NovasArc – Nordic project on vulnerable marine ecosystems and anthropogenic activities in Arctic and sub-Arctic waters

Kortlægning af sårbare marine økosystemer og menneskelige aktiviteter i arktiske og sub-arktiske områder

First workshop in 2017
Reykjavik, Iceland, 30 January - 3 February

Participating project team

Participants: Petur (Færøyene); Steinunn, Julian, Stephan, Haraldur (Island); Pål, Lene, Kristin, Øistein, Hanna, (Norway)

Main activities at the meeting
Development of database on VME distribution
Project communication- website and Twitter
Exchange of experience with visual mapping methodology
Identification sheet fishermen & Scientists
Compilation of data on fishing activity
Presentation of the NovasArc project
Modelling distribution of VMEs
Data on Hydrography
Plan for joint activities in 2017

Development of database on VME distribution
Input from literature and new observations of VME distribution was a main activity at the workshop.

- The species list of the VMEs to be mapped was finalized by including VME key species listed in the report from the ICES WGDEC workshop (WKVME 2015) and others that was relevant to the area (see appendix 1). It includes 7 main VME categories and 56 taxa.
- The format of the input matrix was updated (appendix 2.) and was transferred.
- Data on the selected VMEs and their key species in the databases at Hafro, IMR, and Havstovan will be copied into the project specified database.
- The VME species of coral and sea pens from an earlier project between IMR and Hafro will need updating only with new information.
- Github is suggested as a tool to houses the database plus contributions.
- New data to database should be sent to Julian by e-mail as separate excel-sheets with filenames indicating data source, date, and provider e.g. Mareano,2-2-17-PBM.
- Drop box will be used to chare literature on distribution records.

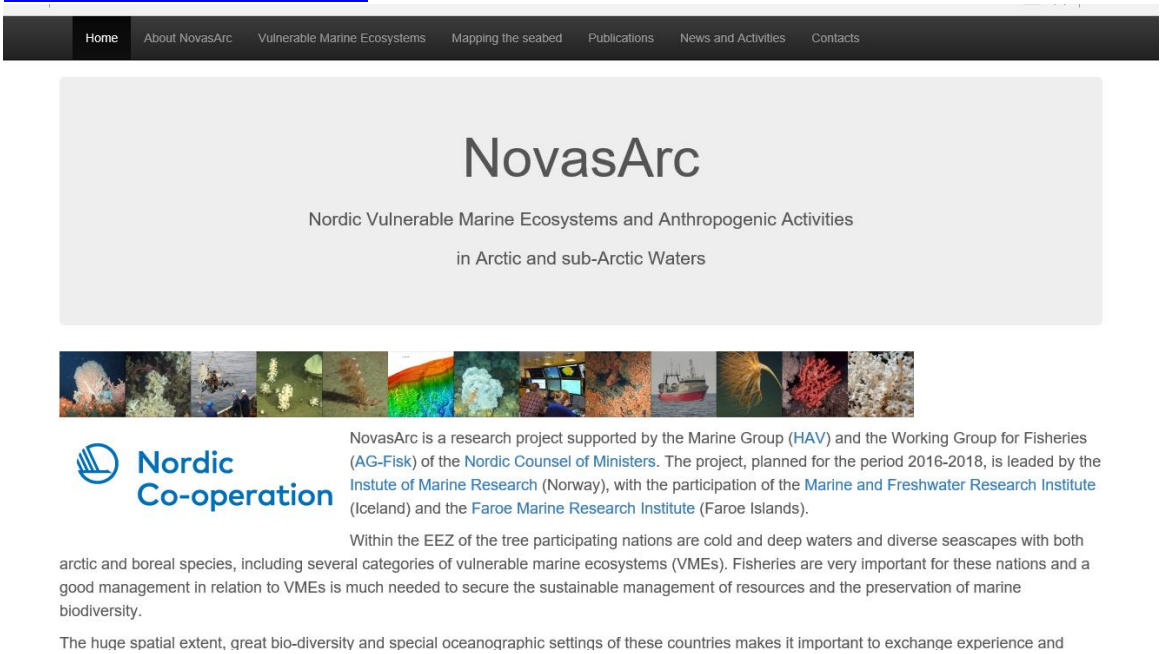
<u>Identification sheet fishermen & Scientists</u>
- Simple guide for recording of VMEs (examples were presented): Identification sheet and report sheet. To be used for mapping and certification by MSC of fleet and increase awareness.
- Informative report on VME species for specially interested fishermen and public.
- Identification guide for scientific purpose

Project communication- website and Twitter

A website was initiated and following content was suggested:
Project description (text based on application)
Partners and link to their institution (Photo of group +++)
Photo of relevant VMEs up-front
Text on ecosystem services provided by VMEs
Presentation of mapping gear (Chimaera +++)
Media activities: (link to media events)
Reports and publications (Reports from meetings etc.)
Activities; Cruises, workshops, conferences
New results: Collaboration with industry, new mapping results….

