International Hydrographic Review, Monaco, LXII (1), January 1985

NAUTICAL CHARTS WITH DENSE GEOGRAPHICAL GRATICULE

by the "Deutsches Hydrographisches Institut"(*)

In contrast to the official topographic charts, nautical charts not only have to be kept constantly up to date, but also have to be adapted to meet the demands of rapidly changing technology in ships and navigational systems. The first requirement, that nautical charts always have to display the currently existing conditions, both complicates and greatly adds to the work of the cartographer. For instance, the required manual correction of the charts in stock as well as the necessity to limit press runs to a relatively small number of copies of an edition at a time, both cause considerable extra work as well as lower profitability in producing charts.

Although the second requirement, the adaptation to new technical developments, always involves additional work, it is — on the other hand — a challenge to the cartographer to solve the new problems. This, indeed, makes cartographic work interesting and prevents it from becoming pure routine.

Among the technical innovations that have had to be taken into consideration are the radio navigation systems. Some 30 years ago, nautical charts first began to facilitate use of these systems by the mariner through an extremely difficult and tedious cartographic effort : points at reasonably close intervals on individual lanes (usually hyperbolas) had to be calculated using circular-function-tables and manually operated mechanical cylinder-type calculating machines and inserted into special lists. Then, by means of manually adjusted coordinatographs, the coordinates of the calculated points had to be spotted, inserted and lettered. Finally, with special rulers, these points had to be connected into lanes and drawn.

Over a period, progress in electronic data processing considerably simplified the design of radio navigation lines of position. Because digital computers and numerically controlled draughting machines are able to operate continuously, i.e. during nights and weekends as well as normal office hours, the time spent by personnel could be reduced to a minimum. Special requirements regarding the radio navigation pattern of LOPs put forward to the Hydrographic Services by users of nautical charts were finally easily fulfilled.

In the meantime, however, technical development has progressed still further, this time not on the cartographic side but on the side of the manufacturers of radio

(*) Bernhard-Nocht-Strasse 78, Postfach 220, 2000 Hamburg 4, Fed. Rep. of Germany.

navigation equipment. The progress in micro-electronics enables the continuous development of smaller and more powerful computers, with the result that, nowadays, radio navigation receivers are able to convert the values of the received and processed lanes into geographical coordinates and thus enable the navigator to plot the position fix on the chart by longitude and latitude. But in doing this on the nautical chart with an overprinted navigation system lattice, he is hindered on the one hand by the many hyperbolic lines of position which reduce the clarity of the chart's display and impede its reading, and on the other hand by the wide spacing of the graticule (latitude and longitude grid lines) which are numbered only at the chart edges. Because the plotting of a position based on the graticule is so difficult on a heavily latticed chart, the navigator is forced to seek the figures corresponding to the lane readings at the edge of the chart, to find the distance from the nearest plotted lane, in order to construct the suitable LOPs parallel to the lanes and find their intersection.

