

Hydrography's Role in Marine Boundary Delimitation

As human use of the oceans continues to grow both in spatial scope of operations and diversity of activities, the use of hydrographic charts in roles other than navigation is expanding. Charts and hydrographic products are increasingly used for a vast range of activities, including the delineation and demarcation of boundaries.

On land, boundary delimitation comprises three steps: 1. definition, or specifying the "locus" of the boundary in the wording of law; 2. delineation, describing the location of the boundary on maps or by co-ordinates and; 3. demarcation, the process of physically marking the geographical location of a boundary. On land, demarcation is easily conceptualised, but in the marine environment, demarcation in situ is rarely possible; consequently demarcation is of necessity combined with delineation, and the medium most frequently used for this combination is the hydrographic chart. The delineated boundary on a chart provides the "public notice" function which fences and survey monuments do on land. Charts thus have a different role than do topographic maps, and Hydro-graphic Offices (HOs) have a different and higher responsibility than do their land-based equivalents. HOs are concerned with ensuring that charts and other hydrographic products can perform this role appropriately and to a known degree of uncertainty.

Hydrography's Boundary Role As Expressed within UNCLOS

The ratification of the United Nations Convention on Law of the Sea (UNCLOS) brought together a great deal of existing practice and treaty law into one codification agreed to by most of the nations of the world. "Baselines from which the breadth of the Territorial Sea is measured" provide one example of hydrography's role, since "normal" baselines are defined as "the low-water line along the coast as marked on large-scale charts". Table 1 offers a brief condensation of the interplay between other Articles of the Convention and hydrography.

Throughout UNCLOS, there are frequent items and issues that should be referred to "the competent international organisation". The Convention does not name these, as is normal in the wording used in treaties and in legislation, but there is a clear understanding that one of the bodies referred to is the International Hydrographic Organisation (IHO). At a different level, the Guidelines produced by the Commission on the Limits of the Continental Shelf (CLCS) require that the accuracy of depth information be determined by the standards of the IHO. Indeed, the CLCS itself is to be "made up of experts on hydrography or geology or geophysics".

Current Use of Charts in Boundary Demarcation

All items displayed on navigation charts are explained in Chart 1, which serves in the same capacity as does a key or explanation of symbols on a land map. Currently, Chart 1 includes the following UNCLOS-related boundaries: International Maritime Boundary, Straight Territorial Sea Baseline, Seaward Limit of Territorial Sea, Seaward Limit of Contiguous Zone, Limit of Continental Shelf, Limit of Exclusive Economic Zone. It also provides for the following, which are not necessarily part of UNCLOS: international boundary on land, limit of fishery zone, customs limit and harbour limit. Not all HOs use all of these, at least they do not use them as yet, but the need has been recognised and the opportunity has been created through their inclusion in Chart 1.

Future Use of Charts in Boundary Demarcation

The increasing expansion of human activities and the focus on the ratification of UNCLOS are reasons to solidify and expand on existing, long-standing uses of hydrographic products as portrayers of boundary information. There are further boundaries not yet included in Chart 1; for example, the limits of Marine Protected Areas. The growing array of marine boundaries can be classified into: Sovereign-Rights, Jurisdictional, Administrative and Rights-Based Boundaries (including Private Ownership Rights, Community Rights, Usage Rights, Customary Rights and Aboriginal Rights). Although it will be clearly some time before all of these can be shown on published charts, it is obvious that Sovereign-Rights Boundaries, which demarcate the areas over which a state exercises power and from which the authority to define the other categories of boundaries devolves, should be shown by the marine organisation of the state, i.e., its HO, on its official products.

Issues Surrounding the Inclusion of Boundaries on Charts

Amount of Information That Can Be Portrayed

Traditional paper charts can only include a fixed number of types of information, due to limitations of what paper and ink could reasonably portray in a clear and readable manner. What should and could be included was and continues to be the subject of intense debate, with the desire "to show as much as possible" being dampened by concern that "showing too much will render the chart too cluttered to be easily and safely read". One outcome has been that many HOs take a minimalist approach to portraying boundaries, showing as few as they can reasonably get away with. Boundaries do affect navigation, since different rules apply as some of them are crossed. However, HOs have been loathe to show many other boundaries.

The introduction of "Electronic Charts" brought with it the potential to alleviate this situation since the file that supports an EC can contain far more information than is displayed at any one time. It is possible to include, in a chart's file, all the boundaries that lie within its area, ready to be displayed should the user of the chart so desire.

Boundaries May Not Be Final

It is a characteristic of boundaries in general that they are rarely final, and are often in dispute or under negotiation. This does not mean that they cannot be shown but their portrayal needs to include more than their location: the conditions that apply to the location should be

specified also. Having the right metadata, including the source of the boundary information and any datums they refer to, would be an important consideration.

Boundaries May Be in Dispute, Uncertain, Or Incomplete

Boundaries contested could be marked as such and the metadata could include the data source. More significantly, there are many limits and boundaries that may be uncertain from legal, political, and/or technical perspectives. Government organisations may not want to show some boundaries in case the depiction on an official chart lends some weight or status to them. More importantly, there are boundaries that are poorly delineated for legal, historical, or technical reasons and chart producers may want to limit any liability for the information portrayed. Furthermore, there are many cases of incomplete boundaries and the HO would have to make a decision as to what parts to show, what symbology to use, and what sources to use. In essence this puts a great deal of responsibility on the HO when there is no official national file of boundaries and limits.

Datum Not Known Or Problematic

One of the biggest challenges in portraying boundaries on hydrographic charts will be establishing appropriate standards for metadata. This includes, but is not limited to, the tidal and/or geodetic datums used in boundary delineation and the methods used for establishing these datums. The fact that this item of metadata has not been traditionally well managed is today a constant source of uncertainty in the delimitation of marine boundaries and limits. HOs should take the lead in establishing appropriate metadata standards for marine boundaries.

Steps Towards Success – Production of a Data Base

While it is clear that there are many boundaries for which hydrography can and should be the prime source of information, it is also clear that work must be done to organise marine boundary information. Efforts underway to date include the Baltic Sea Hydrographic Commission and the North Sea Hydrographic Commission both of whom have begun building databases of maritime boundaries within their respective areas. Pilot data bases and boundary classification schemes are important steps in understanding the problems and limitations of existing data and in developing better standards for future hydrographic work and chart production.

Summary

There are many boundaries in the water and, unlike the situation for most land boundaries, the only common visualisation tool we have for these boundaries are hydrographic charts. Hydrographic charts presently show some boundaries and should show more; even those that are not shown on charts are part of the fundamental hydrographic data set. Ensuring that boundaries are so treated requires classifying them, defining appropriate metadata standards, resolving discrepancies, and building a database which contains boundaries as spatial objects.

HOs could stand back and let other organisations worry about marine boundaries and limits. However, this would be an opportunity missed for taking a lead role, as the producers of the primary common marine datasets, in ensuring that chart users know not only where they are and how deep the water is, but also who has rights of ownership, jurisdiction, and administration in the area of concern.