

Final Report on the Analysis of the Responses to the Mariners Questionnaire

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HYDROGRAPHIC OFFICE

Introduction

DQWG4 - Action 03A:

“....report back usefulness of the current display of quality indicators in ENC’s.”

Dissertation topic:

A specification for the development of future methods of representing data quality in ENC’s

Over 600 responses have been received. This report is based on 574 responses. The remaining responses could be collated and used to verify sample.



DQWG4 – 03A – Mariner's Questionnaire

Outline

- Nature of the analysis as conducted
- Review of the demographic information and the sample makeup
- Review of the results by section
- Review of wider research into representing uncertainty of geospatial data
- Conclusions
- Specification



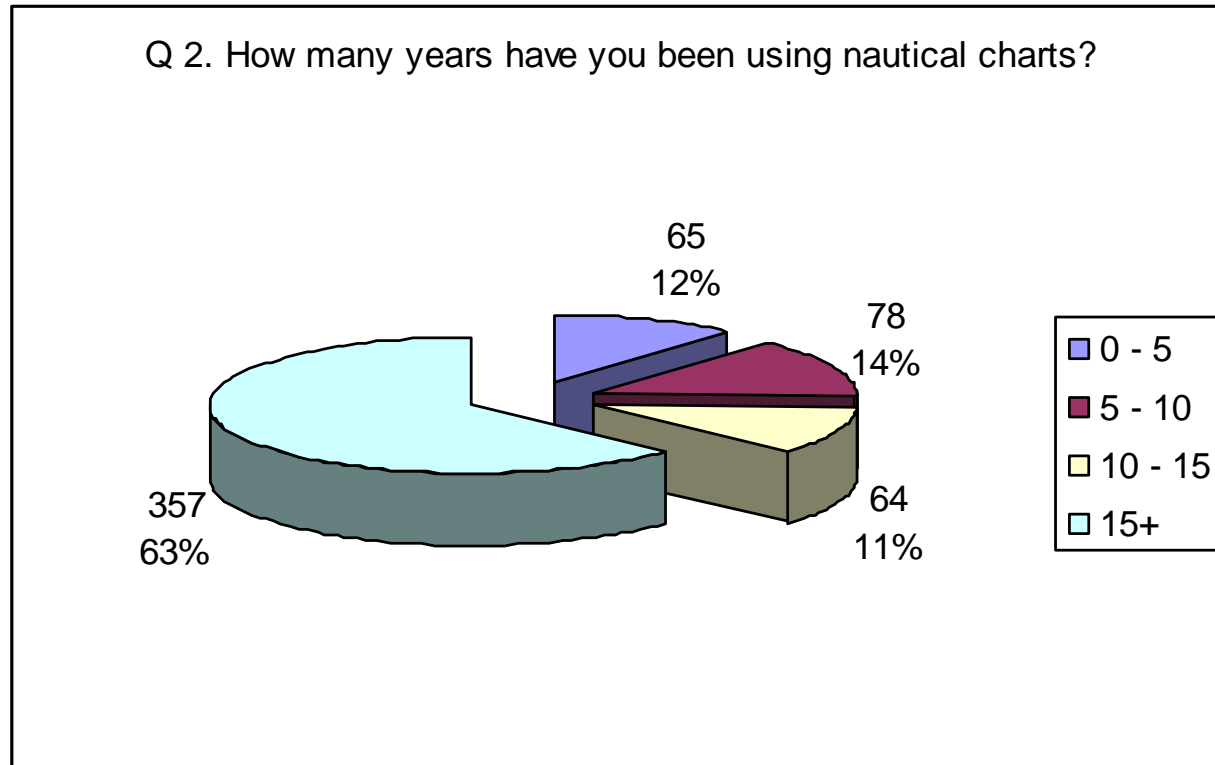
DQWG4 – 02A – Mariner's Questionnaire

Nature of the Analysis

- Questionnaire is made up of quantitative and qualitative questions.
- Qualitative analysis involves the identification of themes to support quantitative results
- Where appropriate, responses have been marked – In practice this proved difficult and this must be considered subjective
- Sector analysis was used to filter results by demographic information etc.



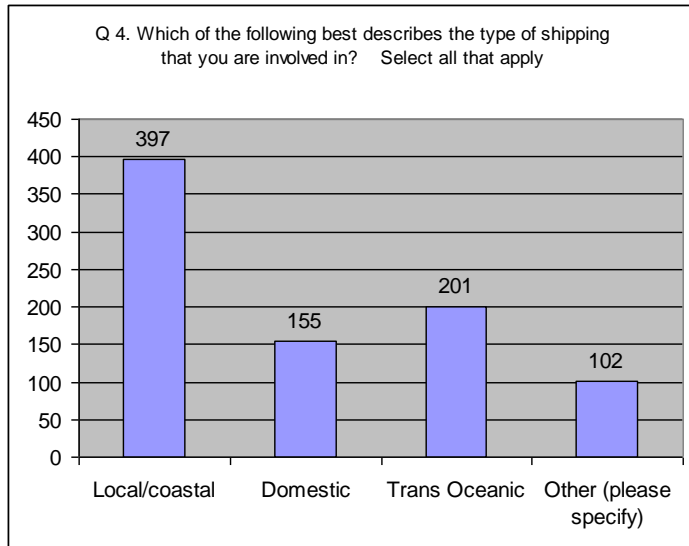
Section 1 – Demographic Information



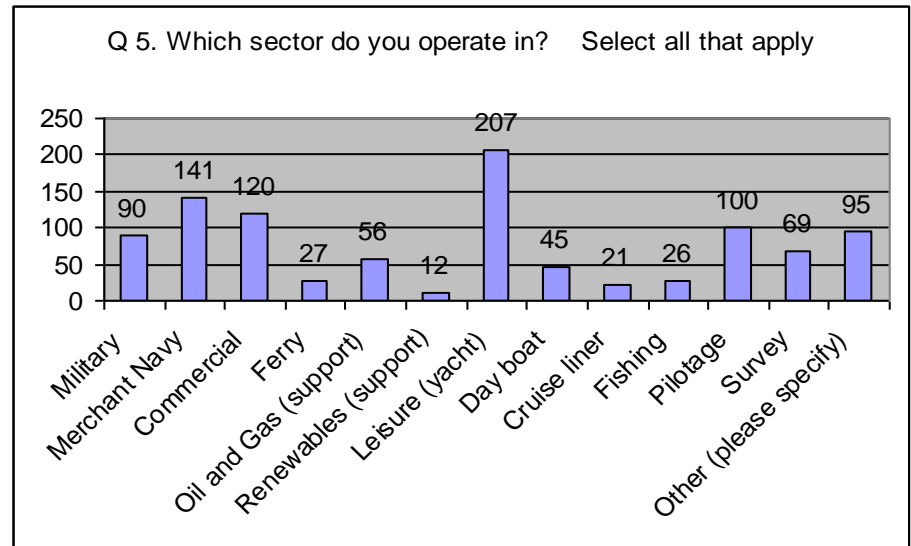
- Total of 564 responses to question
- 63% of respondents have over 15 years experience



