

Developing QA protocols for use in CCW diving monitoring programme

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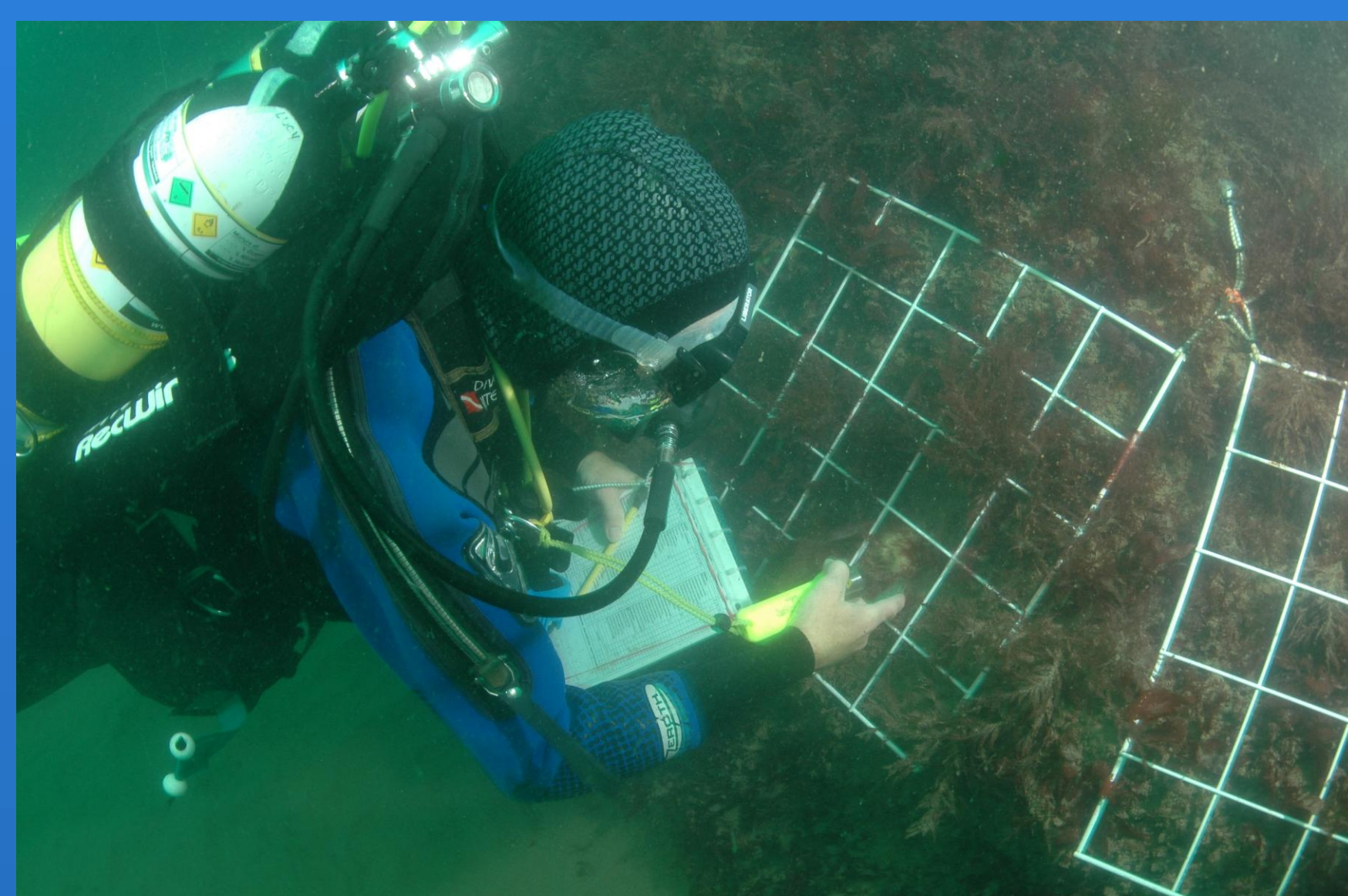
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INTRODUCTION & BACKGROUND

CCW's Across Wales Diving Monitoring Project, which runs from 2004 until 2011, has been recording species data from numerous sublittoral rock communities within each of four Welsh marine SACs.

