CHAPTER 3

Observed Ice Charts

- ❑ Preparation of Ice Charts
- ❑ Dissemination of Aerial Ice Charts
- ❑ Dissemination of Shipboard Ice Charts
- ❑ The Egg Code
- ❑ Symbols Used on Ice Charts
- ❑ Supplementary Procedures for Indicating Total Concentration
- ❑ Colour Coding Ice Charts
- ❑ Examples of the Use of the Egg Code
- ❑ Examples of Ice Charts

This chapter deals with basic procedures for preparing and transmitting ice charts. Ice charts are of importance to icebreaker captains, commercial shipping interests and fishing vessels to assist them in finding the easiest passage through the ice or to avoid the ice when feasible to do so. The data on the chart is of vital importance to ice forecasters, serving as the basis for:

- ice hazard warnings
- preparation of daily ice analysis chart
- short- and long-range ice forecasts, and seasonal outlooks
- preparation of regional ice charts

3.1 Preparation of Ice Charts

Time and care are necessary to prepare ice charts. Details and precision are of the outmost importance.

3.1.1 Drawing Procedures

Ice charts are drawn directly on a computer screen using GIS (Geographic Information Systems) software. This software has been developed specifically for the Coast Guard to allow precise observation and quick transmission of data.

It is beyond the scope of this manual to describe this particular software in detail. It is sufficient to know the precision of observation is greatly increased by the use and integration of the Global Positioning System (GPS). The usefulness of the data is enhanced by the automatic verification of all coding and final preparation of charts.

Data will generally be transmitted in the form of electronic files and distributed by CIS to clients. Maps of observed data will also be produced by CIS and made publicly available.

For examples of actual ice charts see Figure 3.2 (p. 3-24), Figure 3.3 (p. 3-25), Figure 3.4 (p. 3-26) and Figure 3.5 (p. 3-27).

3.2 Dissemination of Aerial Ice Charts

Data (in the form of electronic files or charts) is of special importance to the ice forecasters and analysts and ships operating in or near the areas observed during the reconnaissance mission. Files are updated continuously while airborne and sent frequently. Partial files, rough copies and final copies of charts may be sent in-flight to the Canadian Ice Service, the appropriate Coast Guard ice offices and Coast Guard ships as necessary.

After the termination of the reconnaissance mission, the ISS will transmit the completed and corrected data to the Canadian Ice Service for distribution.

3.3 Dissemination of Shipboard Ice Charts

An ISS serving on icebreakers equipped with appropriate communication equipment should relay their ice information (even if incomplete) before 1800 UTC to CIS. Upon completion of the duty day, a second transmission is recommended. The data should be sent in the form of an electronic file via cellular phone, landline or satellite link depending on what is practical and available.

If it is not possible to transmit an electronic file, then a map could be printed and send by facsimile.

3.4 The Egg Code

The basic data concerning concentrations, stages of development (age) and form (floe size) of ice are contained in a simple oval form. A maximum of three ice types is described within the oval. This oval and the coding associated with it, are referred to as the "Egg Code". To indicate ice observations interpreted from radar imagery, the oval shall be omitted.

In the following figures and tables where ranges are shown for thickness, floe sizes or other dimensions, a report coinciding with the end point of a range shall be coded as the higher value.

Don Isaacs (CIS)

Photo 3.1: Escorting oil tanker through very close pack, heavily rafted grey ice.

The following is a summary diagram of the Egg Code. This code conforms to international convention and shall be used in coding all visual sea ice and lake ice observations without exception.