Section 1 – Demographic Information



- 855 answers from 547 respondents

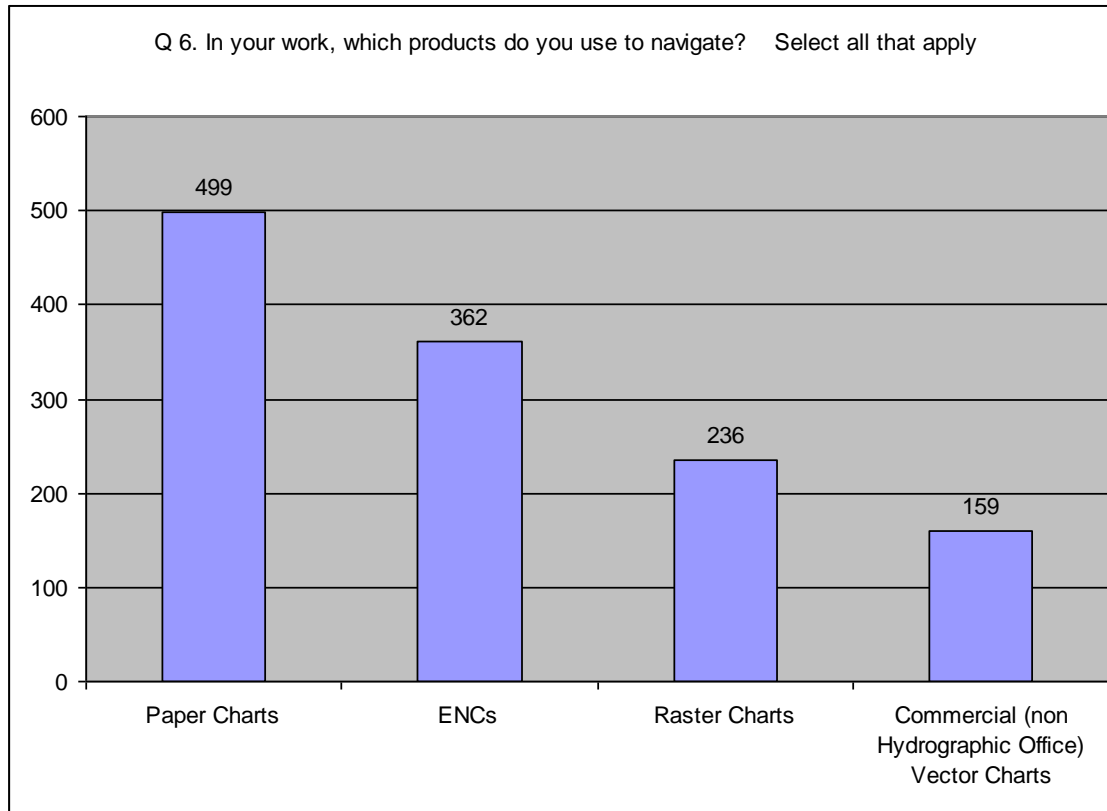


- 1009 answers from 569 respondents

No identifiable themes arising from the 'other' answers



Section 1 – Demographic Information



- Out of the 362 respondents using ENC's only 39 use them exclusively



Section 1 – Summary

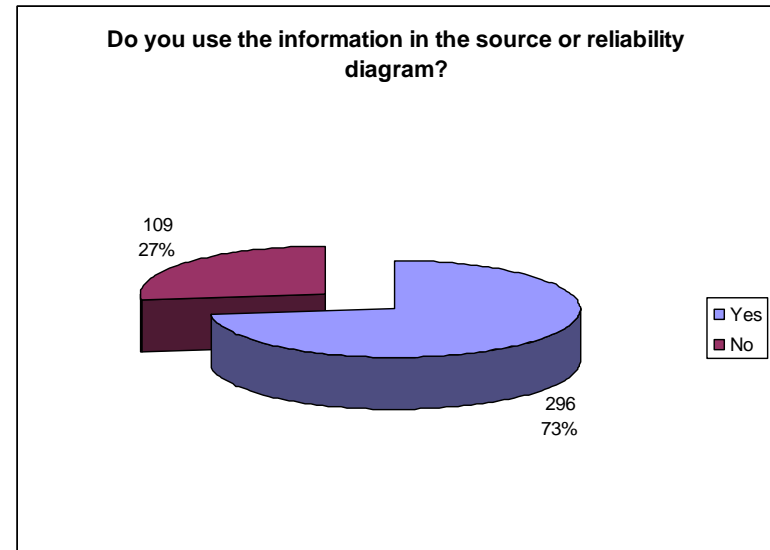
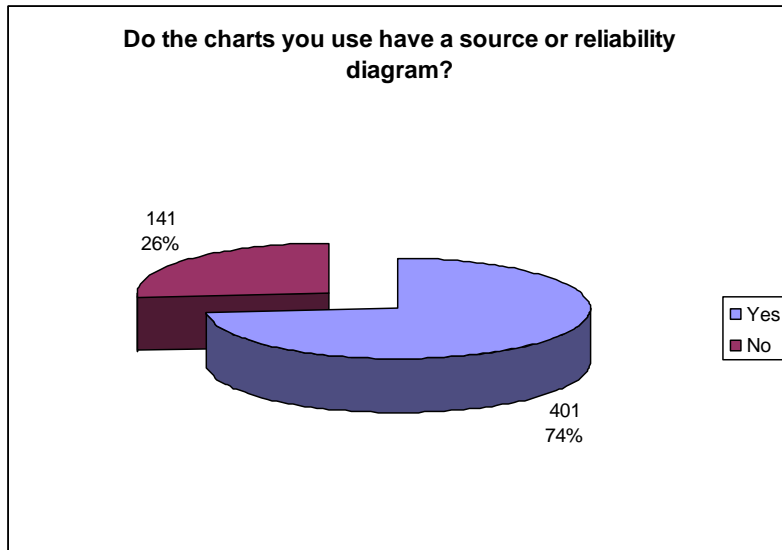
- Vast majority (74%) of respondents have over 10 years navigation experience
- Very good range of shipping sectors represented
- 499 respondents use paper charts whilst 323 of them use ENC's as well. 39 respondent use solely ENC's
- It is considered that a strong representative sample has been gathered



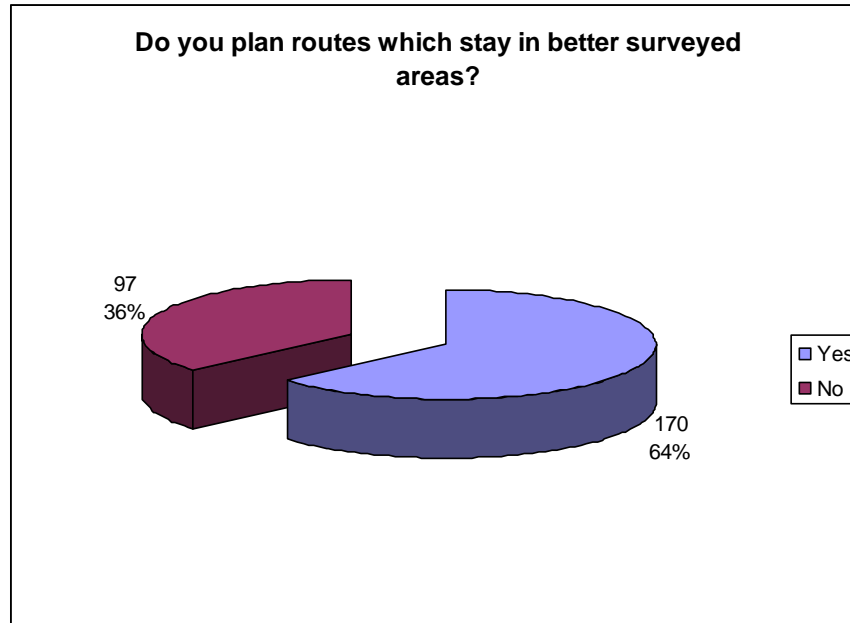
Section 2 – Mariner's perception of existing methods of representing data quality

Paper Charts

For this section a filter was set in the results spreadsheet to eliminate all respondents that had not selected paper charts in question 6, thus focusing the survey sample.



Section 2 – Mariner's perception of existing methods of representing data quality

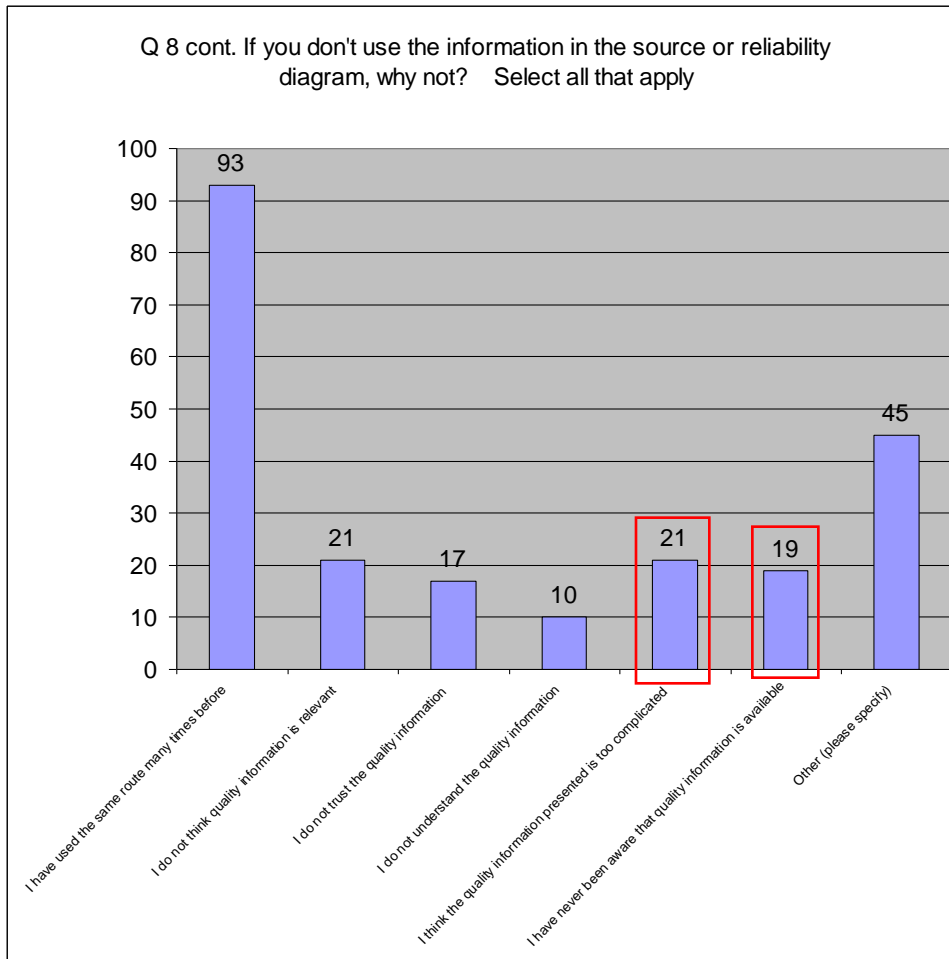


Themes and ranks from those who operate revised procedures in areas of differing survey quality

Theme	Rank
Reduce speed	1
Monitor echo sounder	2



Section 2 – Mariner’s perception of existing methods of representing data quality



Unfortunately the downloading of the data from SurveyMonkey malfunctioned. However we can see that the predominant reason for people not using the Source Diagram is because they have used the same route many times before.



