DQWG DQWG 19/5/4

Meeting 19 25Mar 2024

Agenda Item 5.4

**Proposal for Improving the Allocation of CATZOC** **Values of Crowdsourced Bathymetry (CSB) Data**

Submitted by Chair

**SUMMARY**

Executive Summary: An optimized method for allocating CATZOC Value to CSB data has been proposed to promote the widespread application of CSB data.

Action to be taken: See section 4

**1. Introduction**

The assessment of bathymetric data quality and classification into one of the CATZOCs is generally based on a combination of Position accuracy, Depth accuracy, and Seafloor coverage.

Table 1 ZOC Categories

|  |  |  |  |
| --- | --- | --- | --- |
| **CATZOC/ QoBD** | **Position Accuracy** | **Depth****Accuracy** | **Seafloor Coverage** |
| A1/1 | 5m+5% depth | 0.5m+1% depth | Full area search undertaken, significant seafloor features detected and depths measured.  |
| A2/2 | 20m | 1.00m+2% depth | Full area search undertaken. Significant seafloor features detected and depths measured.  |
| B/3 | 50m | 1.00m+2% depth | Full area search not achieved; uncharted features hazardous to surface navigation are not expected but may exist.  |
| C/4 | 500m | 2.00m+5% depth | Full area search not achieved; depth anomalies may be expected.  |
| D/5 | Worse than ZOC C | Below C | Full area search not achieved, large depth anomalies may be expected.  |
| U/U | Unassessed  | Quality of data has yet to be assessed |
| -/O | Oceanic | Oceanic areas with water depth greater than 200m |

Significant seafloor features are defined as those rising above depicted depths by more than 2 m (depth <40m) or 10% depth (depth>40m)

**2. Discussion**

CSB is the collection and sharing of depth measurements from vessels, using standard navigation instruments, while engaged in routine maritime operations. CSB data consists of data and metadata. The Guidance for Crowdsourced Bathymetry (B-12) states that: “For crowdsourced bathymetry, the data are the depths and geographic positions collected by a vessel, along with the date and time when collected. The metadata provides additional, supporting information about the data, such as the make and model of the echo sounder and GNSS, the vessel’s draft, offset measurements where the sensors were installed on the vessel, and so forth. ”

The characteristics of CSB determine that the quality of data is inevitably uneven. Some CSB data may have high quality, while others may have low quality. Due to time constraints, it is not possible to delve into the CATZOC assignment of CSB data in S-68 edition 1.0.0. Therefore, it is simply recommended to assign CATZOC value D to all CSB data in S-68. However, considering that accurately evaluating the quality of CSB data and assigning appropriate CATZOC values to them will be beneficial to promoting the extensive use of high-quality CSB data, especially in water areas lacking systematic measurement data, it is necessary to further optimize the CATZOC assignment of CSB data based on S-68.

**3. Recommendations**

It is recommended to optimize the CATZOC assignment of CSB data from the following aspects:

1. Seafloor coverage: Full area search and feature detection in CSB are primarily determined by the sensor type employed. If a CSB vessel is equipped with multi-beam echo-sounders with appropriate range, it can be deemed to have achieved the requirement of full area search; otherwise, it should not be considered as satisfying the requirement. If the vessel is equipped with side-scan sonar with appropriate performance, it can be regarded as meeting the requirements for feature detection; otherwise, it should not be seen as satisfying the requirements.
2. Horizontal (positioning) accuracy: The horizontal accuracy of CSB data primarily depend on the positioning equipment and correction methods employed. If CSB vessels are equipped with a global navigation satellite system (GNSS, such as GPS, GLONASS, or Beidou) receiver with a positioning accuracy better than 15m, and if the vessel position has been corrected for the offsets between the GNSS receiver and the transducer, it can be considered that the CSB data collected can meet the requirements of CATZOC in terms of position accuracy.
3. Vertical (depth) precision: Vertical accuracy depends not only on the measuring equipment, but also on the correction, including attitude correction, sensor vertical offset correction, draft correction, sound velocity correction and tide correction. For ease of operation, it can be divided into Full corrected (all corrections have been applied), partial corrected (Only partial corrections have been applied), and uncorrected (no corrections have been applied). After correction, the quality of the CSB data can be more accurately evaluated through accuracy and precision evaluation. Precision – is the degree to which repeated (or reproducible) measurements under unchanged conditions show the same results. Accuracy – is the closeness of agreement between the measurement and the true value.

In summary, it is recommended to optimize the CATZOC assignment of CSB data according to the table 2.

Table 2 Recommended scheme for assigning CATZOC values to CSB data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sensor**  | **Position** | **Data processing** **(Attitude Correction, Sensor Vertical Offset Correction, Draft Correction, Sound Speed Correction and Tide Correction)** | **Quality Control** | **Recommended** **CATZOC value** |
| **GNSS Receiver**  | **Horizontal Offset** **Corrected** | **Full Corrected** | **Partial** **Corrected** | **Uncorrected** | **Precision Meets Requirements** | **Accuracy Meets Requirements** |
| **Yes** | **No** | **Yes** | **No** |
| **Yes** | **No** | **Yes** | **No** |
| Multibeam echo-sounder system + Side-scan sonar system | √ |  | √ |  | √ |  |  | √ |  | √ |  | A2 |
| Multibeam echo-sounder system + Side-scan sonar system | √ |  | √ |  |  | √ |  | √ |  | √ |  | B |
| Multibeam echo-sounder system + Side-scan sonar system | √ |  |  | √ |  | √ |  | √ |  |  | √ | C |
| Multibeam echo-sounder system + Side-scan sonar system | √ |  |  | √ |  |  | √ |  | √ |  | √ | D |
| Multibeam echo-sounder system + Side-scan sonar system | √ |  |  | √ |  |  | √ |  | √ |  | √ | U |
| Multibeam echo-sounder system  | √ |  | √ |  | √ |  |  | √ |  | √ |  | A2 |
| Multibeam echo-sounder system | √ |  | √ |  |  | √ |  | √ |  | √ |  | B |
| Multibeam echo-sounder system | √ |  |  | √ |  | √ |  | √ |  |  | √ | C |
| Multibeam echo-sounder system | √ |  |  | √ |  |  | √ |  | √ |  | √ | D |
| Multibeam echo-sounder system | √ |  |  | √ |  |  | √ |  | √ |  | √ | U |
| Single beam echo-sounder + Side scan sonar system | √ |  | √ |  | √ |  |  | √ |  | √ |  | B |
| Single beam echo-sounder + Side scan sonar system | √ |  |  | √ |  | √ |  | √ |  |  | √ | C |
| Single beam echo-sounder + Side scan sonar system | √ |  |  | √ |  |  | √ |  | √ |  | √ | D |
| Single beam echo-sounder | √ |  | √ |  | √ |  |  | √ |  | √ |  | C |
| Single beam echo-sounder | √ |  |  | √ |  |  | √ |  | √ |  | √ | D |

Note: In cases where the depth exceeds 200m or the range of echo-sounder, it is recommended to assign CATZOC value 'O' to the CSB data.

**4. Action**

The DQWG is invited to:

1. **Note** the information provided;
2. **Establish** a subWG to develop an optimized method for allocating CATZOC

 Values of CSB data.