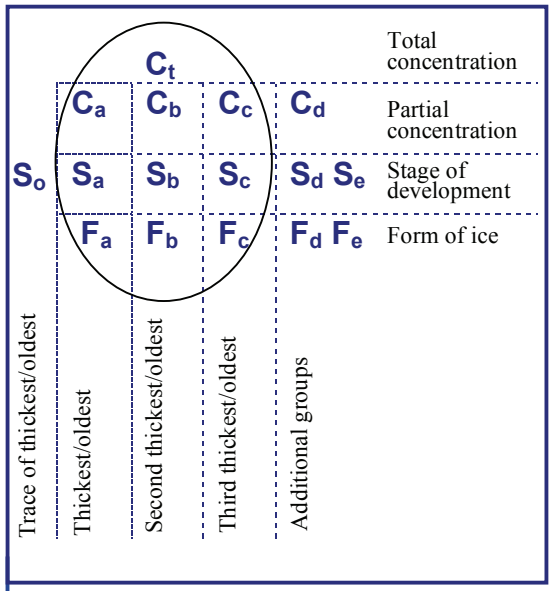


Figure 3.1: The Egg Code

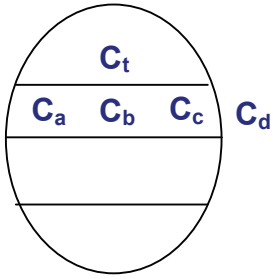
The symbols C_a C_b C_c and F_a F_b F_c correspond to S_a S_b S_c respectively.

There are some minor additions to the Egg Code symbology that are Canadian practice. In Canada, to enable the reporting of additional ice classes, especially during freeze-up and break-up, C_d S_e and F_e can be used. This should not be a common occurrence.

The following pages describe the specific details and rules for completing each level of information within the egg.

3.4.1 Concentration (C)

Total concentration (C_t) of ice in the area reported in tenths and partial concentrations of thickest (C_a), second thickest (C_b), third thickest (C_c) and fourth thickest (C_d) ice in tenths.



Notes:

1. Less than 1/10 (i.e. traces) shall not be reported within the oval except to describe open water (see Example 1, p. 3-21).

2. C_d shall only be included when S_d and S_e are reported (see Example 2, p. 3-21).

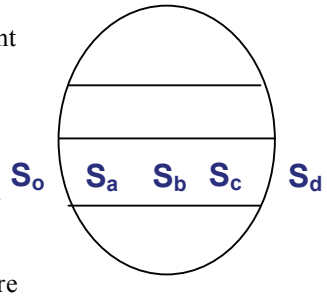
3. When S_d is used and C_d is omitted, C_d equals $C_t - (C_a+C_b+C_c)$ (see Example 3, p. 3-21).

4. When only one ice type is present, the partial concentration shall not be indicated (see Example 4, p. 3-21).

5. When one ice type is present with a trace of a thinner type, only total concentration of the major ice type shall be indicated (see Example 5, p. 3-21).

3.4.2 Stage of Development (S)

Stage of development of thickest (S_o), second thickest (S_a), third thickest (S_b) and fourth thickest (S_c) ice and the thinner ice types S_d and S_e, of which the concentrations are reported by C_a C_b C_c C_d respectively.



Notes:

1. Reference to thicker ice should be understood to mean older ice and conversely, thinner ice to mean younger ice types.

2. Ice is designated as Sea or Lake depending on where it forms. In Canada, the practice is to use lake-ice coding to report ice in the Great Lakes and the St. Lawrence Seaway. Elsewhere, including the St. Lawrence River east of Montreal, sea-ice coding is used for stages of development.

3. S_a, S_b and S_c shall have concentrations of at least 1/10, except when C_t is zero (see Example 1, p. 3-21).

4. Reporting of S_a, S_b and S_c should generally be restricted to a maximum of three significant classes. In exceptional cases further classes may be reported as follows:

S_o - Stage of ice development thicker than S_a, but having a concentration less than 1/10 (see Example 6, p. 3-21).
S_d - Stage of development of the thickest remaining ice types (if more than one type remains). It is the fourth stage present after S_a, S_b and S_c.
S_e - Shall only be reported when a thinner ice type remains after S_d. Partial concentration of S_e is obtained by subtracting partial concentrations ($C_aC_bC_cC_d$) from total concentration (C_t) (see Example 2, p. 3-21).

