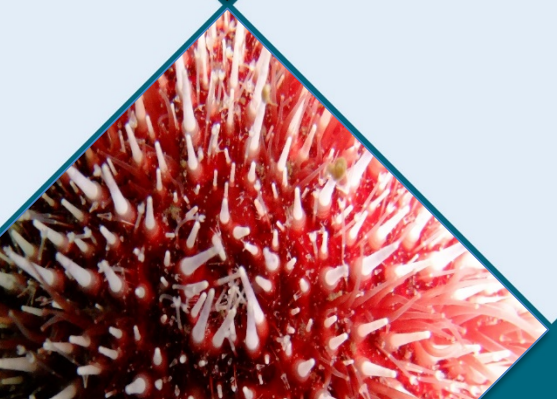

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Patchiness

James Albrecht: Marine Evidence Advisor

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“Patchiness” in Irving 2009

- A reef must have a minimum extent of 25m^2 or greater in size (this 25m^2 also applies to the total area of a patchy reef, rather than the minimum size for a patch)
- Percent coverage of reef was considered as a proxy for patchiness in 2009

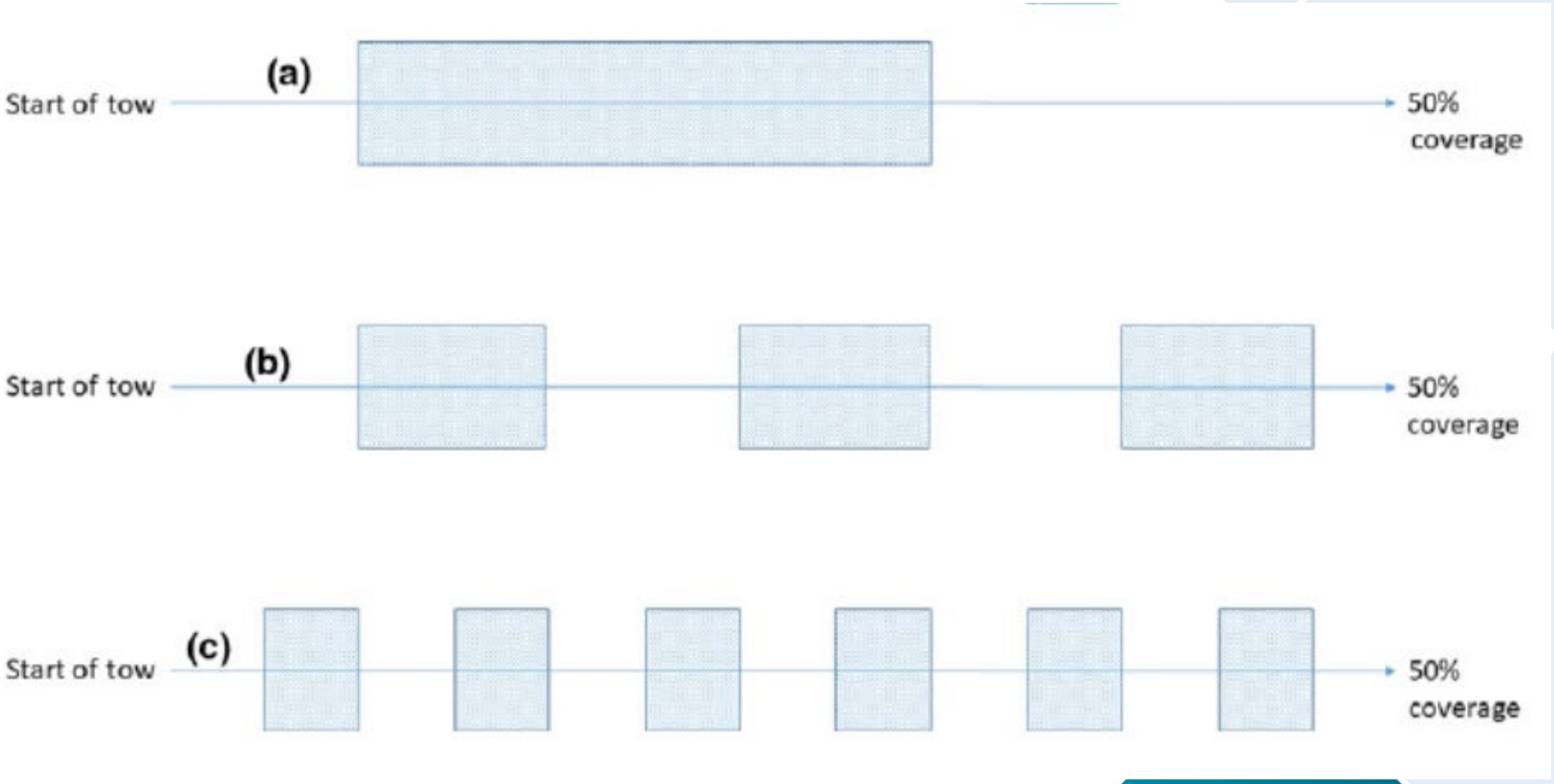
Characteristic	Gp	Not a ‘stony reef’	‘Reefiness’ Low	Medium	High
Patchiness					
(100% cover of 1m x 5m) [A]	1		1m x 50m area Clast-supported 20% cover of 1m x 5m patches	⟷	1m x 50m area Matrix-supported 60% cover of 1m x 5m patches
% cover of hard substrata (>64mm constituent) within ‘reef’	2		>50% coverage by hard substrata, but at least 25% (of the 100%) needs to be cobble-sized or larger if smaller sediments are present.		
(100m^2 *or* 100m [A] x 1m transect)	3	<10%	10-50%	50-75%	>75%
Consensus:		**<10%**	**10-50%**	**50-75%**	**>75%**

