Utsökning av 1170 rev (och 1110 sandbankar) med verktyget Benthic Terrain Modeller

SeaGIS workshop, Umeå 23-24 mars

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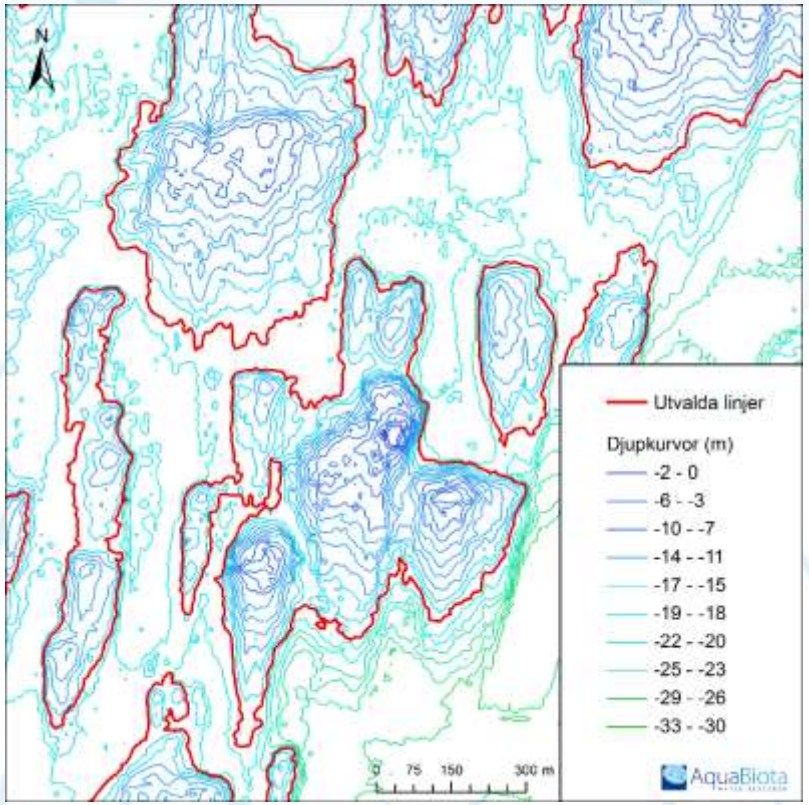
AquaBiota WATER RESEARCH

Bakgrund

- Uppdaterade definitioner för 1170 rev (ändringsförslag ADb 2015-09-15)
- Definieras i princip av substrat > 50 % hårt (>64 mm)
- Olika typer av topografiska hårdbottenformationer, inte bara upphöjningar
  - Klippor, klippväggar, klipphyllor/överhäng, hyllor/avsatser
  - Raviner
  - Block och stenar (>64 mm in diameter)
  - Ryggar/åsryggar
  - Undervattensberg
  - Toppar
  - Lutande eller flat häll
  - Undervattensgejsrar
- Kan gå mot land

Metod

- Tidigare metod – upphöjningens nedersta djupkurva
- Fungerar inte mot fastlandet
- Endast upphöjningar, inga andra formationer
- Kan bli väldigt stora – t.ex. i Stockholms län



Fyhr m.fl. 2013

Metod

- Hur hantera nya definitionerna i GIS?
  - Formationer
  - Relativt automatisk process

- Testade olika GIS-metoder
- Bäst utfall – Benthic Terrain Modeller
  - Verktyg (extension) i GIS (Wright et al. 2005)
  - Tagits fram av NOAA och CZM (Massachusetts Office of Coastal Zone Management)
  - Har använts för utsökning av rev i bland annat Finland

Verktyget klassar bottnen i olika zoner och strukturer baserat på bland annat topografi och lutning.

Benthic Terrain Modeller

Bathymetric Position Index (BPI)

- Jämför varje cells upphöjning med medelupphöjningen av omgivande celler inom en viss radie
- Beräknas från djupraster
- Beräknas både på *fine* och *broad scale*

The BPI algorithm compares each cell's elevation to the mean elevation of the surrounding cells within a user defined rectangle, annulus (donut shape) or circle.