Section 2 – Mariner’s perception of existing methods of representing data quality

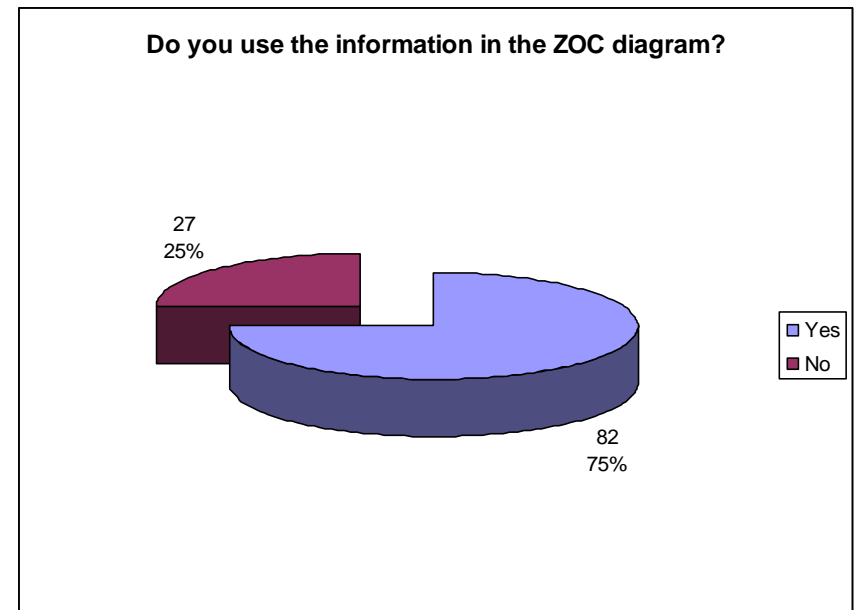
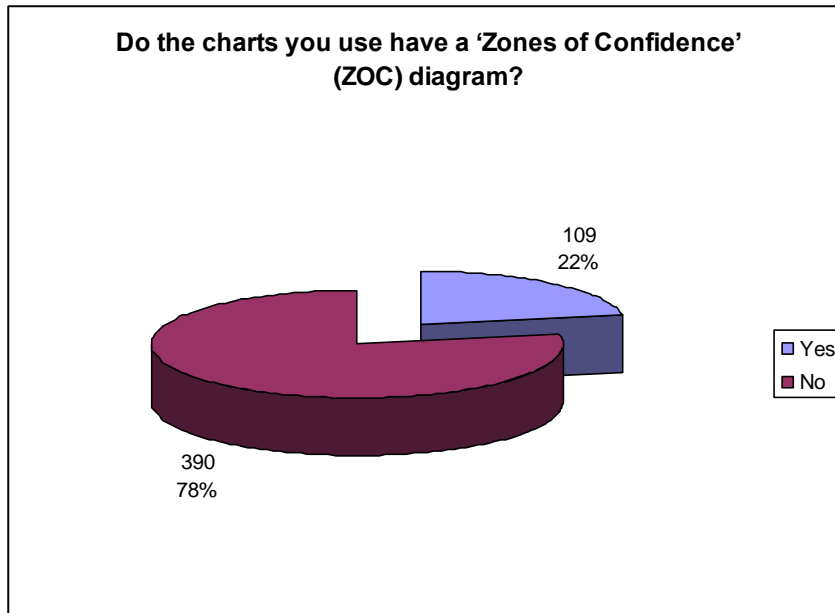
Themes and ranks for why respondents do not use the source or reliability diagram

Theme	Rank
“I trust that the charts are correct”	1
“We are restricted by the Pilots limited area of operation and bow to their local knowledge”	2
“We rely upon experience and instruments instead”	3

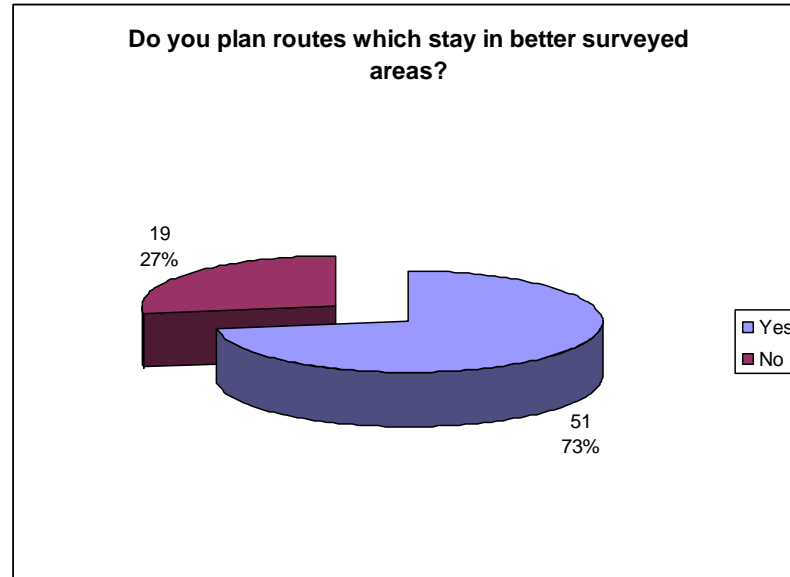


Section 2 – Mariner's perception of existing methods of representing data quality

Paper charts with a zone of confidence diagram



Section 2 – Mariner’s perception of existing methods of representing data quality



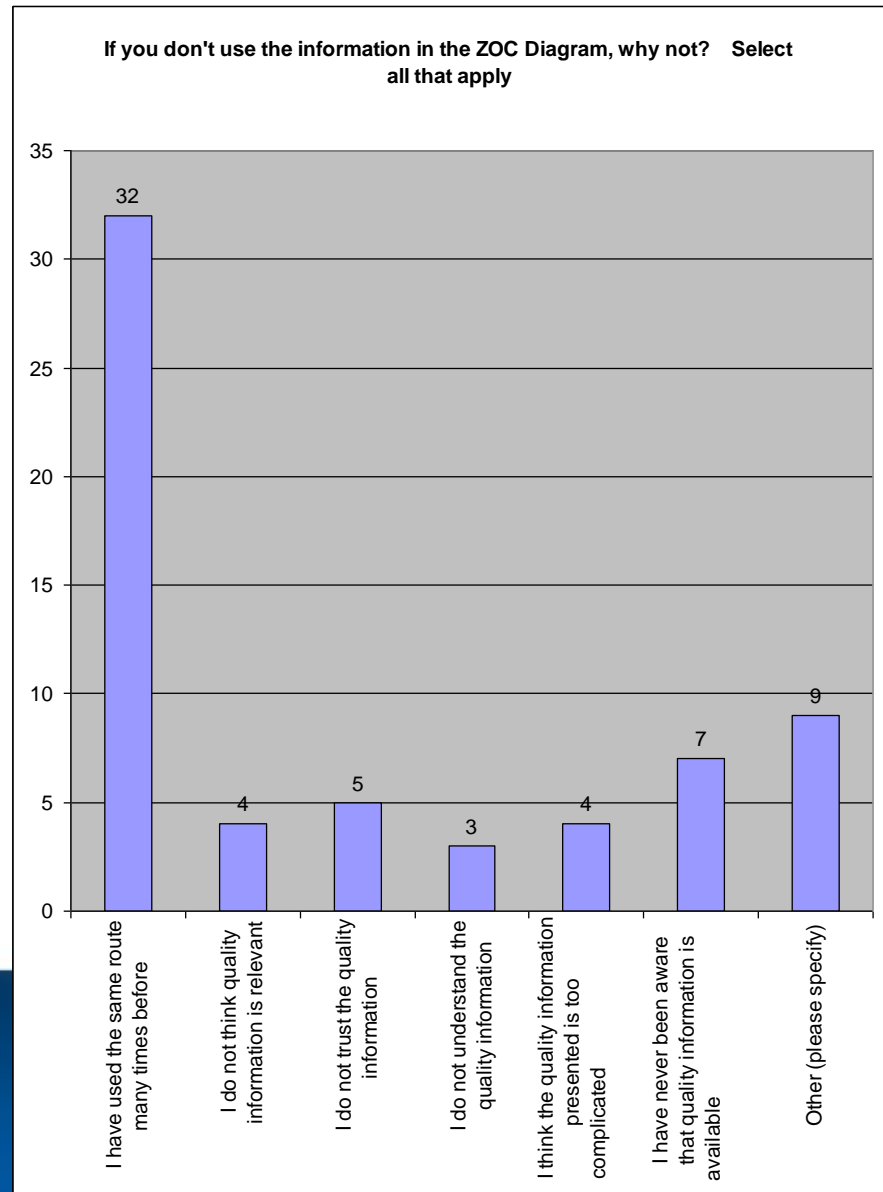
Themes and ranks for revised procedures employed by mariners

