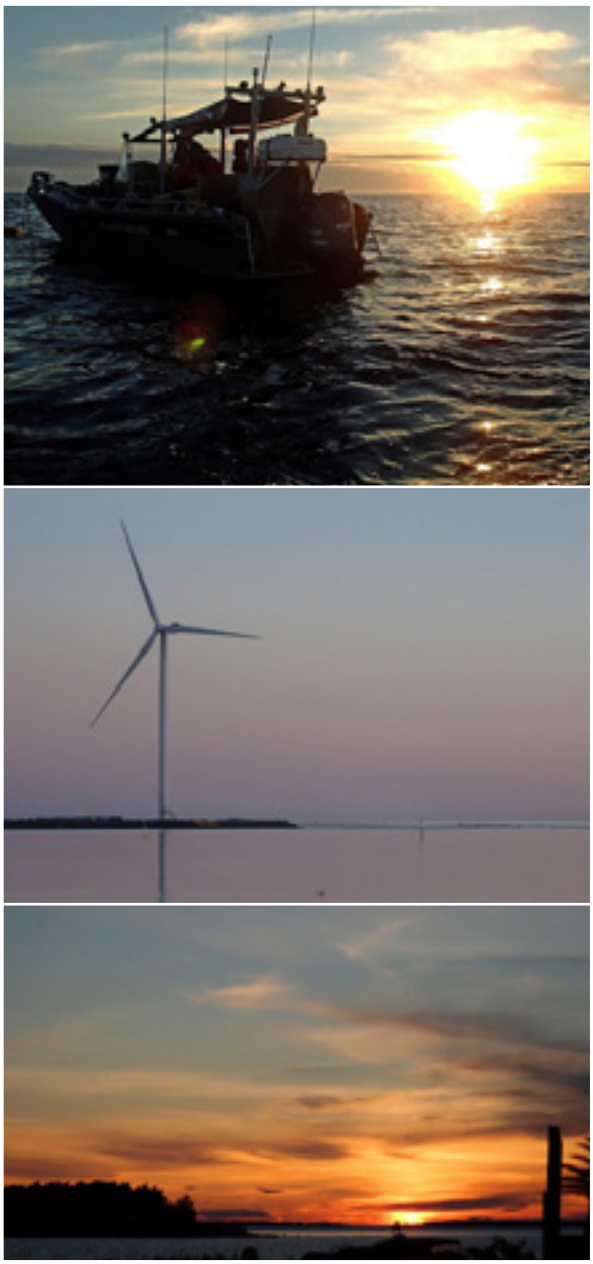
Yön pimein hetki oli vain hieman hämärämpi kuin tänään päivän valoisin hetki.

Tuota maanantaita pääsee fiilistelemään tästä blogista: http://metsahallitusmerella.blogspot.fi/2017/06/maastokausi-pelkkaa-maanantaita.html

Suomalaiset ovat aina osanneet elää vuodenaikojen mukaan. Kesällä pidetään lomaa, juhlitaan, valvotaan, tanssitaan. Talvella istutaan sisällä, syödään, juodaan, jurotetaan tai matkustetaan etelän aurinkoon. Toimistotyö sopii meribiologille talvella hyvin ja on mukavaa, että ei tarvitse olla ulkona viimassa ja räntäsateessa.

Osan kesän maastokartoitusten jännityksestä pääsee elämään myös talvella. Kesän sukelluksilla otettiin tunnistamatta jääneistä vesisammalista näytteitä ja toimitettiin Oulun kasvimuseolle tunnistettaviksi. Kun näytteet tulivat takaisin nimilappujen kanssa, riemulla ei ollut rajoja! Löytyi vanha ystävä kymmenen vuoden takaa, Fissidens osmundoides - sitä ei ole löytynyt sadoillakaan sukelluksilla sitten vuoden 2007. Löytyi Metsähallituksen Perämeren meritiimille lähes tuntematon näkinsammallaji Fontinalis hypnoides, vieläpä monelta eri paikalta. Löytyi toinen kauas taakse jäänyt sammal, Hygrohypnum luridum, jonka muistelen viimeksi nähneeni joskus ennen vuotta 2009. Kuvat näistä sukelluksista vilisevät mielessä kun selaan sukelluslomakkeita.

Talvi on minulle usein akkujen lataamisen aikaa. On aikaa nähdä kavereita, aikaa keskittyä ruuanlaittoon, aikaa matkustaa, aikaa lukea kirjoja. Työpäivät eivät ole yhtä pitkiä kuin kesällä ja aikaa jää kuntosalille, uimiselle



ja pitkille kävelyille. On myös aikaa pitää kesälomat ja saldovapaat.

Töissä saa putsata pöytää joululomaa varten ja valmistautua tulevaan vuoteen. Viime kesän uhanalaishavaintojen syöttäminen kansalliseen tietokantaan tuntuu sitäkin merkityksellisemmältä, kun juuri ollaan tekemässä Suomen uutta uhanalaisarviota ja kaikki uudet havainnot auttavat siinä pähkäilyssä.

Ja on mukavaa ajatella, että kun tammikussa joululoman jälkeen tulen takaisin töihin, vuoden pimein aika on todellakin jo jäänyt taakse ja ollaan jo reipasta vauhtia menossa kohti valoa, kesää ja uutta maastokautta.

Oikein hyvää joulunaikaa ja vuodenvaihdetta kaikille!

Hylkyjä, aarteita ja kuolleita

Essi Keskinen, Metsähallitus, 2. helmikuuta 2018

Minulta kysytään usein, löydänkö meribiologin työssäni aarteita, hylkyjä tai kuolleita ihmisiä. Viimeksi näin kysyttiin vasta pari viikkoa sitten kun olin kertomassa työstäni nelosluokkalaisille http://metsahallitusmerella.blogspot.fi/2018/01/alkulahteilla.html.

Kuolleita ihmisiä en ole koskaan löytänyt (-koputtaa puuta-), enkä haluaisikaan löytää. Aarteet voi määritellä kovin eri tavoin (ei, en ole löytänyt kultakolikoita, vanhaa shampanjaa tai venäläisen tsaarin taideteoksia) eli vaikka omasta mielestäni olen löytänyt aarteita (uhanalaisia lajeja, alueelle uusia lajeja, Suomen pohjoisimpia havaintoja esim. haarukkalevästä ja leväruvesta, upeita vedenalaisia niittyjä, mahtavia geologisia muodostelmia jne jne), kaikki eivät näitä ”aarteiksi” laske.

Jäävät siis hylyt. Niitä olen löytänyt, ja ollut mukana niiden löytämisessä.

Vuonna 2013 Metsähallitus järjesti hylkytalkoot, joihin osallistui sukeltajia ympäri Suomea http://metsahallitusmerella.blogspot.fi/2013/07/perameren-kansallispuistosta-loytyi.html Yksi hylyn osa löytyikin, ja samalla matkalla torniolaiset sukeltajat viistokaiuttivat aluetta, jonne jäi muutamia tulkinnanvaraisia havaintoja, kytemään tulevien saunailtojen puheenaiheiksi.

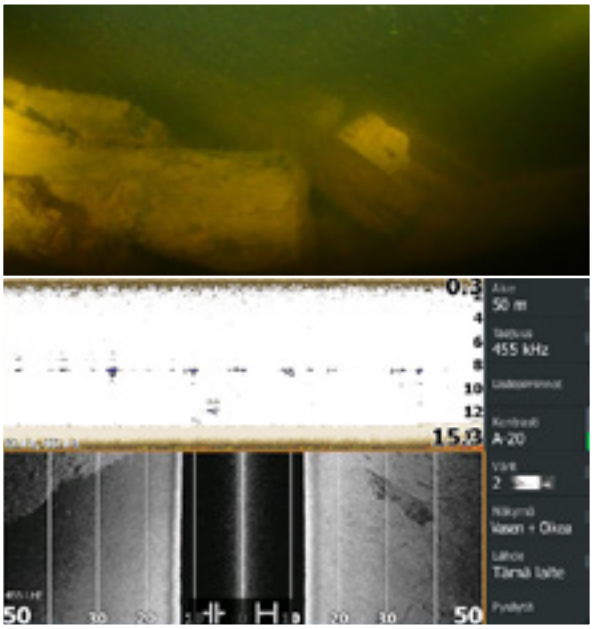
Kesällä 2017 Bothnian wreck exploration -ryhmä viistokaiutti alueella uudelleen, ja löysi selkeästi laajan alueen, jolle on levinnyt sekä kaikenlaista irtotavaraa, että pari suurempaa kappaletta - tämänhetkisen tulkinnan mukaan ainakin kaksi hylkyä.

Lähes jokainen sukeltaja haaveilee siitä, että pääsee sukeltamaan aiemmin löytymättömään ja koskemattomaan hylkyyn. Jollei sukeltaja suostu sitä ääneen sanomaan, mielessään ajattelee kuitenkin.

Minun kohdalleni tuo haaveen toteutus osui, kun eräs Bothnian wreck exploration -ryhmän jäsen, joka tekee paljon vapaaehtoistyötä meritiimin kanssa sukellusapuna toimimisessa, otti yhteyttä, ja kysyi, haluaisinko sukeltaa ensimmäistä kertaa toiseen näistä hylyistä. Tulla pitelemään valoja, kun hän videokuvaa?

Kukapa sukeltaja ei tähän tarttuisi?! Minä ja tiimini olimme jo valmiiksi Hylkyloukuksi nimetyn alueen lähistöllä tekemässä SEAmBOTH-hankkeen vedenalaiskartoituksia, ja sattumalta sillä viikolla tiimissä oli myös vapaaehtoinen meriavustaja, joka pystyi paikkaamaan minua sen kahden tunnin ajan, kun otin saldovapaata sukeltaakseni hylkyyn.

Hylyt lepäävät tasaisella hiekkapohjalla n. 12-13 metrin syvyydessä, ja Perämeressä siellä oli tietysti pilkkopimeää. Lampuillakaan ei näkynyt pitkälle, koska humuspitoinen vesi imee valon tehokkaasti. Muuten vesi oli suhteellisen kirkasta, kun laskeuduimme poijunnarua alas, ensimmäisinä sukeltajina tällä hylyllä.



Viistokaikuluotauskuva ”Hylkyloukusta”, pohjoisella Perämerellä sijaitsevasta alueesta, jolta on löydetty ainakin kaksi eri hylkyä todennäköisesti yli sadan vuoden takaa. Viistokaikukuvaa tulkitaan hieman kuten mustavalkoista valokuvaa, vaikka se onkin tuotettu kaiusta eli äänen perusteella. Alapuolisessa kuvassa yksi hylynpohja näkyy oikealla puolella ja sen ympärillä irtonaista puutavaraa, joka on mitä ilmeisimmin hylyistä peräisi. (Kuva Keijo Suihko)

Suuri osa Perämerellä uponneista laivoista on ”pelastettu”, mikä tarkoittaa sitä, että ne ovat usein ajaneet karille tai matalikolle ja niistä on irrotettu kaikki vähänkin rahanarvoinen ennen kuin aallot ja viimein jäät ovat vieneet loput hylystä. Tämä hylky oli koskematon - arvokkaat osat kuten rustin jumpry ja takilointiin kuuluva pylpyrä olivat paikoillaan meren pohjassa.

Sukeltamisessahan on aina jotain maagista - on hiljaista, rauhallista, usein pimeää ja kylmää. Tällä kertaa maagisuutta lisäsi hylky, jota kukaan ei ollut nähnyt sitten sen painuttua pohjoisen Perämeren pinnan alle yli sata vuotta sitten.

Hylyn tietoja ei vielä ole, eli tällä hetkellä ei tiedetä, miltä vuosikymmeneltä ja kenen rakentama laiva oli, saati sitten miten ja miksi se upposi. Tarkkoja koordinaatteja ei julkisteta ainakaan ennen kuin Museovirasto kesällä on käynyt tutkimassa aluetta. Silloin saadaan toivottavasti lisää tietoa hylyistä ja niiden tarinoista.

Siihen asti täytyy siis vain odotella ja etsiä arkistoista tietoja mahdollisista pohjoisella Perämerellä hävinneistä laivoista, joiden uppoamispaikkoja ei vielä tähän mennessä ole löydetty.

P.S. Jos olet vastuullinen, kokenut ja työteliäs sukeltaja ja kiinnostuit Perämeren alueen tutkimisesta ja hylkykartoituksesta, ota yhteyttä Bothnian wreck exploration -ryhmään Instagrammissa #bothnianwreckexploration

Valtakunnan laajennus

Essi Keskinen, Metsähallitus, 11. maaliskuuta 2018

Horisonttini on laajentunut viimeisen vuoden aikana merkittävästi. Aiemmin olin suojelubiologi, toukokuusta lähtien titteliin on voinut lisätä ”projektipäällikön”. SEAmBOTH-hankkeen myötä olen astunut ulos mukavuusalueeltani eli epämukavuusalueelleni, tai kuten nykyään kuuluu sanoa, olen astunut oppimisalueelleni. Epämukavuusalue on niin negatiivissävytteinen sana. En pysty siis enää välttelemään budjettien ja monimutkaisten Excel-taulukoiden ymmärtämisen yrittämistä luotsatessani kahden maan välistä hanketta kohti maaliviivaa.

Kolmisen viikkoa sitten valtakuntani laajentui myös fyysisesti. Tammikuussa olin vielä Perämeren aluemeribiologi. Sitten Metsähallitus kävi läpi organisaatiouudistuksen, jonka myllerryksessä minä sain lahjaksi Perämeren lisäksi myös Merenkurkun ja pohjoisen Selkämeren. Vuodesta 2006 lähtien tonttini on ulottunut Torniosta Kokkolaan. Maantietä pitkin mitattuna se on noin 330 km. Nyt sain kertarysäyksellä reilut 220 km lisää rantaviivaa (vain maantietä pitkin mitattuna!) hoidettavakseni. Näin minusta tuli Pohjanlahden aluemeribiologi.

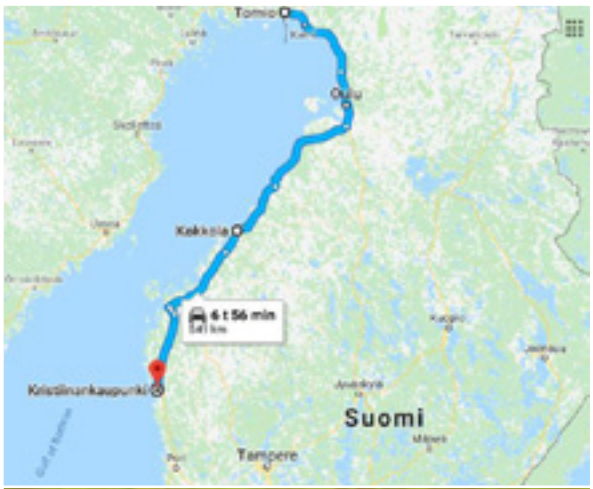
Seuraan siis Aleksanteri Suuren, Napoleonin, Hitlerin, ja keitä näitä valtakuntansa laajentajia nyt on, jalanjäljissä. Ainoana erona on se, että minä en erityisemmin tavoitellut lisämaata, vaan se ojennettiin minulle hopeatarjottimella.