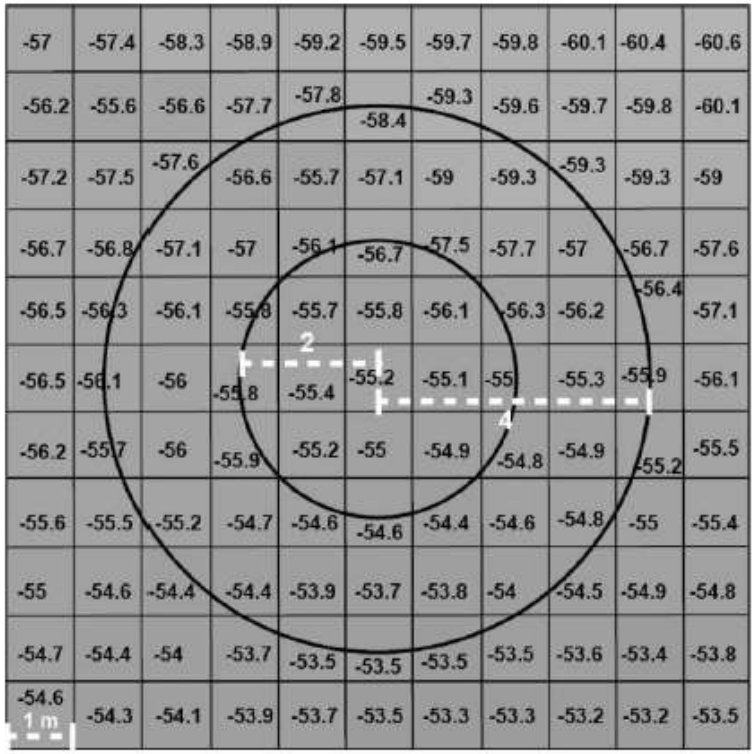
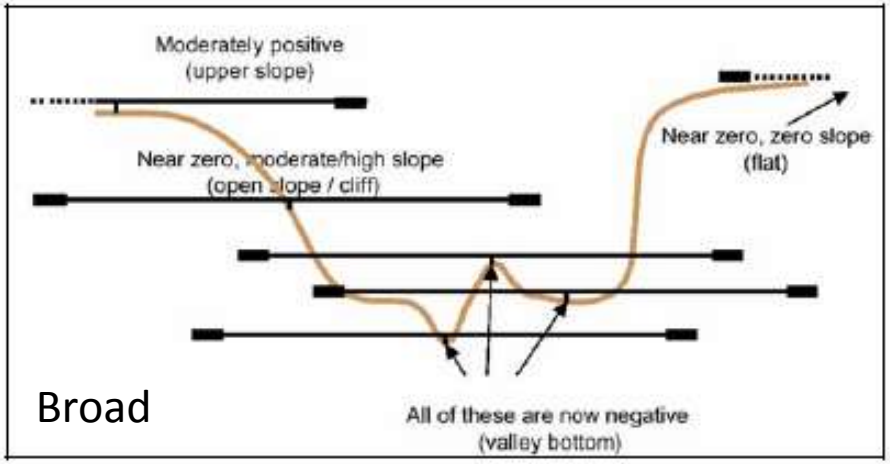
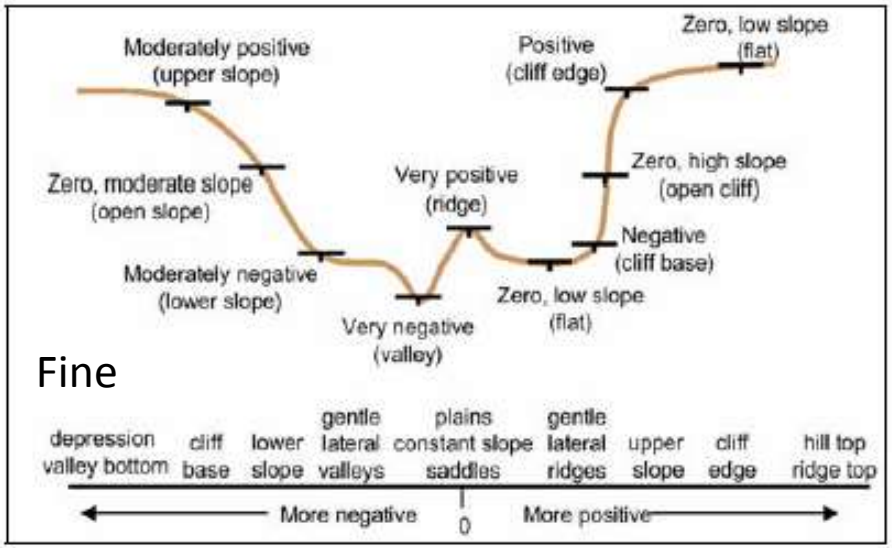


Figure 3. Example of the variables used to derive bathymetric position index (BPI) from bathymetry. The grid cells here (1 m resolution) represent bathymetry as negative values. The annulus has an outer radius of 4 and an inner radius of 2. Therefore the BPI scalefactor is 4 (outer radius multiplied by bathymetry resolution).