-Julian has been working on this since last workshop and reported on progress. It was decided that all should provide input to the website "NovasArc".
-Text and photo was delivered and Julian showed prototype that looked very promising and should be finished within 2 weeks after the end of the workshop.
-It was decided that a logo could be developed by graphic designer.
It was suggested that the project should have a twitter group

http://novasarc.hafogvatn.is//



Exchange of experience with visual mapping methodology
An important part of the project is to share experiences related to visual mapping. At the meeting, recent development related to smaller and less expensive solution using GoPro-cameras was discussed. Haraldur Einarsson from Hafro participated on this part of the meeting.

Pål had new interesting information related to GoPro-cameras used at the Azores and offers from the company BINC manufacturing the equipment. Haraldur added information from similar equipment used around Iceland. It was decided to ask for prices and advise from the company BINC (for details see appendix 2). Based on information available on internet it was estimated that the cost will be ~35000,- DKR including 500 m cable and strong underwater LED lights.
The producer was contacted and BINC indicates that a Sony FDR X3000 could be a better solution than a GoPro camera.

Decision on the equipment to order will be made consulting engineers at the different institutes. Additional adjustments before use will be determined later (clips, ropes, frames etc.). It will be important to secure that the costs related to shipping is as low as possible.
The equipment should be available for testing at the coral mapping cruise in Faroe waters 14-21 of June, arranged by Havstovan.

Compilation of data on fishing activity

It has been decided to present pressure maps for fisheries based on VMS data and electronic logbooks from 2013-15. What gear to get information on and availability of data was discussed. This part of the meeting was attended by Kristin Helle (IMR) who works with data from longlining fisheries off Norway.

Longlines and gillnets: Regarding longlining it was decided to use e-logbook to get an estimate of area affected in general by setting a longline, and for mapping purpose start and stop position is sufficient. For Norwegian fisheries data on gillnets and longlining is available from the web-portal "Barents Watch" (https://www.barentswatch.no/en/).
Trawling activities: VMS data will be used to present active boats as satellite records (pings) sorted to represent trawling activities. If VMS data is not available (i.e. around the Faroes) e-logbooks will be used and information will be convert to pings by looking at trawling time. Norway has VMS and e-logbook but need to get the data from 2013-15 sorted.
Relevant gears are: Trawls (Otter and shrimp…), Danish-seine.
Representation of pressure: Separate maps should be produced for the different gears. Boat trajectory can be used for long lines if possible, for gillnet position, and for trawling Gerittsen grid method should be tested.

Presentation of the NovasArc project

Thursday, February 2 (13:00-14:00) the project was presented for scientists and public in the auditorium at Hafro: Lene, Pål, Petur and Julian provided an overview of goals for the project and preliminary results and activities.

Modelling distribution of VMEs

The distribution of key species related to 7 VMEs and how it relates to environmental descriptors will be used to produce habitat models. The modelled distribution of VMEs will together with the distribution of fishing pressure be the input used in an overall GIS analysis for identification of areas at risk. It was suggested to use "Maxent" or Conditional inference and R-scripts (?) for the modelling coral distribution. At this part of the meeting the M.Sc. student Hanna Sundahl from the university of Bergen took part. She is making coral distribution models for selected areas off Norway. Julian and Hanna will be in contact about strategies for modelling coral distribution.

Data on Hydrography

Øystein (IMR) participated at this part of the meeting (on Skype), Hjalmar (Havstovan) was ill and could not participate.

Scale and depth zones for bottom current information

For the large-scale distribution model near bottom currents are needed for the whole area. Øystein demonstrated what the Nemo model can deliver by an example (see appendix 3). The Nemo model has a resolution of 1/12 grade grid (approximately 10 km) and area, depth and time can be selected.
Øystein will check if Nemo can deliver bottom currents based on z values to get only close to bottom currents. An alternative is to get currents in different depth strata, an example: 100-300; 300-600 600-1000 >1000 meter.
For local/national modelled distribution of VMEs a Nord-Kyst 800m current model will be useful. Current speeds suffer from large uncertainties but values can be delivered for max, mean and range which in turn can be tested against actual measurements.