5. When S_e is not present, S_d may be a trace of ice (see example 6, p. 3-21)

6. Concentration shall not be indicated for S_o and S_e (see Example 2, p. 3-21, and Example 6, p. 3-21).

7. Concentration shall not be indicated for S_d when S_e is not present (see Example 3, p. 3-21, and Example 5, p. 3-21).

DESCRIPTION	THICKNESS	CODE
New ice	<10 cm	1
Nilas, Ice rind	<10 cm	2
Young Ice	10-30 cm	3
Grey Ice	10-15 cm	4
Grey-white ice	15-30 cm	5
First-year ice	≥30 cm	6
Thin first-year ice	30-70 cm	7
First stage thin first-year	30-50 cm	8
Second stage thin first-year	50-70 cm	9
Medium first-year ice	70-120 cm	1•
Thick first-year ice	>120 cm	4•
Brash		-
Old ice		7•
Second-year ice		8•
Multi-year ice		9•
Ice of land origin		▲•
Undetermined or unknown		X

Table 3.1: Coding for Sea-Ice Stages of Development (S_o S_a S_b S_c S_d S_e)

DESCRIPTION	THICKNESS	CODE
New lake ice	<5 cm	1
Thin lake ice	5-15 cm	4
Medium lake ice	15-30 cm	5
Thick lake ice	30-70 cm	7
Very thick lake ice	>70 cm	1•

Table 3.2: Coding for Lake-Ice Stages of Development (S_o S_a S_b S_c S_d S_e)

Notes for Tables 3.1 and 3.2:

1. On the horizontal line giving **$S_oS_aS_bS_cS_dS_e$**, only one dot (•) shall be placed to indicate the distinction between classes of ice. Every coded figure to the left of the (•) is understood to have the (•) as part of its code (see Examples 2, 3 and 6, pp. 3-21).

2. Codes 3 and 6 shall only appear on Canadian charts if the ISS cannot confidently determine the stages of the ice in the area observed. This will happen mostly when using radar or when visibility is poor due to sun reflection, darkness, fog, snow, etc.

3. Codes 8 and 9 shall only appear when measurements have been taken.

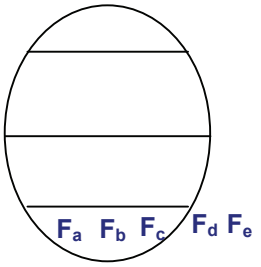
4. Codes 8• and 9• shall normally appear on Canadian charts only from 01 October to 31 December, but if the ISS is confident of the report, it may be used throughout the year, otherwise 7• is used.

5. The symbol ▲• shall only be used within the egg and when the concentration of ice of land origin is 1/10 or more.

6. The symbol **X** (meaning "undetermined") shall be used to designate stages of development or forms of ice only if it is impossible to specify otherwise.

3.4.3 Form of Ice (F)

Floe Size corresponding to S_a S_b S_c S_d and S_e (when S_d and S_e are greater than a trace).



Notes:

1. WMO International procedures also permit reporting of F_p and F_s as the primary and secondary forms of all the ice without reference to stage of development.

2. It is Canadian practice to report $F_aF_bF_c$ as predominant floe sizes of S_a S_b S_c respectively. This makes it necessary, when only S_a and S_b are present, that F_a and F_b shall be followed by a dash (-) where F_c would normally appear (see Example 7, p. 3-21).

DESCRIPTION	WIDTH	CODE
Pancake ice		0
Small ice cake, brash ice, agglomerated brash	<2 m	1
Ice cake	2-20 m	2
Small floe	20-100 m	3
Medium floe	100-500 m	4
Big floe	500-2000 m	5
Vast floe	2 -10 km	6
Giant floe	> 10 km	7
Fast ice		8
Icebergs, *growlers or floebergs*		9
Undetermined, unknown or no form		**X**

Table 3.3: Coding for Form of Ice (F_a F_b F_c F_d F_e)

Notes for Table 3.3:

1. Width refers to the maximum horizontal extent.

2. At least one code 8 must be used for fast and consolidated ice. Other ice types embedded may retain their floe size (see Example 9, p. 3-22).