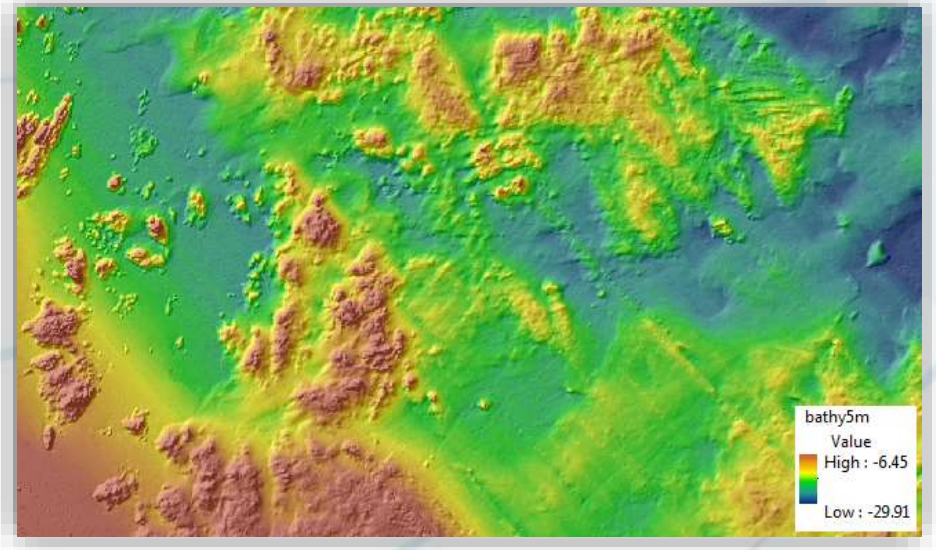
Benthic Terrain Modeller

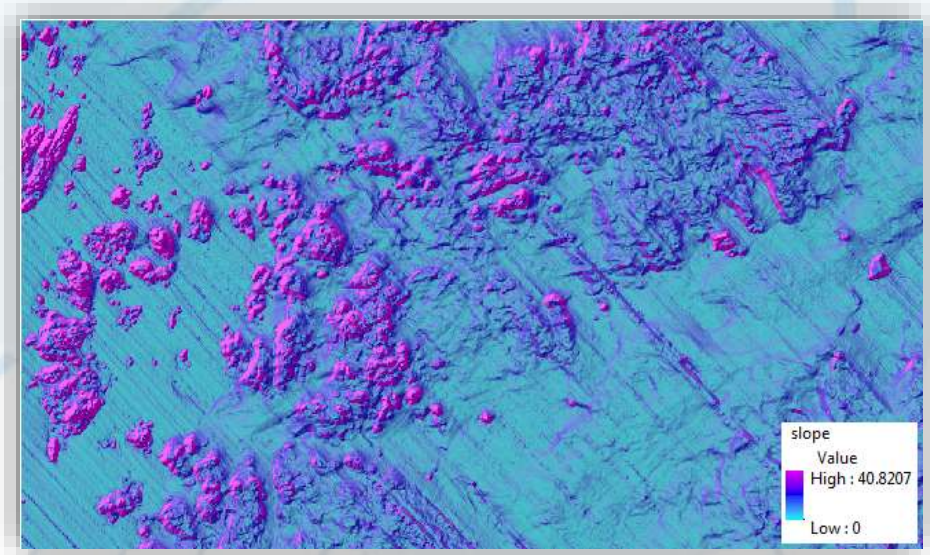
- Negativt BPI – sänkor
- Positivt BPI – upphöjningar
- Noll BPI – konstanta lutningar eller flacka områden