Bottom temperature is easy to get and both max, min and variation (range) based on a longer time span (10-20 years) are relevant as environmental descriptors for VME habitat models.

Plan for joint activities in 2017

Cruises and related activities

FMRI: Faroe coral cruise 14-21 June. 3 guests can join. Initial plans were made. Consider areas where corals are known and fisheries not prohibited.

Existing videos taken by Kristian Zachariassen could be interesting and the use of these will be pursued.

Petur will have a meeting with KZ and discuss equipment and use of videos. Testing new video equipment for mapping VMEs.

MFRI: Icelandic cruise 30/6 – 8/7 mapping benthos visitors can join.

IMR: Dr F. Nansen test cruise 21-27 February. One visitor from Iceland.

IMR: MARENO: 16/3-8/4; 17-29/8; 21/10-13/11.

Results and publications

Publications on distribution of specific VMEs or key-species, actual data and model.

Overlap analysis fishing and VMEs

Level of resolution for VMEs three cases, Iceland, Faroes, Norway

Report in the Norden series

Public outreach

Make a poster asap for general use

Conferences

Future funding sources

Topics: Connectivity, Climate change, Ecosystem services

RANNIS: ”Grants of excellence”, June 15th

RANNIS: general June 15

Nord Pluss:

Arctic Science

Appendix 1

Description of the 7 VME types that are mapped

Species	VME	VME subclass	Code	Sub-code
Soft bottom sponge aggregation				
Geodia spp.	Soft bottom sponge aggregation		1	a
Aplysilla	Soft bottom sponge aggregation		1	a
Stryphnus	Soft bottom sponge aggregation		1	a
Steletta	Soft bottom sponge aggregation		1	a
Thenea spp.	Soft bottom sponge aggregation WKVME		1	b
Hard bottom sponge gardens				
Axinellidae	Hard bottom sponge gardens		2	a
Phakellia	Hard bottom sponge gardens		2	a
Antho dichotoma	Hard bottom sponge gardens		2	a
Tethya spp.	Hard bottom sponge aggregation		2	extra
Mycalidae (*Mycale*)	Hard bottom sponge aggregation WKVME		2	b
Polymastia spp.	Hard bottom sponge aggregation WKVME		2	b
Tetillidae (*Craniella* and *Tetilla*)	Hard bottom sponge aggregation WKVME		2	b
Deep arctic sponge aggregations				
Caulophacus articus	Cold water sponge aggregations		3	
Hexactinellida spp.	Cold water sponge aggregations		3	
Cladorhzidae spp.	Cold water sponge aggregations		3	
Pheronema carpenteri	Cold water sponge aggregations		3	
Reefs				
Lophelia	Reefs		4	
Madrepora	Reefs		4	
Solenosmilia	Reefs		4	
Coral garden soft bottom				
Radicipes	Coral garden soft bottom	Gorgonian	5	a
Acanella	Coral garden soft bottom	Gorgonian	5	a
Isidella	Coral garden soft bottom	Gorgonian	5	a
Flabellum spp.	Coral garden soft bottom	Cup coral field	5	b
Caryophyllia spp.	Coral garden soft bottom	Cup coral field	5	b
Stephanocyanthus spp.	Coral garden soft bottom	Cup coral field	5	b
Coral garden hard bottom				
Lophelia	Coral garden hard bottom	Non reefal scleractinian	6	a
Madrepora	Coral garden hard bottom	Non reefal scleractinian	6	a
Primnoa	Coral garden hard bottom	Gorgonian	6	b
Paragorgia	Coral garden hard bottom	Gorgonian	6	b
Paramuricea	Coral garden hard bottom	Gorgonian	6	b
Callogorgia	Coral garden hard bottom	Gorgonian	6	b
Keratoises	Coral garden hard bottom	Gorgonian	6	b
Swiftia	Coral garden hard bottom	Gorgonian	6	b
Acanthogorgia armata	Coral garden hard bottom	Gorgonian	6	b
Anthothelidae (*Anthothela* spp.)	Coral garden hard bottom	Gorgonian	6	b
Anthomastus grandiflorus	Coral garden hard bottom	Gorgonian	6	b
Heteropolypus spp.	Coral garden hard bottom	Gorgonian	6	b
Chrysogorgiidae (*Chrysogorgia* spp., *Pleurogorgia* spp.)	Hard bottom coral garden WKVME	Gorgonian	6	c
Bathypathes spp.	Hard bottom coral garden WKVME	Antipatharia	6	c
Stauropathes arctica	Hard bottom coral garden WKVME	Antipatharia	6	c
Stylaster spp.	Coral garden hard bottom	Stylasterid	6	d
Pliobothrus spp.	Coral garden hard bottom	Stylasterid	6	d
Stenohelia spp.	Coral garden hard bottom	Stylasterid	6	d
Drifa	Coral garden hard bottom	Cauliflowers	6	e
Duva	Coral garden hard bottom	Cauliflowers	6	e
Gersemia	Coral garden hard bottom	Cauliflowers	6	e
Pseudodrifa	Coral garden hard bottom	Cauliflowers	6	e
Seapen communities				
Umbellula spp.	Seapen communities	Deep sea	7	a
Anthoptilum spp.	Seapen communities	Deep sea	7	a
Pennatula	Seapen communities	Shelf	7	b
Kophobelemnon	Seapen communities	Shelf	7	b
Vigularia	Seapen communities	Shelf	7	b
Funiculina	Seapen communities	Shelf	7	b
Halipteris spp.	Seapen communities	Shelf	7	b