Within the Pembrokeshire Marine SAC, seven monitoring sites have been established, all of which involve the recording of epibenthic species from replicate 0.5m x 0.5m fixed quadrats. Data from each site are recorded annually (weather permitting); and analysed using multivariate statistical software (e-Primer).

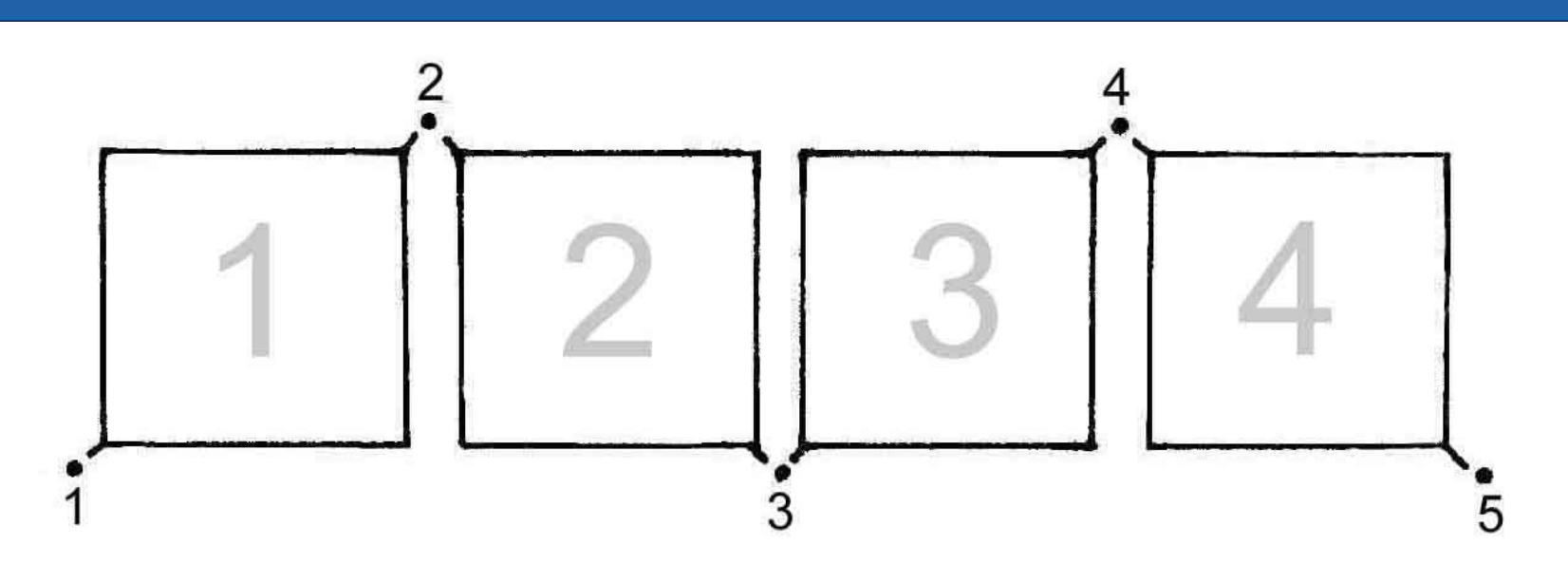


Diver inspecting one of the Thorn Island quadrats, cell by cell. The array of 4 quadrats used in the QA assessments lie adjacent to each other (see diagram below) within the lower infralittoral zone, therefore testing the recorders' in situ identification competence for both flora and fauna.

Photo: Rohan Holt

Underwater *In situ* recording is notoriously prone to stochastic variability (in particular inter-surveyor variation) which can limit the robustness of recorded data and their subsequent analyses. To reduce variability to a statistically acceptable level, recording protocols have been developed and used by all project recorders. These protocols form part of the project's overall Quality Assessment (QA) programme.

At the start and end of the first field-week in 2008 at our Thorn Island site, Milford Haven (51°41.542'N 004°07.021'W), intra-surveyor assessments were undertaken. A summary of results are presented.



The four infralittoral quadrats at Thorn Island are positioned on a near-vertical, low-lying cliff at 5.5m BCD. At the start of survey period, quadrats 1 & 3 recorded; after 5 days the exercise was repeated on quadrats 2 & 4.