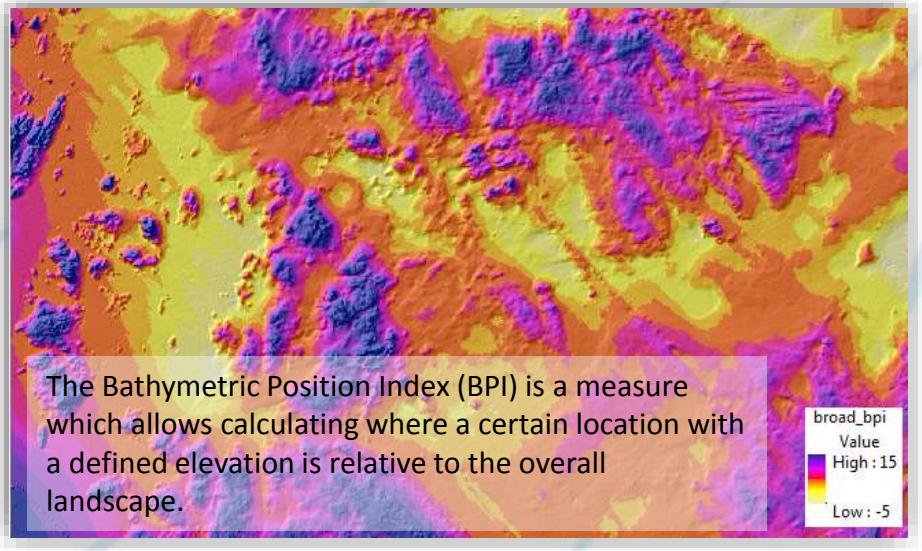




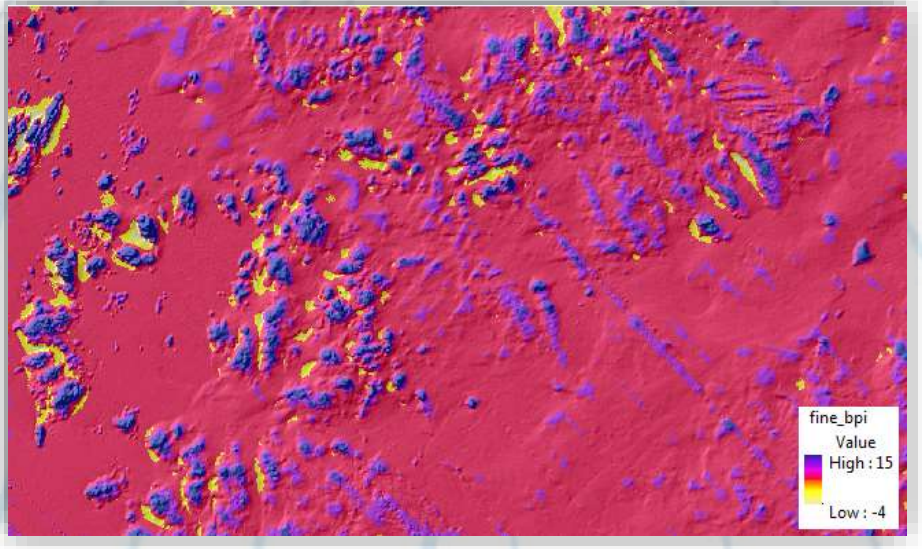
Benthic Terrain Modeller







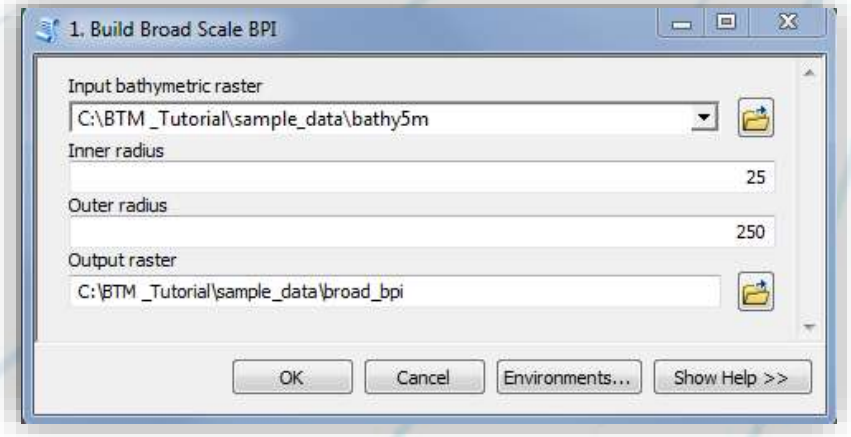
The Bathymetric Position Index (BPI) is a measure which allows calculating where a certain location with a defined elevation is relative to the overall landscape.