“Patchiness” in Irving 2009

- Patchiness was ultimately incorporated into the composition category of the Irving 2009 criteria

Characteristic	Not a ‘stony reef’	‘Resemblance’ to being a ‘stony reef’		
		Low[2]	Medium	High
Composition:	**<10%**	10-40% Matrix supported	**40-95%**	**>95% Clast supported**
Notes: *Diameter of cobbles / boulders being greater than 64mm.* *Percentage cover relates to a minimum area of 25m^2.* *This ‘composition’ characteristic also includes ‘patchiness’.*				
Elevation:	**Flat seabed**	<64mm	**64mm-5m**	**>5m**
Notes: *Minimum height (64mm) relates to minimum size of constituent cobbles.* *This characteristic could also include ‘distinctness’ from the surrounding seabed.* *Note that two units (mm and m) are used here.*				
Extent:	**<25m^2**	←	**>25m^2**	→
Biota:	**Dominated by infaunal species**			**>80% of species present composed of epifaunal species**

The problem with using percentage cover as a measure of “patchiness”



Novel methods for measuring reef "patchiness"

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DOI: 10.1002/ece3.4292

Here we define "true patchiness" as:

a value to represent the propensity of *S. spinulosa* reef to be clustered together rather than to grow uniformly and randomly everywhere.

[2]Joint Nature Conservation Committee (JNCC), Peterborough, UK

Standardized and repeatable data acquisition and analyses are required to enable the mapping and condition monitoring of reefs within Marine Protected Areas (MPAs).

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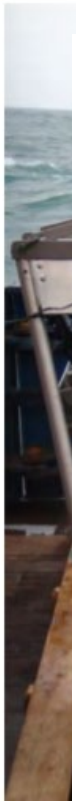
Method

- North Norfolk Sandbanks and Saturn Reef SAC
- Video analysed in 5 second segments
- Gubbay 2007 criteria (similar to Irving but for *Sabellaria*)



