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Mariner Perceptions regarding the Display of Uncertainty on Nautical Charting Products

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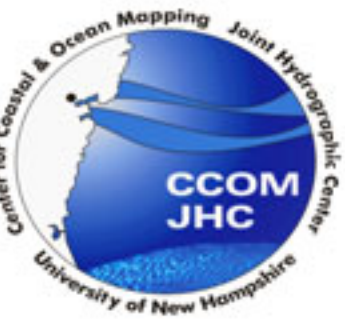
Mariner Perceptions regarding the Display of Uncertainty on Nautical Charting Products.

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Abstract

Over the years, hydrographers and cartographers have struggled with the mechanics of communicating the uncertainty or limitations of collected hydrographic data to the chart user in a simple and meaningful way. Several schemes, such as Source Diagrams (for paper charts) and Zone of Confidence (for Electronic Navigation Charts (ENC's)) have been employed, but the level of use or confidence in this information by Mariners is considered to be rather low. This is no happy state of affairs, as a misunderstanding of charted information's limitations will not support informed decision making on the part of the user. Although data producers/providers have suggested a variety of means to improve the conveyance of uncertainty information, less is known about the views/attitudes of the user. For example:

What is the level of knowledge the user has on the subject?

What measure of uncertainty does the user find meaningful?

What display approach or method would convey uncertainty information to them in a more insightful manner? The proposal is to concoct a targeted Internet-based survey of user groups to ascertain the understanding and preferences of the mariner on the issues.

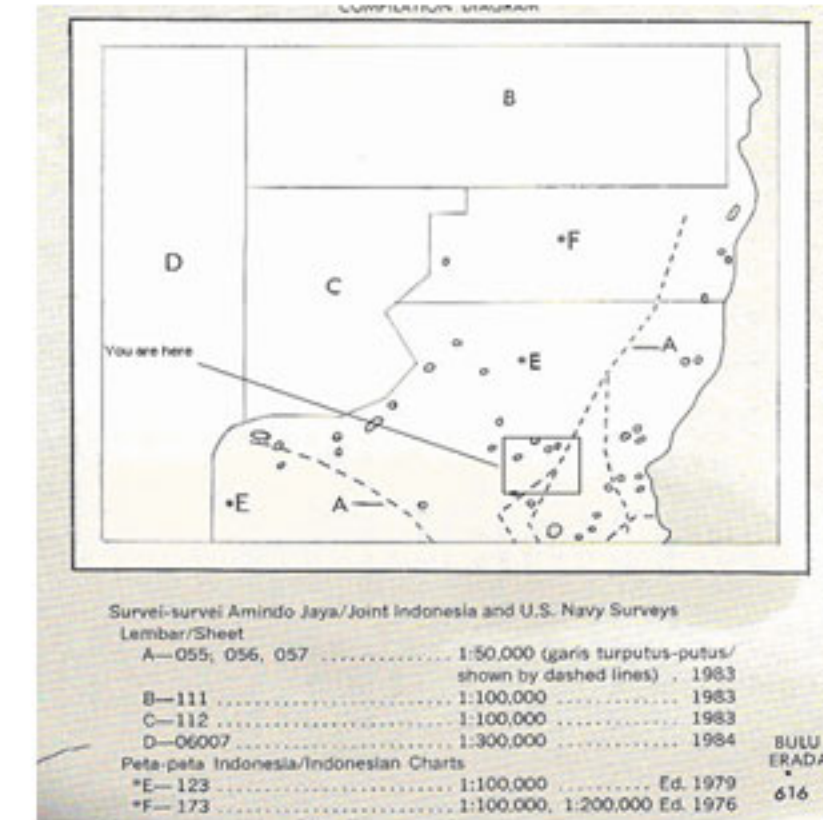
Acknowledgements

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 Dr. Brian Calder
 Dr. David Monahan
 Dr. David Wells

References

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Source Diagrams



This example shows a sample channel with a graphical listing of the data sources used in the chart assembly. For a mariner planning to transit this waterway at a critical under-keel clearance, does this offer sufficient insight?