3. Occasionally the stage of development of fast ice cannot be determined. The area shall be blackened-in to denote fast ice (see Table 3.9, p. 3-18).

4. New sea ice does not have a definite form; therefore, when this stage of development occurs as S_a, S_b or S_c, the symbol **X** shall be used to designate floe size (see Example 4, p. 3-21).

5. Floe size is not included for S_o, S_d and S_e if the concentration of these ice types is less than 1/10. Otherwise floe sizes for S_d and S_e are optional.

6. If there is a significant variation in floe sizes in an area containing only one particular ice type, the ISS may enter the applicable floe-size categories in the lowest part of the oval reserved for floe size. The largest floe-size category shall be put on the left side within the oval, followed by the other applicable floe sizes. In this case, the partial concentrations listed (C_a C_b C_c C_d) would match the partial concentration of floe sizes, instead of different ice types.

3.4.4 Coding and Symbology for Strips and Patches ∾ C

The ∾ symbol, placed at the bottom of the oval in the section reserved for Form of Ice, indicates that the ice is in strips and patches; the concentration within the strips and patches is represented by **C**. (see Example 11, p. 3-22).

When strips and patches are observed in open-water areas, the symbol shall be placed to denote the position of the strips and patches. If the ice in the strips and patches is of the same composition as that inside an adjacent ice edge, no oval is required. If the ice in the strips and patches is of a different composition, an oval shall be used with an arrow or arrow(s) to the strips-and-patches symbol(s). To avoid confusion, the strip symbol must be included with the total concentration (see Example 10, p. 3-22).

In an area where the ice is arranged in strips and patches and the ice floes are medium or greater, the floe size shall be indicated by using two ovals. The floe sizes are indicated as normal in the first oval, with the ∾ symbol placed between the first and second ovals. The ∾ symbol is repeated in the second oval beside the total concentration of the strips and patches (see Example 12a, p. 3-22).

An alternate way of reporting the same situation as above:

In an area where the ice is arranged in strips and patches and the ice floes are medium or greater, the floe sizes shall be indicated as normal. Both the total concentration and the concentration within the strips will be placed in the space reserved for C_t, with the ∾ symbol between them. When this option is used, C_a C_b C_c and possibly C_d refer to the total concentration and not the concentration within the strips. For example, C_t can be reported as **2** ∾ **9** meaning the total concentration is 2 tenths with strips of 9 tenths and the partial concentration(s) shall equal 2 tenths (see Example 12b, p. 3-22).

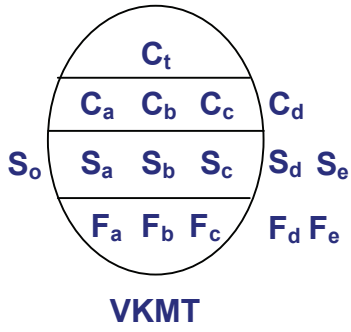
In an area of ice where some thicker ice type(s) is (are) embedded as strips and patches, these shall be indicated by the use of two ovals. The overall partial concentrations of the ice types are indicated in the first oval and the concentrations within the strips and patches are indicated in the second oval. The ∾ symbol shall be placed between the two ovals and along with the total concentration in the second oval (see Example 13, p. 3-22).

3.4.5 Coding for Brash

If 1 tenth or more of brash is present, it will always be C_a.

If brash is present, S_a will always be a dash (-), otherwise the normal table is to be used.

Brash is already indicated in the table as 1, therefore F_a = 1 confirms the dash (-) for S_a.



Four digits (**VKMT**) shall be added below the oval to indicate the thickness concentration breakdown of the brash that is present. Table 3.4 (next page) shows the thickness categories for agglomerated brash. The breakdown shall be entered going from right (**T**) to left (**V**). In the case where there is no thickness for thin but there are entries for medium, thick and very thick a zero (**0**) shall be placed in the thin column. This also holds true for medium (**M**) and thick (**K**) regardless of the combination (see Example 14, p. 3-23 to Example 17, p. 3-23).