Themes	Rank
Don't enter ZOC C or worse, and exercise caution in ZOC B	1
Increased under keel clearance depending on ZOC	2



Section 2 – Mariner's perception of existing methods of representing data quality

The most common reason (from 32 respondents) for not planning routes that stayed in better surveyed areas was because respondents 'had travelled the same route many times before'. Unlike previous questions relating to source or reliability diagrams, there were no identifiable themes

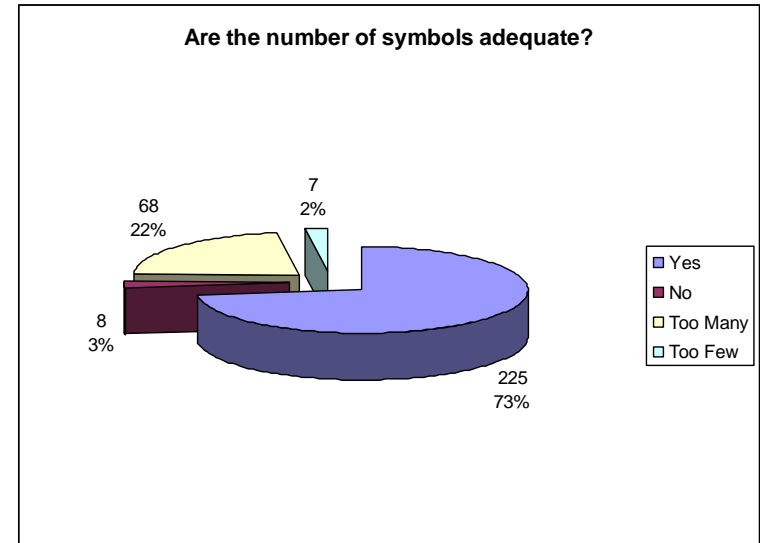
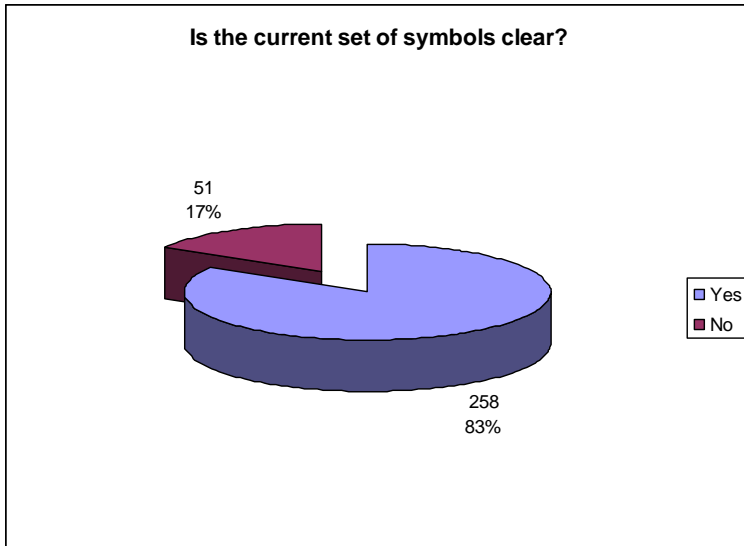


Section 2 – Mariner’s perception of existing methods of representing data quality

Mariner’s awareness of existing data quality indicators (paper charts)

DQI	Do you understand the meaning of...?		Of those who answered yes, how many were correct?	
	Yes (%)	No (%)	Correct (%)	Incorrect (%)
Broken depth contour symbol	56	44	73	27
Broken coastline symbol	66	34	69	31
Dotted danger line symbol	76	24	44	56
Discontinuity between surveys note	53	47	55	45
Unsurveyed note	88	12	94	6
Depths note	88	12	74	26
PA	62	38	98	2
PD	62	38	90	10
ED	62	38	82	18
SD	62	38	79	21
Rep'd (1999)	62	38	36	64
Sounding in an upright font	44	56	36	64
Discolored water note	59	41	corrupted	corrupted
Sandwave symbol	64	36	91	9
Dredged to note	98	2	98	2
Potentially dangerous wreck symbol	98	2	76	24
Bar above a dangerous wreck symbol	75	25	57	43
Works in progress legend	93	7	100	0

Section 2 – Mariner's perception of existing methods of representing data quality

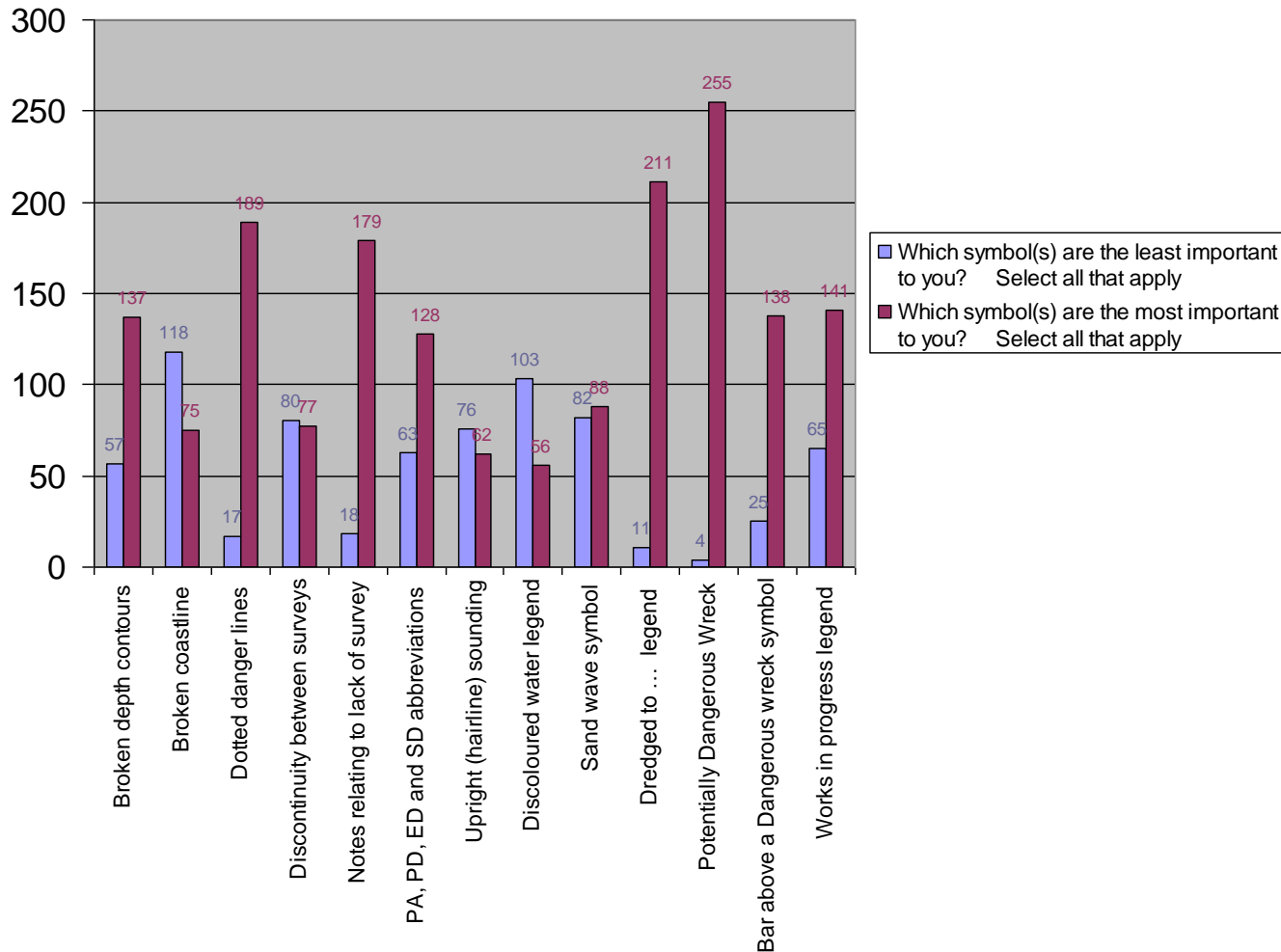


- Clarity of symbols appears to be generally good
- However five indicators appear to be ambiguous
- Definitely enough symbols, perhaps even too many?