Cartographic Devices

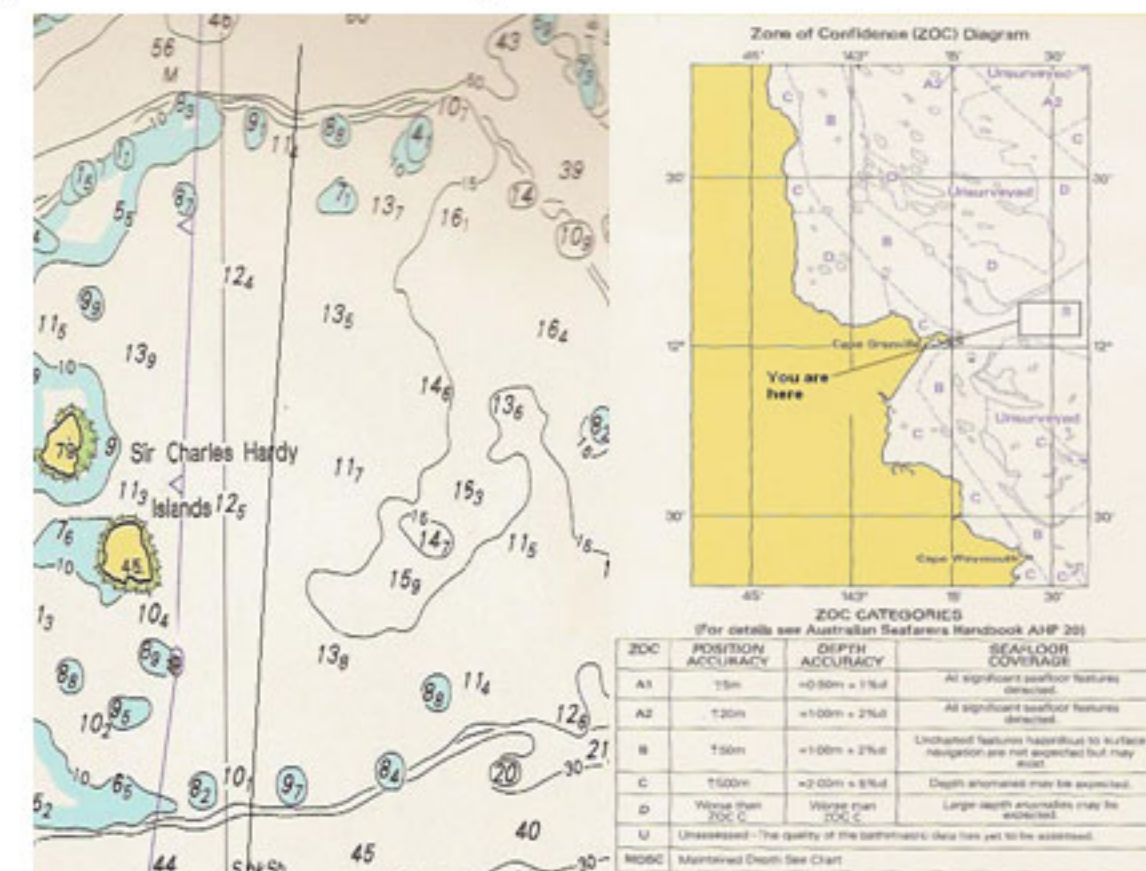
| General | Item | Description | Symbol |
|---------|------|--|--------|
| 1 | AD | Numbered sounding | AD |
| 2 | BD | Blanking sounding | BD |
| 3.1 | AD | Applied soundings | AD |
| 3.2 | AD | Applied with your input, but not accepted | AD |
| 4 | AD | Applied but not confirmed (empty or blank) | AD |

| Item | Description | Symbol |
|------|----------------|--------|
| 10 | Depth of water | 10 |
| 11 | Depth of water | 11 |
| 12 | Depth of water | 12 |
| 13 | Depth of water | 13 |
| 14 | Depth of water | 14 |
| 15 | Depth of water | 15 |
| 25 | Depth of water | 25 |
| 30 | Depth of water | 30 |
| 31 | Depth of water | 31 |

Areas of no data can be represented by symbols (item 25), or empty (blank) space.

Legends, (items 1-4) timesteps (item 10 and 14), and symbology (items 13, 30 and 31) may be used to qualify data.