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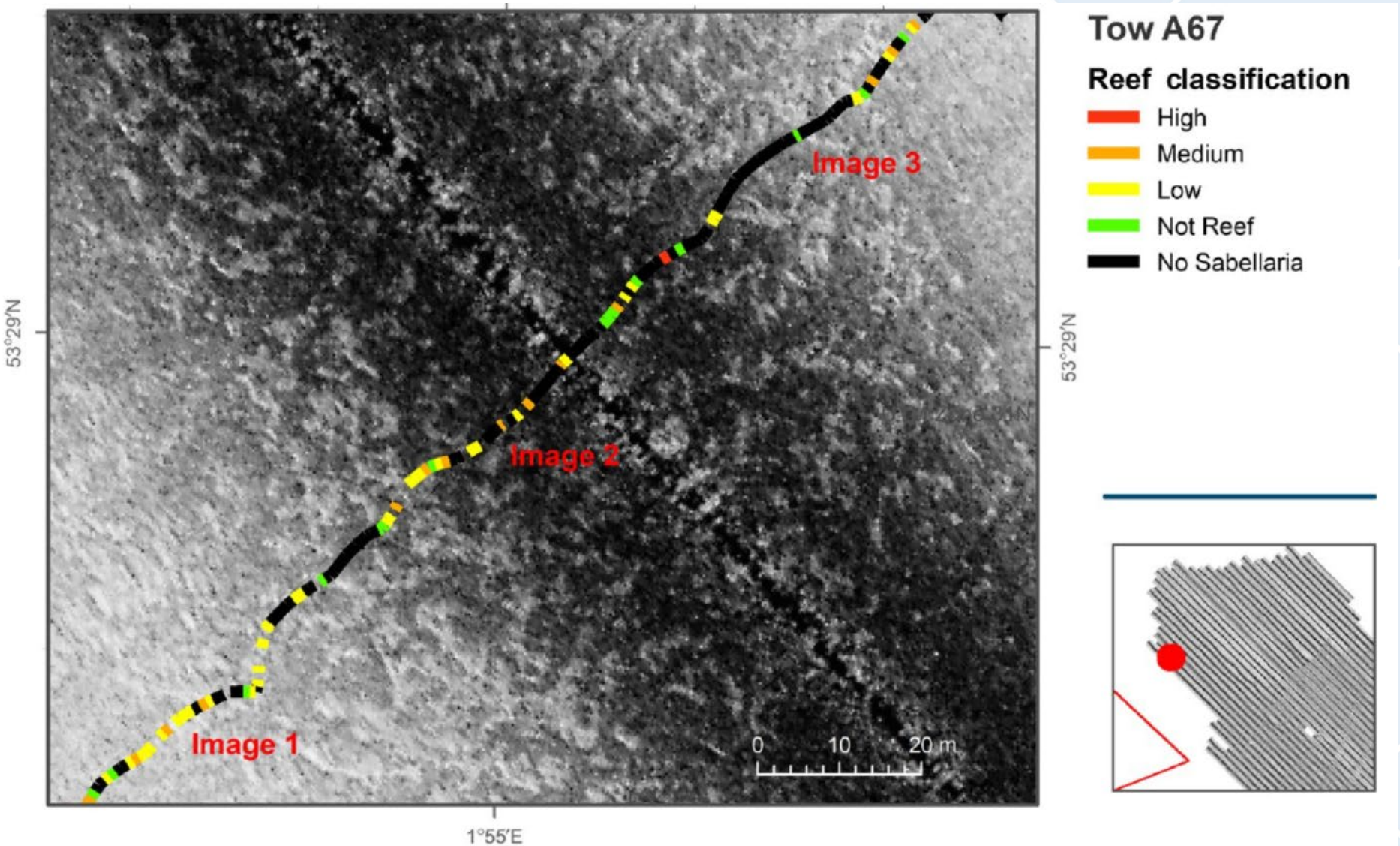
			Elevation (cm)			
			<2	2–5	5–10	>10
Reef structure matrix			Not a reef	Low	Medium	High
% Cover	<10%	Not a reef	Not a reef	Not a reef	Not a reef	Not a reef
	10–20%	Low	Not a reef	Low	Low	Low
	20–30%	Medium	Not a reef	Low	Medium	Medium
	>30%	High	Not a reef	Low	Medium	High

Note. Combination of scores to produce relative scores of "reef status" was based on expert judgment (Fugro, personal communication).

of line

Segmented transect



Patchiness Index

$$K = p_o / p_r$$

- where p_o is the mean patch size observed
- p_r is the mean patch size if the presence of reef

TABLE 2 Summary of values of *Sabellaria spinulosa* reef status (% cover and elevation) and associated patchiness per video transect ordered according to survey stations where the largest patches of reef were observed

