

Supplementary Information

A three-step process for assessing the scientific value of historical ROV imagery

Step 1: Scoring the extent of usable imagery of a structure

The extent of usable imagery of a structure can be noted as either unusable (0), some sections of ROV imagery usable (1) or most sections of the ROV imagery usable (2) (S-Table 1). These scores often differ depending on whether the video is to be used to assess fish or marine growth as fish require a greater field of view while marine growth assessments require close-up imagery of structures.

S-Table 1: Step 1. Scoring the extent of scientifically-usable ROV imagery of a structure. Separate scores recorded for fish and marine growth.

Score	Descriptor	Reason(s)
0	Unusable	<ul style="list-style-type: none"> • ROV focused on a specific task on a small area of infrastructure only • No clear imagery of structure
1	Sections usable	<ul style="list-style-type: none"> • Only sections of collected imagery suitable for fish/marine growth associations with the structure
2	Most usable	<ul style="list-style-type: none"> • Most ROV video imagery can be used to assess fish/marine growth associations with the structure

Step 2: Scoring data resolution that can be obtained from ROV imagery

Each ROV video can be scored on a scale of 0 – 5, according to the resolution/level of data that can be obtained with 0 indicating unusable imagery for assessment through to 5 where high taxonomic resolution is possible for fish (S-Table 2) and moderate for marine growth (S-Table 3).

To be able to assess fish type, diversity, abundance, and the extent and complexity of marine growth, ROV video must be of sufficient quality, possess suitable lighting and move at a slow and steady rate. These are requirements that do not necessarily need to be achieved for the ROV to perform routine tasks and, as such, availability of suitable ROV video is often lacking. Fish are comparatively easy to identify with higher taxonomic resolution than marine growth, with marine growth sometimes extremely difficult to identify to species level without handling specimens (e.g. sponges).

S-Table 2: Step 2. Scoring ROV video according to resolution of data on fish assemblages that can be obtained.

Score	Descriptor	Evaluation	Data metric(s)
0	Unusable	None	N/A
1	Very poor	Fish identifiable to family/genus level only	Estimated family richness

2	Poor	Fish identified to family/genus level, ca. 25% of fish viewed identified to species	Family richness Estimated species richness
3	Average	Fish identified to family/genus level, ca. 50% fish identified to species, estimated abundances for some species	Estimated species richness Estimated abundance
4	Good	Nearly all fish identified to species level (species richness), abundances and information on interaction with structure	Species richness Abundance for most species Behaviour
5	Excellent	Fish identified to species level (or in the deep sea to different morphotypes of unknown species), abundances and information on interaction with structure. Estimates of fish size possible using structures as reference.	Species richness Abundance Behaviour Estimates of fish size

S-Table 3: Step 2. Scoring ROV video according to resolution of data on marine growth habitats that can be obtained.
*Note: it is often not possible to identify all marine growth forming species from imagery – this would require laboratory analysis.

Score	Descriptor	Evaluation	Data metric(s)
0	Unusable	N/A	N/A
1	Very poor	Presence of marine growth (broad-level classification)	Estimated broad-level classification e.g. Phyla or functional groups
2	Poor	Broad classification of marine growth (with some uncertainty), percent cover and complexity measures	Estimated broad-level classification Estimated % cover Estimated complexity
3	Average	Broad classification of marine growth, some genus/species-level IDs, percent cover and complexity measures	Broad-level classification % cover Complexity
4	Good	Broad classification, 20% species-level IDs, percent cover and complexity measures	Broad-level classification Estimated species richness/detailed groupings % cover Complexity

Score	Descriptor	Evaluation	Data metric(s)
5	Excellent	Detailed classification, 50% species-level IDs, percent cover and complexity measures	Estimated species richness*/detailed habitat groupings % cover Complexity

Step 3: Estimating the scientific value of historical ROV imagery

The overall scientific value of ROV imagery can be determined by combining the scores obtained in Step 1 and Step 2 (S-Table 4) with results presented numerically to reflect this ranking, e.g. '2,4' with 2 being 'most suitable' and 4 being 'Good'. It is possible for imagery to be scored a 0 (unusable for science) but higher, e.g. even a 3 or a 4 for an ability to gain high-level data on fish/marine growth. This would occur when an ROV is performing a focused task on a very small section of structure where close-up imagery of fish/habitats could be obtained yet the overall video is of no value as a survey for fish/marine growth. ROV video considered to be of 'high scientific value' will gain a combined score of 1,5 or 2,4 or 2,5 while moderate quality ROV video will be scored 1,3 or 1,4 or 2,3. ROV imagery of low scientific value will possess all other score combinations (S-Table 4).

S-Table 4: Step 3. Combining scores of ROV video survey suitability (S-Table 1) and the scientific value according to data metrics that can be obtained (S-Tables 2,3) to give an overall assessment of scientific value as low (orange), moderate (green) or high (blue).

Data Level → Suitability ↓	0	1	2	3	4	5
0						
1						
2						