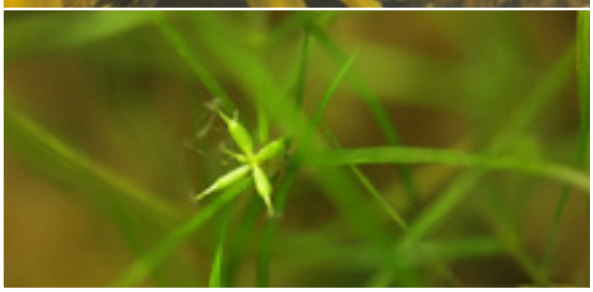
Uusien alueiden mukana seuraavat uudet haasteet. Merenkurkun kytkykauppana tulee tietysti ruotsinkieli, joka ei ummikko-oululaiselta taivu. Virkamiesruotsi on suoritettuna, mutta 20 vuotta sitten, eikä silloin keskusteltu ruotsiksi ekosysteemipalveluista, merialuesuunnittelusta, rehevöitymisestä, ilmastonmuutoksesta saati sitten aluevalvontalaista, ympäristövaikutusten arviointihankkeista tai vedenalaisesta biologisesta monimuotoisuudestas.

Uutuuttaan loistavia ovat myös sidosryhmät. Perämeren alueen sidosryhmät - Ely-keskukset, luonnonsuojelujärjestöt, veneilyseurat, meripelastusseurat, sukellusseurat, yliopisto sun muut - ovat tulleet tutuiksi ja tiedän, kehen ottaa yhteyttä. Mitäpä minä näistä tietäisin Merenkurkussa, saati sitten kaukaisella pohjoisella Selkämerellä?

Merenkurkun myötä sain myös uusia haasteita, joilla päästä jylläämään uudelle oppimisalueelleni: säädösvalmistelun, Maailmanperintötien ja muut kimurantit hankkeet, jotka nostattavat ja kuohuttavat tunteita ja pitävät aluemeribiologin varpaisillaan.

Äitini, professori, joka on sekä naisasianainen että uraohjus, kyselee minulta aina, onko minulla nyt tarpeeksi mahdollisuuksia edetä urallani. On ollut vaikeaa selittää, että en halua varsinaisesti edetä urallani, jos etenemisellä tarkoitetaan perinteistä ylöspäin kipuamista. Jokainen pykälä ylöspäin tarkoittaa enemmän paperitöitä ja vähemmän töitä maastossa ja



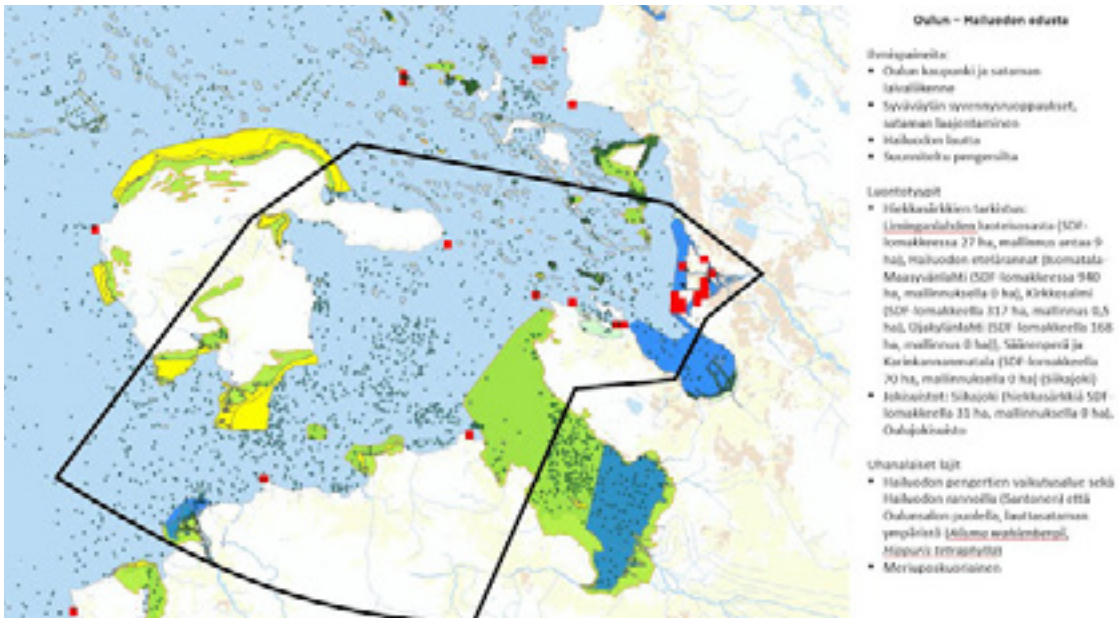


minulle oikeiden ja konkreettisten asioiden parissa. Olen sen sijaan sanonut, että haluaisin edetä lateraalisesti, kasvattaa asiantuntemustani ja tietämystäni juuri tällä käytännön tasolla, jolle olen päässyt ja jossa viihdyn.

No, nyt sitä sitten edettiin lateraalisesti, 220 km kertaharppauksella.

Suunnittelun suunnittelua

Essi Keskinen, Metsähallitus, 17. huhtikuuta 2018



Kevät on totisesti suunnittelun aikaa. Meritiimin suunnittelijat eli kesän maastotiimien vetäjät ovat tulossa töihin ja suunnittelemaan töitä joskus toukokuussa. Tällä hetkellä suunnitellaan suunnittelijoiden palkkaamista. Minä puolestani suunnittelen suunnittelijoille pohjia, joiden avulla he voivat tehdä tarkemmat suunnitelmat.

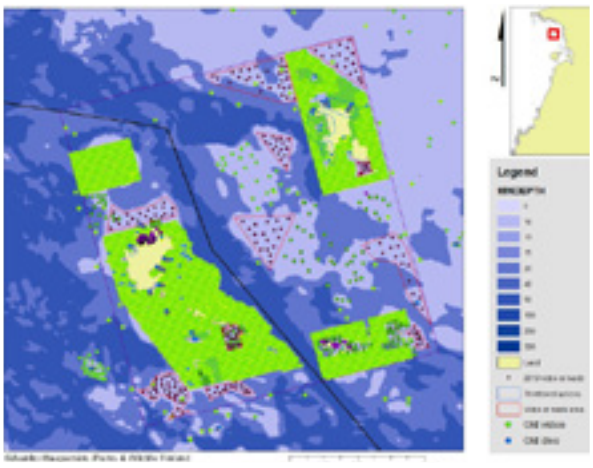
Metsähallituksen toimesta merellä tulee tänä kesänä liikkumaan VELMU-tiimejä, Metsähallituksen omia kenttätiimejä ja hanketiimejä ainakin SEAmBOTH- ja Kvarken flada -hankkeista. Hankkeissa on jo omat suunnittelijansa, ja he ovat jo aloittaneet kesän töiden suunnittelun.

Eri tiimeillä on hiukan eri tavoitteet ja päämäärät, vaikka kaikki tähtäävätkin tietysti Itämeren vedenalaisen luonnon yhä parempaan tuntemukseen ja sitä kautta sen parempaan hoitoon ja kuntoonsaattamiseen. Hankkeilla on omat agendansa, ja Metsähallituksen tiimit työskentelevät natura-alueiden kartoitusten parissa.

Otetaan esimerkiksi VELMU-hanke. Nyt VELMU 2 -vaiheessa halutaan keskittyä mm. suurten kaupunkien edustoille, mistä löytyy paljon ihmispaineita, muille alueille, joilla luontoarvot ja ihmispaineet potentiaalisesti ovat törmäyskurssilla, vedenalaisten natura-luontotyyppien tunnistamiseen (niiden raportointiaika on ensi vuonna) ja uhanalaisten lajien entistä parempaan tuntemukseen. Kun nämä päämäärät laitetaan kartalle päällekkäin, muutamia alueita pitkin rannikkoa hyppää esille.

SEAmBOTHin hankealueena on pohjoinen Perämeri Hailuodosta Tornioon. Kesän kartoitukset keskittyvät siis tälle alueelle. Aiemmin maastotukikohtina on pidetty lähinnä Ulkokrunnin saarta ja Selkä-Sarvea Perämeren kansallispuistossa, mutta näiden alueiden vedenalainen luonto alkaa olla pian kertaalleen kartoitettu. Tänä kesänä keskitytään mannerrantojen koluamiseen ja erityisesti Kemijoen suistoon. Maastosuunnitelmien mukana tulee tietysti logistiikan suunnittelu. Metsähallituksen meritiimi on nyt ensimmäistä kertaa historiassa yhden tiimin sisällä, ja ennen kahden alueen alle kerätyt inventointivälineet ovat nyt yhden tiimin omaisuutta. Sen jakaminen kesän kaikille eri maastotiimeille on haastavaa. Ja missä yövytään, pitääkö vuokrata vai omistaisiko Metsähallitus jossain kiinteistöjä, mistä löytyvät vuokralaiturit ja kuka niitä isännöi, mistä saa ensi kesänä veneisiin bensaa ja mitkä asemat ovat kuivina?

Samaan aikaan kuin muuttolinnut alkavat palata Pohjolaan, Metsähallituksen kesän suunnittelijat palailevat talvilomiltaan, ulkomailta, opinnoistaan, kuka mistäkin, ja alkavat nimensä mukaisesti suunnitella kesää.



Kaiken ykseys

Essi Keskinen, Metsähallitus, 9. toukokuuta 2018

Viime perjantaina osallistuin väitöstilaisuuteen. FM Kaisa Lehosmaa väitteli lähteiden ihmispaineista ja kunnostuksesta ja ansaitsi hienosti tohtorinarvonsa.

Kaisa aloitti vesistönsuojelunsa Metsähallituksen meritiimissä vuonna 2011. Osallistuin yhtenä ohjaajana hänen graduunsa, joka käsitteli jokivirtaamia ja jokiveden kuljettamia ravinteita. Näytteitä Kaisa otti sekä ulkomereltä Krunnien saaristosta, jokisuistojen edestä että joen alajuoksulta.

Väitöskirjansa myötä Kaisa on siis edennyt akateemisella urallaan merestä joen kautta vesistön ylimpään pisteeseen, lähteeseen asti.

Kun puhutaan vedestä - sateesta, valtameristä, jäätiköistä, lähteistä, fladoista, jokisuistoista, Itämerestä, pohjavedestä, kraanavedestä, pilvistä, kasteluvedestä - puhutaan aineesta, joka liikkuu ympäriinsä lähes miten haluaa välittämättä valtioiden tai edes maantieteellisistä rajoista saati sitten ihmisen yrityksistä ohjailla sitä. Etelä-Pohjanmaalla tulvi (taas) tänä keväänä, Keski-Euroopassa satoi lunta tänä talvena, Pohjanmereltä ei ole taas pariin vuoteen tullut suolapulssia ja pilvet liikkuvat sinne minne niitä huvittaa, vaikka niitä voidaankin hieman yrittää ohjailla kemikaaleilla (tärkeiden asioiden kuten Olympialaisten tieltä).

Karonkkapuheessa kiitin Kaisaa siitä, että hän edelleen toimii ”minun Itämereni” hyväksi. Se, mitä Kaisa lähteilleen tekee, vaikuttaa lopulta myös Itämereen, mikäli lähde sijaitsee oikealla puolella vedenjakajaa (vedenjakajalla tarkoitetaan sitä maantieteellistä linjaa, jonka toiselta puolelta vesi virtaa esim. Itämereen ja toiselta puolelta Jäämereen).

Sanastossakin veden ja sen muodostamien elementtien ja ekosysteemien tärkeys on ymmärretty. Ollaan jonkin alkulähteillä tai asia voi olla vedenjakaja. Toisaalta sillan alta on ehtinyt virrata jo paljon vettä.

Luonnon kannalta joen ja meren ykseys on selvä. Lohi vaeltaa jokeen kutemaan ja mereen syömään, ankerias tekee päinvastoin, mutta päätyy aina Sargassomereen asti lisääntymään. Ahvenet, särkikalat ja hauet nousevat rantaniityille ja fladoihin (pieniin laguuneihin) kutemaan ja niitä kalastetaan tonnitolkulla merestä.

Leikitkö pienenä kevätpuroilla? Minä ja sisarukseni säästimme pääsiäismunien muovisia yllätyskoteloita, eri värisiä, ja laskimme niitä sokkeloisten kevätpurojen mukana alavirtaan. Kilpailimme siitä, kenen päätyy nopeimmin ”alajuoksulle” eli viemäriin.

Maapallon mittakaavassa meri on viemäri, ja sinne päätyvät loppujen lopuksi kaikki kevätpurot ja lähteiden vedet. Suomen lähteet ja purot ovat lähes kaikki juomakelpoista vettä, joidenkin jokien suhteen jo ehkä hieman miettisin, mutta pääpiirteissään Suomen vedet ovat hyvässä kunnossa. Lukuunottamatta muutamaa oravaa vesitornissa ja Raksilan sarjakakkaajaa, meidän

jokemme eivät kuljeta mereen esimerkiksi runsaita määriä ruumiita, kuten pyhä joki Ganges. Vaikka Suomessakin puhuttiin aikanaan happosateista, meidän sateemme ovat silti linnunmaitoa verrattuna Kiinan ilmansaasteisiin.

Muistetaan, kuinka kaikki on yhteydessä kaikkeen, H2O kiertää, lähteet päätyvät jokiin ja meriin ja merestä nousee kalaa ja sinne pääsee uimaan. Tässä ollaankin jo ympäristönsuojelun ja ympäristökasvatuksen ytimessä.

Armaat meren mönkijäiset

Essi Keskinen, Metsähallitus, 11. kesäkuuta 2018

Sidosryhmät! Nuo ihanat ja kamalat kannustavat ja vastustavat tekijät!

Kun vuonna 2006 tulin meribiologiksi Metsähallitukselle, en edes tiennyt, mitä ”sidosryhmä” tarkoittaa. Nyt tiedän - jonkunlaista yhteistyökumppaneiden, kiinnostuneiden, asianomaisten ja muiden vastaavien verkostoa. Meritiimin sidosryhmiä ovat töistä riippuen mm. Merimuseo, ELY-keskukset, yliopistot, luonnonsuojelujärjestöt, kalastajat, mökkiläiset, Meripelastusseurat ja Merivartiosto.

Sidosryhmiltä voi saada valtavasti tukea - esim. alueelliset sukellusseurat toivovat aina, että järjestämme sukellustapahtumia ja niissä kannustavat työtämme, avaamme vedenalaisen luontopolun tai postaamme Facebookiin vedenalaisia valokuvia Perämeren kansallispuistosta tai ylipäätään Perämereltä, Meripelastusseurat ovat sidosryhmä, jonka palveluja emme toivottavasti tule koskaan merellä tarvitsemaan, mutta jotka ovat elintärkeitä olla olemassa, Oulun yliopiston Perämeren tutkimusasema tarjoaa meille tutkimusasemansa kenttätukikohdaksi jne.

Välillä sidosryhmien kanssa käytävät keskustelut saattavat turhauttaa. Kalastajat haluaisivat ampua sekä hylkeet että merimetsot, tuulivoimayhtiöt haluaisivat pystyttää kaikki matalikot ja kalojen kutualueet täyteen tuulivoimaloita, satamat haluaisivat ruopata ja läjittää kaikkialle ja mökkiläiset haluaisivat raivata joka ikisen kynnyksen arvokkaista fladoista, jotta pääsisivät mökkirannoilleen veneellä.

