

## BSBD-WG Report to the BSHC 24<sup>th</sup> Conference

The Baltic Sea Bathymetry Database Working Group has not held any meeting during the last year.

### 1. Status of the work of BSBDWG

Since the last conference the portal has been up and running without interruptions on the portal itself. The problem that download requests sometimes gets a timeout have still occurred sometimes. Those that has contacted us regarding this we have referred them to use the development machine instead and that has worked without problems. The cause is still unknown. The problem will be solved when a new server is set up.

The bathymetric model at present time is the same as the version published in December 2013 but work is ongoing for an update of the 500m model without any changes of the portal itself. This work has regrettably been further delayed, but a new 500m model is ready for publication shortly, and a 200m model based on the same input data has also been prepared but needs further evaluation prior to publication. Both models indicates significant improvements to the model.

We have continued to use the Amazon Web Services with the same setup and size of servers. Together with the server for the BSHC webpage and development server, the monthly cost is presently about 250\$.

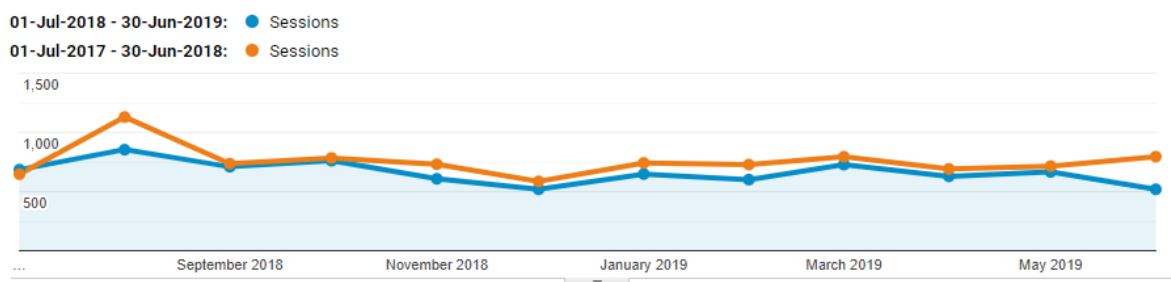
### 2. The use of the bathymetric database

#### 2.1. The portal











The portal address remains as [data.bshc.pro](http://data.bshc.pro)

The site is fairly widely used and the number of visits on the portal between the first of July 2018 and first of July 2019 is 7928 (9085 visits 2018) made by 5810 unique visitors (6477 visitors 2018).

The peak number of daily visits during the period originates also 2018 from August but this time one week later than the previous year and 95 visits were made to the portal on one day.



The last year Sweden, Poland and Germany still has been the most frequent users of the BSBD portal and together they stand for 47.07% (51.36%) of the visitors.

Country	Users	% Users
1.  Sweden	1,946	33.30%
2.  Poland	442	7.56%
3.  Germany	363	6.21%
4.  United States	348	5.96%
5.  Finland	314	5.37%
6.  United Kingdom	251	4.30%
7.  France	191	3.27%
8.  Denmark	173	2.96%
9.  Estonia	167	2.86%
10.  Russia	152	2.60%

**Figure 1 Top ten countries using the portal July 2018-July 2019**

The number of registered active links to the portal is the same this year 100 (previous year 101), *except from these we know that in some places our portal is mentioned and the address is given as inactive links (plain text).*

- 26% (62% for previous year) of the visitors arrive to the portal from one of the active links.
- 14% (12% for previous year) of the visitors, that use active links to reach the portal, use the link on the BSHC homepage.

The significant drop in % for the visitors from active links indicates most probably, that many users have learnt the address, or have it bookmarked in their browsers.

## 2.2.Downloads

We have not made any statistic images showing the areas and frequencies for downloads the last years.

We have had 18 (6 for 2017) support questions sent by email to us and they mainly concerns downloads and/or questions about higher resolutions.

We know that the model has been used for illustrations in articles and books as well as for use in a number of student theses. A quick search (google scholar) gives at hand that the paper that was written when the model was presented has been cited more than 15 times in scientific articles. A Google Scholar search for "baltic sea bathymetry database" gives 87 hits for articles referencing to that phrase.

## 2.3. Use of OGC services

We know that the WMS service is used by many users including county administrations and other governmental organisations. Some users also have an internal cache service for the use in their own GIS systems. This internal cache reduces the number of downloaded tiles from our servers as they only need to download each tile once.

As an example the number of DNS-Queries for the month of April was 106 980 (100 758 year 2018, 102,324 year 2017, 37,689 year 2014, 46,847 year 2015 and 42,875 year 2016), This is only an indication and not an actual number of requests, but indicates a small increase in the number of calls.

The HELCOM map portal (uses ESRI server) can still not make use of external WMS services and for that reason redistributes the BSBD by themselves and we do not know the frequency of users on that service.

