Paper for Consideration by SCUFN-35.2

Follow-up SCUFN35.1/12:

SCUFN Member Ohara to prepare a new integrated draft version of this recommendation (incl. Horizontal Strategy) for circulation to SCUFN Members for comments. (15 July 2022).

Submitted by:	Yasuhiko Ohara (SCUFN Vice-Chair) and Kevin Mackay (SCUFN Member)
Executive Summary:	This proposal recommends revisions to the draft Cook Book as appropriate, also future revision of B-6 as appropriate.
Related Documents:	None
Related Projects:	Cookbook (e.g., Actions SCUFN33/06, SCUFN33/15, SCUFN33/32, SCUFN33/52), and SCUFN30/106, SCUFN31/08, SCUFN32/184, SCUFN33/41, and SCUFN34/VTC03/13

Introduction/Background

1. This action originally was assigned as Action SCUFN30/106 (and SCUFN30/113): to propose a general strategy to define the optimal horizontal resolution, which derived from the many Chinese proposals in SCUFN30 that proposed relatively minor features in close association with the nearby already-recognized features. SCUFN also faced a similar problem with some Philippines' proposals during SCUFN34/VTC03 (e.g., "Bitaog Hill"). This type of proposal is considered as not a good protocol, since this can result in clutter and inflation of undersea feature names and a lack in consistency of names with already-recognized associated features, thereby SCUFN cannot manage these undersea feature names in an appropriate fashion. SCUFN needs to establish a general strategy of how to deal with the naming proposals in general, when taking into consideration that the current technology allows us to know more in detail the structure and morphology of the undersea features. In other words, SCUFN may want to limit the size (relief and horizontal extent) of the undersea features to be considered in a SCUFN meeting. Following SCUFN31/108, the Generic Term Group led by Yasuhiko Ohara proposed the following guideline defining the areal size of an undersea feature that is eligible for naming:

   "The areal size of an undersea feature should generally be identified on a map scale of 1:1,000,000 and/or a map generated with a 15 arc-second grid bathymetric data. When proposing a minor undersea feature that does not meet this criterion, the proposer should explain the reason why they want to name it. The reasoning may include that the proposed feature is (1) an important landmark for geological and/or geophysical and/or biological

phenomena, (2) an important landmark for sampling point such as a dredge point, and/or (3) an important landmark for description of geology and/or geophysics of the area, etc."

2. Following SCUFN32/184, Kevin Mackay prepared a general strategy and guidelines defining the optimal horizontal resolution that are eligible for naming in the draft Cook Book:

   "Minimum dimension

   The size of undersea features that are named has always been dependent of the mapping technology. At the time SCUFN was established, in 1975, single beam sounding systems were the 'standard' equipment used and features were identified, defined and named based on a few ship tracks. This meant that only significantly large features, usually greater than 10 kilometres across were mapped and named. Also, there were often assumptions on the form of the feature resulting in the assignment of Generic Terms that do not comply with the criteria set in this cookbook.

   By 2000, multibeam sounders were commonly used on research vessels and smaller features less than 10 square kilometres were being routinely mapped in detail and named. Shipborne multibeam sounders used for offshore surveys typically have a resolution of 10 to 50 m depending on water depth and currently feature architecture on the scale of about 500 m is used to define Generic Terms. With multibeam sounding systems now being used on autonomous underwater vehicles (AUVs) the mapping resolution is better than 1 metre and features of a few 10s in size of meters are being defined.

   SCUFN does not have any minimum size for features to be named. However as with terrestrial features, undersea features less than a few hundred metres across are usually not named except in special case that are usually based on historical significance".

3. In SCUFN34, Sub-Committee confirmed the need to further develop a general strategy and possible guidelines defining the optimal horizontal resolution between undersea features that are eligible for naming. This action was tasked to Generic Terms Group led by Kevin Mackay (SCUFN33/41 refers).