Pääasiassa sidosryhmätyöskentely on kuitenkin mukavaa, mielenkiintoista ja palkitsevaa.

Viime viikon SEAmBOTH-tiimi vietti pereydytystä, orientointia ja valmistautumista tehden erään sidosryhmän mökillä. Vuokrasimme Raahen Meripelastusseuran mökin Lapaluodosta kahdeksi päiväksi ja kävimme läpi kaikki varusteet (toimivat), perehdytyksen (ohjelmat pääosin toimivat) ja orientoitumisen (kalenteri on kunnossa ja kesä suunniteltu). Samalla suunniteltiin Raahen meripäiville osallistumista yhdessä Meripelastusseurojen kanssa.

Kun torstaina lähdimme Raahesta, saimme perään tekstiviestin ”Kiitos taas kun kävitte, te armaat pienet meren mönkijäiset.”

Hyvinvointia luonnosta

Noora Kantola, Metsähallitus, 19. kesäkuuta 2018

Ihminen on aina pyrkinyt hyötymään luonnosta jossakin muodossa. Nykypäivänä yksi luonnosta hyötymisen muoto on sen käyttäminen vapaa-ajan viettopaikkana, luontoon halutaan mennä rentoutumaan ja lataamaan akkuja sekä viettämään aikaa mukavan toiminnan parissa. Luonnon merkitys ihmisen henkistä ja fyysistä hyvinvointia edistävänä tekijänä on todistettu useissa tutkimuksissa, ja tämän voi varmasti jokainen luonnossa liikkunut allekirjoittaa omakohtaisista kokemuksistakin. Oli luonto sitten kaupungissa oleva puistoalue tai kaukaisempi paikka, sen rauhoittavan ja mielialaa kohottavan vaikutuksen voi tuntea jo muutamassa minuutissa.

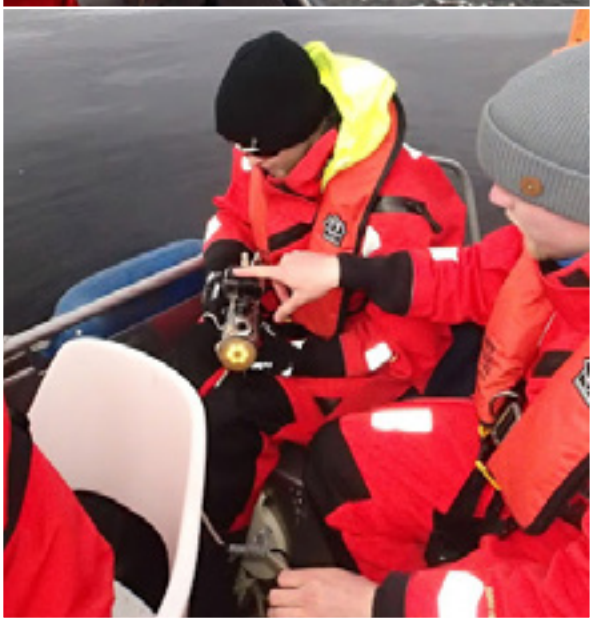
Metsähallitus on mukana Luontoa toimintaan – hankkeessa, jonka päätoteuttajana toimii Lapin ammattikorkeakoulu Oy ja osatoteuttajina Metsähallituksen lisäksi Oulun kaupungin nuorisopalvelut ja Pellon kunta. Hankkeen tavoitteena on syrjäytymisvaarassa olevien ihmisten osallistuminen ja voimaannuttaminen luonnossa tapahtuvan mielekkään toiminnan avulla sekä pysyvien yhteistyömallien kehittäminen kuntoutustoimijoiden ja luontoympäristöstä vastaavien tahojen kesken. SEAmBOTH –tiimi osallistui Luontoa toimintaan –hankkeeseen viime viikolla, kun saimme päiväksi mukaamme vieraita Oulun Erä- ja liikuntapajasta.

Vietimme päivän merellä Oulun edustalla ja Hailuodon pohjoispuolella drop-videoita kuvaten. Päivämme alkoi Hietasaaren satamasta, jossa Suvi kertoi aluksi vieraillemme SEAmBOTH-hankkeesta, tiimimme työnkuvasta sekä Perämeren alueen ainutlaatuisesta luonnosta.

Tunnin venematkan jälkeen aloitimme videoiden kuvaamisen. Ville opetti aluksi haran heittoa ja se sujui ensikertalaiselta erinomaisesti.

Haranheiton jälkeen perehdyttiin videoiden kuvaamiseen ja vieraamme kuvasivat useita videoita päivän aikana ja sekin sujui oikein mallikkaasti.

Päivä oli myös hyvä oppitunti siitä, kuinka sää voi muuttua merellä useita kertoja yhden päivän aikana. Aamulla sää oli kaunis ja tyyni, mutta lounastauolla saimme keinua jo vaahtopäissä. Iltapäivällä sää tyyntyi hieman, mutta kotimatka taittui taas melko kovassa aallokossa. Saimme kaikki varmasti kokea meren mieltä puhdistavan vaikutuksen tämän päivän aikana, tyynellä säällä mieli lepäsi ja paluumatkan aallokossa saimme nollata ajatukset kaikesta muusta ja nauttia veneen ja aaltojen antamasta kyydistä. Meidän tehtävämme on huolehtia luonnosta, jotta voisimme tulevaisuudessakin käydä nollaamassa ajatuksemme siellä ja nauttimassa sen hyvinvointiamme edistävistä vaikutuksista.



Harvinaisuuksia bongaamassa

Essi Keskinen, Metsähallitus, 8. heinäkuuta 2018

Lintubongarit bongaavat lintuja. Kasvibongarit sitten kai bongaavat kasveja.

Miksi kutsutaan meribiologia, joka innostuu joka kerta löytäessään uhanalaisen lajin? Se ei ole varsinaista bongausta, koska lajia ei ole erityisesti lähdetty etsimään, vaan se löytyy sattumalta.

Krunnien luonnonsuojelualue Perämeren saarten natura-alueella on meribiologin ja kasvibongaajan taivas. Upossarpioita ja nelilehtivesikuusia vain vilisee ja niihin kompastelee joka lätäkössä, lahdelmassa ja lammikossa. Sukeltaessa törmää melkein aina ahdin- ja vellamonsammaliin, jotka ovat alueellisesti uhanalaisia. Meribiologi innostuu, vaikka uhanalaisen kasvin löytäminen tietääkin aina lisätyötä Eliölajit -tietojärjestelmän HERTTA-sovelluksen kautta, johon uhanalaiset lajit viedään.

Saumaton Perämeri SEAmBOTH-hankkeen meritiimi törmäsi myös maallikkokasvibongareihin Perämeren kansallispuistossa viime viikolla. Saaristopäivien ja järjestettyjen risteilyjen innostamana kaksi eteläsuomalaista luontoharrastajaa oli lähtenyt ensimmäistä kertaa elämässään Perämeren kansallispuistoon, sinne kun ei normaalisti pääse ilman omaa venettä.

Toisella miehistä oli pieni vihko, jonka kanssa hän lähestyi meitä meribiologeja.
-Mitäs punaleviä täältä löytyy, entä mitä lajia ärviöitä? Mitä vedenalaisia uhanalaislajeja täältä löytyy? Kysymyksiä tulvi, ja vastauksia kertyi pieneen ruutuvihkoon.

Siitähän mies sitten innostui, kun kerroimme, että voimme näyttää hänelle joitakin vedenalaislajeja vesikiikarin läpi, ja hän pääsee ne itse bongaamaan.

Täältä sitä upossarpiota löytyy!

Mies kääri reippaasti housunlahkeet ylös ja kahlasi pelastautumispukuihin sonnustautuneiden meribiologien perässä mereen.

Seurasi ilahduttavaa lapsenomaista riemua, kun mies sai kirjoitettua lajin toisensa jälkeen pienene ruutuvihkoonsa. Löytämisen ilo ja riemu on valtava voima, ja erityisen hienoksi hetken teki se, että ilman meribiologien apua ja vesikiikaria mies ei olisi lajejaan löytänyt.

Ihmiset ovat metsästäjä-keräilijäkansaa. Löytämisen tuottama mielihyvä on selvästi edelleen geeneissä.

Saumatonta sidosryhmäyhteistyötä

Noora Kantola, Metsähallitus, 13. heinäkuuta 2018

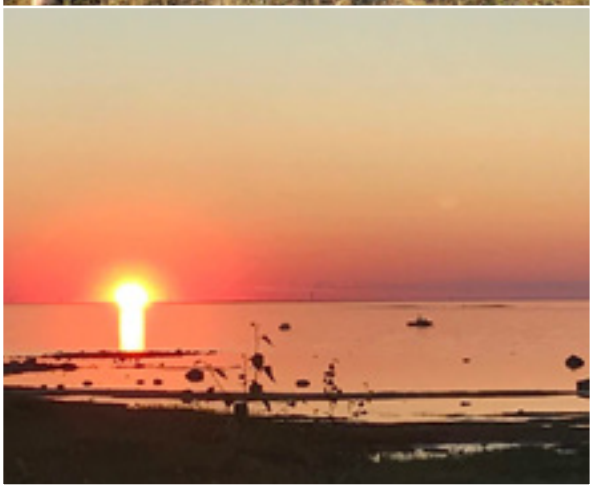
Saumaton Perämeri SEAmBOTH -hanke järjesti Ulkokrunnin saarella, Oulun yliopiston Perämeren tutkimusasemalla, Krunnien luonnonsuojelualueella sidosryhmätilaisuuden. Kuulostaa kuivakkaalta, vaikka oli kyllä kaikkea muuta.

Ulkokrunni on tuulille altis, ja edes Meripelastajat eivät mielellään lähde yli kymmenen metrin pohjoistuulella Krunneille. Vene pitää jättää poijuun, ja viimeiset puoli kilometriä hoitaa pienellä maihinnousuveneellä. Kun Krunneilla järjestää mitä tahansa, täytyy aina ottaa säävaraus huomioon.

Tällä(kin) kertaa sään jumalat olivat suosiollisia - tuulta oli hädin tuskin kolme metriä sekunnissa, aurinko paistoi siniseltä taivaalta ja lämpö oli hellelukemissa.

SEAmBOTH-hankkeen sidosryhmistä paikalle saatiin haalittua Iin Meripelastajat, Oulun yliopisto, Meritaito, Suomen yliopistokiinteistöt Oy, kalastajia, huviveneilijöitä, sukeltajia, Maakrunnin säätiön edustajia ja Krunnien vartija. Kerroimme hankkeesta ja sen tavoitteista ja keskustelimme siitä, mihin kerättyjä aineistoja voidaan käyttää. Sidosryhmät puolestaan kertoivat, mitä toivovat hankkeelta. Yliopisto toivoi yhteistyössä järjestettävää vesikasvien lajintunnistuskurssia, Maakrunnin säätiö toivoi suomenkielistä raporttia nimenomaan Krunnien luonnonsuojelualueen vedenalaisesta luonnosta ja kalastajat toivoivat pohjanlaatukarttoja nimenomaan jyrkänteistä, joilla vedetään troolia - hiekkaa vai kivikkoa, ero on merkittävä.

Virallisen tilaisuuden jälkeen seurasi verkostoitumispäivällinen ja Pookitanssit - kaiuttimista virtasi meriaiheisia paritansseja kuten Albatrossi, Vanhoja poikia viiksekkäitä, Laivat, Meren rannalla jne. Jalka oli kevyt ja kesäilta kaunis, aurinko laski ja aurinko nousi.

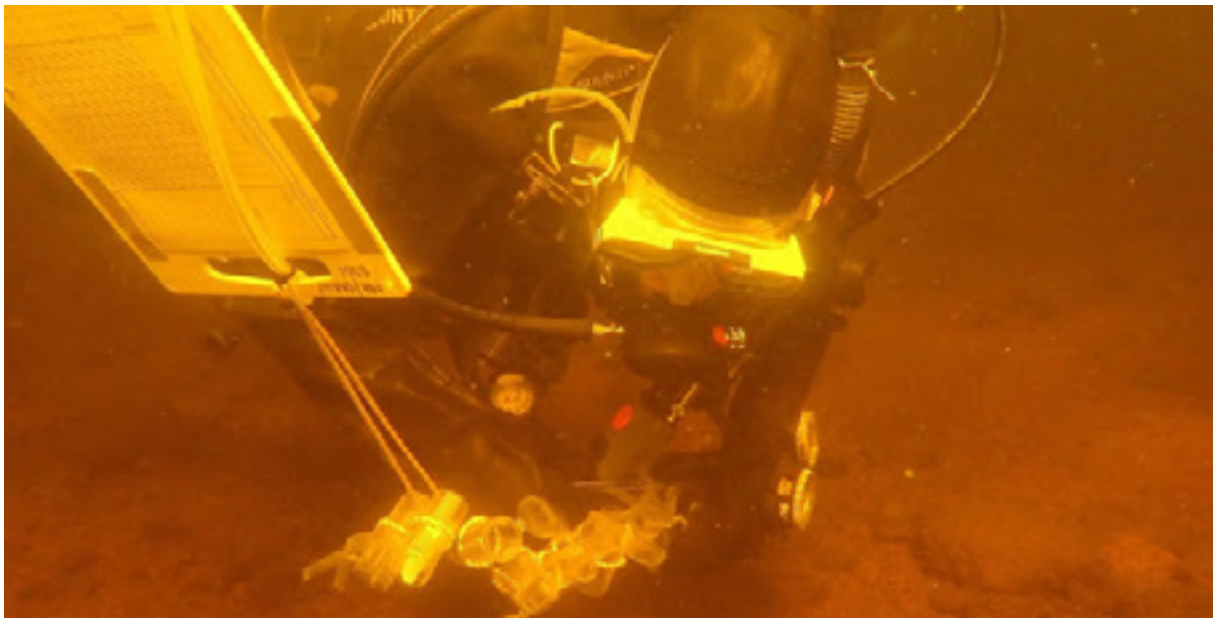


Yöllä saunottiin, aamulla mentiin nukkumaan ja aamiaisella keskusteltiin vielä hankkeesta.

Kyllä jäi lämmin ja saumaton mieli.