## 3. Work Group participants

*Mr. Hans Öiås* has during the last year been acting as the Chair of the WG. The activity during the year has been low.

The manning at SMA will from not be assigned further resources to produce new models.

The current WG members and points of contact is:

Country	Name	E-mail address
Denmark	Jens Peter Weiss Hartmann (Used as point of contact)	<a href="mailto:jepha@gst.dk">jepha@gst.dk</a>
Estonia	Peeter Väling Signe Paevere	<a href="mailto:peeter.valing@vta.ee">peeter.valing@vta.ee</a> <a href="mailto:signe.paevere@vta.ee">signe.paevere@vta.ee</a>
Finland	Juha Tiihonen Leila Rapeli	<a href="mailto:juha.tiihonen@traficom.fi">juha.tiihonen@traficom.fi</a> <a href="mailto:Leila.Rapeli@traficom.fi">Leila.Rapeli@traficom.fi</a>
Germany	Jürgen Monk	<a href="mailto:juergen.monk@bsh.de">juergen.monk@bsh.de</a>
Latvia	Normunds Duksis	<a href="mailto:normunds.duksis@lhd.lv">normunds.duksis@lhd.lv</a>
Lithuania	Emilis Tertelis (Used as points of contact)	<a href="mailto:emilis.tertelis@tsa.lrv.lt">emilis.tertelis@tsa.lrv.lt</a>
Poland	Witold Stasiak	<a href="mailto:w.stasiak@ron.mil.pl">w.stasiak@ron.mil.pl</a>
Russia	(No contact person appointed)	<a href="mailto:main@gunio.ru">main@gunio.ru</a>
Sweden	Hans Öiås	<a href="mailto:Hans.oias@sjofartsverket.se">Hans.oias@sjofartsverket.se</a>

Denmark, Lithuania and Russia have not appointed participants for the WG.