Analysis/Discussion

4. The Generic Terms Group understands that there have been several efforts to identify seafloor morphology, including (1) automated technique to detect undersea features by Undersea Feature Names Project Team (lead by Anna Hendi; SCUFN33-08.2A refers), and (2) analysis of the bathymetric terrain model using the bathymetry- and reflectivity-based estimator for seafloor segmentation (BRESS) method developed by Masetti et al. (2018) (see also Sowers et al., 2020). The Generic Terms Group recognizes that there also has been a community effort to compile seabed "geomorphology" in relation to the latter

technique (Dove et al., 2020), where “geomorphology” is a concept that includes genesis and composition of seafloor morphologies.

https://zenodo.org/record/4075248#.YtZ2ZOzP3A4

These efforts tell us usefulness of the state-of-the-art machine learning technique to identify seafloor morphology. For example, in its Introduction of Masetti et al. (2018), it reads that “*The proposed method attempts to mimic the approach taken by a skilled analyst assuming that, when called upon to manually segment a seafloor area, the analyst initially evaluates the context surrounding the area and attempts to take full advantage of both bathymetric and reflectivity products rather than focusing on small-scale geomorphometric variability (e.g., local rugosity)*. *The result is a bathymetry- and reflectivity-based estimator for seafloor segmentation (BRESS) that mimics the positive aspects of the segmentation process as performed by a skilled analyst (e.g., the use of context and multiple inputs) but avoids the inherent deficiencies (subjectivity, processing time, lack of reproducibility)*”.

5. Following the above analysis, the Generic Terms Group understands that any attempts to develop a general strategy and guidelines defining the optimal horizontal resolution between undersea features will be subjective at this stage; this “subjective” or “arbitrary” horizontal resolution will have no scientific basis at this stage. Instead, SCUFN needs to work with specialists doing computational approach to set quantitative thresholds to define the optimal horizontal resolution between undersea features.

6. On the other hand, the general strategy and guidelines defining the minimum dimension of undersea features that are eligible for naming in the draft Cook Book prepared by Kevin Mackay was based on the objectives of Seabed 2030, considering the existing display rules of the GEBCO Gazetteer.

7. The Generic Terms Group sees no significant flaws on the general strategy and guidelines defining the minimum dimension of undersea features that are eligible for naming in the draft Cook Book prepared by Kevin Mackay, although some minor amendments are deemed necessary to allow some flexibility when implementing this.

Recommendations

8. The Generic Terms Group recommends the following general strategy and guidelines defining the minimum dimension of undersea features that are eligible for naming in the draft Cook Book (the amendments are underlined):

    “Minimum dimension

    The size of undersea features that are named has always been dependent of the mapping technology. At the time SCUFN was established (at that time, the committee was called SCGN), in 1975, single beam sounding systems

were the 'standard' equipment used and features were identified, defined and named based on a few ship tracks. This meant that only significantly large features, usually greater than 10 kilometres across were mapped and named. Also, there were often assumptions on the form of the feature resulting in the assignment of Generic Terms that do not comply with the criteria set in this cookbook.

By 2000, multibeam sounders were commonly used on research vessels and smaller features less than 10 square kilometres were being routinely mapped in detail and named. Shipborne multibeam sounders used for offshore surveys typically have a resolution of 10 to 50 m depending on water depth and currently feature architecture on the scale of about 500 m is used to define Generic Terms. With multibeam sounding systems now being used on autonomous underwater vehicles (AUVs) the mapping resolution is better than 1 metre and features of a few 10s in size of meters are being defined.

SCUFN does not have any minimum size for features to be named. However as with terrestrial features, undersea features generally less than a few hundred metres across are usually not named except in special case that are usually based on historical and/or scientific significance. In these special circumstances, the proposer of the name of a minor undersea feature would need to describe the reason for proposing a minor feature in a proposal".

9. The Generic Terms Group further recommends the SCUFN to work with specialists doing computational approach to set quantitative thresholds to define the optimal horizontal resolution between undersea features. This work partly can be done by the inputs from a joint project between British Geological Survey, Geoscience Australia, Geological Survey of Norway, and Geological Survey of Ireland on Seabed Morphology (see Dove et al., 2020), in which GEBCO Guiding Committee members Geoffroy Lamarche and Kim Picard are involved. SCUFN already asked Geoffroy Lamarche and Kim Picard to closely liaise with SCUFN on this project during the GEBCO Guiding Committee 38 in April 20, 2022.

Justifications and Impacts

10. The proposed general strategy and guidelines defining the minimum dimension of undersea features that are eligible for naming will help SCUFN manage the inflating undersea feature name proposals in an appropriate fashion. Implementation of the proposed revisions would impact the draft Cook Book and future revision of B-6.

Action required of SCUFN

11. SCUFN is invited to:
    a. Note this proposal.
    b. Consider the recommendations in sections 8 and 9.