DESCRIPTION	THICKNESS
Very Thick (**V**)	>4m
Thick (**K**)	>2-4m
Medium (**M**)	1-2m
Thin (**T**)	<1m

Table 3.4: Thickness Categories for Brash (VKMT)

Notes:
1. $C_a = V + K + M + T$
2. This is a Canadian coding procedure.
3. By convention a trace of brash is not coded.

Don Isaacs (CIS)

Photo 3.2: An icebreaker escorting a freighter above the Québec City bridges clearly show thick river brash ice.

3.5 Symbols Used on Ice Charts

3.5.1 Symbols for Dynamic Processes

Compacting

Optional
1 Slight compacting
2 Considerable compacting
3 Strong compacting

Diverging

Shearing

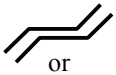
Drift

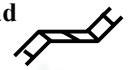
Optional
15 (indicate drift speed in tenths of knots) (e.g. 15 – 1.5 knots)

3.5.2 Symbols for Openings in the Ice

Crack  This symbol indicates the presence of cracks in the area.

Crack  This symbol represents a crack at a specific location.

Lead  or  The width in nautical miles may be specified.

Frozen lead  The orientation of the crosslines may be varied to distinguish them from other hatching lines.

3.5.3 Symbols for Topographical Features

Ridges/Hummocks

 $\overline{h}$ /hx or f  $\overline{h}$ /hx

C

optional 

C

C Concentration or area coverage in tenths.
f Frequency in numbers per nautical miles (**f** is an alternative for **C**).
$\overline{h}$ Mean height expressed in decimetres and included when known.
hx Maximum height expressed in decimetres and included when known.

Rafting

C (concentration C in tenths)

Jammed brash barrier

3.5.4 Symbols for Ice Thickness

Thickness t_E (t_E = thickness measured in centimetres)

Thickness t_E (t_E = thickness estimated in centimetres)

Examples: 35 35

When more than one measurement has been taken, both mean and maximum thicknesses are reported, as shown below:

30/40

3.5.5 Coding for Stage of Melting

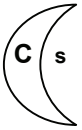
Stage of melting
(see Table 3.5 below for m_s)

DESCRIPTION	COVERAGE	CODE
No melt		0
Few puddles	1-3/10	1
Many puddles	>3/10	2
Flooded ice		3
Few thaw holes	1-3/10	4
Many thaw holes	>3/10	5
Dried ice		6
Rotten ice		7
Few frozen puddles		8
All puddles frozen		9
Undetermined or unknown		X

Table 3.5: Coding for Stage of Melting (m_s)

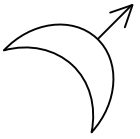
3.5.6 Coding and Symbology for Snow Cover

Snow cover



C - concentration (or area coverage) in tenths

s - snow depth, according to Table 3.6



(the orientation of the symbol with an arrow can show the direction of sastrugi)

DESCRIPTION	CODE
no snow	0
1 - 5 cm	1
6 - 10 cm	2
11 - 20 cm	3
21 - 30 cm	4
31 - 50 cm	5
51 - 75 cm	6
76 - 100 cm	7
> 100 cm	8
unknown	9

Table 3.6: Coding for Snow Depth (s)

3.5.7 Coding and Symbology for Ice of Land Origin

Triangular symbol shown:

nn
△
yy

nn= number, see following Table 3.7
yy = day of month of sighting

NUMBER	CODE
None	00
1	01
2	02
3	03
4	04
5	05
6	06
7	07
8	08
9	09
10	10
11	11
12	12
13	13
14	14
15	15
16	16
17	17
19	19

NUMBER	CODE
1 - 9	20
10 - 19	21
20 - 29	22
30 - 39	23
40 - 49	24
50 - 99	25
100 - 199	26
200 - 499	27
500 or more	28
Undetermined	99

Table 3.7: Number of Bergy Bits/Growlers or Icebergs (nn)