Section 2 – Mariner's perception of existing methods of representing data quality

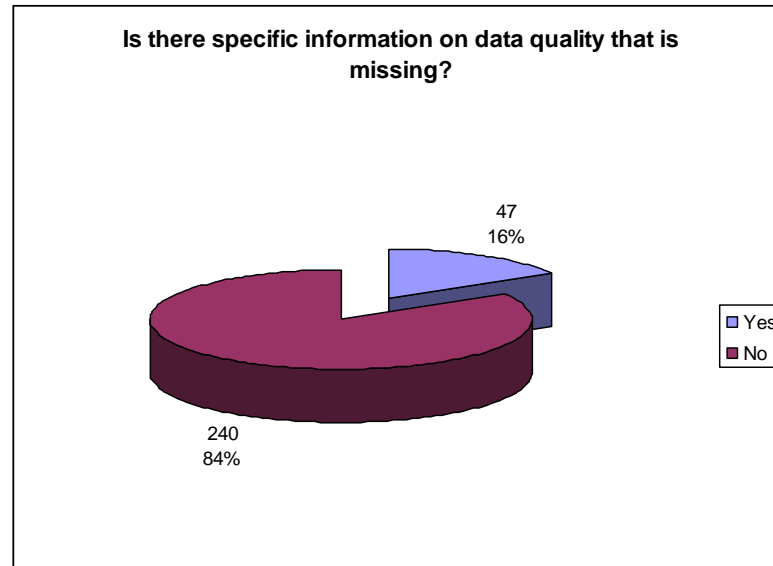
Which symbols are the most/least important to you



Dotted danger lines, Potentially dangerous wreck, dredged to... legend and Notes relating to lack of survey are the most popular symbols



Section 2 – Mariner’s perception of existing methods of representing data quality



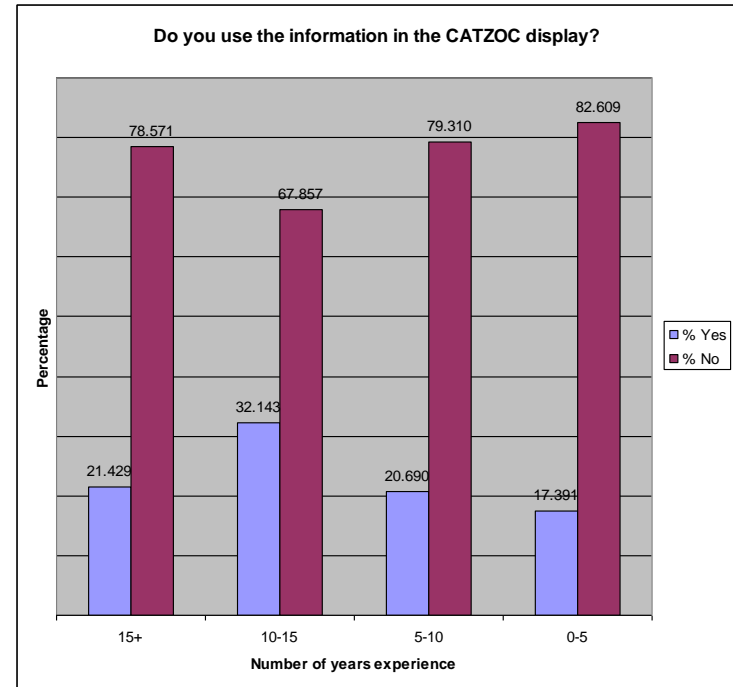
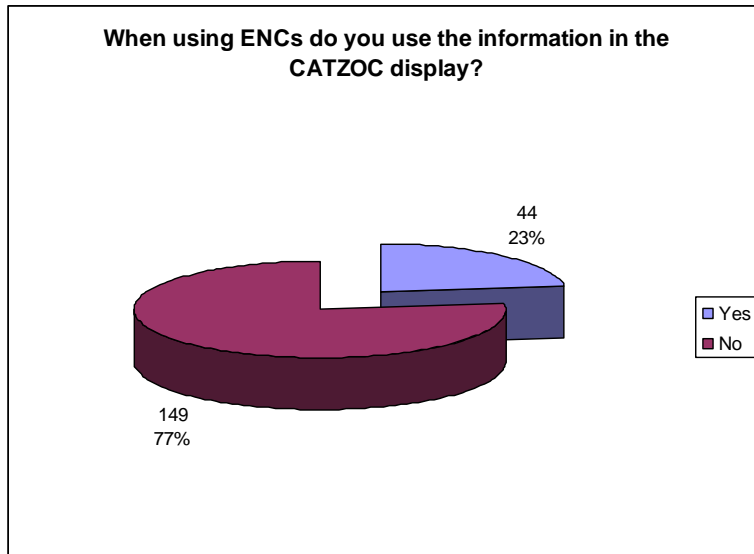
Themes and ranks for specific data quality information that is missing from paper charts

Themes	Ranks
Charts with ZOC diagrams don't have survey date	1
More information on survey type	1



Section 2 – Mariner's perception of existing methods of representing data quality

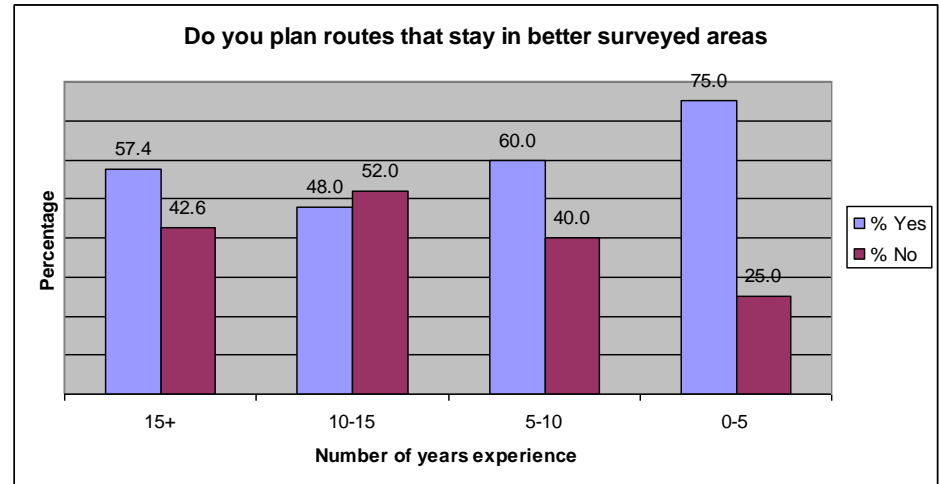
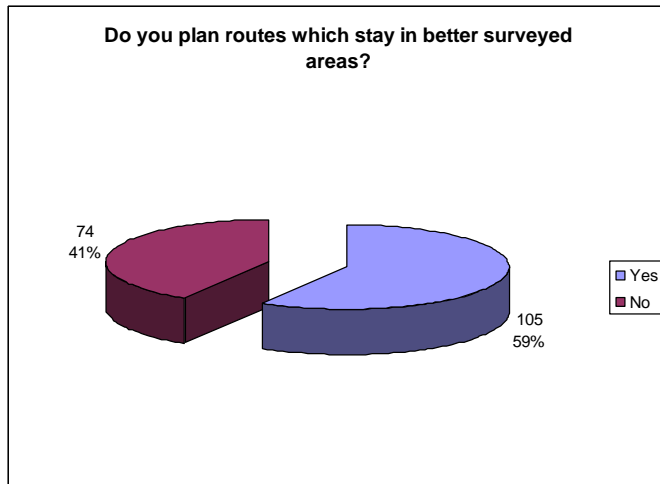
ENCs



- Large percentage of ENC users do not use the information in the CATZOC display



Section 2 – Mariner’s perception of existing methods of representing data quality



Themes and ranks from those who operate revised procedures in areas of differing survey quality

Theme	Rank
Reduce speed	1
Monitor echo sounder	2



Section 2 – Mariner’s perception of existing methods of representing data quality

Mariner’s awareness of existing data quality indicators (ENCs)