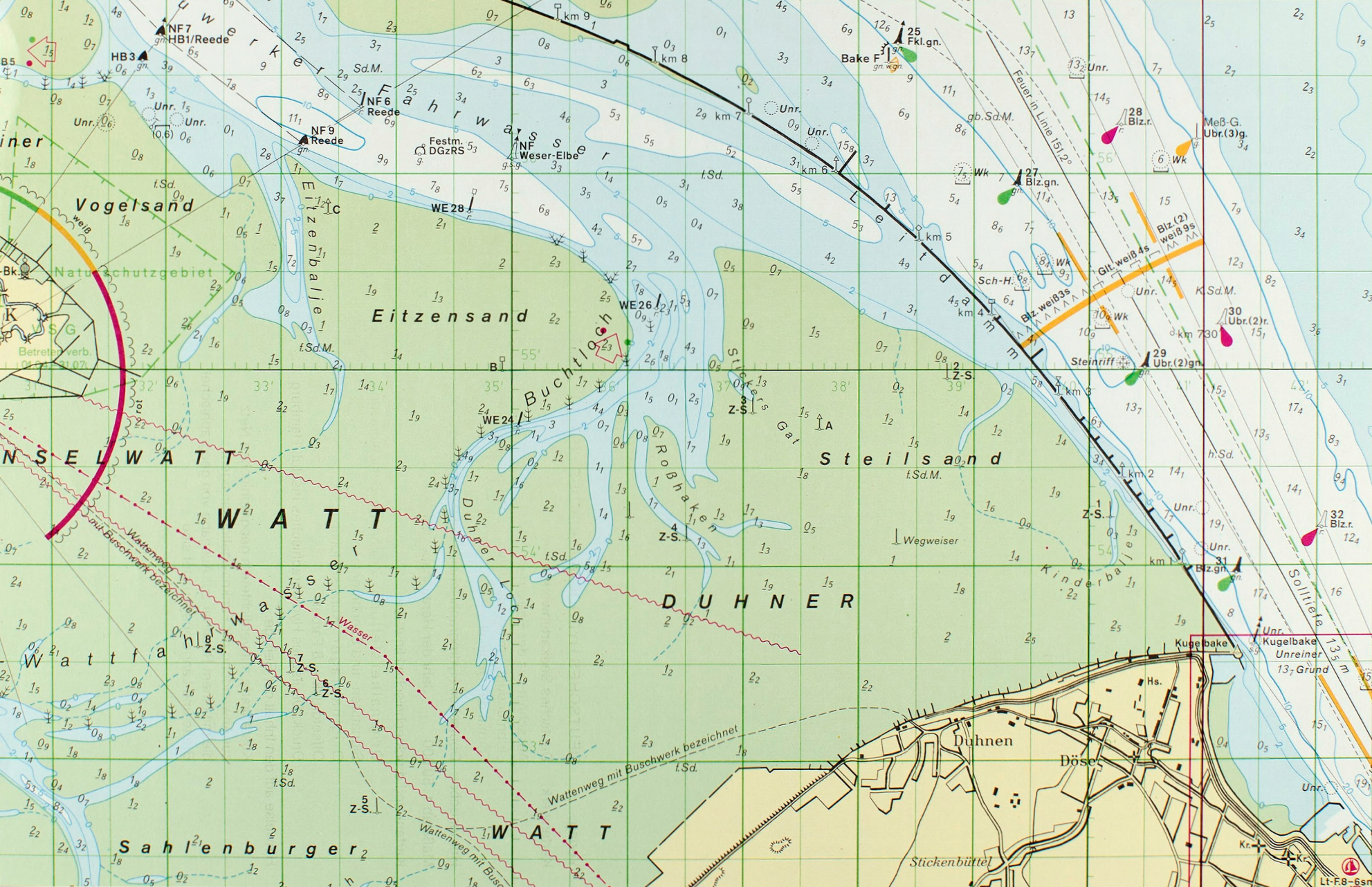
This construction of parallel LOPs has been the agreed procedure in the use of latticed charts for many years, and though it may sound tedious, the effort needed has been small compared with all the work which had to be done with astronomical observations, computation and evaluation. Further, the astronomical navigation would normally give a fix only at intervals of some hours, while radio navigation systems would generally allow the mariner to read the positions nearly continuously. However, it is clear that the cartographic advances in the display of lattices, so welcomed by the mariner in the past, have been made obsolete by new technology and are viewed as an unwelcome detriment to the effective use of the chart today.

There is a related problem, for it is often desirable, since modern technology allows it, to plot the position of a vessel on the nautical chart in use at frequent intervals. For this purpose, even on standard nautical charts without navigational system lattices overprinted, the usual pattern of wide-spaced graticule lines is of disadvantage as was noted above. Users of German nautical charts, therefore, requested an additional edition of nautical charts showing the pattern of a "Dense Geographical Graticule" instead of the usual overprinted pattern of hyperbolic radio navigation grid lines.

The DHI has followed this suggestion and — as a test — issued some charts of the North Sea, which had been printed previously with Decca Lanes and a standard graticule presentation, in a second version with a "Dense Geographical Graticule" and no Decca lattice. Both versions were updated by the NfS (German Notices to Mariners). For two of these charts which were published without Decca Lanes, the new "Dense Geographical Graticule" is the only version being offered now.

These newly published charts with "Dense Geographical Graticule" were accepted by the mariner with great enthusiasm — including both users and non-users of radio navigation systems. The DHI, therefore, intends to replace all nautical charts now showing the wide-spaced geographical grid pattern by charts of the new type with "Dense Geographical Graticule". This also includes the INT charts being produced or printed by the DHI.

In the recently published chart with "Dense Geographical Graticule" the spaces between grids vary according to scale ratio as follows :


Vogelsand
Eitzensand
Steilsand
DUHNER WATT
Sahlenburger WATT
Neuwerker Fahrwasser
Leitdamm
Eitzenbalje
Buchtlogh
Roßhafen
Duhner Loch
Steers Gat
Kinderbalje
Solltiefe
Wattfahrwasser
Wattenweg mit Buschwerk bezeichnet
Duhnen
Döse
Stickenbüttel
Unreiner Grund
Wegweiser
Steinriff
Sch-H.
Festm. DGzRS
Naturschutzgebiet
Betretenverb.
NF7 HB1/Reede
HB3
NF6 Reede
NF9 Reede
NF Weser-Elbe
Bake F
25 Fkl.gn.
28 Blz.r.
27 Blz.gn.
29 Ubr.(2)gn.
30 Ubr.(2)r.
31 Blz.gn.
32 Blz.r.
Meß-G. Ubr.(3)g.
Blz (2) weiß 9s
Blz. weiß 3s
Glt. weiß 4s
Feuer in Linie 151,2°
Kugelbake
WE 28
WE 26
WE 24
km 9
km 8
km 7
km 6
km 5
km 4
km 3
km 2
km 1
km 730
Z-S.
Unr.
Wk
Hs.
Kr.
Lt-F.8-6s