Template for input to database on the 7 VMEs

Species	VME						Position						Environment		Obs. VME	Abundance		Sampler	Data	
	Code	Dec. Star		Dec. End		Orig. Star		Orig. End		Point type	Geogr.				Code					
	(1-7; a-e)	Lat.	Long.	Lat.	Long.	Lat.	Long.	Lat.	Long.	(1=transect, 2=center, 3=observation)	area	Depth (m)	Temp. (°C)	Substr.	Terrain	(1-7; a-e)	Value	Unite	Gear	Source	Provider

Appendix 2

GoPro information

Questions mailed to BINC: Is it possible with live feed of video over 500m cable?
Will the cable be strong enough for the drag along a such a long cable?
Will we rely on programmed start of video and lights, or is it possible to control this via the cable?

Information from BINC:

1) If you plan on using a Hero5, we suggest the Benthic 3 since the Benthic 2 is for the Hero3/4.
2) We can transmit signal 1000M+ via twisted pair cable. This requires attaching 2 cylinders (GPH 10"+GPH 6") to the back of the Benthic camera. These cylinders hold 12v power pack, voltage regulator, and a video signal booster board (sometimes a timer is also added). A USB plug is plugged into the GoPro which connected to the video booster board. The video signal is then sent to tethered cable which is terminated at the surface with a video receiver. The video receiver has cable that can be plugged into a laptop or TV. The cable we have is custom made cable and requires several weeks to manufacture. Our cable is fairly stiff and rather thick compared to other ROV cable since this type of set-up is typically used on trawlers which require a certain level of abuse. We have client who have used regular Cat5/6 (for outdoor use) in shallower water successfully. Regardless of the cable you use, we strongly recommend running a cable (or dyneema rope) along the video cable. This cable/rope must be shorter than the video cable so that is absorbs all the strain. We recommend at least a 500kg rating on that cable/rope. The video signal you will get at the surface will be of a much lower quality than what the GoPro is actually recording. But it's good enough resolution to see what there is around the camera.
3) The easiest way to control the camera/light is via programmable timers that can be integrated in the flashlight and/or camera housing. We aren't well versed enough in controlling the camera via the cable from the surface to make recommendation. However, we know some our clients have use RS232 plug to interface with the camera. Our timers can also be mounted in series so that you can have maximum flexibility (Delay camera/light for 1 hour, then light /camera on for 30 minutes, off for 20 minutes and repeat the 30/20 cycles 100 times.)
4) For the lights, we strongly recommend the Custom light vs the Nautilux because a) The Custom light is brighter b) the custom light will give you enough light for at least 7 hours (vs 1.5-2h with the Nautilux). The custom light does come with a programmable timer.
5) The GoPro 4/5 are very difficult to interface with a timer due to proprietary GoPro codes. So that requires special coding which we do not supply due to legal ramifications. GoPro 3 and 3+ are easier (time on-off). The easiest is the GitUP camera which we use extensively for such projects. The video quality of the GitUP is not up to GoPro Hero4/5 in the strictest video quality terms but does a very good job nonetheless less. There are plenty of video comparisons on youtube. Please type Gitup2 vs GoPro to see the difference.
6) We are working on a new camera housing for Sony FDR-x3000 which we found to be the best camera for our application. This housing will rated to at least 3000m. This housing should be available within 45 days.