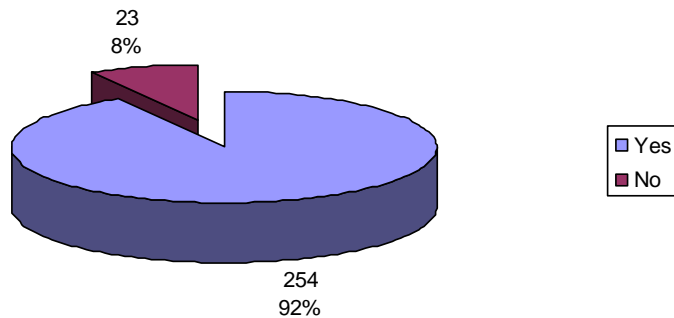
DQI	Do you understand the meaning of...?		Of those who answered yes, how many were correct?	
	Yes	No	Correct	Incorrect
HORACC	24	76	57	43
POSACC	29	71	60	40
SOUACC	31	69	91	9
VERACC	22	78	78	22
SURATH	42	58	91	9
SURSTA	32	80	94	6
SUREND	21	79	94	6
TECSOU	43	57	96	4
QUASOU	31	69	78	22
QUAPOS	27	73	79	21

Sample was filtered to show answers from respondents that stated that they used ENCs and that they used them to navigate

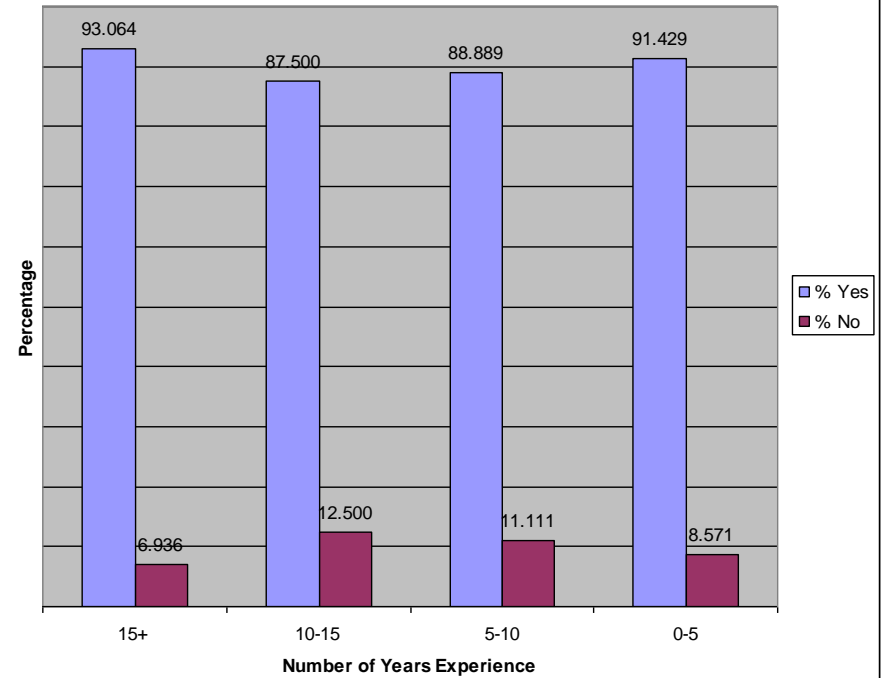


Section 3 – Wider Data Quality Issues

Q 41. Do you feel that the data quality of the paper chart or ENC that you use, is of any relevance to you?

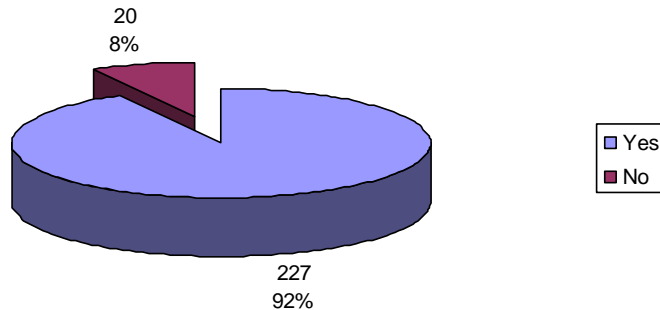


Do you feel that the data quality of the paper chart or ENC that you use, is of any relevance to you? Sector analysis by experience

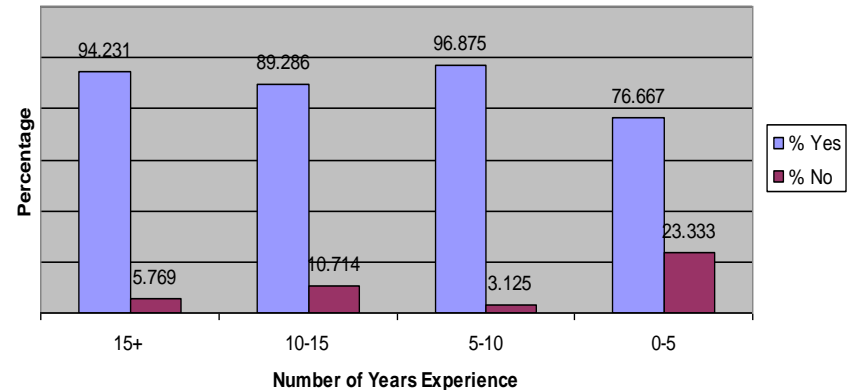


Section 3 – Wider Data Quality Issues

Q 44. Do you take into account the mobility of the seabed (For example sand waves, siltation) when navigating/passage planning?



Do you take into account the mobility of the seabed when navigating/passage planning? Sector analysis by experience



Themes and ranks for how respondents judge the mobility of the seabed

Themes	Rank
By comparing echo sounder information, date of survey and charted depth	1
Local factors and tidal strength	2
From sailing directions	2



Section 3 – Wider Data Quality Issues

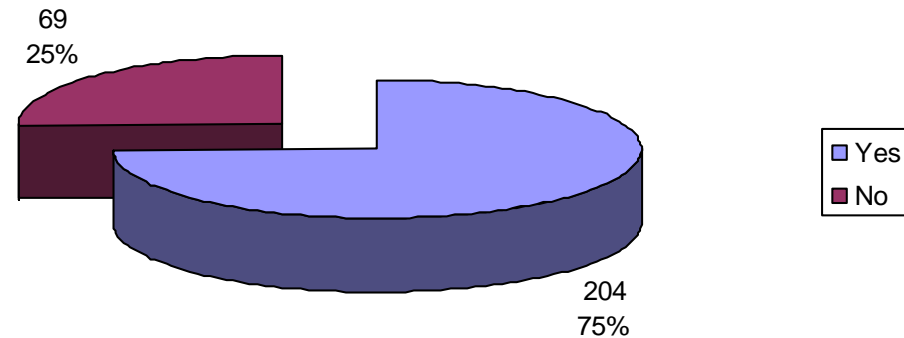
Themes for those who answered yes

Themes	Ranks
Increase UKC in areas covered by old or poor surveys	1

Themes for those who answered No

Themes	Ranks
Because the route has been traveled several times before	1

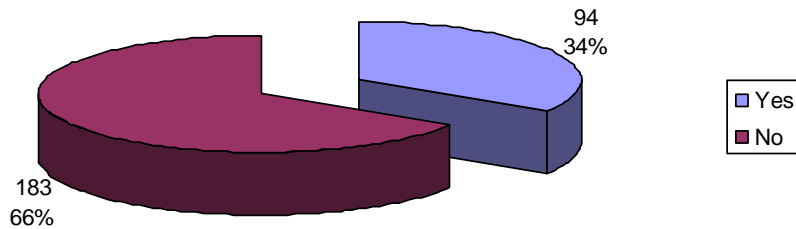
Q 46. Do you take data quality information into account when determining a safe minimum under keel clearance?



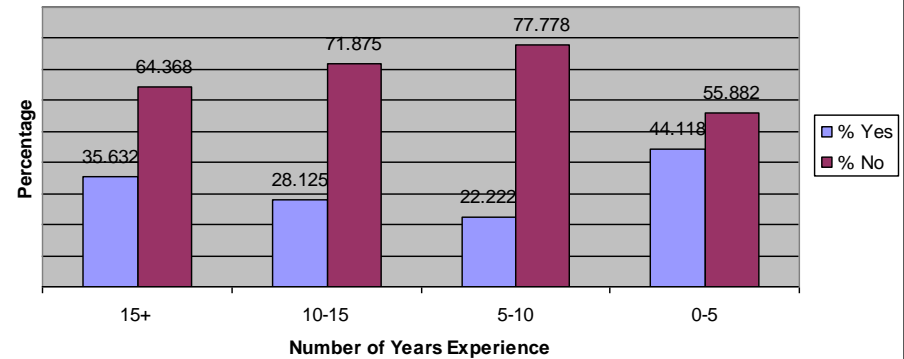
Section 3 – Wider Data Quality Issues

Training

Q 47. Do you feel that you have received sufficient training on data quality?