Tonnin sukellus

Essi Keskinen, Metsähallitus, 26. heinäkuuta 2018



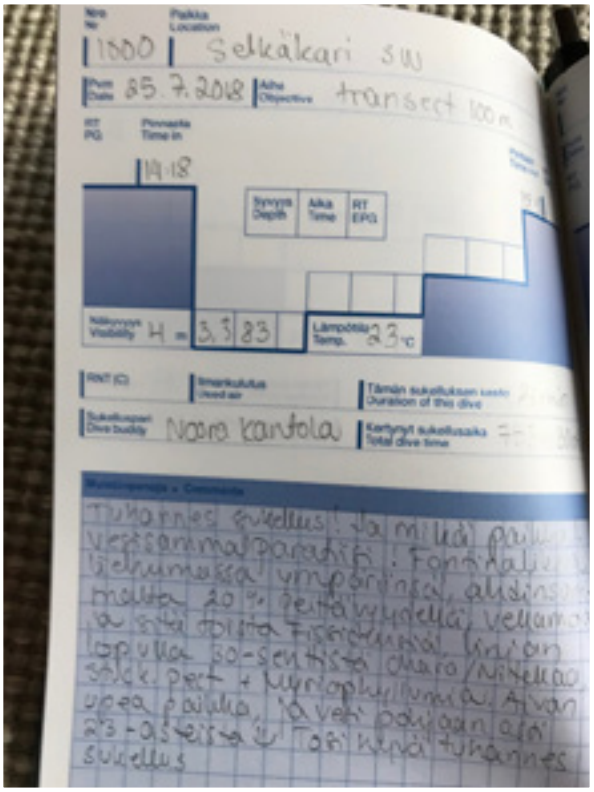
Tein eilen tuhannennen sukellukseni. Se tuntui merkittävältä virstanpylväältä sukeltajanurallani. Illalla aukeni shamppanja ja skoolattiin. En edes häpeillyt ehdottaa maljaa omalle tonnin sukellukselleni. Olen aloittanut sukeltamisen lukiossa, ja nyt se on työtäni. Tuhannes sukellus ei tuntunut lainkaan vähäpätöiseltä.

Ja minkälainen sukellus se oli! Aivan uskomattoman kaunis paikka, Perämerta parhaimmillaan, kun meribiologin silmin katsotaan. Vesisammalparatiisi - alueellisesti uhanalaisia vesisammalia jopa 20 prosentin peittävyydellä, neljää, viittä eri vesisammalta samalla näytepisteellä. Huojuvia kolmekymmensenttisiä näkinpartaisia, kirkkaanvihreitä hapsivitoja ja ärviöitä. Aaltojen pohjaan heijastamia väikkyviä auringonsäteitä.

Vesi oli pinnasta pohjaan 23-asteista. Linnunmaitoa siis. Viimeksi olen Suomessa sukeltanut kuivapuvulla ilman välihaalaria kesällä 2014, ja nyt sitten taas.

Kaikki meni nappiin, vaikka aallot kyllä huojuttelivat aika kovasti. Uhanalaisia lajeja oikealla ja vasemmalla, limen- ja kirkkaanvihreinä huojuvia kasveja, molemmissa lyijykynissäkin oli terät tallella sukelluksen loppuun asti.

Pinnalle palatessa aurinko paistoi, lämpöä oli lähes 30 astetta, tuuli lempeä. Mikäs tässä, juhlasukelluksen päätteeksi. Kyllä maailma on aika mainio paikka.



Kuitupuu karkuteillä

Nikolas Sanila, Metsähallitus, 1. lokakuuta 2018

Metsähallituksen SEAmBOTH tiimin kanssa kesällä liikkuessa pinnanalainen maailma on tietenkin keskiössä, mutta aina ei tule ajatelleeksi ihan kaikkea mitä se saattaa kätkeä. Videoitaessa, sukellettaessa ja kahlatessa näkee sekä oppii paljon, mutta joskus sitä jokin pääsee todellakin yllättämään. Esimerkiksi uppotukeista on ollut tiimissä puhetta. Pahimmillaan suurimmaksi osaksi veden alla kelluva tukki saattaa aiheuttaa valtavaa vahinkoa nopeasti liikkuvalle veneelle.

Ajoittain esimerkiksi Simon jokisuistosta löytyi yksitäisiä pienempiä tukkeja ja puunpalasia, mutta yleensä niin lahonneina ja pohjamutiin hautautuneina, että niistä ei kenellekään varaa aiheudu. Mutta vihdoin siirtyessämme lännemmäs Kemiin, tuli ensimmäinen pahamaineinen uppotukki kunnolla tutuksi. Stora Ensoltahan karkasi syksyllä 2017 1500 kuutiota kuitupuuta eli tukkeja Kemin edustalla…

Töiden loputtua iltapäivästä matka kahlaajia noutamaan Maia-veneellä sujui hiljalleen eteenpäin varovasti liukuen, kun joku huomasi jotain kelluvan muutamia metrejä keulasta. Lähestyessämme varovasti huomasimmekin hämmästykseksemme kyseessä olevan paksu tukki, jonka pää pisti vain muutaman vaivaisen sentin pinnan yläpuolelle.

Jatkoime matkaamme kahlaajia hakemaan ja keskustelimme sillä aikaa tukista. Haettuamme kahlaajat aloimme uudestaan tähystää tukin perään kiikarien ja kuuden silmäparin voimin. Ja pitkään saimme tähystääkin kunnes tukki vihdoin osui taas silmiimme, ja silloin vain muutamien kymmenien metrien päässä keulastamme.

Yhden pukeutuessa pelastautumispukuun, toiset selvittivät, onko tukki irrallaan ja näin ollen helposti hinattavissa vaiko kenties kiinni pohjassa. Viimeistään hypätessäni veteen ja uituani tukin luokse kykenimme toteamaan sen olevan valtava, ja selkeästi irtonaisena kelluva.

Vedessä tukin kanssa kelluminen oli mieleenpainuva kokemus. Kun kerran on tukin kohdannut, ei voi jättää ajattelematta mitä muutakin tuolla syvyyksissä voi piileksiä ja jäädä miettimään meren mysteereitä. Kun tukki vihdoin oli saatu, ainakin toivon mukaan, hyvin kiinnitettyä yhdestä päästä veneeseen oli aika kavuta ylös veneeseen ja lähteä hinaamaan.

Tukki onneksi pysyi hyvin kiinni hinauksessa, ja muutamassa kymmenessä minuutissa olimme vihdoin päässeet sataman suojiin ja oli aika uida taas tukin kanssa rantaan. Muiden ajaessa Maian laituriin omalle paikalleen, uiskentelin tukkia vetäen pikkuhiljaa kohti veneramppia.

Koko tiimi oli mukana vetämässä tukin kuivalle maalle. Noin vajaa nelimetrinen tukki jolla oli leveyttä vajaat 30 cm, oli ilmiselvästi ollut meressä jo jonkin aikaa. Siihen oli myös muun muassa ehtinyt kasvaa useita murtovesisieniä. Saatuamme päivän hyvän työn

päätökseen lähdimme kohti majoitustamme, ja olimme iloisia tuottoisan päivän johdosta.

Muutaman päivän kuluttua taas kentällä liikuimme taas uusia pisteitä kohti tehden videointeja ja kahlauksia eri paikoissa eri puolilla Kemin jokisuistoa ja merialueita. Kahlatessamme pitkin rantoja näimme yhden tukin rantautuneen korkean hiekkasärkän päälle ja vain hetkeä myöhemmin puhelimeen kilahti viestiä Maialla videoimassa olevalta porukalta, joka ilmoitti myös nähneensä tukin. Ei kestänyt kauaa ennen kuin jo seuraava viesti kilahti puhelimeen ja kävi selväksi, että tukkeja on lisääkin. Pian uusille tukkihavainnoille ei enää meinannutkaan tulla loppua, ja muutaman päivän sisällä sekä kahlaajat, jotka löysivät tukkeja rantautuneina mataliin lahdelmiin ja rannoille, settä videoijat, jotka näkivät yhä uusia tukkeja ilmestyvän kameran kuviin, ymmärsivät että näitä on paljon.

Esimerkiksi iltaisin videoita nimetessä, saattoi parhaimmillaan, tai pitäisikö sanoa pahimmillaan, nähdä useampia tukkeja samassa ruudussa. Myös pienellä kumiveneellämme liikkuessa saatoimme ajoittain nähdä useammankin tukin kelluvan lähes vierekkäin yksi pääty vain muutaman sentin merenpinnan yläpuolella, juuri ja juuri näkyvissä. Valitettavasti koska kartoituksiakin pitää tehdä, ei tukkien pelastamiseen syrjäisiltä paikoilta voi käyttää tunteja jokaisesta työpäivästä, vaikka se hauskaa ajoittain olisikin. Niin kauan, kun tukit eivät välitöntä vaaraa muulle vesiliikenteelle aiheuta, ei jokaisen poiskuljettamiseen työn ohessa keskitytä. Mutta jatkossa silmät pidetään vielä enemmän auki. Myös muilla seuduilla on tietenkin aina syytä noudattaa varovaisuuta vedenalaisten vaarojen suhteen, vaikka ei SEAmBOTH tiimin tapaan liikkuisikaan lähes aina uusilla ja ennestään tiimille tuntemattomilla vesillä. Koskaan ei voi tietää mitä kaikkea siellä veden alla lymyää.

Turvallista veneilyä!

Silonäkinparran metsästys

Susanna Greus, Metsähallitus, 9. lokakuuta 2018

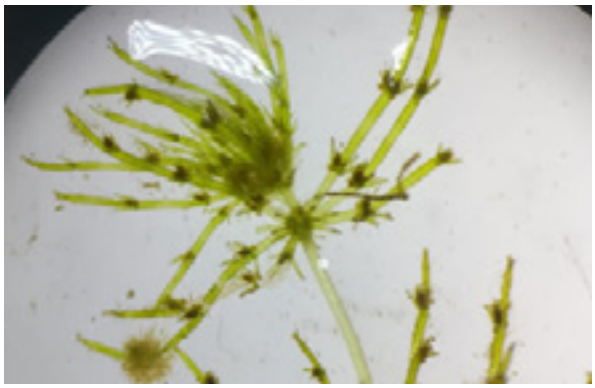
Olin ollut harjoittelussani Saumaton Perämeri SEAmBOTH -hankkeessa noin kuukauden verran. Minulle oli suotu vihdoin kunnia tehdä kahlauspisteitä itsenäisesti, ja olinkin sitä kautta päässyt myös suppailun makuun. Suppilaudalla kahlauspisteiden teko käy joutuisasti, ja innokkaana musiikinkuuntelijana myös rakas matkakaiuttimeni pysyy mukana menossa.

Oli tiistaiaamu ja olin todella väsynyt, joten yksin työskentely sopi minulle hyvin. Kohteenani oli Herakari Kemin edustalla, ja aloitin matkani saaren lounaisosasta, jonne minut jätettiin. Tavoitteena oli kiertää saari Luoteiskrunnin kautta ja palata Hirsiletonkrunnin länsipuolelta takaisin Etelään. Sain meloa Prissanmatalassa rauhassa tyynillä vesillä pienten sadekuurojen ripotellessa niskaani, samalla nauttien maisemista ja musiikista. Ensimmäiseltä kahluupisteeltäni ei edes löytynyt kasveja, ja jatkoin matkaani kivikkoista länsirantaa myöten kohti pohjoista. Seuraavilta pisteiltä löytyi hyvin tuttuja lajeja, enkä päässyt antamaan minulle tuntemattomille kasveille omia nimiäni. Työkavereideni iloksi olen siis alkanut nimeämään kasveja itse keksimilläni nimillä, jotta näytteiden tunnistusvaiheessa muistaisin mitä kasvia milläkin merkinnällä tarkoitan. Heidän mielestään hulvattomin nimi tähän mennessä on ollut pylpyrätilliruoho, joka mielestäni oli oikein kuvaava.

Mutta palataan takaisin matkalleni. Saaren pohjoispään eli Luoteiskrunnin ylitettyäni onneni muuttui. Pilvet hälvenivät, aurinko alkoi paistaa, ja löysin erilaisia lajejakin. Tein ensimmäisen pisteen, jolle jouduin nimeämään itse lajin, jota en aikaisemmin ollut tavannut. Tämä laji sai nimekseen haarajuurikaveri. Sain myös ensimaistiaiset Chara brauniista eli silonäkinparrasta, sillä pisteeltä löytyi muutama pienempi yksilö. Tässä vaiheessa en osannut arvata, mitä olinkaan löytänyt.

Koko saaren koillisosa oli melko matalaa ja pehmytpohjaista aluetta, jossa kasvoi valtavasti esimerkiksi pystykeiholehden ja kelluskeiholehden risteymää, kanadanvesiruttoa, sekä järvikaisloja. Pysähdyin suurelle kivelle nauttimaan välipalasta ja maisemista. Tämän jälkeen jatkoin matkaani kohti seuraavaa pistettä Herakarin ja Hirsiletonkrunnin välissä, mutta tieni keskeyttikin umpeenkasvanut väylä. Päätin tehdä tälle yhä viidakkomaisemmalle matalikolle ekstrapisteen. Alueella kasvoi kanadanvesiruttoa, katkeravesirikkoa ja aiemmin mainittua keiholehtien risteymää aivan mattona. Käännyin tämän pisteen jälkeen pakon sanelemana takaisin kohti koillista, ja jatkoin tietäni kohti lähintä pistettä seuraavalla väylällä Hirsiletonkrunnin ja Hahtileton välissä.

Jos Hirsiletonkrunnin ja Hahtileton välistä aluetta katsotaan ortokuvasta, voidaan nähdä paljon vihreää näiden saarten välissä. Vihreät alueet selittyvät sillä, että alue on täyttä järvikaislasaarekeviidakkoa. Tämän viidakon laidalla sijaitsi seuraava piste, jolla kasvoi myös valtavia kaksikymmensenttisiä näkinpartaisleväpensaita. Ihastelin hienoja lisääntymiselimiä, joita itse kutsun



Silonäkinparta Chara braunii. (Kuva Ville Savilampi)

pylpyröiksi, ja otin mukaani näytteen. En vielä tässä vaiheessa osannut arvata löytöni erityislaatuisuutta. Jatkoin matkaani yhä sankempaan järvikaislaviidakkoon, ja toivoin pääseväni Hirsiletonkrunnin eteläpuolelle työkavereitani vastaan lounasaikaan mennessä. Väistelin järvikaislapuskia ja yritin etsiä väylää eteenpäin. Tein matkallani pisteen metrin syvyisessä vedessä viidakossa. Hirsiletonkrunnin kaakkoisosaan päästyäni ympäristö oli muuttunut jälleen kivikkoiseksi, ja löysinkin vesisammalia viimeiseltä pisteeltäni. Lopulta työkaverini löysivät minut, ja pääsimme lounastamaan ja jatkamaan työpäivää.

Hypätään seuraavaksi perjantaiaamuun, jolloin olimme jo palanneet toimistolle, ja työkaverini Lajihirmu-Ville alkoi tarkistaa viikon näytteitä. Alkuun kaikki lajit olivat vanhoja tuttuja. Itse nimeämäni haarajuurikaveri olikin oikealta nimeltään Ranunculus reptans eli rantaleinikki. Näytteiden katselu oli tässä vaiheessa jopa hieman tylsää Villen mielestä. Mutta kun hän avasi näytepussin HV13 (eli Hyvä viikko 13), muuttui ääni kellossa. Ensiksi hän iloitsi hienoa näkinpartaislevää. Sitten hän hiljeni. Kun Ville innostuu jostakin lajista, hän menee hiljaiseksi, ja avaa lajitietokirjallisuuden. Tässä vaiheessa voi jo hieman udella, oliko siis löytynyt jotain jännää. Ja tällä kertaa oli, sillä kyseessä oli Chara braunii. Ville tutki ja ihasteli lajia pitkän tovin, olihan löytö erityislaatuinen ainaisiin katkeravesirikkojen tunnistuksiin verrattuna!