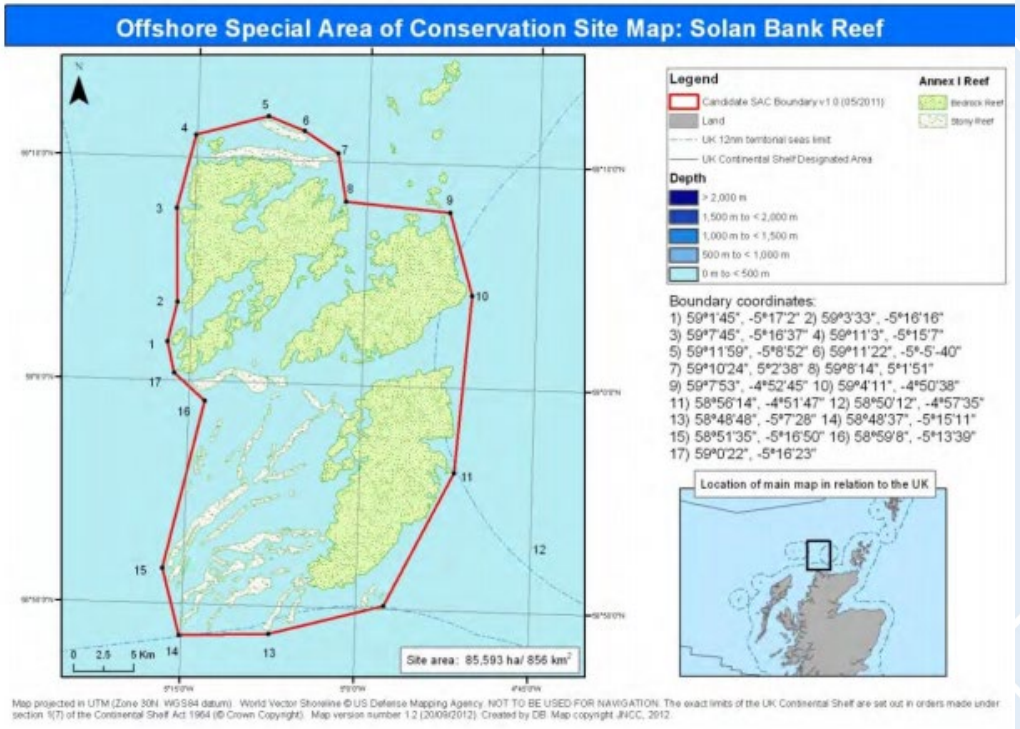
Stn	% Of video tow					No. of patches	Ave patch length	Median patch length	Size range of patches	K p_o/p_r
	No reef	Not reef	Low reef	Medium reef	High reef					
A68	21.39	5.28	65.83	7.50	0.00	28	10.07	5	1–41	2.16
A69	42.59	9.60	41.92	5.89	0.00	47	7.28	5	1–25	3.10
A67	44.87	8.97	39.32	6.62	0.21	56	4.54	2	1–26	2.03
A63	65.53	17.96	11.65	3.88	0.97	19	3.74	2	1–14	2.46

Note. Average patch length is defined as the mean number of consecutive (excluding missing observations) 5-s segments that *S. spinulosa* reef was observed. *K* is the test statistic, defined as the mean observed patch size (p_o) divided by the mean patch size if reef occupancy in a segment was random (p_r) Station code (Stn) refers to the area (e.g., A) and tow number (e.g., 68) collected during the survey.

- 1 = present, 0 = absent
- Three patches of size 1, 3, and 2
- The segment size determines the minimum patch size

Solan Bank

- Drop camera survey in areas of bedrock and stony reef
- Video transects were analysed using three different methods as follows:
  - 10 second segments
  - 20 second segments
  - habitat > 60 seconds
- Video segments analysed according to Irving 2009 criteria



Solan Bank outputs

- 20 second video segments took **2.6 times** the to analyse compared habitat segmented videos

Table 4.1 Total and average minutes taken to analyse 2014 Solan Bank Reef SCI imagery per transect, video subsection, still and per analysis method employed. Additionally total and average area surveyed for stills, video subsections and analysis methods.

Analysis method	Total transects analysed	Total minutes analysis	Average minutes per transect	Total stills / sections analysed	Average minutes per still / section	Total area surveyed (m^2)	Average area surveyed per still / section (m^2)
Stills	166	26,311	168.7	1696	16.2	2,553.8	1.5
Video: 10 second	6	2,550	425.0	486	5.3	1,903.5	4.1
Video: 20 second	73	16,444	225.3	4015	4.2	25,119	6.4
Video: habitat	77	6,617	85.9	131	62.0	26,218.5	192.2
Total video	156	25,611	164.2	-	-	53,241	-

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