Do you feel you have received sufficient training on data quality?
Sector analysis by experience



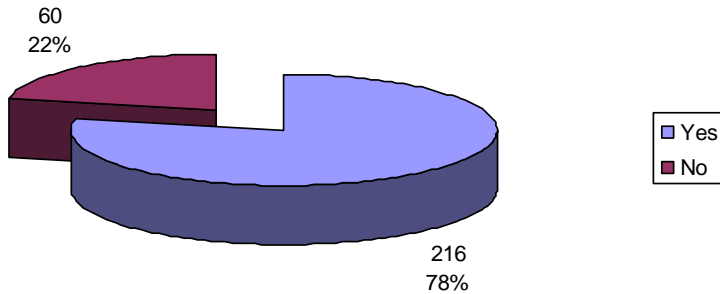
- Difference in opinion depending upon experience



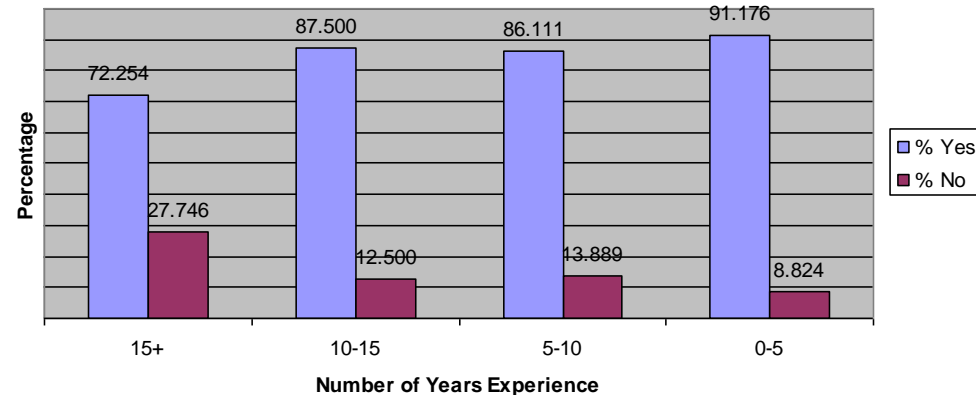
Section 3 – Wider Data Quality Issues

Training

Q 48. Would you like to receive further training/information on data quality?



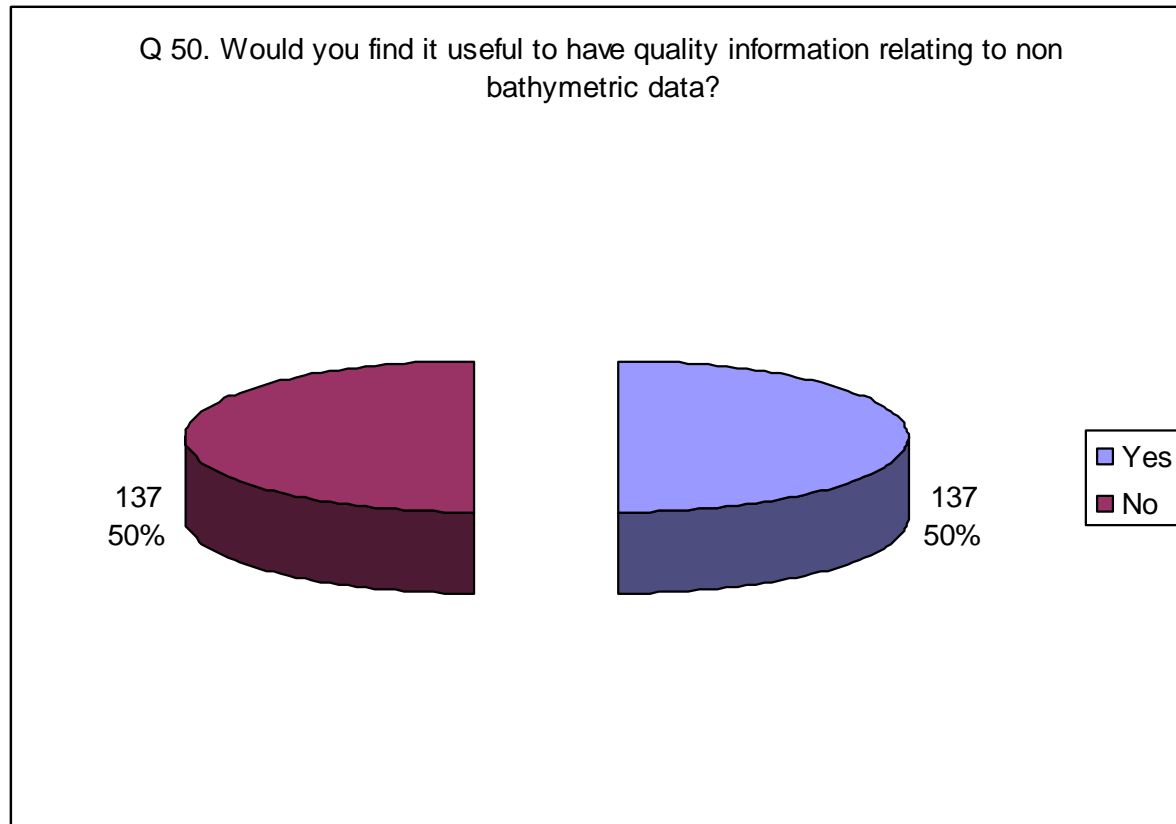
Would you like to receive further training/information on data quality? Sector analysis by experience



- Positive response to more training across the experience range



Section 3 – Wider Data Quality Issues

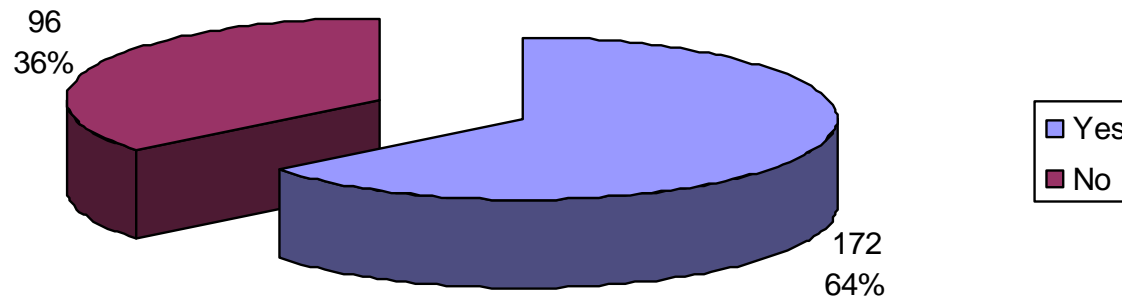


- Of those who said Yes, the most popular type of information was Port and Harbour data



Section 4 – Future Developments

Q 56. All existing data quality indicators relate to charted parameters. Would you like any new system (ECDIS) to take into account your own vessel parameters; for example, draught, length, beam, under-keel clearance?



Section 4 – Future Developments

Themes for why respondents would like future developments linked to vessel parameters

Themes	Ranks
Makes it easier to take quality information into account	1
Reduces the number of calculations needed	2
It would help to run test routes during planning	2

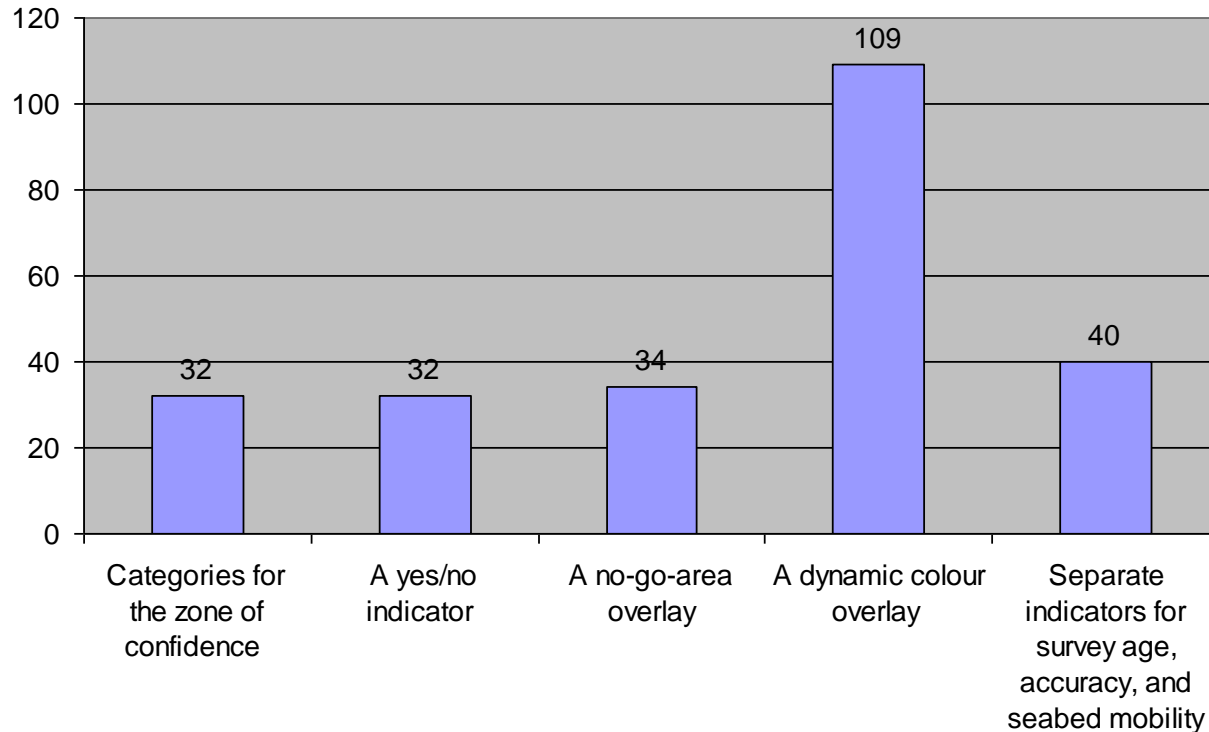
Themes for why respondents would **not** like future developments linked to vessel parameters