Verlag: DEUTSCHES HYDROGRAPHISCHES INSTITUT, Hamburg

Kartenwerk: Deutsches Seekartenwerk

Ausschnitt aus der Seekarte Nr. 44
„Elbmündung" mit verdichtetem geographischen Netz
Format der Originalkarte 74 × 110 cm

Herausgeber: Deutsches Hydrographisches Institut, Hamburg

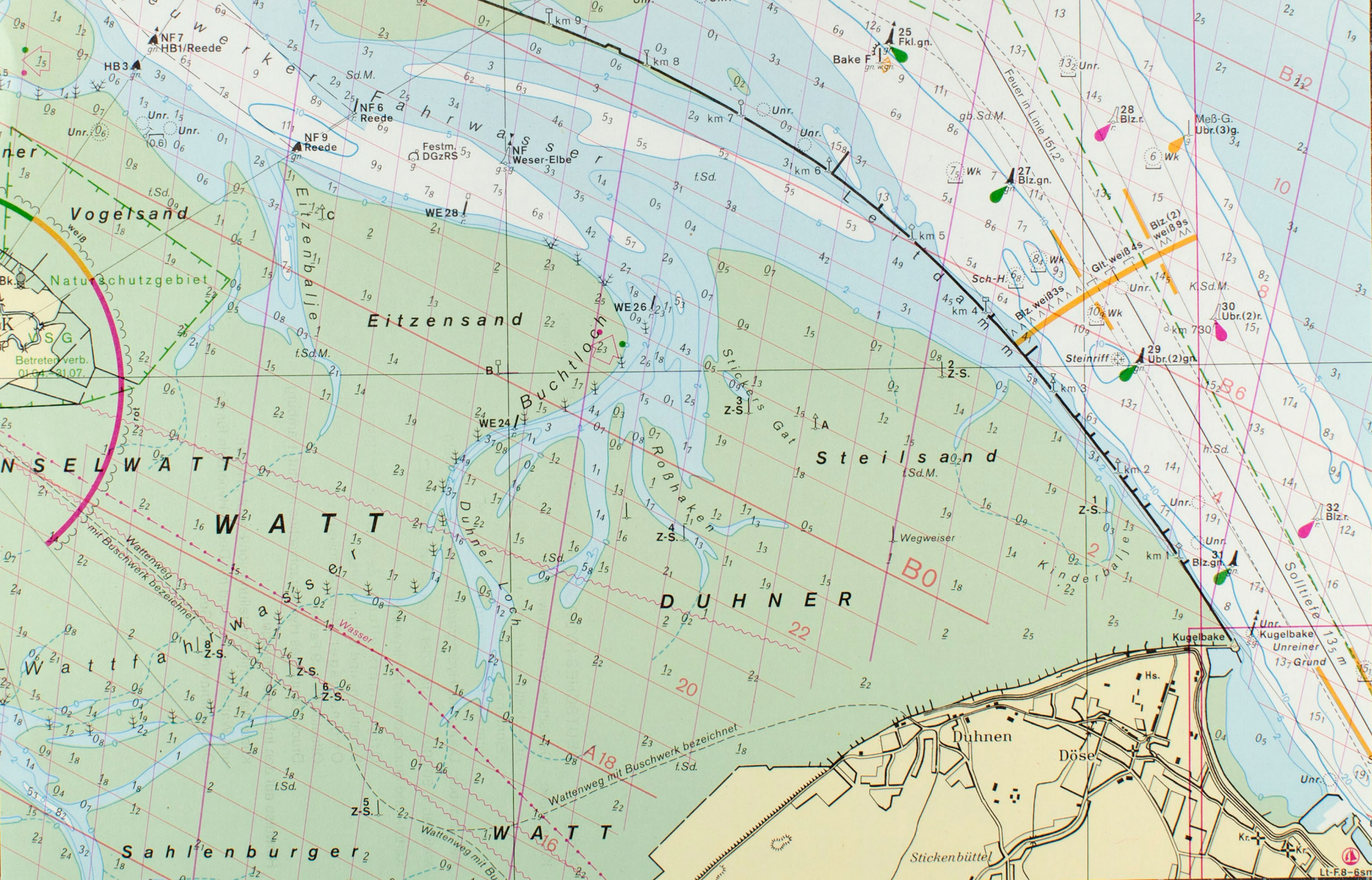
Maßstab 1:50 000 Jahr der Herausgabe: 1983