Zone of Confidence (CATZOC)



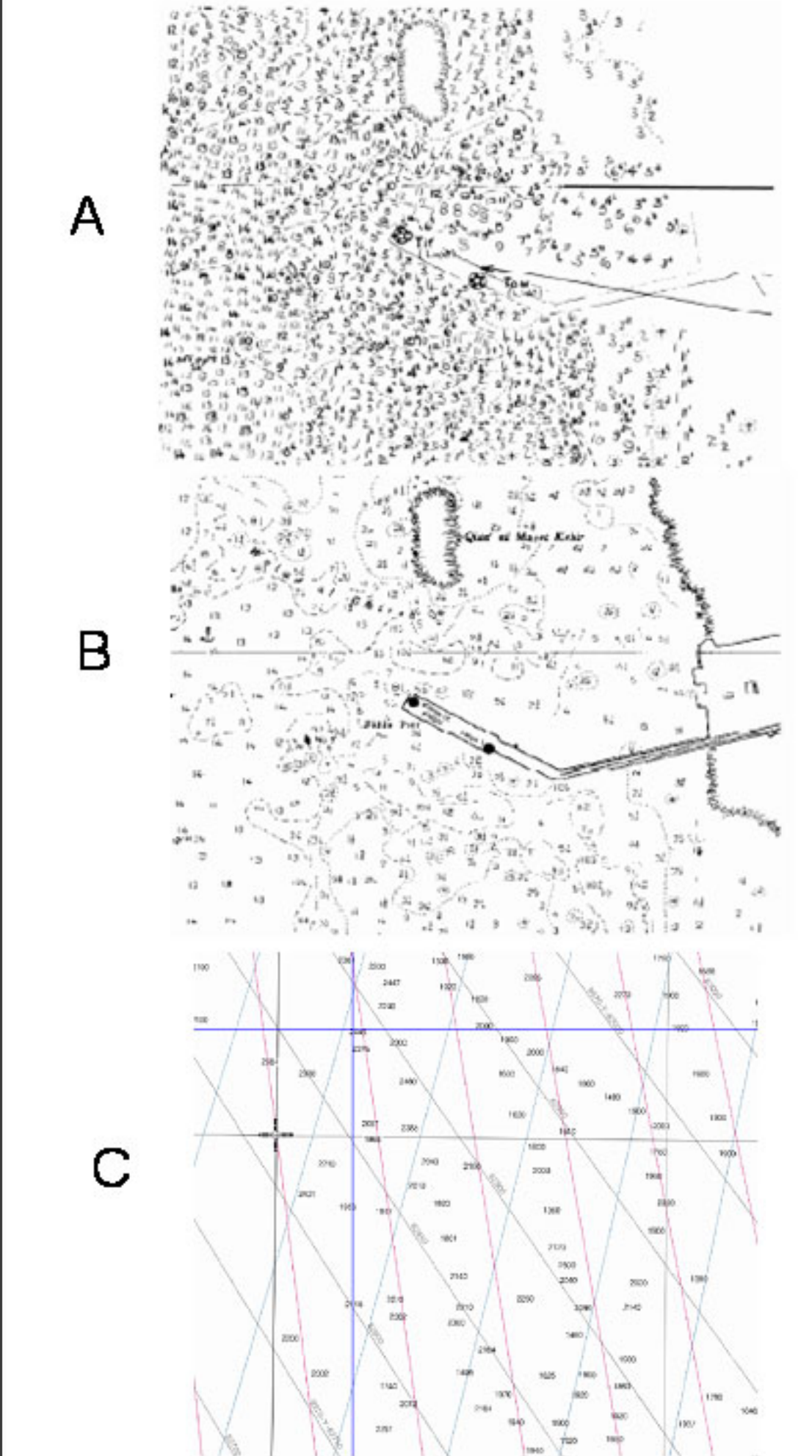
The hydrography in this example is not listed by source, but by an accuracy/completeness criterion. While a more scientifically correct attribution of the data's uncertainty, is this a useful tool for the Mariner?

Electronic Display



Is a CATZOC attribute, displayed by query sufficient for the Mariner? Would a shaded surface indicating degree of uncertainty be more useful?

Scale and Thinning



Not every data point is used in the final product. "A" was thinned to create "B". Notice the other chart snippets; "C" scaled for open ocean, and to the far left, scaled for coastal use. Does the pattern, or lack of soundings adequately convey the amount of data to the user?