



19th Meeting of the Data Quality Working Group

Proposal for Improving the Allocation of CATZOC Values of Crowdsourced Bathymetry Data

Agenda Item 5.4A

DQWG-19, VTC Event, 25- 26 March 2024



IHO

1.INTRODUCTION / BACKGROUND

International Hydrographic Organization

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	DepthAccuracy	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)



IHO

2.DISCUSSION/RECOMMENDATIONS

International
Hydrographic
Organization

- Crowdsourced bathymetry (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.”



IHO

2.DISCUSSION/RECOMMENDATIONS

International
Hydrographic
Organization

- 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 for promoting the widespread 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.



IHO

3.RECOMMENDATIONS

International
Hydrographic
Organization

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

a) 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.



IHO

3.RECOMMENDATIONS

International
Hydrographic
Organization

b) 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.



IHO

3.RECOMMENDATIONS

International
Hydrographic
Organization

c) 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.



IHO

3.RECOMMENDATIONS

International Hydrographic Organization

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		Full Corrected	Partial	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

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.



IHO

3.RECOMMENDATIONS

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		Full Corrected	Partial	Uncorrected	Precision Meets Requirements		Accuracy Meets Requirements		
	Yes	No	Yes	No				Yes	No	Yes	No	
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



IHO

4. ACTION

International
Hydrographic
Organization

The DQWG is invited to:

- a. Note** the information provided;

- b. Establish** a subWG to develop an optimized method for allocating CATZOC Values of CSB data.