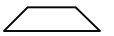
DESCRIPTION	SYMBOL	
	ONE	MANY
Growler		
Bergy bit		
Iceberg (size unspecified)		
Small iceberg		
Medium iceberg		
Large iceberg		
Very large iceberg		
Ice island		
Ice of sea origin (floeberg)		
Radar target (suspected berg)		

Table 3.8: Symbology for Ice of Land Origin

Notes:

1. Tabular iceberg indicated by adding a horizontal line through any of the symbols as shown in the following example. These symbols can be combined with a number, if exact numbers are known.
   Example:

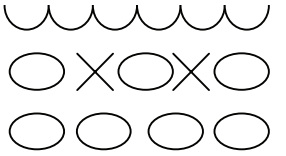
2. For further detail on reporting ice of land origin, see Chapter 4.

3.5.8 Symbols for Defining Limits

Limit of Undercast

Limit of Radar Observations

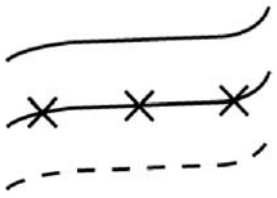
Limit of Visual Observations



Observed Edge or Boundary

Ice Edge or Boundary from Radar

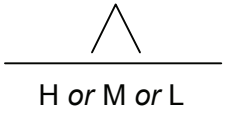
Estimated Edge or Boundary



3.5.9 Supplementary Coding for Radar Observations

Relative Roughness

Light	up to 1/10	L
Medium	2/10 - 3/10	M
Heavy	4/10 - 10/10	H



Note:
Areas showing no radar return shall be indicated NIL ECHO.

3.6 Supplementary Procedures for Indicating Total Concentration

In order to facilitate readability of the chart, ice-covered areas may be hatched according to total ice concentration. The hatching symbology (developed by WMO) may be applied to all areas of ice concentration or only to some of them. Whenever hatching is applied, the hatching symbols as shown in Table 3.9 shall be used. No International Rules are given for the thickness of the hatching lines; the thickness may be the same throughout all hatched areas or may vary in the sense that the thickest lines are used for areas of thicker ice. It is Canadian practice not to hatch ice charts except for total concentrations less than 1/10th.

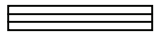
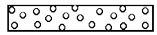
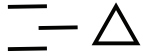
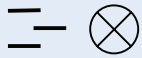
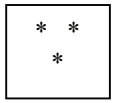
DESCRIPTION	HATCHING
Fast Ice	
10/10 Consolidated ice, Compact ice and 9-9+/10 Very close pack/drift ice	
7-8/10 Close pack/drift ice	
4-6/10 Open drift ice (Line spacing is twice that of Close pack/drift ice)	
1-3/10 Very open drift ice	
Open water (less than 1/10 sea ice, no ice of land origin)	
Bergy water (less than 1/10 sea ice may be present and total ice concentration is less than 1/10)	
Water with Radar Targets (less than 1/10 sea ice may be present and total ice concentration is less than 1/10)	
Ice free (no ice present)	

Table 3.9: WMO Symbols For the Hatching of Total Concentration of Ice

Note:
Presence of new ice can be indicated by the following symbols scattered throughout area affected:



3.7 Colour Coding Ice Charts

3.7.1 Introduction

For several years, the Ice Service Specialists have been applying a colour code to ice information charts for the Canadian Coast Guard operations in the St. Lawrence River and the Gulf of St. Lawrence. This has proven to be quite beneficial to individuals making transportation decisions based on these information products. More recently, we have modified and expanded this colour code for application in all coastal waters of Canada, including the Arctic.

3.7.2 The Colour Code

This colour code is intended to assist navigation decisions in ice infested water. It is loosely based on the concept of a traffic light where green represents proceed, yellow represents caution and red represents danger. The objective of the colour code application is to enable a person to quickly assess general ice conditions. A ship sailing in a given area can easily assess the general ice conditions and hence qualify the difficulty or ease to either navigate through easily, or to reduce speed or to stop the ship.