TRAINING

- A DVD containing (i) descriptions of each site; (ii) site-specific species checklist; (iii) photographs of previously recorded specimens from the site; (iv) video clips of *in situ* quadrats; (v) standard operating procedures / recording protocol; is distributed to all surveyors a week before the fieldwork commences.

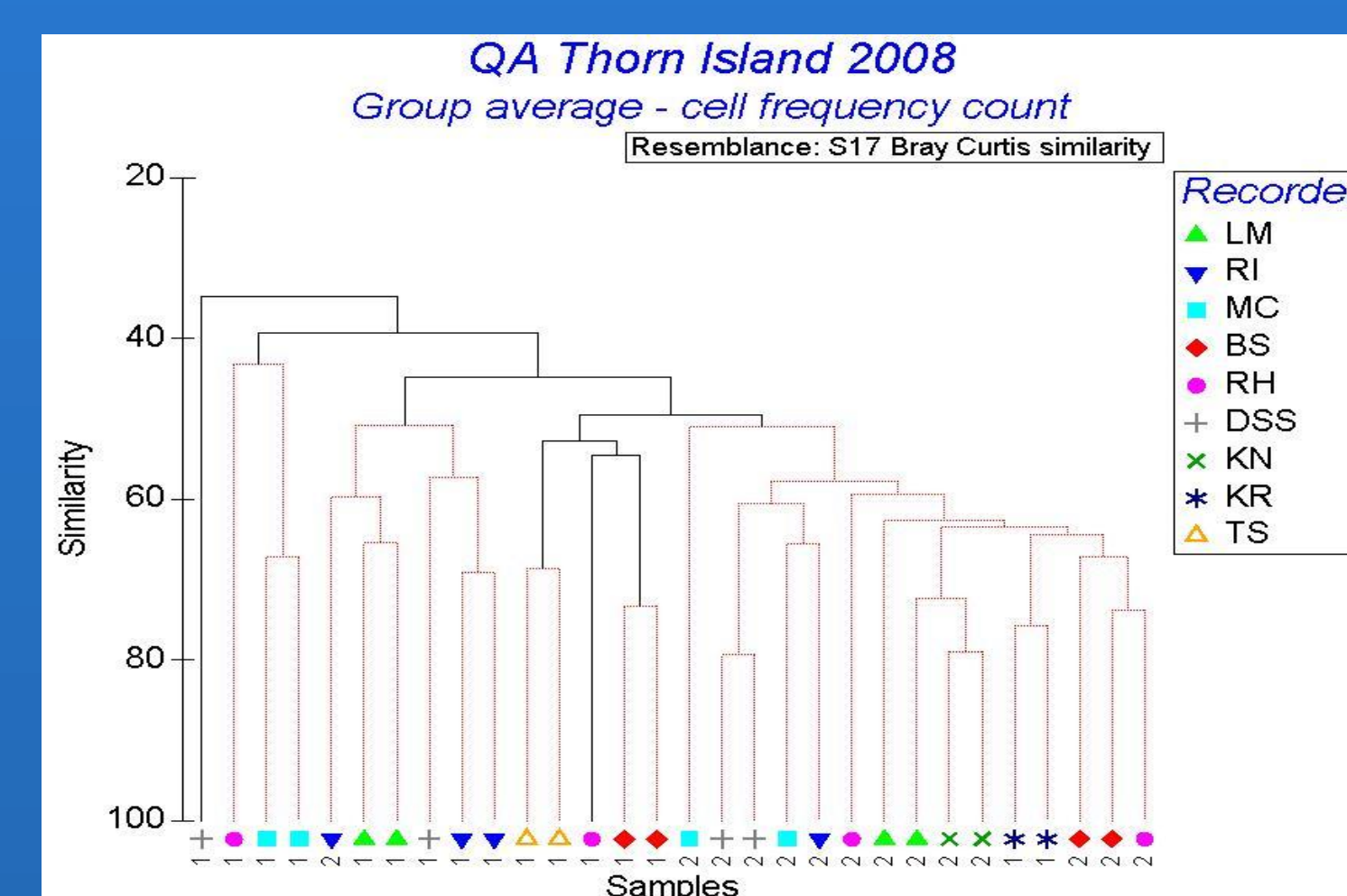
- Once the fieldwork is underway, a species ID session is held each evening, covering the species likely to be encountered the following day. Photographs, video and voucher specimens are all utilised.
- Surveyors are encouraged to provide feedback during the ID sessions, pointing out recording inconsistencies and agreeing key ID features for ambiguous identifications.