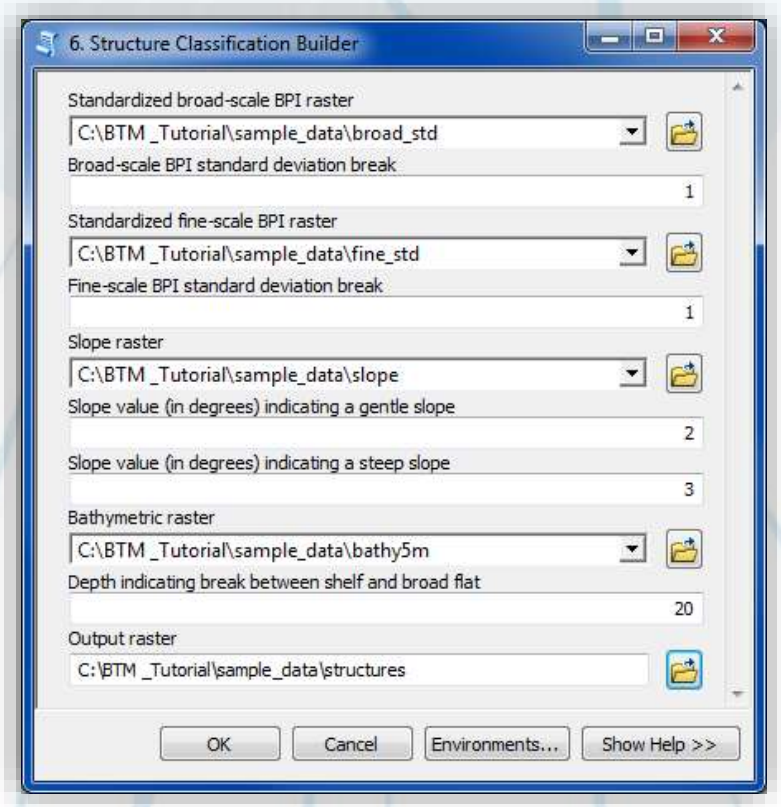


Benthic Terrain Modeller

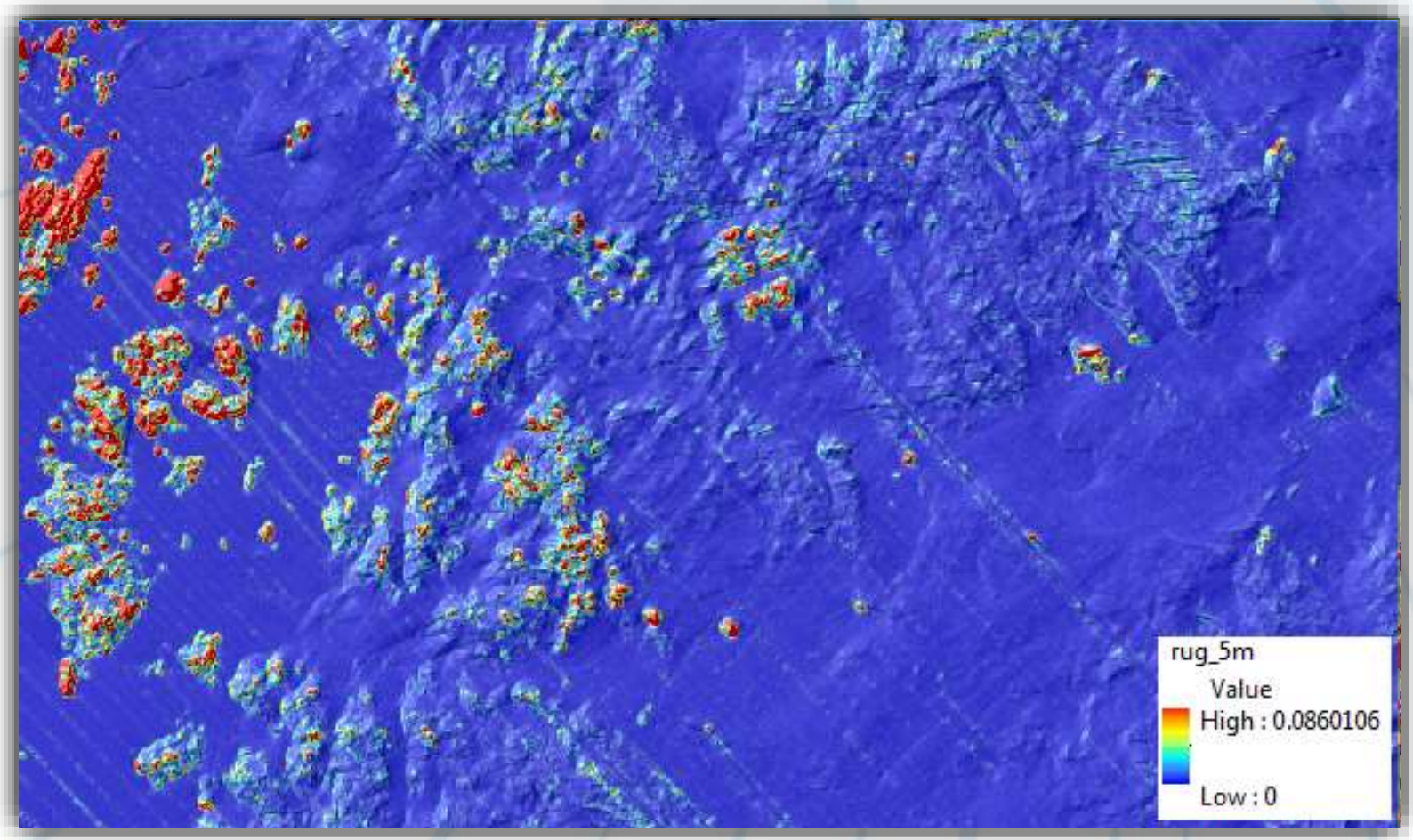
De värden som måste anges är:

- Inre och yttre radie för *broad* och *fine BPI*
- Lutning
  - Gentle slope
  - Steep slope
- Djup – *indicating break between shelf and broad flat*



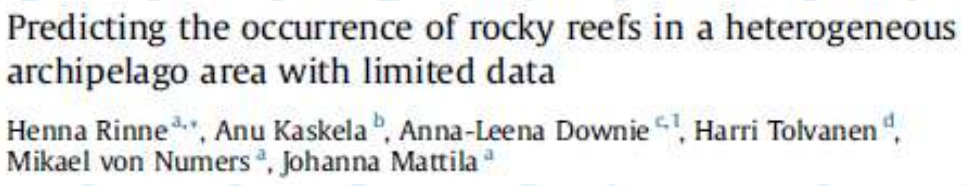


Benthic Terrain Modeller



BTM i Finland

- *Predicting the occurence of rocky reefs in a heterogenous archipelago area with limited data (Rinne m.fl. 2014)*
  - 25 m upplösning i djupdata
  - BPI-ytor (1 km, 2.5 km, 5 km) med olika radie testades
  - Jämförelse med substrat- och artdata för att bestämma BPI-värden
  - Lutning, brytvärde = 5 grader


Predicting the occurrence of rocky reefs in a heterogeneous archipelago area with limited data

Henna Rinne[a,*], Anu Kaskela[b], Anna-Leena Downie[c,1], Harri Tolvanen[d], Mikael von Numers[a], Johanna Mattila[a]