Themes	Ranks
Vessel parameters are constantly changing	1
Danger of over simplifying and introducing an error	1



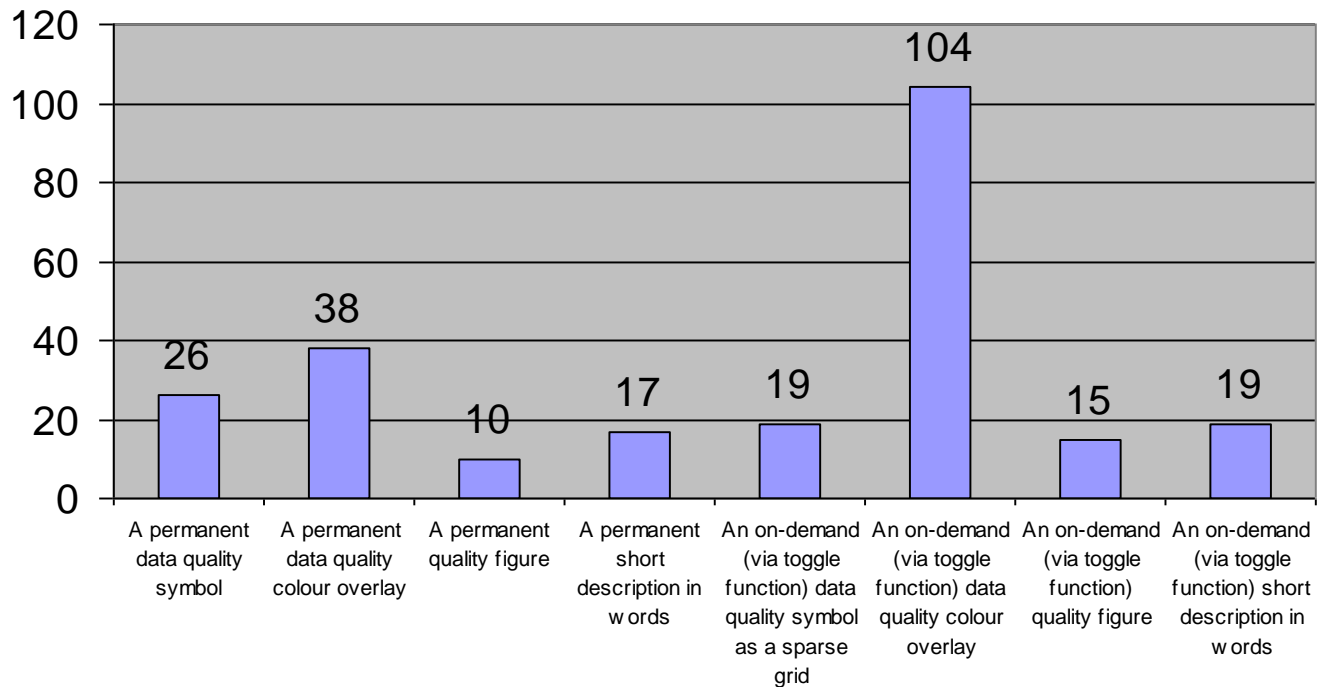
Section 4 – Future Developments

Q 58. In addition to the existing methods of representing data quality several alternatives have been suggested. Please consider the list below and indicate which concept you prefer and why.



Section 4 – Future Developments

Q 59. Please consider the following visualisation methods and indicate which concept you would like to see utilised in conjunction with your answer from the previous question.



Review of Further Research into Data Quality Representation

The representation of data quality is multi faceted

Pang et al. (1997) Visualisation pipeline:

1. **Collection uncertainty** – error in measurements and modelling in the acquisition process
2. **Derived uncertainty** – data processing and manipulation
3. **Visualisation uncertainty** – product compilation

Therefore a clear decision must be made as to what information the mariner can use



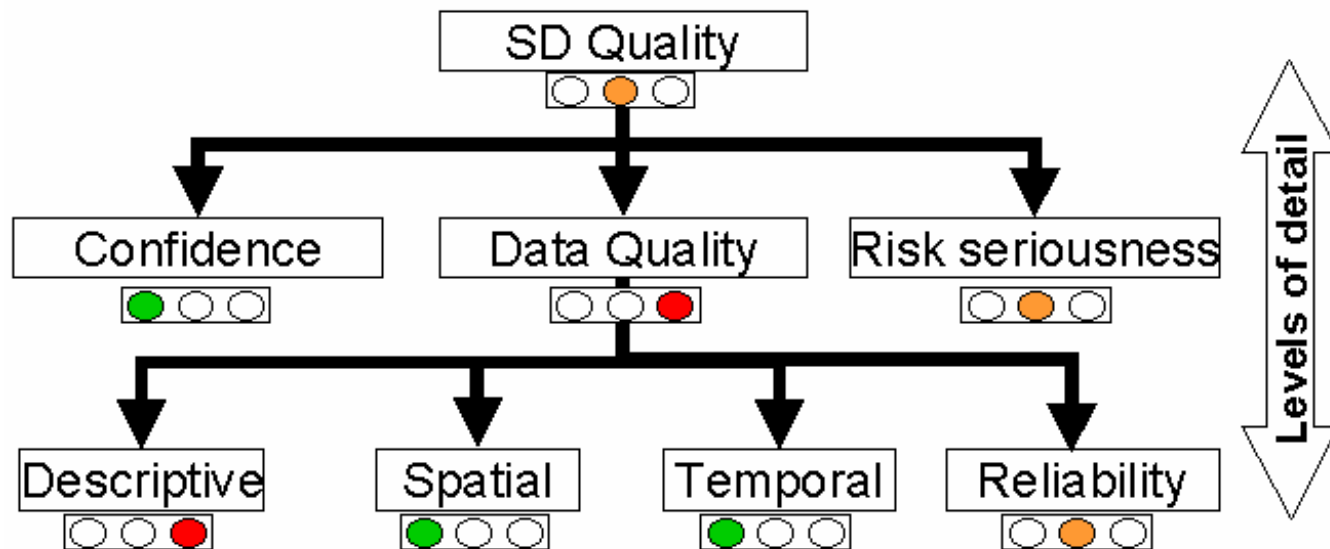
Review of Further Research into Data Quality Representation

- There has been very little research into how geospatial data uncertainty affects the decision making of map/chart users
- Reece and Mathews (1993) suggest that in uncertain situations a decision maker will undervalue negative evidence and overvalue positive evidence
- MacEachren et al. (2005) introduce the concept of expert and lay users of geospatial products. The implication is that Mariner's exhibit characteristics of both types of decision makers



Review of Further Research into Data Quality Representation

Devillers et al. (2002) – Model for representing data quality in a GIS environment



Conclusions

The conclusions drawn from the initial analysis are still valid

Q: Is the current display of quality indicators in ENC's useful?

- Large proportion of ENC users are not using the CATZOC information
- The additional S-57 DQ indicator attributes are not understood and not used
- Majority of mariner's state that they have not received enough training on data quality issues, and that they would like to receive more training



Specification for Developing Future Methods of Representing Data Quality in ENCs

1. All data quality information should be discoverable
2. A minimum of the constituent elements of CATZOC should be encoded in ENCs for depth areas
3. The data quality of near shore topography should be included in any new method of representing data quality
4. Temporal degradation of data quality attribute should be indicated
5. New representation methods should be able to accommodate dynamic inputs from new developments such as dynamic tides, UKC and vessel specific parameters



Specification for Developing Future Methods of Representing Data Quality in ENCs

6. Where possible ENC attribute names should be more descriptive
7. Visualisation should take advantage of the mariner's preference for a on demand colour overlay
8. Any new representation method should allow for the user to assign notation or reminders for specific places or features
9. Any new representation method should be accompanied by an appropriate education strategy

