Paper for Consideration by ENCWG4

ECDIS in-built safety functions performance vs Chart compilation practices

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Executive Summary:	The grounding of the container ship 'Kea Trader' in July 2017 highlighted an interesting disconnection between source data generalisation/charting practices and ECDIS' 'Look-Ahead' and 'Route check' functions. The way the safety framework set up by mariners interacts with Point symbols (e.g. UWTROCs. OBSTRNS, etc) must be understood by data producers and potential amendments to ECDIS performance discussed by stakeholders.
Related Documents:	NCWG4-10.4A
Related Projects:	S-101PT, DQWG

Introduction / Background

According to IMO's Standard Performance for ECDIS (11.4.6), '*An indication should be given to the mariner if, continuing on its present course and speed, over a specified time or distance set by the mariner, own ship will pass closer than a user-specified distance from a danger (e.g. obstruction, wreck, rock) that is shallower than the mariner's safety contour or an aid to navigation.*'

Globally accepted cartographic practices include the use of point features in lieu of area features when the scale of the product denies a clear and unambiguous depiction of an object at true scale. This process is commonly known as 'generalisation'.

Analysis/Discussion

The grounding of the container ship 'Kea Trader' in July 2017 highlighted a disconnection between universally accepted chart generalisation practices and ECDIS performance. See 'Annex A' and Malta's Marine Safety Investigation Unit accident report.

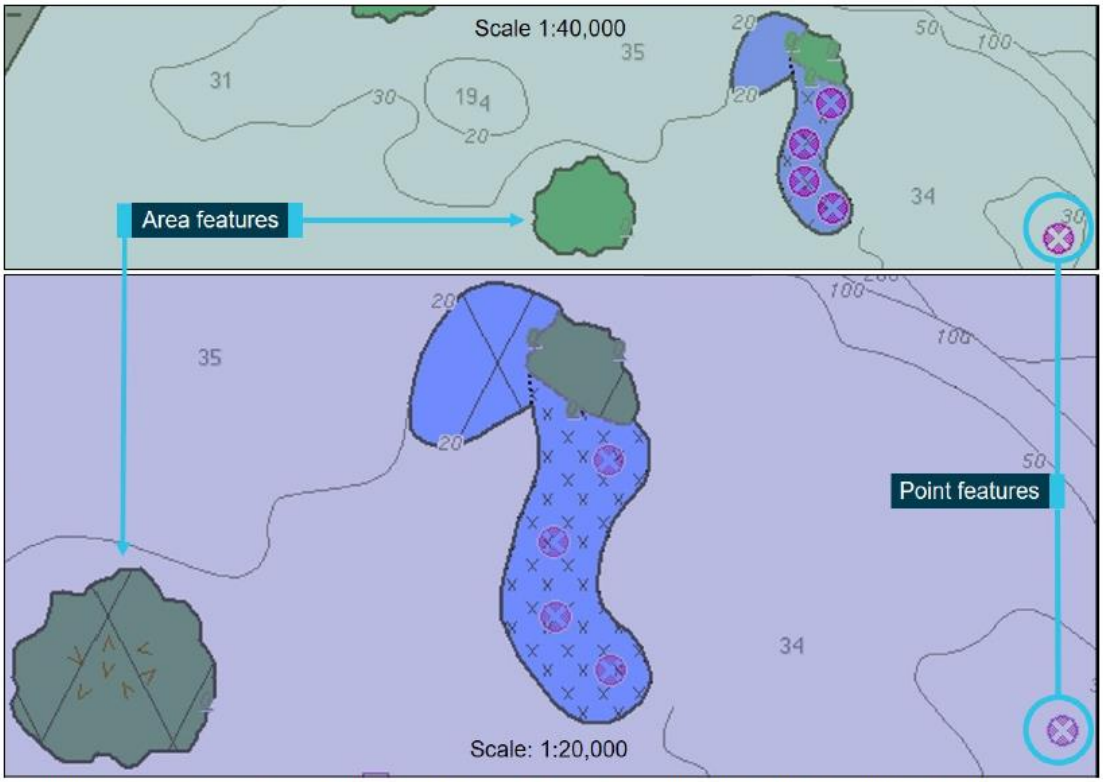
During chart compilation is common practice to 'convert' area features into point features when the corresponding point symbology 'covers' the area feature at the product's compilation scale. On the 'Kea Trader' case, Recif Durand was charted as an UWTROC point object in GB204637 because the point symbol covers the shoal area at 1:700 000.

A key difference to note between area features and point features on an ECDIS display is that, area features change size in proportion to the scale at which the ENC is being viewed whereas the symbols representing point features remain the same size (see Figure). Unlike area features, the size or shape of the point feature's symbol does not necessarily represent the size or shape of the feature it is depicting.

The ECDIS route safety checking function checks a route safety region against the chart database for dangers. With regard to point features, the ECDIS route safety region is only checked against the true position of the point feature regardless of the actual extent of the physical feature it represents. Essentially, ECDIS would only identify a feature as a danger to the planned route if its charted position in the ENC (its exact Lat/Long) falls within the route safety region.

IMO's 'Performance Standard for ECDIS' requires an Indication when *'own ship will pass closer than a user-specified distance from a danger.'*

Based on current source generalisation practices and the way ECDIS safety checking functions behave the <u>extent</u> of a 'danger' (e.g. obstruction, wreck, rock) is not equally interpreted by ECDIS and producers.



The images demonstrate a key difference between area features, which change size proportionate to the scale at which the ENC is being viewed, and point features, which remain the same size regardless of scale. The top picture is at scale of 1:40,000 and lower picture is at 1:20,000.

Conclusions

1. There's a disconnection between source data generalisation practices and ECDIS 'look ahead' and 'route check' in-built safety functions.
2. Mariners' ability to over scale ENCs continues to be a problem and it clearly impacts on safety of navigation.