BTM i Finland

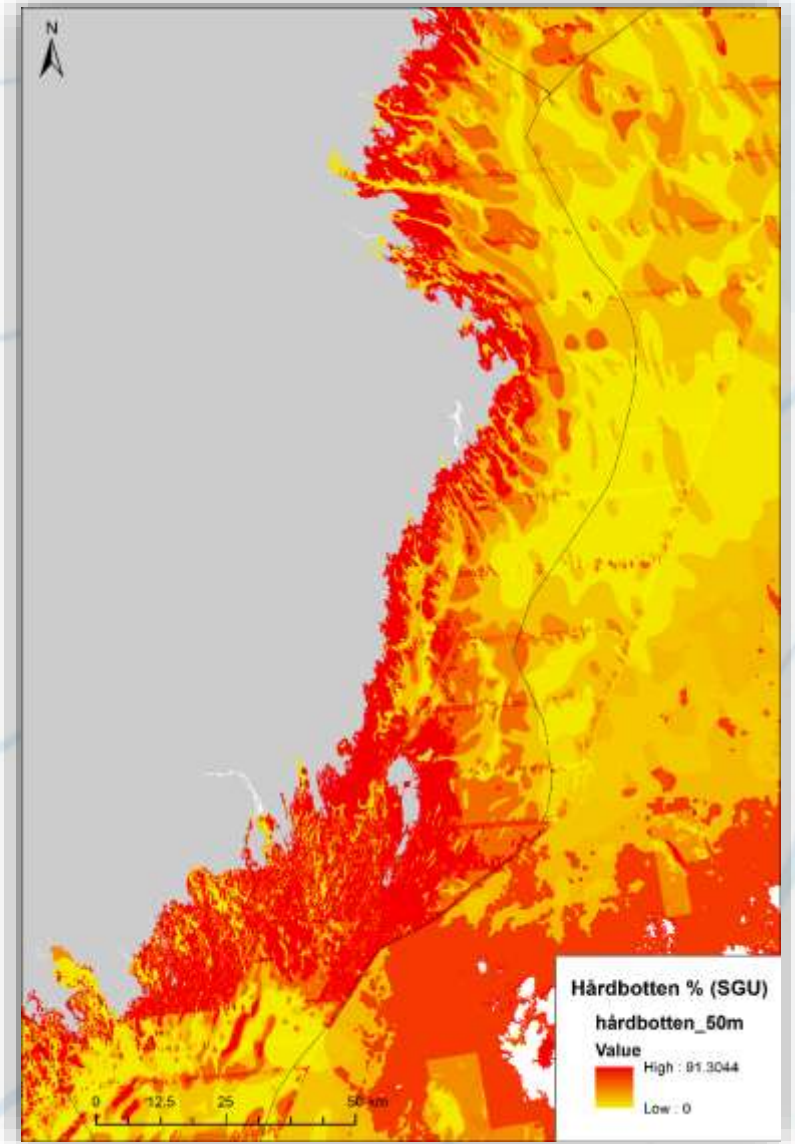
- Potentiella rev i Finland:
  - Narrow crests – 84 % hårdbotten
  - Broad crests – 60 % hårdbotten
  - Local crest on flat – 52 % hårdbotten
  - (Obs! inte slope - endast 33 % hårdbotten)

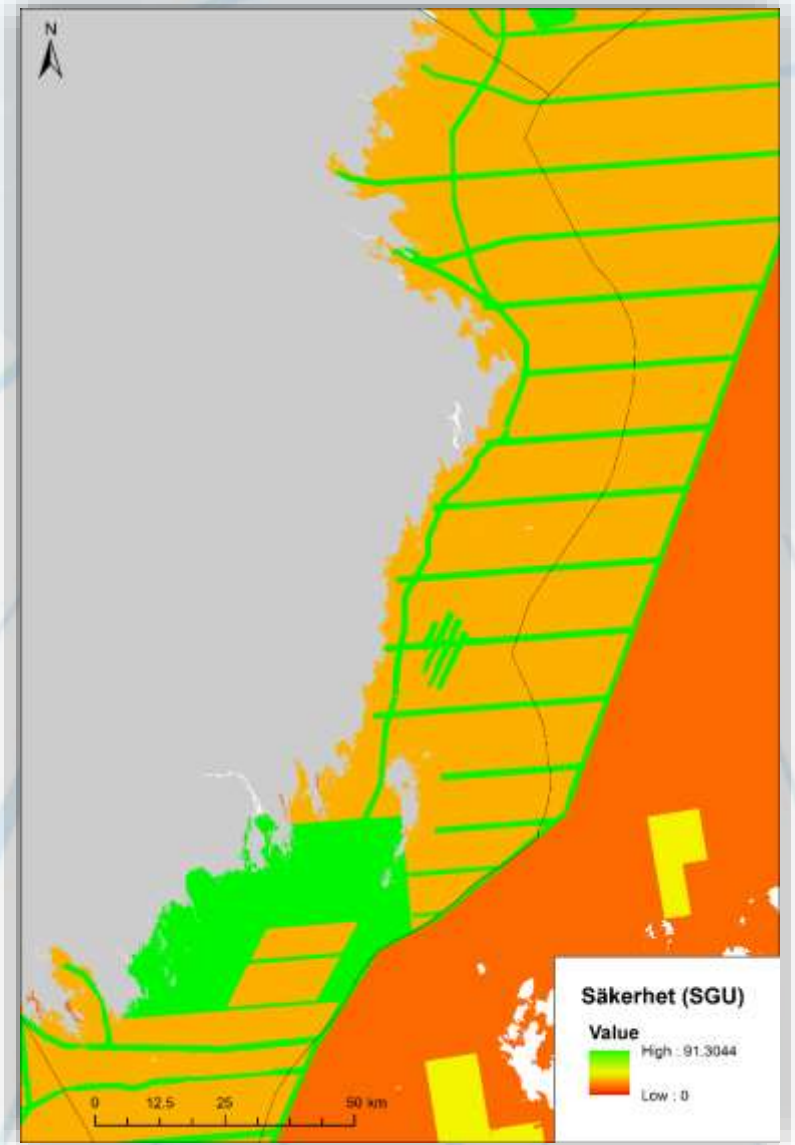
- Verifierade med fältdata – majoriteten var rev