- Irresolvable similar species are recorded in combination to higher taxonomic level (typically *genus*).

RECORDING PROTOCOLS

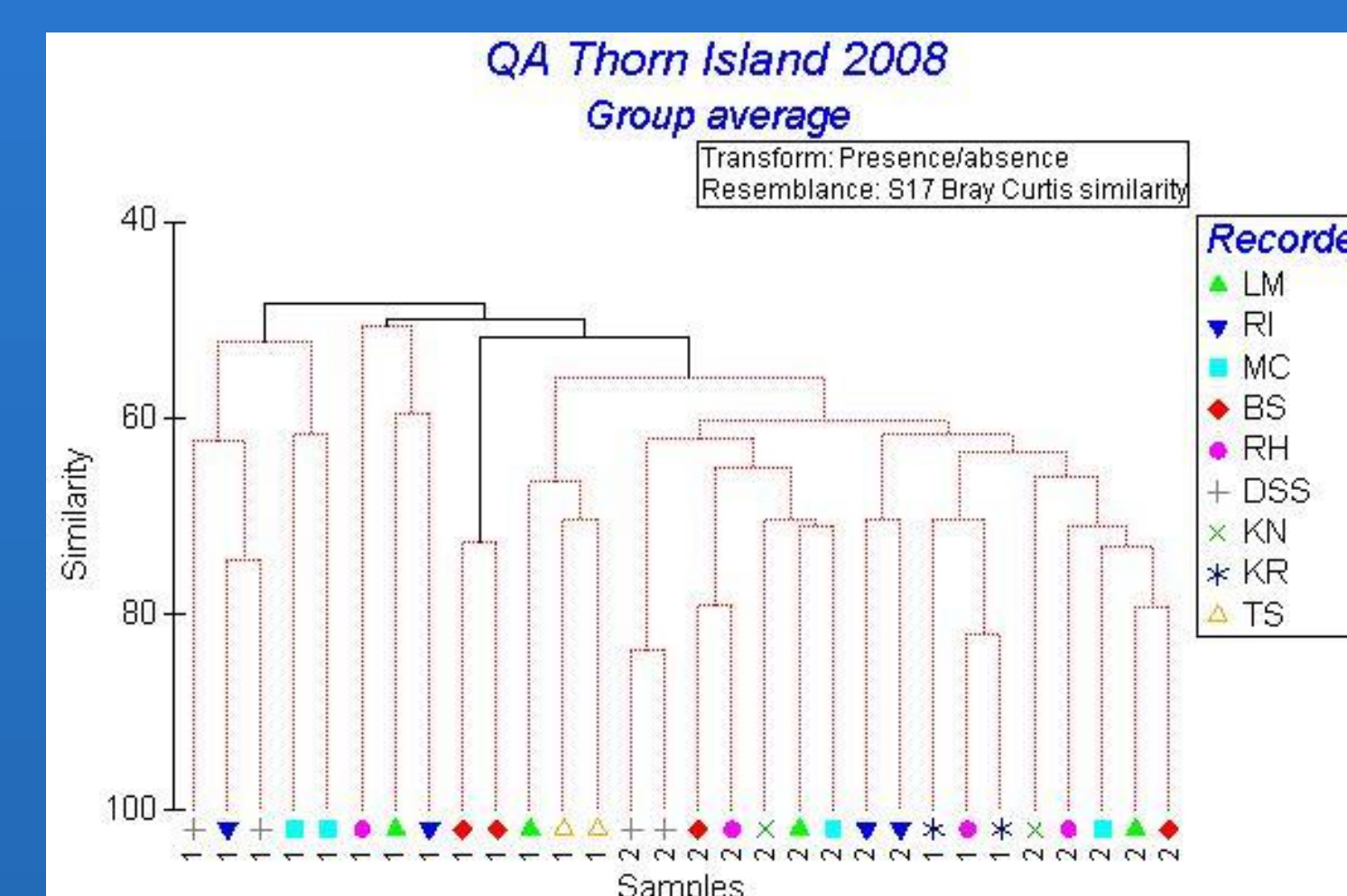
- Each quadrat is divided into 25 cells, with every species being counted by cell frequency. Cells are sequentially inspected in a zig-zag pattern from top left to bottom right of quadrat;
- Time limit of 20min per quadrat, divided into 4 x 5min recording periods;
- Surveyors are instructed to record the most visually conspicuous / dominant species first;
- Surveyors not to use the checklist to 'search' for species;
- Prior to recording, one minute is spent 'cleaning' the quadrat area (ie. ensuring no masking of undergrowth by overlying algae);
- Other rules relate to specific species and how to record them.