Kun laji oli tunnistettu, päätettiin se prässätä ja tallettaa tiimin lajikansioon sekä lähetettäväksi Luonnontieteelliseen keskusmuseoon. Työpaikalle saapui pikaisesti käymään myös esimieheni Essi, joka ihasteli hienoa lajia, ja kertoi ettei hänkään ollut itse edes koko lajia päässyt ennen näkemään. Hieno löytö siis kerrassaan. Kahden viikon kuluttua, kun tiimi jatkoi töitään Kemissä, pääsi myös monet muut tiimiläiset liittymään Chara braunii -kerhoon, kun lajia löytyi muistakin paikoista. En tiedä, onko laji levinnyt siis Kemiin, vai onko sitä vasta nyt etsitty oikeista paikoista lähempää jokisuistoa, mutta on hienoa löytää uusia havaintoja harvinaisista lajeista. Herakarin, Luoteiskrunnin, ja Hahtileton alueella voidaanki nähdä, kuinka aluekohtaista havaintojen löytäminen voi olla, kun periaatteessa yhden saaren rannat vaihtelevat pohjanlaadultaan ja kasvistoltaan näin paljon.

Sammalviidakossa

Essi Keskinen, Metsähallitus, 30. marraskuuta 2018

Helteinen maastokausi 2018 helli Perämeren SEAmBOTH -hankkeen meritiimiä tyynillä 30-asteisilla aurinkoisilla päivillä. Kemi-Tornion edustalla ilma on harvoin yli 20-asteista ja vesi ei koskaan. Paitsi kesällä 2018, jolloin vesi oli kuuden metrin syvyydessä parhaimmillaan (vai pahimmillaan?) 26-asteista.

Perämeren tiimiä hellittiin myös upeilla vesisammalviidakoilla. Maastokaudella 2018 haluttiin kerätä enemmän tietoa jokisuistoista, ja Kemi- ja Torniojoen suistot muodostavat käytännössä yhden jättiläismäisen jokisuiston koko pohjoiselle Perämerelle.

Perämeren murtovesi on niin suolatonta, että rakkohauru ei viihdy täällä lainkaan. Eteläisemmällä Itämerellä rakkohauru (entiseltä nimeltään rakkolevä) on ns. avainlaji, joka muodostaa avainhabitaatteja. Tämä tarkoittaa sitä, että rakkohaurun muodostamat vedenalaiset niityt kalliorannoilla ja kivikoissa muokkaavat ympäristöä sellaiseksi, että monet muutkin lajit viihtyvät alueella - pikkukalat saavat suojaa, selkärangattomat ruokaa, monet rihmalevät ja levärupi kiinnittymispinnan itselleen ja vaskikala mahdollisen pesimäpaikan.

Perämerellä rakkohaurun paikan ovat ottaneet makeamman veden lajit, vesisammalet. Rutiininomaisesti 1-7 m syvyydellä olevalta suhteellisen avoimelta kivikkopohjalta löytyy vähintään kolme sammallajia, isonäkinsammal (Fontinalis antipyretica), vellamonsammal (Fissidens fontanus) ja tursonsammal (Oxyrrhyncium speciosum). Jokisuistoja lähestyessä sammallajien lukumäärät vain lisääntyvät niin että Kemin edustan saarten rannoilla tai riutoilla sukeltaessa sadan metrin mittaiselta sukelluslinjalta saattaa löytyä jopa kuusi lajia vesisammalia. Yhteensä kesän vesisammallajien saldo taisi lähetä kymmentä, tai peräti tusinaa.

Parhaimmillaan vesisammalten peittävyys ylittää puolet kivikosta, ja suurimmillaan näkinsammalet voivat olla 20-35 cm pitkiä huiskaleita. Toki monet sammalet ovat pikkuriikkisiä ja niitä hädin tuskin näkee piilevän alta, mutta ainakin ne ovat elossa ja vihreitä - suurin osa rihmalevänäytteistä, jotka otetaan mikroskooppitarkasteluun pohjoisella Perämerellä, osoittautuu kuolleiksi määrityskelvottomiksi rihmaleviksi ja runsaaksi piileväkerrokseksi.

Ruotsalaiset SEAmBOTH-kollegat Norrbottenin lääninhallituksesta toivat vesisammalnäytteensä meille katsottavaksi, koska he eivät olleet tehneet sitä koskaan ennen itse. He eivät ylipäätään olleet juuri kiinnittäneet huomiota vesisammaliin.

Löysimme kuusi eri lajia, mutta hämmentävästi lajit olivat painottuneet hyvin eri tavoin kuin Suomessa. Meillä heittämällä yleisimmät lajit ovat isonäkinsammal, vellamonsammal ja tursonsammal, mutta Ruotsin puolella vellamonsammalta ei löytynyt lainkaan, tursonsammalta vain yksi kituvahko verso, ja isonäkinsammalta vain hieman, muiden näkinsammalten ollessa yleisempiä. Tosin Ruotsin puolella kartoitetut alueet olivat erilaisia kuin Suomessa, ja vellamonsammal on helppo sivuuttaa koska se on niin pieni. Ehkä tuleva maastokausi 2019 antaa vastauksen tähänkin ihmettelyyn.

Oli miten oli, vesisammalet ovat mielestäni kivikkoisen Perämeren kauneinta antia.

Ei nimi miestä pahenna?

Essi Keskinen, Metsähallitus, 12. joulukuuta 2018

Perämeren SEAmBOTH -hankkeen meritiimi on nimennyt kaikki tietokoneet, ulkoiset kovalevyt ja suuren osan kameroistakin.

Veneillähän on tietysti nimet - kumiveneemme nimi oli Bella Bambina eli lyhyesti vain Bella, ennen kuin se otti ja kuoli maastokauden 2018 rasituksiin. Isommat veneet ovat Maia ja Inca. Maia on osa VELMU- eli kansallisella vedenalaiskartoitushankkeen rahoituksella hankittua neljän veneen 7,5 -metristä laivastoa, joka on nimetty Seulasten eli Plejadien tähtijoukon mukaan. Wikipedia kertoo, että ” Kreikkalaisessa mytologiassa plejadit olivat seitsemän sisarusta, joita Orion jahtasi. He pyysivät apua Zeukselta, joka muutti heidät kyyhkyiksi ja sijoitti taivaalle. Sisarusten – Alkyone, Sterope (tai Asterope), Kelaino, Elektra, Maia, Merope ja Taygete – lisäksi heidän vanhempansa Atlas (isä) ja Pleione (äiti) ovat tähtijoukossa sen itäisellä reunalla.”

VELMU-veneitä ovat Maia, Asterope, Alkyone ja Elektra. Kun sitten Perämerelle hankittiin Maialle pikkusisarus, Seulaset oli lähes käytetty ja nimeämisessä päätettiin lähteä toiseen suuntaan - etsimään alkuperäisestä etymologiasta riippumatonta paria Maia-nimelle. Sellainen löytyi Väli-Amerikasta, jossa maia-intiaanien rinnalla elivät inkat. Oli sitten huonoa kommunikaatiota, että Incasta tuli Inca nimenomaan Ceellä eikä K:lla, kuten oli tarkoitus. ”C” kuulostaa Perämerelle hieman hienostelevalta, fiiniltä ja ehkä jopa vierasperäiseltä, mutta onneksi se lausutaan kuten K.

Miksi sitten nimeämme tietokoneita ja ulkoisia kovalevyjä? No onhan helpompaa sanoa uudelle kesätyöläiselle että ”Voit käyttää Exceliä Senjalla, ja talleta se Kertulle”, kuin että ”Voit ottaa toisen niistä Dell-koneista, sen, joka on Suvin käytössä ja joka on toisessa niistä samanlaisista mustista repuista, ja talleta Excel yhteen niistä kolmesta oranssista rugged-kovalevystä, siihen, jossa on se pieni lommo etureunassa ja jonka USB-liitin on hiukan löysä”. Tästä syystä me ryhdyimme nimeämään asioita.

GoPro-kamerat ovat nimeltään Alfa ja Beta, jotta tiedämme helposti, millä kameralla on minkin veneen sen päiväinen aineisto.

Samalla kun esineille annetaan nimet, ne saavat myös inhimillisiä luonteenpiirteitä. Ulkoiset maastokelpoiset kovalevyt on tahallaan nimetty ronskien naisten nimillä - Hilda, Kerttu, Justiina, Elviira. Nämä eivät pääsääntöisesti kuulosta miltään herkiltä ja häilyväisiltä keijukaisilta vaan reippaasti työhön tarttuvilta emäntähahmoilta, joilta onnistuu fyysinen työnteko. (Jos lukijoissa nyt on muunlaisia Hildoja, Kerttuja, Justiinoita tai Elviiroita, en yritäkään niputtaa teitä kaikkia tähän kuvaukseen - tämä oli vain yleistys, joka lähti ensinnäkin Pekan ja Pätkän Justiinasta ja siitä että Octoberfestillä on varmasti joku ronski saksalainen tarjoilijatar, joka pystyy kantamaan molemmissa käsissään vähintään neljä litran oluttuoppia, ja hänen nimensä voisi kyllä olla Hilda).

Maastotietokoneet ovat pääsääntöisesti tuntuneet miehiltä. On Pikku-Paavo, Rane ja Reino. Yrjö on jo hautuumaalla. Toisaalta toimiston työtietokoneet, joiden herkkä hipiä ei kestä pärskettäkään merivettä eivätkä ne muutenkaan voi hyvin toimiston seinien ulkopuolella, ovat Senja ja Eppu. Minun uusin tietokoneeni (jolla ei vielä ole nimikylttiä kannessaan) on selkeästi Eppu III. Edellinen oli Eppu Jr, ja tämä uusin tulokas on osoittautunut varsin vaativaksi ja ehkä jopa ylimieliseksi. Haluaisin laittaa hänen nimensä alkuun HRH eli Her Royal Highness, Hänen Kuninkaallinen Korkeutensa. Vielä 18 soittoa Fujitsun käyttötukeen myöhemmin olen tilanteessa, jossa kaksi työpyyntöä on auki ja tiimillinen tietokoneihmisiä kummastelee, miksi Eppu III:n Word-, Excel- ja Skype -ohjelmien fontit ovat pehmeitä ja huonosti luettavia kun muiden ohjelmien fontit toimivat vallan mainiosti. Tänään asennetaan koko Office-paketti uudelleen. Saa nähdä, tuleeko Eppu III:sta valmista lainkaan - se on varmaa, että kahta seuraavaa leasing-vuotta en tuijota näitä pehmeitä ja hämäriä kirjaimia, jotka saavat silmät hyppimään.

Nimiin latautuu paljon ennakkoluuloja, kuten tekstistä käy ilmi. Kenenkään Kertun, saati sitten Senjan tai Epun, ei kuitenkaan pidä vetää hernettä nenään tästä kirjoituksesta. Joku nimi vauvoillekin annetaan, ja tällä hetkellä harvempi varmasti nimeää vastasyntynyttään Yrjöksi tai Jormaksi, vaikka ne ovat oikein hyviä ja kelpoisia nimiä hiukan vanhemmille miehille. Niistä vain syntyy tietty aikuisen miehen mielikuva, jota ei yhdistetä tällä hetkellä pikkuvauvoihin.

Kumivene Bellan nimi olisi hyvin voinut olla jotain ronskia, reipasta ja ulkoilmaelämään viittaavaa, niin kovasti se työskenteli tehdäkseen oman osansa meritiimin kartoituksista. Alussa emme voineet tietää sen parhaita luonteenpiirteitä ja niinpä siitä tuli Bella.

Tänä talvena olemme ostamassa uutta kumivenettä. Onko sinulla ehdotuksia sen nimeksi? Jos on, kirjoita kommenttisi joko suoraan blogin kommentiksi tai sitten sille Facebook -sivulle, josta tämän blogin löysit. Jos keksit työteliään ja hyvän nimen veneelle, jaa se ihmeessä SEAmBOTH-meritiimin kanssa, ja nimiehdotuksesi saattaa päätyä historiankirjoihin osaksi Saumaton Perämeri -hankkeen maastokauden 2019 töitä.

Vapaaehtoisten kantava voima

Essi Keskinen, Metsähallitus, 12. helmikuuta 2019

Mitä tekee meribiologi kun kumiveneen pohjalankut napsahtavat poikki kesken maastoinventointien ja ollaan Kemin satamassa? Soittaa tietysti tutulle sukeltajalle ja aktiiviselle vapaaehtoistoimijalle, joka asuu samalla paikkakunnalla ja tarjoutuu oitis auttamaan.

Paikallisesta nikkarointikaupasta haettiin sopivankokoinen lastulevy, entiset pohjalaudat piirrettiin siihen, ja sitten vain sirkkeli soimaan etupihan nurmikolla!

Viidentoista minuutin sahaamisen ja hiomisen jälkeen kumiveneessä oli uudet pohjalaudat.

Jos samoja olisi lähtenyt ostamaan kaupasta valmiina, olisi luultavasti pitänyt avata lompakkoa isommalle kuin pari kymppiä maksanut levy, ja odotella määrämittaisten vahvikkeiden sahaamista, jos se olisi onnistunutkaan. Nyt koko hommaan laiturilta laiturille meni vajaa tunti, ja sitten päästiin taas jatkamaan töitä.

Vapaaehtoisia on ollut avussa vaikka missä. On pystytetty ja purettu vedenalaista luontopolkua, järjestetty sukellus- ja opetustapahtumia ja ennen kaikkea inventoitu pohjoisen Perämeren vedenalaista luontoa.

Haluan virallisesti kiittää kaikkia Metsähallituksen meritiimiä koskaan auttaneita vapaaehtoistyöntekijöitä: sukeltajia, varusteidenkantajia, inventoijia, venekuskeja, nikkaroijia, opiskelijoita, työharjoittelijoita, saunanlämmittäjiä, talkoolaisia, ulkomaisia ja kotimaisia luonnonsuojelijoita ja kaikkia muita, jotka ovat ilman palkkaa (vaikka joskus sentään ruokapalkalla) tehneet ainakin Perämeren meritiimin elämästä huomattavasti helpompaa, mukavampaa ja kustannustehokkaampaa.

Toivottavasti voimme tulevaisuudessakin jatkaa joissakin vapaaehtoistyön merkeissä pitkään jatkunutta yhteistyötä Itämeren suojelun parissa!

Punainen kirja

Essi Keskinen, Metsähallitus, 8. maaliskuuta 2019

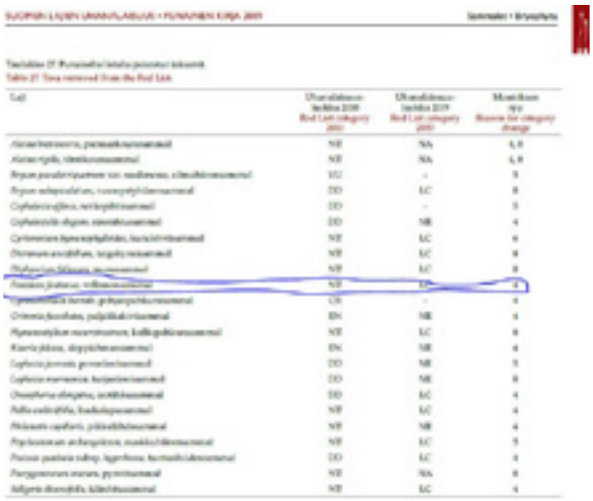
Kuuntelen parhaillaan Ympäristöministeriön livelähetystä Suomen lajien uhanalaisuusarvioinnista 2019. Metsähallituksen erikoissuunnittelija Jari Ilmonen kysyi esityksensä aluksi, onko yleisö pukeutunut punaiseen Punaisen listan julkistuksen kunniaksi, koska hän itse on pukeutunut mustaan. Moni muistaa, mitä Trio Niskalaukaus lauloi mustasta puvusta ja mitä se yleensä symboloi. Monen lajin uhanalaisstatus on heikentynyt sitten vuoden 2010, jolloin arvio on tehty viimeksi. Mm. ankerias on kärsinyt kovasti - se putosi (tai nousi?) erittäin uhanalaisesta äärimmäisen uhanalaiseksi. ”Sukupuutto, tuo hiljainen tappaja, on lähempänä kuin koskaan”, on kuultu päivän aikana jo muutamaan kertaan.