GOPro-based towed video platforms for seabed inspection

Some notes from Pål Buhl-Mortensen

ScoutPro and GoBenthic - Specialized camera housing for GoPro

https://www.tindie.com/products/GroupBinc/extreme-depth-underwater-housing-for-gopro/

ScoutPro, certified to a depth of Certified to a depth of 1.500m (152 ATM, 154 BAR). Length 8.3cm, Width 6.5cm, Height 5.4cm. Price: $299.00.

GoBenthic, certified to a depth of 2600m (243 ATM). Length 8.3cm, Width 6.4cm), Height 5.4cm. Due to its extreme depth rating, GoBenthic is heavily used in manned submersibles, UUV and ROV. Price: $499.00

BINC - Modular camera housings for extreme depth and environment

http://groupbinc.com/

Benthic 3 for GoPro Hero 5 - $ 499.00

Certified to a depth of 2600m (243 ATM). Deep enough for an easier connection to a subsea connector. Length 8.6cm, Width 7.6cm, Height 6.3cm.

Programmable underwater video light - Nautilux custom - $ 989.00

Rated for 1750m, up to 3500 lumens of neutral white light using two high output Cree LEDS. After 7 hours, it still provides enough light to shoot videos (up to 1500 lumens).

18 Mode programmable timer. Delaying when the light comes on, or turning on/off after a certain time frame is very easy to achieve. 12V battery pack comes with its own charger. The

Nautilux Custom is made with a GPH 2 and a GPH Extension. The GPH 2 contains the battery while the GPH Extension contains the LED drivers and the Programmable Timer. Lengths: 41cm, width: 7.6cm, weight: 2.6kg.

Control/live video board for GoPro Hero 3, 3+ ,4 - $ 24.99

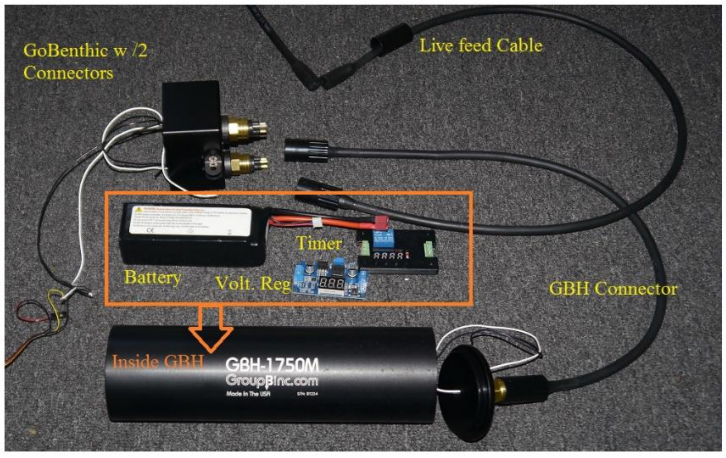
30-pin board fits in the back of a GoPro Hero3, 3+, and 4. This board allows charging the GoPro with a 5V external power source using the red (pos) and black (neg) wire. Additionally, you can get a live video feed by using the yellow wire

SeeBenthic ROV and underwater camera system cable - $4.50/m
This cable is 10.5mm (0.41") thick. This cable is not buoyant. The net weight per 1000m is 78kg (171 lb).

This is what has been ordered from BINC by colleagues at IMAR/MARE, the Azores:

SALESPERSON	JOB	SHIPPING METHOD	SHIPPING TERMS	DELIVERY DATE	PAYMENT TERMS	DUE DATE
Frank	IMAR-1	USPS	FOB	TBD	Pre-pay	Prior shipping

QTY	ITEM #	DESCRIPTION	UNIT PRICE	LINE TOTAL
2	VFP	VideoFins Pro -	US$ 199	US$ 398
2	Nautilux	Nautilux Flashlight, Wide	US$ 189	US$ 378
2	GPH	General Purpose Housing 1750m	US$ 399	US$ 798
2	C Clamp	Custom clamp for GPH/VideoFins	US$ 89	US$ 178
4	GB2	GoBenthic 2 -Housing fro GoPro	US$ 499	US 1996
		TOTAL		US$ 3748
		Discount		347.80
		Shipping		115
		NEW TOTAL		3515.20



Several free suspended, towed systems have approached a similar shape, utilizing the delta-wing shape as used for the towed pinger in the search of the Malaysian Airline. Including simple electric controlled flaps could increase the performance and ensure safer tows. To enable slow (<2knt) towing speed, the wings must be wider than illustrated above. Also, the flaps must be big enough to provide response at slow speed.

Appendix 3

Map of currents at 200-meter depth for the Nemo model based on 1 day average (from Øistein).