RESULTS



SIMPER ANALYSIS (CELL FREQUENCY)
Groups 'before QA' and 'after QA'
Average dissimilarity = 56.45

Species	Before QA	After QA	Av. Diss.	Diss/SD	Contrib%	Cum.%
CRUSTACEA	4.53	15.30	5.82	1.50	9.95	9.95
Molgula sp.	6.13	17.13	5.99	1.82	9.02	18.97
Polysarpa scuba	3.23	13.60	4.66	1.81	8.26	27.23
Heterosiphonia plumosa	5.87	13.33	3.35	1.53	5.33	32.56
Callithersia ciliata	15.93	11.40	3.21	1.67	5.69	38.25
Electra pilosa	8.40	5.47	3.01	1.25	5.33	44.18
Dendrobia grossularis	4.20	4.53	2.63	0.98	4.66	49.63
Polysiphonia aurantium	3.93	1.40	1.73	0.60	3.06	51.90
Bugula plumosa	4.60	5.20	1.51	1.37	2.68	54.58



SIMPER ANALYSIS (PRESENCE/ABSENCE)
Groups 'before QA' and 'after QA'
Average dissimilarity = 47.49

Species	Before QA	After QA	Av. Diss.	Diss/SD	Contrib%	Cum.%
Cordia testudinata	0.33	0.33	1.48	1.82	3.12	3.12
PORIFERA INDET	0.07	0.67	1.43	1.32	3.01	6.13
Scrupocellaria sp.	0.27	0.73	1.34	1.22	2.82	8.96
CRUSTACEA	0.40	0.53	1.31	1.16	2.76	11.71
Cleavelina lepadiformis	0.33	0.73	1.30	1.14	2.73	14.44
Dysidea fragilis	0.60	0.13	1.28	1.14	2.65	17.09
Cyrtopleura ramosa	0.15	0.53	1.19	1.03	2.49	19.58
Amphilectus fucorum	0.47	0.60	1.14	0.99	2.41	21.99
Polysiphonia sp.	0.27	0.53	1.13	1.01	2.39	24.37
Dasyatis dipodomys	0.40	0.53	1.13	1.00	2.37	26.75
Polysiphonia aurantium	0.47	0.53	1.13	0.98	2.37	29.12
Dendrobia grossularis	0.53	0.60	1.12	0.97	2.35	31.47
Dilomus variolosus	0.47	0.27	1.09	0.95	2.29	33.76
Brongniartella byssoides	0.20	0.47	1.06	0.94	2.24	36.00
Boreomastax asparagoides	0.27	0.47	1.06	0.95	2.24	38.23

Cluster analysis dendrograms above show clear divide of surveyor records between 1 (before QA), and 2 (after QA). Black tree lines indicate e-Primer SIMPROF routine, which highlights statistically significant divide in clusters. Note almost all recorders separated across this divide; more pronounced when counting (cell frequency) tested. Surveyor KR arrived later and therefore undertook some QA in group session prior to exercise.

SIMPER routine tabulates ranked contribution each species makes to total dissimilarity between Groups. The highest ranked taxa all featured during the Thorn Island QA process as ambiguous identifications, also more pronounced in cell freq counts.

CONCLUSIONS

- Consistency in cell frequency counting (ie. abundance measures) most improved by QA process
- QA process identifies ambiguous taxa and quantifies subsequent reduction in surveyor variability after between-dive ID sessions
- *Note: crypsis of spp also factored into QA, although not presented here*

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