However, this does not consider the other variables such as winds, currents or ship design which are important considerations in any ice navigation decision. The most detailed ice information continues to reside in the ice egg codes.

3.7.3 How to Interpret the Code

The following text is intended to assist an individual interpret the colour presentation.

Open or Bergy Water

- Areas of open water or bergy water are coloured blue.

Blue – open or bergy water

Presence of Ice

- For ice concentration of one tenth or greater, the ice type must be separated into two categories: less than 15 cm and greater than 15 cm thickness:

Ice Types Thicker than 15 cm

- The colour for a given ice area will be determined by the total concentration of the ice types thicker than 15 centimetres and is represented by the following list:

Green – from 1 to 3 tenths of ice thicker than 15 cm

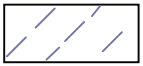
Yellow – from 4 to 6 tenths of ice thicker than 15 cm

Orange – from 7 to 8 tenths of ice thicker than 15 cm

Red – from 9 to 10 tenths of ice thicker than 15 cm

Presence of Old Ice

- The presence of old ice (multi-year ice) is indicated by the colour purple, and is represented by the following list:



Purple Dash Lines – indicates the presence of 1 to 4 tenths of old ice

Purple Background – indicates the presence of 5 tenths or more of old ice

Presence of Fast Ice

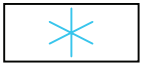
- The presence of fast ice, regardless of the thickness is always black or grey. The grey background allows seeing additional information that can be added on fast ice.

Black – fast ice regardless of thickness

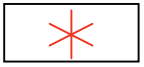
Grey – fast ice regardless of thickness

Ice Types Thinner than 15 cm – No Colour Assigned in Background

- Ice less than 15 centimetres in thickness is indicated by a star code and the colour of the stars is determined by the predominance between grey ice (10 to 15 cm) and new ice (0 to 10 cm), and is represented by the following list:



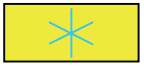
Blue Stars – predominance of ice thinner than 10 cm



Red Stars – predominance of ice thickness between 10 and 15 cm

Ice Types Thinner than 15 cm – Colour Assigned in Background

- Secondary ice types with less than 15 centimetres in thickness are indicated by a star code and the colour of the stars is determined by the predominance between secondary grey ice (10 to 15 cm) and secondary new ice (0 to 10 cm), and is represented by the following list:



Blue Stars – predominance of secondary ice thinner than 10 cm

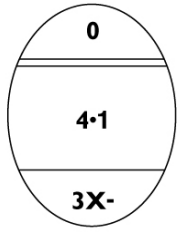
Red Stars – predominance of secondary ice thickness between 10 and 15 cm

The star code is placed over top of the background colour. In the case of 9 to 10 tenths of ice (red background) and predominance of ice thickness between 10 and 15 cm (red stars), there is only one colour which can be represented: red. The result of red stars on a red background is red.

3.8 Examples of the Use of the Egg Code

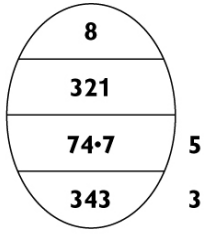
3.8.1 Various Ice Type and Concentration Combinations

Example 1
Less than one tenth of ice to show open water. Some thick first-year in small floes; new ice is also present and has no floe form.

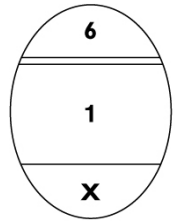


Example 2
9+/10 total ice concentration. 3/10 old ice in small floes, 2/10 thick first-year ice in medium floes, 1/10 thin first-year ice in small floes, 2/10 grey-white ice in small floes, and the remaining 2/10 is new ice with no floe form.

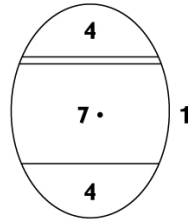
Example 3
8/10 total ice concentration. 3/10 old ice in small floes, 2/10 thick first-year ice in medium floes, 1/10 thin first-year ice in small floes and 2/10 grey-white in small floes.