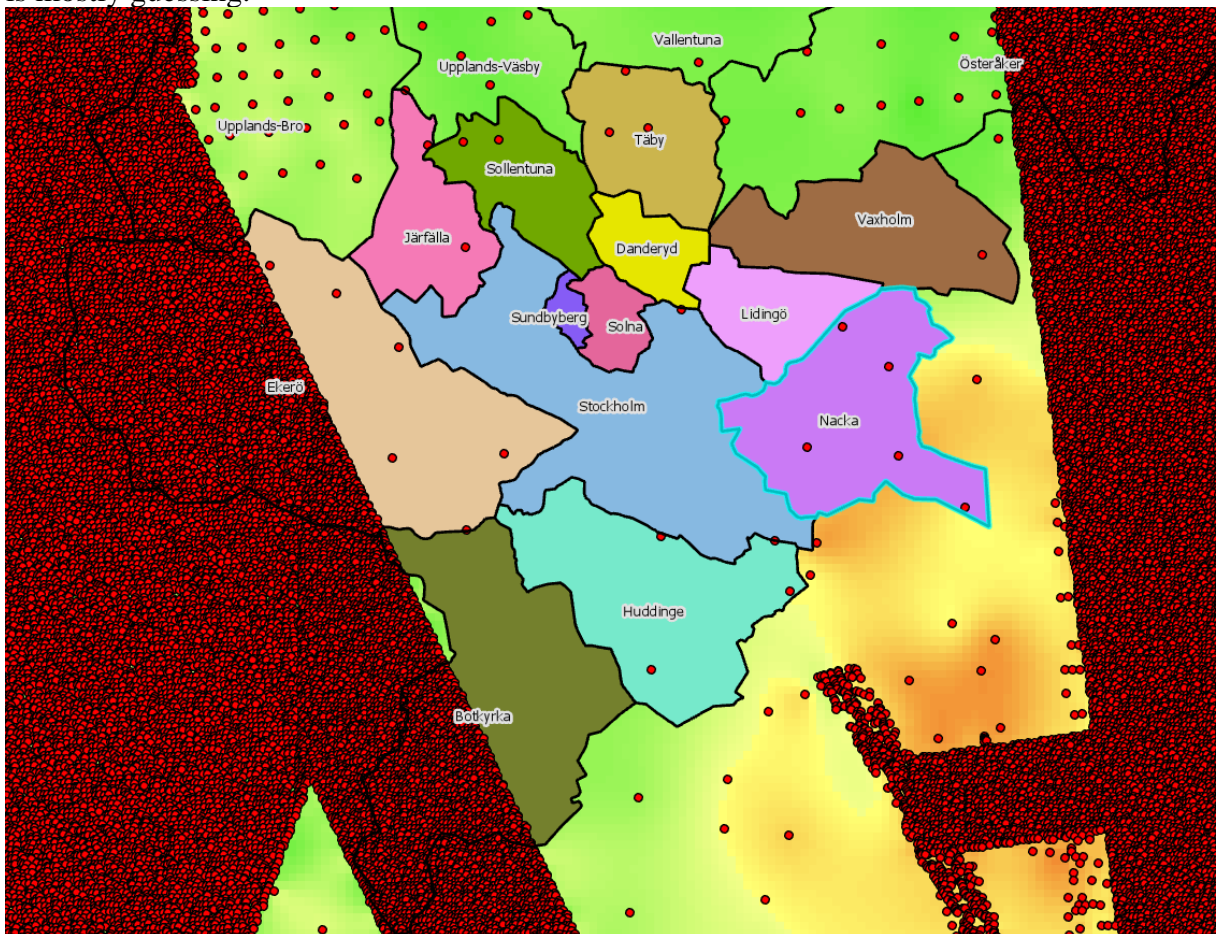
## 4. Performed work

During the last year we have run an internal project at SMA to set up a production line and instructions for creation of BSBD, as well as EMODNet models. This will lead to that we in the future will not be as dependant on individual resources in the future allow easier and more frequent updates.

The updated BSBD 500m grid has not yet been published on the website and includes the Lithuanian dataset. The model is drastically improved due to a high grade of new survey data compared to the version 0.9.3.

We are currently also working on a 200m model using the same datasets that was used by SMA for the EMODNet High Resolution Bathymetry. This is as far as it is reasonable to go without to high degree of interpolations except for the Estonian and German waters, where higher resolutions is available and no financial or legal restrictions exist. The plan is to provide both the 500 and the 200m from the BSBD portal.

When it comes to data modelling it is the sparsest areas that is the most demanding and any improvement of the available density there helps significantly. Below is an image from the worst area in the Swedish part of the Sea of Bothnia, showing the available data points and as a background Stockholm and its surrounding municipalities. It then becomes obvious that it is impossible to produce a model that in a good way describes the true seafloor as it is mostly guessing.



The area above is in the present plan aimed to be surveyed 2021, but two lines in the centre part of it has been surveyed during transit to other survey areas this year.

## 5. Presentations

No presentation has been held or is planned for the near future.

## 6. Comparison BSBD/EMODNet HRSM

Dr Martin Jacobsson, Sarah L. Greenwood, et al. from the Stockholm University has written a scientific article for where they mention the IOWTOPO, BSBD and EMODNet

HRSM. The article has still not been published but has been out for review and can here be found in the present form, including comments: <https://www.ocean-sci.net/15/905/2019/os-15-905-2019.html>. In the article they indicate that they need to transform the EMODNet and IOWTOPO dataset into an ETRS89 LAEA projection to get an equal point distribution when using it. The main focus of the article is to compare the new EMODNet HRSM to the IOWTOPO.

From SMA we sent, amongst others, the following comment regarding the EMODNET HRSM :

*The resolution of data from the Swedish side of minimum and maximum values within 300m, gives the result that there is only theoretical possibility to populate 2 out of 14 cells of 115x57.5m (at Lat 60).*

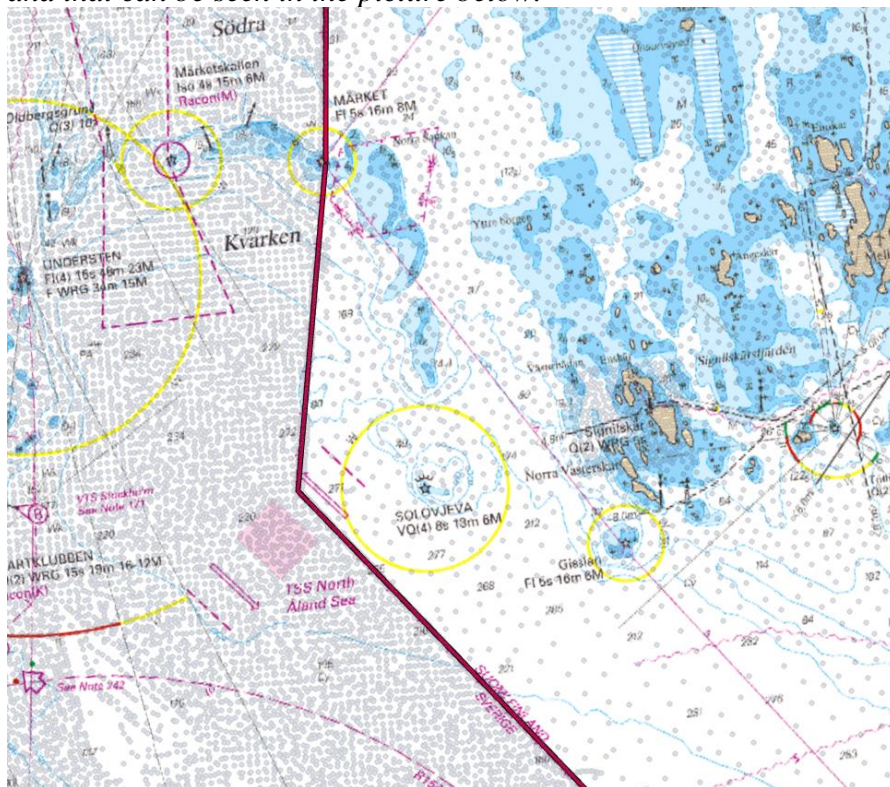
*In the case where the data comes from digitized older, and sparse, surveys (plummets) both the min and max depth in the SMA database (within the selection cell) will be identical and on identical position, hence populating only one of the 14 cells.*