Kaikista huonoista uutisista huolimatta päivästä on noussut myös toivoa. Professori Ilari Sääksjärvi Turun yliopistosta piti innostavan puheen siitä, mitä merkitystä lajeilla ja lajiston monimuotoisuudella on. Hän päätti puheensa tokaluokkalaisten koululaisten perusteluille lajien häviämistä vastaan. Jopa pienet lapset ymmärtävät monimuotoisuuden merkityksen. Lapset olivat luetelleet monimuotoisuuden tarpeen syiksi mm. sen, että jos jokin peto häviää, sen saaliseläimet saattavat lisääntyä liikaa, sen, että on hienoa kun maapallolla on värejä, muotoja, ääniä jne ja viimeisenä loppukaneettina sen, että ”eläimistä voi saada ystäviä”.

Tilaisuudessa puhuttiin myös siitä, että luonnon monimuotoisuuden vähenemisestä ja lajien katoamisesta pitäisi puhua entistä enemmän. Ilmastonmuutos on jo oikealla tavalla ”arkistunut” asia - uskoi siihen tai ei, oli siitä mitä mieltä tahansa, ihmiset tuntevat sen. Kun taas puhutaan ”luonnon monimuotoisuuden vähenemisestä”, moni on jo eksyksissä. Siksi luonnon monimuotoisuudesta ja uhanalaisuuksista täytyy puhua yhä enemmän, nostaa asiaa esille ja opettaa sitä sekä lapsille että aikuisille, päättäjille ja Pihtiputaan mummoille.

Muutamia toivonpilkahduksiakin löytyi Suomen punaiselta listalta. Oma voittoni oli vellamonsammalen putoaminen pois uhanalaisten listalta. Syynä oli tiedon lisääntyminen, ja tässä voin rehellisesti röyhistää rintaa ja sanoa, että Metsähallituksen Perämeren meritiimi, joka on tehnyt vuodesta 2006 töitä peruskartoitusten lisäksi mm. kansallisissa VELMU-kartoituksissa ja tällä hetkellä Saumaton Perämeri #SEAmBOTH -hankkeessa. Vellamonsammal on pieni ja huomaamaton, se kasvaa kivikossa metrin ja seitsemän metrin välillä ja se ei tartu haraan kauhean hanakasti. Lähes ainut tapa löytää se on sukeltaa. Aiemmassa arvioinnissa vellamonsammal oli valtakunnallisesti silmälläpidettävä ja alueellisesti uhanalainen, ja Perämeren meritiimi on täyttänyt uhanalaislapun toisensa jälkeen ja syöttänyt tiedot Hertan Eliölajit -tietokantaan. Nyt tuo urakka loppuu tähän! Ja siihen on syynä se, että nyt tiedetään, että vellamonsammalta on jokaisella kivikolla sopivalla syvyydellä sopivan avoimella paikalla ja aiemman uhanalaisstatuksen syynä oli tiedon puute, ei todellinen lajin ahdinko.

Nelilehtivesikuusi on edelleen uhanalaisten listalla, vaikka sen status putosikin erittäin uhanalaisesta vaarantuneeksi.



Karkkia silmille: punaiselta listalta poistettu pikkuruinen vellamonsammal, poistamisen syynä tiedon lisääntyminen.

Kun tietoa nyt on näin paljon, olisi jo aika ryhtyä tekoihin. Monen lajin kohdalla tiedetään myös keinot, joilla lajia voitaisiin suojella, mutta usein resurssit puuttuvat. Ja suojelu kyllä tehoaa kun sen päätetään tehoavan - tämänpäiväisistä esimerkeistä kirkkaiten loisti ehkä merikotka, joka on noussut vuosikymmenten takaisesta lähes sukupuuton partaalla ryömineestä tilastaan niin komeaan liitoon, että tänään merikotka pääsi kokonaan pois punaiselta listalta. Vielä vuonna 2015 merikotka on arvioitu vaarantuneeksi, ja tänään se on saanut statuksen ”elinvoimainen”. Kun merikotkalla meni huonosti, tutkittiin siihen syitä, aloitettiin talviruokinta, vähennettiin ympäristömyrkkyjen pääsyä Itämereen ja ryhdyttiin kiinnittämään huomiota salatappoihin ja tuulivoimaloihin. Tiedon ja päätöksen avulla laji saatiin pelastettua.

Tämänpäiväisen seminaarin ja Punaisen listan julkistuksen jälkeen ei pitäisi tuntea lannistumisen tai luovuttamisen tunnetta vaan entistä suurempaa tahtotilaa lajien ahdinkoon vaikuttamiseen. Meillä on tieto, nyt sitä pitäisi pystyä soveltamaan.

Maastosta maailmalle

Essi Keskinen, Metsähallitus, 19. toukokuuta 2019

Vanha kiinalainen arvoitus kysyy ”Jos puu kaatuu metsässä eikä ketään ole kuulemassa, kuuluuko siitä ääni?”

Tutkija tai maastokartoittaja voi kysyä samaa: ”Jos minulla on hienot tulokset mutta niitä ei julkaista missään, olenko silloin tehnyt lainkaan työtä?”

Tätä korjaamaan, ja viemään Metsähallituksen nimeä ja osaamista maailmalle, mentiin Pietariin GeoHab 2019 -kongressiin. Metsähallitukselta olivat edustettuina Saumaton Perämeri SEAmBOTH-, Tila2- ja BalticRim -hankkeet.

Vuosittain Geological and Biological Marine Habitat Mapping kokoontuu viikoksi toukokuussa, eri puolille maailmaa. Se kutsuu kokoon ”samat vanhat naamat” GeoHabin alkuajoista lähtien, ja lisäksi uusia väitöskirjatutkijoita, tutkijoita, konsultteja ja myös virkamiehiä. Pääosa osallistujista ja esiintyjistä on lähempänä merenpohjan geologiaa, topografiaa ja syvyystietoa, mutta joukkoon mahtuu myös meitä meribiologeja ja nykyisin myös meriarkeologeja ja muita kulttuuri- ja historiapuolen meritutkijoita.

GeoHab-kongressin rakenne on muotoutunut hyväksi havaituksi jo vuosia sitten: maanantaina on työpaja, rekisteröityminen ja illalla icebreaker-juhla eli tervetuliaisjuhla, tiistaista torstaihin on 1-20 minuutin mittaisia esityksiä välillä 9.00-18.00, iltaisin on posterisessiot, yhtenä iltana kongressin gaalapäivällinen ja perjantaina ekskursio johonkin lähialueen mielenkiintoiseen geologiseen ja/tai biologiseen tai välillä myös kulttuurihistorialliseen kohteeseen.

Tätä kaavaa noudattaen neljä Metsähallituksen suunnittelijaa, erikoissuunnittelijaa ja meribiologia vietti Pietarissa erittäin antoisan ja mielenkiintoisen, vaikka toisaalta myös hyvin työntäyteisen viikon.

Hienoina nostoina viikosta voi poimia mm. posterien esittelyn. Posterit olivat koko viikon esillä heti kokoushuoneen ulkopuolella niin että niitä ehti katsoa myös lyhyillä väliajoilla. Välillä posterit on haudattu johonkin takahuoneeseen niin että niitä joutuu erikseen lähteä katsomaan. Posterisessiossa mm. SEAmBOTH-hankkeen posterit vetivät kiinnostuneita tutkijoita puoleensa ja joidenkin kysymyksiin sai vastata jopa 10-15 minuuttia. Marianne Katainen Metsähallitukselta teki upean taiton postereille ja ne pystyttiin printtaamaan karttatuotannon printterillä 150 cm korkealle kiiltävälle paperille. Hienolta näytti ja kiitos vielä Mariannelle!

Toinen nosto voisivat olla todella mielenkiintoiset esitykset. Osa aiheista ei osunut ammatillisesti eikä myöskään oman mielenkiinnon kohteisiin, mutta monet osuivat vähintään toiseen. Moni näytti tekevän samantyyppistä geologista ja biologista habitaattikartoitusta kuin SEAmBOTHissa tehdään ja dronea oli käytetty matalilla alueilla habitaattikartoitukseen. Muutamilla mailla oli käytössään

automaattisia vedenalaisia robottikameroita, jotka samalla viistokaiuttavat. Jonkun verran käytettiin automaattista habitaattitunnistusta videoilta tai kuvista. Eräässä esityksessä matalia vesialueita, jollaisia suurin osa SEAmBOTH-hankkeen kartoitusalueista on, kutsuttiin ”semi-aquatic”-nimellä, puoliakvaattisiksi :) Itse miellämme itsemme meribiologeiksi emmekä vai ”puolisukeltajiksi”.

Verkostoituminen on äärimmäisen tärkeää ja sitä pääsi tekemään kerran elämässä -gaalaillallisella Jusupovien palatsissa jousioktetin soittaessa ja tarjoilijoiden kantaessa yhä uusia ruokalajeja pöytään. Koska seminaaripäivät kestivät aamuyhdeksästä iltakuuteen, Pietariin ei ehtinyt tutustua kuin perjantain ekskursiolla, mutta samalla kun tutustuimme Pietarinhoviin, Kronstadtin maanpuolustukselliseen saareen ja Nevajoen tulvakontrollijärjestelmiin, retkellä pääsi keskustelemaan sekä eri maiden että kotimaisten mutta eri organisaatioiden kollegoiden kanssa.

Kaiken kaikkiaan kongressista jäi erittäin positiivinen olo, abstraktikirjaa täytyy lukea vielä tarkemmin kotona ja hiukan jäsennellä kaikkea koko viikon aikana kuulemaansa uutta ja mielenkiintoista. Aivan heti kaikki ei edes sula vaan hoksautuksia eri esityksistä varmaan tipahtelee mieleen pitkin alkukesää.

P.S. SEAmBOTH-posterit ovat ladattavissa pdf-tiedostoina hankkeen sivuston uutisosiosta:

https://seamboth.com/news/

Mustatäplätokon maailmanvalloitus

Essi Keskinen, Metsähallitus, 25. kesäkuuta 2019

Kellon Kiviniemen kalasatama, ensimmäinen työpäivä merellä kesän uusille luontokartoittajille. Aurinko paistaa, ilma on nätti, ollaan lähdössä merelle harjoittelemaan videokuvausta.

Venettä lähestyy kalastaja, joka on hoksannut Maian kyljessä Metsähallituksen sinivihreät teipit. Kalastajalla on SEAmBOTH-tiimille tuliaisia.

-Tuli tämmöinen. Tuolta Kattilankallasta. En ole ennen nähnyt. Mikähän lienee rumilus.

Tiimin jäsenet tutkivat kalaa. Se on selkeästi pohjakala, koska maha on litteä ja rintaevät suuret. Väritys on tumma ja pääkin iso. Mutta eihän tämä tämmöinen kuulu Suomen kalalajistoon, niihin kahteenkymmeneen kahdeksaan lajiin, jotka löytyvät Itämerestä.

- Voisiko se olla joku omituinen? Joku vieraslaji? Mitä niitä nyt on? Mustatäplätokko? Mutta tällä ei ole mustaa täplää.

Kalastaja kertoo, että verkko oli hieman runnellut kalaa, ja sen selkäevästä puuttuu palanen. Juuri se kriittinen palanen, jossa paljonkertova musta täplä sijaitsee.

No niin, nyt on siis mustatäplätokko levinnyt jo Oulunkin korkeudelle saakka. Samalla laji on ensimmäinen havainto SEAmBOTH-hankealueella. Kala on lähtöisin Mustanmeren ja Kaspianmeren seutuvilta ja on saapunut Itämerelle 1990 -luvulla, Suomen rannikolle vuonna 2005. Kalaa tavataan suurimpien satamien läheisyydestä eli selkeästi se matkustaa painolastivesien mukana tai runkoon takertuneena munana. Suomenlahdella mustatäplätokko leviää jo ihan omalla painollaan ja on monin paikoin valloittanut pohjan muilta kaloilta lähes kokonaan.

Kun Metsähallituksen Perämeren meritiimi edellisen kerran törmäsi mustatäplätokkoon, se tapahtui Raahessa. Silloin Itämeren pohjoisin havainto mustatäplätokosta löytyi sieltä, muutama vuosi sitten, nyt pohjoisin havainto siirtyi Oulun pohjoispuolelle. Joku epäili havainnon olevan maailman pohjoisin, koska Ruotsissa tämä vieraslaji on varsin eteläinen ja USA:n Suuret Järvet, joihin mustatäplätokko on levinnyt, taas sijaitsevat Oulun eteläpuolella.

Jos maalla kurttulehtiruusu ja lupiini levittäytyvät ja vievät tilaa alkuperäisiltä lajeilta, meressä samaa tekee mustatäplätokko. Yhteistä monille menestyville vieraslajeille on se, että ne ovat generalisteja kaiken suhteen - syövät lähes mitä vaan, eivät ole turhan nirsoja veden lämpötilan tai laadun suhteen, pärjäävät lähes millaisissa olosuhteissa vain ja osaavat löytää sopivan ekolokeron uusista elinympäristöistä ja uusista ravintokohteista.