Karten- und drucktechnische Hinweise:

Originalherstellung: Zeichnung, Schichtgravur,
Signaturen- und Schriftmontage
Originalträger: Kunststoffolien
Offsetdruck – 8 Farben
Druck: Deutsches Hydrographisches Institut, Hamburg

Hinweise auf den Inhalt der Beilage:

Küstenkarte mit verdichtetem geographischen Netz
zur Anwendung mit Funknavigationsanlagen,
die mit einem Rechner zur Ausgabe von geographischer
Breite und Länge ausgerüstet sind


NF 7
HB1/Reede
HB 3
NF 6
Reede
NF 9
Reede
Sd.M.
Unr.
Festm.
DGzRS
NF
Weser-Elbe
Fahrwasser
km 9
km 8
km 7
km 6
km 5
km 4
km 3
km 2
km 1
Leitdamm
Bake F
25
Fkl.gn.
Feuer in Linie 151,2°
gb.Sd.M.
28
Blz.r.
Meß-G.
Ubr.(3)g.
Wk
27
Blz.gn.
Blz (2)
weiß 9s
Glt weiß 4s
Blz weiß 3s
Sch-H
K.Sd.M.
30
Ubr.(2)r.
km 730
Steinriff
29
Ubr.(2)gn.
2
Z-S.
3
Z-S.
4
Z-S.
1
Z-S.
31
Blz.gn.
32
Blz.r.
Kugelbake
Unreiner
Grund
Solltiefe
135 m
Eitzenballe
Eitzensand
Buchtloch
Stickers Gat
Steilsand
Roßhafen
Kinderballe
Duhner Loch
Wegweiser
WE 28
WE 26
WE 24
B
A
C
Vogelsand
weiß
Naturschutzgebiet
Betreten verb.
01.04.–31.07.
NSELWATT
WATT
DUHNER
Wattenweg mit Buschwerk bezeichnet
Wasser
Watt
Sahlenburger
Duhnen
Döse
Stickenbüttel
Hs.
Kr.
B12
B6
B0
A18
A16
22
20
10
8
6
4
2

Verlag: DEUTSCHES HYDROGRAPHISCHES INSTITUT, Hamburg

Kartenwerk: Deutsches Seekartenwerk

Ausschnitt aus der Seekarte Nr. 44 D
„Elbmündung" mit Decca-Kette 9B
Format der Originalkarte 74 × 110 cm

Herausgeber: Deutsches Hydrographisches Institut, Hamburg

Maßstab 1:50000 Jahr der Herausgabe: 1968, 1983

Karten- und drucktechnische Hinweise:

Originalherstellung: Zeichnung, Schichtgravur, Signaturen- und Schriftmontage
Originalträger: Kunststoffolien
Offsetdruck – 9 Farben
Druck: Deutsches Hydrographisches Institut, Hamburg

Hinweise auf den Inhalt der Beilage:

Küstenkarte mit Darstellung von Haupt-, Neben- und Wattfahrwassern und mit Decca-Hyperbeln für die Ortsbestimmung auf See

Chart scales	Space between grids
1:30 000 to 1:50 000	30″
1:50 000 to 1:100 000	1′
1:100 000 to 1:200 000	2′

Thus, in charts of the German North Sea and Baltic Sea the following dimensions of rectangles formed by the grid lines appears :

Chart scale	Size of rectangles
1:30 000	18.0 mm × 31.0 mm } (every second grid
1:50 000	11.0 mm × 18.0 mm } line intensified)
1:100 000	11.0 mm × 18.0 mm
1:150 000	14.5 mm × 24.5 mm

The thickness of the finer grid lines is 0.1 mm, and of the intensified lines is 0.25 mm. The colour chosen is green for the following reasons :
— the colour character for green lights differs considerably from green grids;
— all other chart entries of green colour are of minor importance for navigation;
— this colour would not overload the chart representation.

The two enclosed samples show a section of the German nautical chart No. 44, one with overprinted Decca pattern (2 hyperbola groups) and the other with the new "Dense Geographical Graticule".

As already mentioned in the *International Hydrographic Bulletin* of September 1983, on page 353, the DHI is of the opinion, too, "that latticed charts will still be needed for many years to come". The DHI, however, also believes that the course it has adopted is generally the right one and meets the demands of the users of nautical charts. Whether the colour chosen, the thickness of grid lines, the subdividing, etc., represent the best possible solution, remains yet to be seen, and the DHI welcomes suggestions which may lead to improvements.