*In rare cases a min and maximum value from the same or neighbouring selection cells falls within the same Emodnet cell valid min, max and average values should exist in the EMODNet cell.*

*In the end this means that even if the area are surveyed by modern methods, only 2 (sometimes 1) of 14 (13.5) emodnet cells contains a measured sounding, the rest is filled by interpolated values.*

*If instead a cell of 115x115m would have been used the ratio would have been 2 populated cells out of 7 and less north southerly influence on the interpolation of the remaining empty 5 cells.*

*For the Finnish side the point density is even more sparse than on the Swedish and that can be seen in the picture below.*



**Difference between Swedish (300m) and Finnish data density**

They also conclude that sub-sampling of full coverage high-resolution bathymetry instead of interpolating from heterogenic and sparse single beam depth soundings is a great benefit, and that the possibility to have min, max and average values for each cell also improves the usefulness of the DTM.

It is in my opinion still worth to keep the BSBD as a separate model at least as long as the EMODNet uses unprojected grids without zoning, that is requested in the INSPIRE requirement for grids, or changes for an appropriate grid such as ETRS89 LAEA or LCC. The latter is also suggested in the INSPIRE documentation. The BSBD model in 500m and in the future 200m resolution is, for the overall Baltic area, resolutions more suitable to the available source data than an unprojected gridding to 1/16 of a minute causing excessive interpolations and north-southerly artefacts.

## **7. Cooperation's**

### **7.1.GEBCO**

GEBCO recognizes the BSHC database as a Regional Mapping Project. No delivery to GEBCO has been made during the last year but will be done when a new model has been published.

### **7.2.EMODnet**

BSBD 0.9.3 is used in the latest EMODnet High Resolution Seabed Mapping model where there is very sparse data available. For all other parts the available source data has been used.

SMA as well as Germany and Latvia is a partners in the EMODnet “High Resolution Seabed Mapping” (phase III). SMA has the role of coordinator for the Baltic and BSH for the North Sea.

## **8. Financing**

SMA can continue to keep the portal alive, update the model and also some additional development. The main issue has been to find time to do the needed work, but we hope that the incorporation in the normal workflow will solve this issue.

## **9. Future plans**

Soon publish the updated 500m model and after that to publish a 200m model that is less smoothed and interpolated than the Emodnet model.

The new version will also cover the Norwegian areas of Skagerrak and include the data delivered from Lithuania.

An updated coastline will come together with the 200m resolution grid.

We have on our development environment included the basin borders and names for presentation in the portal, but these needs to be adjusted to the coordinates decided and approved by the BSHC before publication on the portal. They will also be made available as a separate WMS/WFS layer.

- In a future revision of BSBD to include at least data from Russian ENC cells, if that will be allowed by the Russian HO.
- We still hope to get better, un-modelled dataset from Denmark in higher resolution and extracts from Charts/ENC east of Bornholm where no other digital data has been delivered to BSBD or EMODNet HRSM. The present available resolution of a 500m grid from Denmark also restricts the modelling accuracy, especially for the positioning of the depths.
- Further optimization of the production tools and documentation.
- Compile and provide additional bathymetric layers with higher resolution where the data providers and legislation permit (Germany and Estonia).
- Enhance the coastline for cutting, masking and presentation in the portal. The present coastline is taken only from Swedish nautical charts. Except for that we have received coastlines in vector format from Estonia, Poland and Germany. The separate coastlines need to be stitched together and land areas to be created to be used for cutting operations and as masks in the portal presentation.
- Arrange a WG meeting for a revision of the present specification (version 1.0) for the future work.

## **10. Actions for the BSHC 24th Conference**

The BSHC 23d Conference is requested to:

1. Note this report
2. Consent that the work with the portal continues as stated above using the WG members as a reference group.
3. Consent to publication of the basin names and boundaries, if BSHC24 accept the suggested coordinate list.
4. Endorse future cooperation with GEBCO and EMODnet.