Mustatäplätokko on ruskeanlaikullinen pohjakala, jonka koiras tummuu kutuaikaan lähes mustaksi. Tältä Kattilankallasta nostetulta mustatäplätokolta puuttuu tyypillinen musta täplä - sen pitäisi olla selkäevässä puuttuvan palasen kohdalla. (Kuva Suvi Saarnio, Metsähallitus)

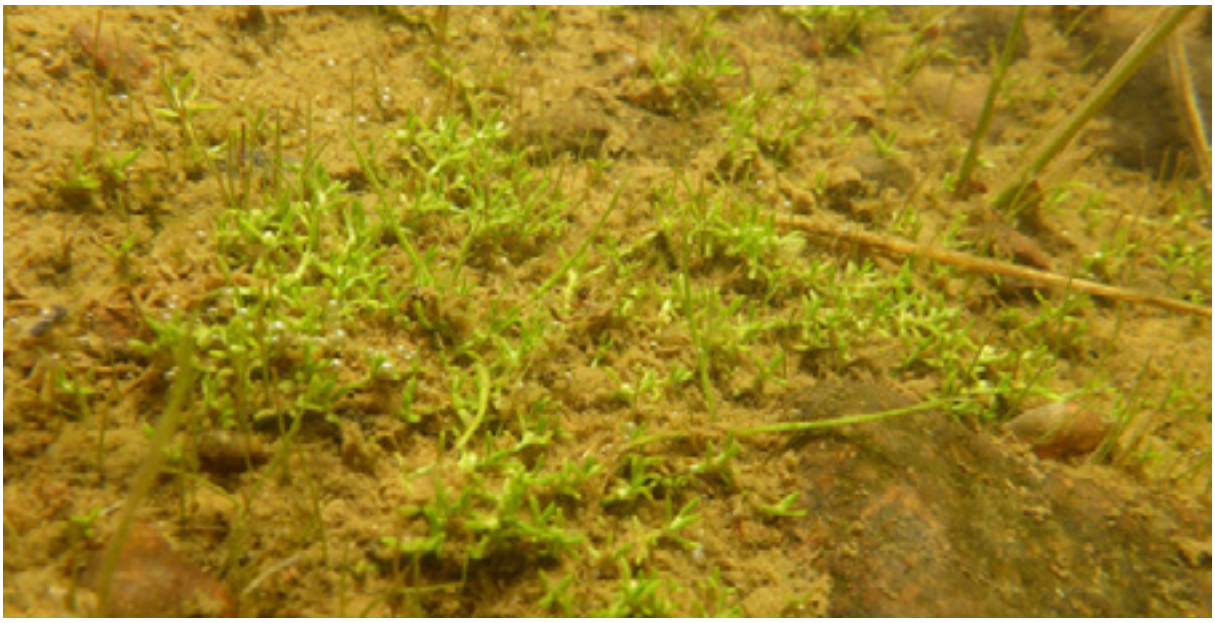
Mustatäplätokon tunnistaa selkäevän selkeästä mustasta täplästä. Tämän yksilön on kuvannut Janica Borg akvaario-olosuhteissa.

Suomi ratifioi alusten painolastivesiä koskevan kansainvälisen sopimuksen joitakin vuosia sitten. Muutaman vuoden sisällä kaikkien alusten täytyy ryhtyä käsittelemään painolastivesiään tavalla, joka estää uusien vieraslajien siirtymisen merialueelta toiselle.

Joidenkin lajien kohdalla ollaan kuitenkin jo myöhässä. Eiköhän mustatäplätokko ole tullut jäädäkseen. Jos saat sen onkeen, heitä pannulle - sieltä mistä se on kotoisin, kalaa pidetään aivan kelpo ruokakalana. Ja muista ilmoittaa vieraslajihavaintosi, jos sellaisia tulee vastaan!

Vesikasvien levinneisyystiedot laajenevat

Essi Keskinen, Metsähallitus, 18. heinäkuuta 2019



Vaarantunut vesipaunikko Raahen natura-alueella. (Kuva Catherine Egerton, Metsähallitus)

Pohjanlahdella eletään tänä kesänä jännittäviä aikoja! Kolmen eri hankkeen neljä eri tiimiä on tämän maastokesän aikana tehnyt havaintoja kolmesta eri lajista aivan uudelta alueelta.

Rannikko-LIFE eli CoastNet LIFE -tiimi, joka työskentelee Raahen natura-alueella, löysi ensimmäistä kertaa natura-alueen rajojen sisäpuolelta vaarantuneen VU paunikon, Crassula aquatica. Kun tarkastelee ympäristöhallinnon uhanalaistietokantaa Hertta Eliölajit, heti natura-alueen rajan ulkopuolelta löytyy 1x1 km kokoinen ruutu Preiskarin saaren itäpuolelle sijoitettuna. Sen tietona on ”vuonna 1994 lisätty arkistohavainnosta”.

Nyt havainnon teki suomalaistunut australialainen vapaaehtoistyöntekijä. Vapaaehtoiset todella hyödyttävät hankkeita! Raahen natura-alue on siis saanut uuden uhanalaishavainnon.

Yhtä jännittäviä kuuluu Merenkurkusta ja pohjoiselta Perämereltä. SEAmBOTH-hankkeen tiimi ja Perämeren ja Merenkurkun VELMU-tiimit ovat kaikki löytäneet jokisuistoista ja muista lähes makeista vesistä, mm. Torniojokisuistosta ja mahdollisesti myös Merenkurkusta, lapinvesitähteä Callitriche hamulata. Lähdekirjallisuudessa lajin levinneisyydeksi mainitaan Lappi ja Häme. Onhan Meri-Lappikin toki osa Lappia, mutta kasvia ei mitä ilmeisimmin ole esiintynyt missään päin Itämeren rannikkoa aiemmin. Nyt havainnot on varmistettu Luonnontieteellistä keskusmuseota myöten.

Kolmas lajin aiemmin tunnetun levinneisyysalueen laajentuminen löytyy Merenkurkusta, josta Mustasaaresta Värlaxfjärdenistä löytyi poimuvitaa Potamogeton crispus ”suuria määriä ympäri sitä lahtea”. ”Luulisin että jos sitä on noin paljon, se olisi jo levinnyt lähialueille”, sanoo Merenkurkun VELMU-tiimin luontokartoittaja. Aiemmin poimuvidan levinneisyysalue on ollut hyvin

Poimuvita. (Kuva Teemu Mustasaari, Metsähallitus)

eteläsuomalaispainotteinen.

Suurella todennäköisyydellä nämä löydöt eivät tarkoita sitä, että lajit olisivat välttämättä levittäytymässä uusille alueille, vaan sitä, että on vielä paljon, mitä ei vedenalaisesta luonnosta tiedetä. Vesikasveihin on kuitenkin hankalampi päästä käsiksi kuin maakasveihin, ja jokaista kolkkaa Suomen merialueista ei ole vielä selvästikään koluttu.

Iso kiitos tarkkojen maastokartoittajien lisäksi myös hankerahoittajille, jotka ovat tehneet mahdolliseksi nyt käynnissä olevat kartoitukset! LIFE, Interreg Nord ja Ympäristöministeriö: Tuhannesti kiitoksia!

Raportoinnin ihanuus

Essi Keskinen, Metsähallitus, 4. syyskuuta 2019

Interreg-hankkeissa tehdään väliraportointi noin viiden kuukauden välein. Edellinen raportointi, nro 4, sattui lokakuun alusta helmikuun loppuun. Minä ja Suvi pidimme tuolloin molemmat paljon lomia, joulu ja uusivuosi sattuivat tähän väliin, maastotyöt oli jo tehty ja niiden tuloksia vain vietiin tietokantoihin, eikä mitään erityisiä kokouksiakaan sattunut tuohon väliin. Raportointi 4:n väliraportti oli laihanlainen - asiat luistavat ja juoksevat, mutta varsinaisia virstanpylväitä ei tällä välillä saavutettu.

Toista on ollut raportoida raportointikautta 5, maaliskuun alusta elokuun loppuun. Ensinnäkin tuohon väliin sattuu tietysti merkittävimpänä maastokausi. Siitä ei olekaan kuin hyvää sanottavaa. Maaginen tuhannen kahlauspisteen saalis ylitettiin, kesän tavoitteet saavutettiin, uusia uhanalaishavaintoja tuli rutkasti, uusia vesisammalia löytyi Perämereltä viisi (5!), lapinvesitähden levinneisyys ulottui ensimmäistä kertaa Perämerelle aiemmin tunnettujen Lapin ja Hämeen lisäksi, ja kahden lopputyön aineistot kerättiin kesän aikana. GTK:n (Geologian tutkimuskeskus) kanssa tehtiin yhteistyötä savikanjonien ja -labyrinttien kartoituksessa ja Norrbottenin lääninhallituksen kanssa yhteistyötä yleisötapahtumassa Torniossa. Huonona uutisena oli, että nopeasti levittäytyvä vieraslaji mustatäplätokko löydettiin kesällä pohjoisimmillaan Oulusta.
Kun Metsähallituksen Perämeren meritiimi edellisen kerran törmäsi mustatäplätokkoon, se tapahtui Raahessa. Silloin Itämeren pohjoisin havainto mustatäplätokosta löytyi sieltä, muutama vuosi sitten, nyt pohjoisin havainto siirtyi Oulun pohjoispuolelle. Joku epäili havainnon olevan maailman pohjoisin, koska Ruotsissa tämä vieraslaji on varsin eteläinen ja USA:n Suuret Järvet, joihin mustatäplätokko on levinnyt, taas sijaitsevat Oulun eteläpuolella.

Lisäksi tälle raportointikaudelle osui myös mahtava Pietarin kansainvälinen kongressi, GeoHab 2019, hienosti onnistunut sidosryhmätilaisuus Oulussa, Raahen meripäivät Pooki flakkaa, jossa kävi noin 20 000 vierasta, Tornion Leton sataman Päivä merellä -tapahtuma ja yksi oikein onnistunut nuorisotyöpaja. Lisäksi toukokuussa pidettiin todella mainio Zonation-työpaja.

Eivät ole raportoinnit veljeksiä, vaikka saman ajanjakson kattavatkin. Rahamäärien käytöstäkin näkee, että kesällä tapahtuu - kesällä käytetään 3-4 kertaa niin paljon rahaa kuin talvella, jolloin töissä olemme vain minä ja Suvi, kun kesällä tiimissä on lisäksi harjoittelija ja luontokartoittaja, polttoainetta ostetaan tuhansilla euroilla, vuokrataan autoa, mökkejä ja laitureita ja täydennetään inventointikalustoa.

Väliraportoinnin hyvä puoli projektipäällikölle on se, että itsekin huomaa, kuinka paljon tässä oikein on edistytty. Raportointikausi 5 oli mahtava, kuutoselta (syyskuun alusta tammikuun loppuun) on taas odotettavissa hiljaisempi raportti.

Työharjoittelu merellä

Petra Saari, Metsähallitus, 18. syyskuuta 2019

Härkäletossa kivikkoiten rantojen kahluupisteiden tekoa. Tämän kaltaisissa paikoissa kasvaa yleensä rihmaleviä ja vesisammalia.
(Kuva Suvi Saarnio, Metsähallitus)

Meret ovat mielestäni kaikista kauneimpia ja kiehtovimpia luonnonympäristöjä. Etenkin vesikasvit ja makrolevät kiinnostavat minua, sillä niillä on tärkeä rooli rannikon ekosysteemissä alueen tärkeimpinä perustuottajina, hiilen sitojina, rannikon sedimenttien vakauttajina, aaltojen vaikutusten vaimentajina, maalta tulevien ravinteiden suodattajina ja elinympäristöinä monille muille eliöille. Makrofyyttien levinneisyyden ja siinä tapahtuvien muutosten tehokas kartoitus on tärkeää, jotta voidaan ymmärtää paremmin ympäristöä sekä ohjata päätöstentekijöitä ympäristönsuojeluun, turismiin, kalastukseen ja aluesuunnitteluun liittyvissä toimissa. Pinnanalaisten kohteiden tutkiminen on kuitenkin haastavaa, sillä vedessä hengittämiseen tarvitaan laitteita, eikä merenpohjan alueita ole pystytty sen vuoksi kartoittamaan samassa määrin kuin maa-alueita. Merissä on vielä paljon tutkittavaa, mikä tekee niistä mielestäni hyvin kiinnostavia. Monet tekijät, kuten rehevöityminen, ilmastonmuutos ja vieraslajit, uhkaavat merien ekosysteemien hyvinvointia. Siksi haluan olla mukana tutkimassa niitä, jotta voimme jatkossa tehdä hyviä päätöksiä niiden hyvinvoinnin edistämiseksi ja näiden kauniiden ympäristöjen säilyttämiseksi. Ilahduin siis valtavasti, kun sain kuulla, että pääsen työharjoitteluun Metsähallituksen luontopalveluihin SEAmBOTH-hankkeeseen vesikasvien kartoitukseen.

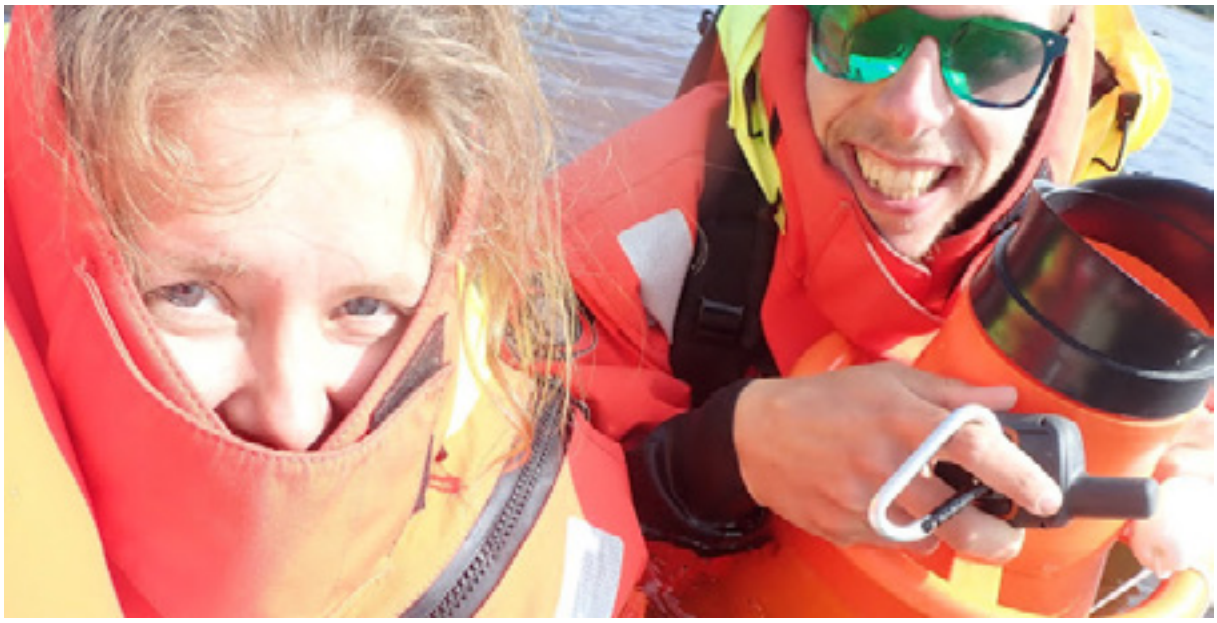
Työpäivät ovat alkaneet yleensä niin, että koko ryhmä lähtee aamulla yhdessä kentälle. Työtehtäviä ovat esimerkiksi kahlauspisteiden teko, jossa liikutaan pisteeltä toiselle joko kävellen, kumiveneellä tai SUP-laudoilla, merenpohjan videokuvaaminen veneestä käsin tai sukeltaminen.

Iltapäivällä jokainen on keskittynyt oman vastuualueensa hoitamiseen. Minun tehtäväni on ollut näytteiden mikroskopointi ja lajien tunnistus. Se on ollut todella kiinnostavaa, sillä koen, että siten oppii

Pääsin tekemään kesän ainoan kalliolla sijainneen kahluupisteen.
(Kuva Suvi Saarnio, Metsähallitus)

parhaiten uusia lajeja. Olen todella kiinnostunut oppimaan lajitunnistusta, mutta välillä tuntuu, että aika tai mikroskoopin suurennus eivät riitä lajitason tunnistukseen. Esimerkiksi monien rihmalevien tunnuspiirteet ovat nähtävissä vain tarkemmalla mikroskoopilla kuin mikä meillä on käytössä. Jos emme pysty tunnistamaan lajia, näytteen voi lähettää tunnistettavaksi Oulun tai Helsingin yliopiston kasvimuseolle. Kesän alussa, jolloin monet kasvit olivat hyvin pieniä, tunnistus oli jätettävä sukutasolle. Olisipa loputtomasti aikaa lajintunnistuksen opetteluun!