BTM i Västerbotten

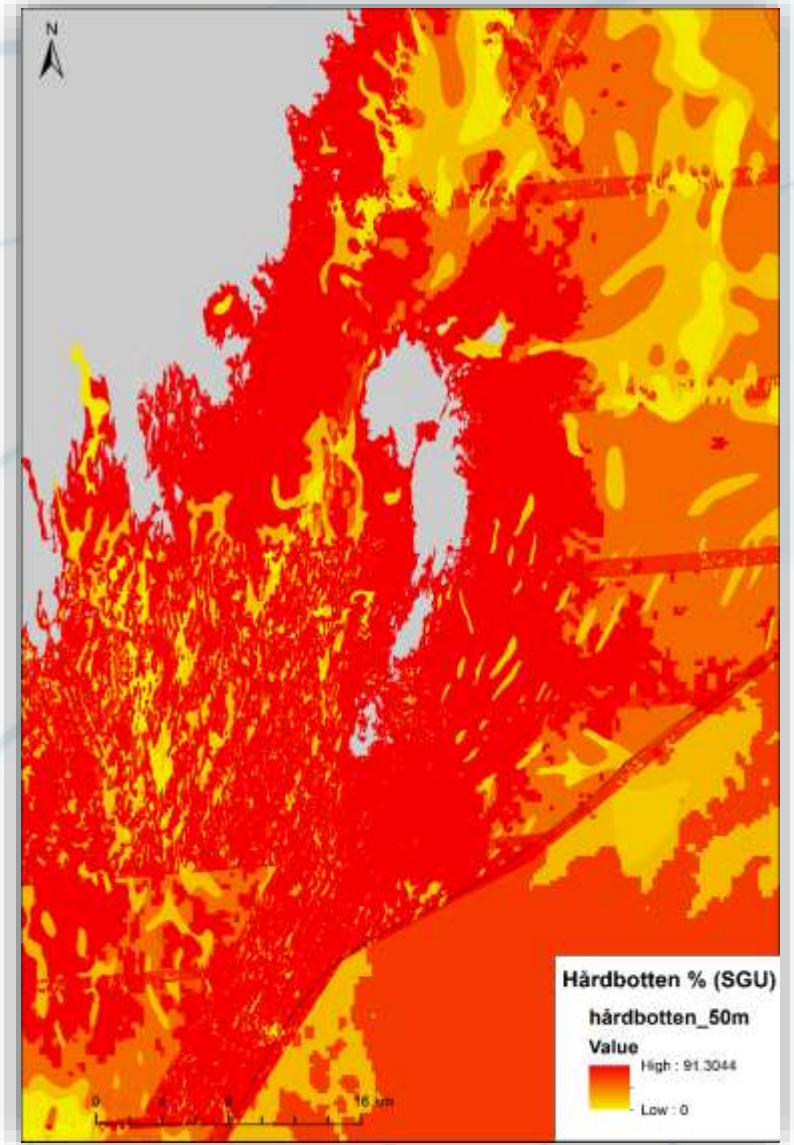
- Testade några olika värden för Västerbotten, bäst utfall såg ut att bli:
  - broad irad = 50 och orad =500
  - fine irad = 6 och orad = 50
  - Lutning = 2 (gentle) och 3 (steep) (kan diskuteras?)
- Såg rimligt ut i förhållande till batymetri och substrat