Recommendations

Some of the options are:

- Discuss the pros and cons of 'locking' the ECDIS maximum display scale to the one encoded in the ENC (or M_CSCL). An alternative option would be for ECDIS to resize point symbols 'on the fly' to always cover the same geographic area independently of the display scale selected (back to RNC times?).
- Amend S-52/S-64 in order to drive enhancements to the way ECDIS in-built safety functions interact with S-57 point features such as UWTROC, WRECKS and OBSTRN.
- Introduce more robust route checking algorithms when developing the future performance standards for the next generation (S100) ECDIS.

Justification and Impacts

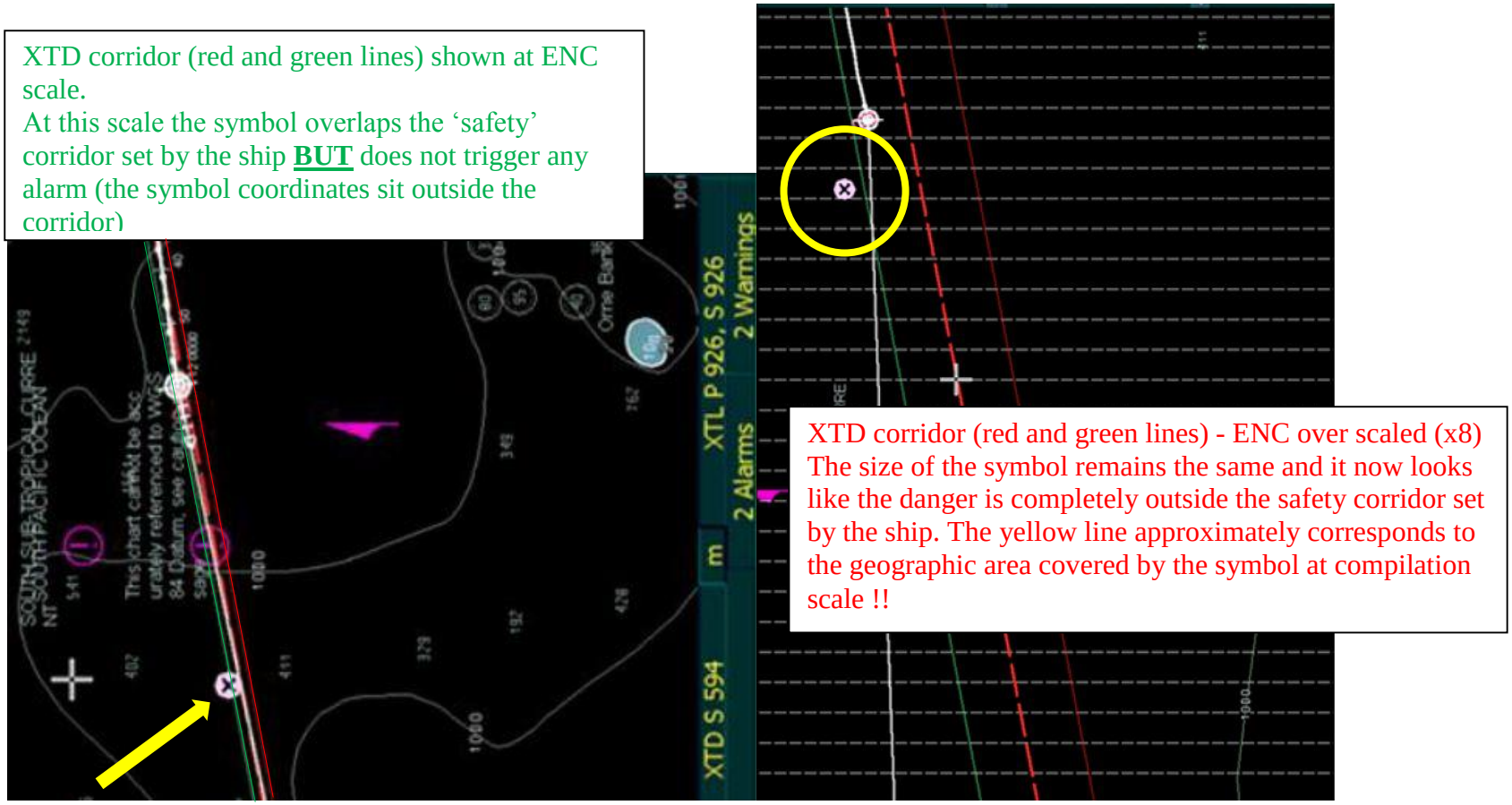
- Mariners have the power to 'over zoom' ENCs in ECDIS (not good practice but possible).
- Mariners frequently 'over zoom' and sail 'too close' to dangers (this has been reported in several maritime accidents' reports).
- By changing the way HO's compile and generalise features and the way ECDIS interacts with the areas covered by point features the IHO can make navigation safer.

Action Required of ENCWG

The ENCWG is invited to dscuss the topic and agree on the merits of proceeding with some of the recommendations.

Annex 'A'

XTD corridor (red and green lines) shown at ENC scale.
At this scale the symbol overlaps the 'safety' corridor set by the ship **BUT** does not trigger any alarm (the symbol coordinates sit outside the corridor)



XTD corridor (red and green lines) - ENC over scaled (x8)
The size of the symbol remains the same and it now looks like the danger is completely outside the safety corridor set by the ship. The yellow line approximately corresponds to the geographic area covered by the symbol at compilation scale !!

Note: FOR REASONS OF ECONOMY, DELEGATES ARE KINDLY REQUESTED TO BRING THEIR OWN COPIES OF THE DOCUMENTS TO THE MEETING