Lajien oppimisen lisäksi yksi parhaimmista asioista työssä on ollut merellä olo ja veneellä ajaminen.



Kahluupisteitä tehdessä voi päästä uimaan veneväylien yli. (Kuva Petra Saari, Metsähallitus)

Pidän vauhdista, veneen liikkeestä aaltojen tahdissa, merimaisemasta ja keskittymisestä yhtäaikaisesti useaan asiaan kuten plotterin ja syvyyden seuraamiseen, reitinsuunnitteluun, merimerkkeihin ja muuhun liikenteeseen. Olin jonkin verran ajanut venettä aiemminkin, mutta kesän aikana opin myös uusia asioita, kuten solmuja ja veneen ajamista laituriin.

Haastavinta veneen ajamisessa oli videoinnin aikana ajaminen, kun minun tuli pitää vene paikallaan kovassa tuulessa ja aallokossa pistettä tehdessä. Ensiksi ajoin kohteelle GPS-laitteen avulla, niin että veneen perä tai keula oli aaltojen tulosuuntaa kohti, jotta videokuvausta hankaloittava veneen keinuminen olisi mahdollisimman vähäistä. On vaikeaa, kun vedessä ei ole mitään näkyvää kohdetta, johon tähdätä, vaan piste tulee katsoa GPS-laitteelta. Ensimmäisillä kerroilla yritin monta kertaa ajaa samalle pisteelle, koska vene liukui pisteen yli lähestyessäni kohdetta liian nopeasti tai kun tuuli ja aallot liikuttivat venettä. Ei myöskään riittä, että kerran ajaa pisteen päältä, vaan vene tulee myös pitää paikallaan vähintään sen ajan, kun videota kuvataan. Se ei ollut aluksi helppoa, sillä aallot ja tuuli painoivat jatkuvasti venettä pois pisteeltä. Pikkuhiljaa pisteille ajaminen alkoi sujua ja siitä tuli yksi hauskimmista tehtävistä.

On ollut mahtavaa päästä päivittäin näkemään pinnan alle mitä erilaisimmissa meriympäristöissä. On ollut avoimia ja kivikkoisia pienten saarien rantoja, joissa on kasvanut vain rihmaleviä ja vesisammalia sekä matalia ja pehmeäpohjaisia suojaisia jokisuistoja, joissa on usein ollut todella monipuolinen vesikasvilajisto.

Koko kesän aikana vain yhdellä kartoituspisteellä on ollut helsinkiläiselle tuttua kalliota. Suurin ero merimaisemassa eteläisen ja pohjoisen Itämeren välillä onkin ollut Perämerelle tyypilliset hyvin matalat ja

Pääsimme Maian hinattavaksi saarelta toiselle. (Kuva Teemu Uutela, Metsähallitus)

kivikkoiset rannat sekä Suomenlahden kalliorannat.

Nyt kun puolessa välissä kesää tuntuu, että työhön alkaa tulla rutiinia, on hieman harmillista, että loppu häämöttää jo nurkan takana (ja blogi ehdittiin julkaista vasta töiden loppumisen jälkeen, toim. huom). Kesä on mennyt todella nopeasti ja olen oppinut paljon uutta. Ensi vuonna aloitan gradun tekemisen, ja luulen että työharjoittelussa oppimistani taidoista on hyötyä aiheen valinnassa ja työn kenttäosuuden tekemisessä. Työ SEAmBOTH-hankkeessa on ollut todella mielenkiintoista!

Pohjoisen Perämeren vesikasvillisuuskartoitusten tuloksia

Linnea Bergdahl, Länsstyrelsen, 24. huhtikuuta 2020

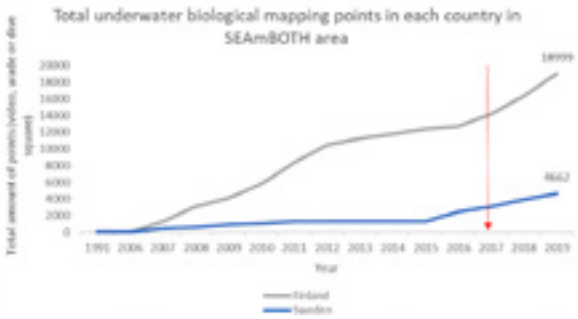
Jos haluat tehdä kartan meriluonnosta, sen kasvillisuudesta ja siihen yhdistyvistä luontoarvoista, yksi ensimmäisistä tehtävistä on alkaa etsiä biologista meritietoa. Tätä tietoa ei ainoastaan käytetä mallinnuksessa ja karttojen tekemisessä, vaan lisäksi se kertoo meille paljon vedenalaisista maisemista, lajien levinneisyydestä ja yleisyydestä ja mistä mitäkin lajeja löytyy. Kolme pitkää kesää SEAmBOTHin maastotiimit sekä Suomessa että Ruotsissa keräsivät valtavan määrän dataa vesikasveista ja eläimistä pohjoisella Perämerellä. Haluatko tietää, mitä löysimme ja miten löysimme sen? Rullaa alaspäin ja katso tuloksia!

Meribiologista dataa kerättiin käyttäen muutamia erilaisia menetelmiä. Vesikasvillisuutta (makrofyyttejä) kartoittaessa käytettiin drop-videointia, kahlausta ja sukellusta.

Näille menetelmille yhteistä on se, että ne kaikki antavat näytepisteeltä samat tiedot eli tiedon lajista ja sen peittävyydestä näytealalla. Näytepisteellä on tietty ala, esimerkiksi 4 m2. Näytepisteeltä kerätään yleensä myös muuta tietoa, esimerkiksi pohjasedimentin laatu, syvyys, lämpötila, suolaisuus ja näkösyvyys tai vaakanäkyvyys.

Projektin aikana hankealueelta pohjoiselta Perämereltä kerättiin vesikasvillisuusdataa kaikkiaan 23 661 pisteeltä.

Näytepisteiden kumulatiivinen kertyminen vuosittain Suomessa ja Ruotsissa. Punainen nuoli kertoo SEAmBOTH-hankkeen alkamisajankohdan.



Ylläolevasta graafista voi nähdä, että Suomen puolelta tietoa oli ennen hanketta huomattavasti enemmän kuin Ruotsista. Ruotsissa SEAmBOTH-hankkeen maastokartoitukset olivat ensimmäiset laaja-alaiset ja systemaattiset vedenalaisen luonnon kartoitukset pohjoisella Perämerellä.

Yhteensä 167 vesikasvilajia löydettiin hankkeen aikana. Vaikka vesikasveja löydettiinkin reilusti yli sata lajia, jotkin lajeista olivat yleisempiä kuin toiset. Dataa analysoimalla saadaan selville viisi yleisintä lajia, jotka yhdessä kertovat paljon pohjoisen Perämeren vedenalaisesta kasvillisuudesta.

	FIN	SWE	Yhteensä
Näkinpataiset (lajeja)	10	10	10
Vesisammalet (lajeja)	20	17	23
Vesisammalet (sukuja)	12	9	14
Levät (lajeja)	15	10	16
Levät (sukuja)	28	20	32
Putkilokasvit (lajeja) 114	113	118	
Putkilokasvit (sukuja)	76	74	76
Lajeja	159	150	167
Sukuja	126	113	132

Taulukko kertoo SEAmBOTH-projektialueelta löydettyjen kasvilajien- ja sukujen määrän. Taulukkoon on koottu sekä maastohavainnot että kirjallisuuslähteiden havainnot.

Kaiken kaikkiaan Suomesta ja Ruotsista löydettyjen lajien ja sukujen määrä oli suhteellisen samanlainen. Suurin ero löytyy vesisammallajeista ja levälajeista. Tämä voi johtua osaltaan hieman erilaisista ympäristöolosuhteista. Suomessa rannat ovat matalampia ja pidempiä ja vesi on hieman suolaisempaa kuin Ruotsissa. Ero voi johtua myös siitä yksinkertaisesta syystä, että Suomesta dataa on noin neljä kertaa enemmän kuin Ruotsista. Kuten sanotaan: mitä enemmän etsii, sitä enemmän löytää. Putkilokasvien lajimäärä puolestaan oli lähes identtinen Suomessa ja Ruotsissa. Kolme lajia löytyi vain Suomesta (tai niitä ei ole vielä löytynyt meriympäristöstä Ruotsissa): nelilehtivesikuusi (Hippuris tetraphylla), sahalehti (Stratoites aloides) ja kilpukka (Hydrocharis morsus-ranae). Vain yksi laji löytyy ainoastaan Ruotsin puolelta, ja se on vieraslaji kiehkuravesirutto (Elodea nuttallii). Lisää tietoa Suomen ja Ruotsin välisistä eroista vedenalaisessa biologissa löytää englanniksi tästä blogista.

Vesisammalet ovat pohjoisen Perämeren erikoisuus. Normaalisti nämä makeanveden lajit löytää järvistä, joista ja puroista, mutta Perämeressä ne pystyvät elämään tarpeeksi matalan suolapitoisuuden takia. Yhteensä 23 lajia on tällä hetkellä löydetty alueelta, eikä se välttämättä ole viimeisin luku. Kahdentoista vuoden intensiivisten vedenalaiskartoitusten jälkeen Suomesta löytyi vielä maastokaudella 2019 kuusi uutta vesisammallajia. Ennen SEAmBOTH-projektin alkua Ruotsin hankealueelta tiedettiin vain muutamia harvoja vesisammallajeja, nyt luku on 17.

Vesikasvillisuuskartoitusten ohessa tehtiin myös joitakin huomioita eläimistä pohjoisella Perämerellä. Ensimmäinen havainto vieraslaji mustatäplätokosta (Neogobius melanostomus) Oulun korkeudella asti tehtiin kesällä 2019. Aiemmin laji on löytynyt Raahesta. Mustatäplätokko on aggressiivisesti leviävä vieraslaji, joka saapui Itämerelle etelästä, eikä sitä aiemmin ole löydetty niin pohjoisesta kuin SEAmBOTH-alueelta. Tämä ei siis ole hyvä uutinen.

SEAmBOTH-maastotyöretki oli sekin, jolla Ruotsin ensimmäinen meriuposkuoriainen Macroplea pubipennis löydettiin. Sitä ei koskaan aiemmin oltu löydetty koko Ruotsista, vaikka sitä löytyykin SEAmBOTH-hankealueen vastapuolelta Suomesta suunnilleen samalta korkeudelta. Lue lisää meriuposkuoriaisen löytämisestä ja miten sitä etsitään sekä Metsähallitus merellä -blogista.

Ajat muuttuvat - ja maisema myös

Aarno Kotilainen, GTK, 30. huhtikuuta 2020

Pohjanlahti noin 2000 vuoden kuluttua. Piirros Harri Kutvonen, Geologian tutkimuskeskus GTK.

”The Times They Are a Changin”, eli ajat muuttuvat, lauloi Bob Dylan kerran, kauan sitten. Aikojen muuttuminen on kuitenkin yhtä totta nykyäänkin, kun koronavirus muuttaa maailman tilannetta ja sosiaalista käyttäytymistämme koko ajan. Myös ympäristö muuttuu, osaksi omien tekojemme seurauksena, osaksi luonnon omien prosessien myötä.

SEAmBOTH-hanke alkoi kolme vuotta sitten ja päättyy tänään. Kolmessa vuodessa ehti tapahtua paljon, mutta toisaalta vuodet menivät nopeasti. Geologisella aikaskaalalla kolme vuotta on häviävän pieni hetki. SEAmBOTH-hanke tuotti valtavan määrän uutta tietoa pohjoisen Perämeren luonnosta, biologiasta ja geologiasta.

Ruotsin Geologinen tutkimuskeskus SGU ja Suomen Geologian tutkimuskeskus GTK keräsivät yhteensä yli 5000 km seismis-akustisia luotauslinjoja ja näytteitä merenpohjasta. Uusien tietojen perusteella luodut kartat kattavat noin 500 km2 alueen merenpohjaa. SGU tuotti myös merenpohjan substraattimalleja koko SEAmBOTH-alueelle eli heidän karttansa perusteella voi katsella, onko pohja hiekkaa, soraa, kiveä vai mutaa. Hankkeen tulokset yli tuplasivat kaikki aiemmat geologiset datat, mitä alueelta oli olemassa.

Miltä merenpohja sitten näyttää? Geologiset kartat pilottialueilta kertovat, että merenpohja koostuu pääosin monista pehmeistä sedimenteistä kuten mudasta ja savesta. Kuitenkin alueet, joille nykyisin kertyy pehmeää pohja-ainesta (ns. sedimentoitumisalue) ovat pieniä verrattuna koko Perämereen. Korkearesoluutioisella eli tarkalla kartoitusdatalla näkyvät merenpohjan pienetkin piirteet (suurimittakaavainen kartta), jotka harvemmalla kammalla eli pienimittaisessa kartassa eivät näy. Yksi näistä pienistä geologisista piirteistä ovat kovasta savesta muodostuneet rakenteet. Näissä kohteissa savi on hyvin kompaktia ja kovaa ja voi muodostaa riuttamaisia rakenteita. Nämä geologiset muodostelmat ovat hyvin samantapaisia kuin Metsähallituksen vuonna 2014 löytämät savilabyrintit Leipäreiden lounaispuolelta.

Ihmisvaikutukset voivat näkyä veden alla ja myös merenpohjassa, myös SEAmBOTH-alueella. Geokemialliset analyysit pehmeästä mudasta viittaavat siihen, että ihmisperäisiä haitallisia aineita kuten kadmiumia, lyijyä, sinkkiä ja elohopeaa on kertynyt merenpohjaan. Näiden raskasmetallien pitoisuudet vähenevät järjestelmällisesti joka puolella pohjan pintaa kohti eli niitä on joutunut pohjaan vähemmän viimeisten muutamien vuosikymmenien aikana. Joillakin alueilla kadmiumin ja sinkin pitoisuudet ovat kuitenkin edelleen pintasedimenteissäkin suhteellisen korkeita.

SEAmBOTH-hankealue, kuten koko Pohjanlahtikin, on nopean maankohoamisen aluetta, mikä puolestaan johtaa merenpohjan jatkuvaan eroosioon. Eroosio paljastaa uusia alueita (esim. vanhoja merenpohjan kerrostumia) ja maankohoaminen puolestaan tuo näitä alueita ensin matalammalle ja sitten rantaan asti. Maankohoaminen muokkaa rannikkoa ja merenpohjaa hitaasti mutta varmasti.
Pitkällä aikavälillä, noin 2000 vuoden kuluttua, ja jollei merenpinnan nousu merkittävästi kiihdy Itämerellä, meriyhteys Perämeren ja Selkämeren väliltä katkeaa ja Perämerestä tulee Euroopan suurin sisäjärvi, Peräjärvi. Tämä ainutlaatuinen ja kaunis alue on siis jatkuvan muutoksen alaisena. Me emme voi vaikuttaa geologisiin muutoksiin, mutta me voimme, ja meidän täytyy, huolehtia siitä, että meremme pysyy hyvässä kunnossa tulevillekin sukupolville. SEAmBOTH-projekti päättyy, mutta matkat jatkuu. Ei ole mitään muuta pysyvää kuin jatkuva muutos.