Substrat i Västerbotten





Substrat i Västerbotten



Överlagring med HUB

HUB	På upphöjning	%	På steep slope	%	Utanför upphöjning och steep slope	%	Totalsumma
AA.A1C5 Baltic photic rock and boulders dominated by perennial filamentous algae	961	66	128	9	368	25	1457
AA.A1S Baltic photic rock and boulders characterised by annual algae	298	43	112	16	286	41	696
AA.M1C5 Baltic photic mixed substrate dominated by perennial filamentous algae	155	21	181	24	419	55	755
AA.A2T Baltic photic rock and boulders characterized by sparse epibenthic macrocommunity	101	39	42	16	114	44	257
AA.H1B1 Baltic photic muddy sediment dominated by pondweed (Potamogeton perfoliatus and/or Stuckenia pectinata)	84	10	63	8	688	82	835
AA.A1C Baltic photic rock and boulders characterized by perennial algae	79	66	9	8	32	27	120
AA.M1S1 Baltic photic mixed substrate dominated by filamentous annual algae	71	25	38	14	171	61	280
AB.M4U Baltic aphotic mixed substrate characterized by sparse epibenthic macrocommunity	56	29	12	6	123	64	191
AA.A1H Baltic photic rock and boulders characterized by epibenthic moss animals (Bryozoa)	52	90	2	3	4	7	58
AA.A1C1 Baltic photic rock and boulders dominated by Fucus spp.	48	45	28	26	31	29	107
AA.M2T Baltic photic mixed substrate characterized by mixed epibenthic macrocommunity	46	19	50	21	147	60	243
AA.H4U Baltic photic muddy sediment characterized by no macrocommunity	40	6	128	19	521	76	689
AA.H1B4 Baltic photic muddy sediment dominated by Charales	39	15	23	9	201	76	263
AA.J4U Baltic photic sand characterized by no macrocommunity	31	7	67	16	334	77	432
AA.A1V Baltic photic rock and boulders characterized by mixed epibenthic macrocommunity	21	25	8	10	55	65	84
AA.A4U Baltic photic rock and boulders characterized by no macrocommunity	19	25	13	17	45	58	77
AA.M1B1 Baltic photic mixed substrate dominated by pondweed (Potamogeton perfoliatus and/or Stuckenia pectinata)	18	18	9	9	73	73	100
AA.A1H1 Baltic photic rock and boulders dominated by crustose moss animals (Electra crustulenta)	17	100	0	0	0	0	17
AA.M1C Baltic photic mixed substrate characterized by perennial algae	17	16	19	18	69	66	105
AB.A4U Baltic aphotic rock and boulders characterized by no macrocommunity	17	36	12	26	18	38	47
AA.M4U Baltic photic mixed substrate characterized by no macrocommunity	16	13	15	12	92	75	123
AB.I4U Baltic aphotic coarse sediment chracterized by no macrocommunity	16	36	2	4	27	60	45
AA.I2T Baltic photic coarse sediment characterized by mixed epibenthic macrocommunity	15	16	36	38	44	46	95
AA.M1B4 Baltic photic mixed substrate dominated by Charales	15	8	23	12	162	81	200
AA.A1R Baltic photic rock and boulders characterized by soft crustose algae	14	61	3	13	6	26	23

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AA.H1S3 Baltic photic photic muddy sediment dominated by Vaucheria spp.	7	5	28	19	111	76	146
AA.J1B1 Baltic photic sand dominated by pondweed (Potamogeton perfoliatus and/or Stuckenia pectinata)	9	6	26	17	118	77	153
AA.H1B4 Baltic photic muddy sediment dominated by Charales	39	15	23	9	201	76	263
AA.M1B4 Baltic photic mixed substrate dominated by Charales	15	8	23	12	162	81	200
AA.M1C Baltic photic mixed substrate characterized by perennial algae	17	16	19	18	69	66	105
AA.H1V Baltic photic muddy sediment characterized by mixed epibenthic macrocommunity	1	1	18	18	80	81	99
AA.I4U Baltic photic coarse sediment characterized by no macrocommunity	5	7	16	21	55	72	76
AA.M4U Baltic photic mixed substrate characterized by no macrocommunity	16	13	15	12	92	75	123
AA.A4U Baltic photic rock and boulders characterized by no macrocommunity	19	25	13	17	45	58	77
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AB.A4U Baltic aphotic rock and boulders characterized by no macrocommunity	17	36	12	26	18	38	47
AA.J1B4 Baltic photic sand dominated by Charales	4	5	11	13	69	82	84

Överlagring med HUB

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AA.M4U Baltic photic mixed substrate characterized by no macrocommunity	16	13	15	12	92	75	123
AA.H1B Baltic photic muddy sediment characterized by submerged rooted plants	3	3	3	3	91	94	97
AB.J4U Baltic aphotic mixed substrate characterized by sparse epibenthic macrocommunity	6	6	10	10	84	84	100
AA.H1V Baltic photic muddy sediment characterized by mixed epibenthic macrocommunity	1	1	18	18	80	81	99
AA.M1B1 Baltic photic mixed substrate dominated by pondweed (Potamogeton perfoliatus and/or Stuckenia pectinata)	18	18	9	9	73	73	100
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AA.J1V Baltic photic sand characterized by mixed epibenthic macrocommunity	5	8	4	6	54	86	63

Resultat – potentiella rev

- Överlagring med substrat
- Överlagring med inventeringsdata/yttäckande artutbredningskartor
- Handpåläggning/kvalitetsgranskning
- Avgränsning övriga naturtyper

Diskussion

- Vilken skala ska vi jobba på? Hur stora/små rev ”vill” vi ha?
  - Max/minstorlek?
  - Olika storlek i olika områden/län
- Fångar vi in alla relevanta formationer?
- Bör vi ha en djupgräns för rev (Östersjön)?
- Substratunderlagen av varierande upplösning och säkerhet. I många fall grova och osäkra substratunderlag. Hur hantera detta?
- Typiska arter för naturtypen – överlagring med inventeringsdata eller yttäckande data ger viktig information. Särskilt HUB-klassade data.

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