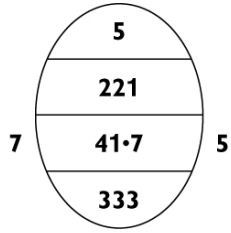
Example 4
6/10 of new ice with no floe form.



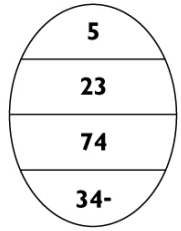
Example 5
4/10 of old ice in medium floes. New ice is also present with a concentration of less than 1/10.



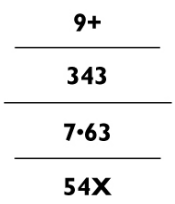
Example 6
5/10 total ice concentration. 2/10 thick first-year ice, 2/10 medium first-year ice and 1/10 thin first-year ice. All in small floes. Old ice and grey-white ice with a concentration of less than 1/10 are also present.



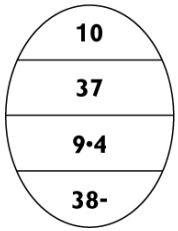
Example 7
5/10 total ice concentration. 2/10 thin first-year ice in small floes and 3/10 grey ice in medium floes.



Example 8
9+/10 total ice concentration. 3/10 old ice in big floes, 4/10 first-year ice in medium floes and 3/10 young ice with floes undetermined. Horizontal lines with no egg shell indicates that data has been interpreted from radar.

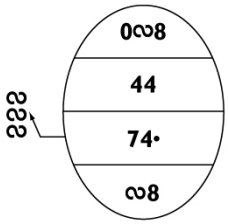


Example 9
Fast grey ice with 3/10 multi-year ice in small floes embedded.

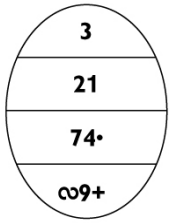


3.8.2 Strips and Patches

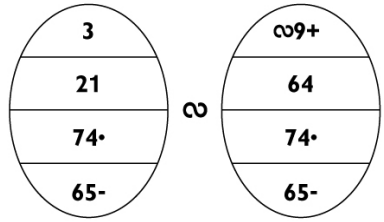
Example 10
Open water with strips and patches of old and thick first-year ice in small floes.



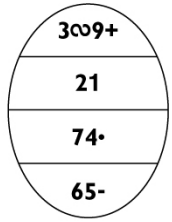
Example 11
3/10 total ice concentration. 2/10 old ice and 1/10 thick first-year ice. All ice is concentrated in strips and patches of 9+/10.



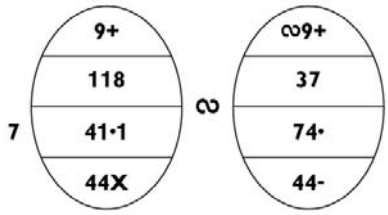
Example 12a
3/10 total ice concentration in strips and patches of 9+/10. 6/10 old ice in vast floes and 4/10 thick first-year ice in big floes. These floe sizes are significant and warrant the use of two ovals.



Example 12b
An alternate way to describe the same conditions with 3/10 total ice concentration in strips and patches of 9+/10. 6/10 old ice in vast floes and 4/10 thick first-year ice in big floes. These floe sizes are indicated because they are significant.

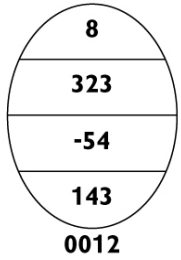


Example 13
9+/10 total ice concentration comprised of 1/10 thick first-year ice, 1/10 medium first-year ice, 8/10 new ice and old ice with a concentration of less than 1/10. The old and thick first-year ice are distributed throughout the area in strips and patches made up of 3/10 old and 7/10 thick first-year ice. All ice types in the second oval must be included in the first oval.

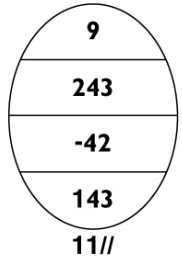


3.8.3 Brash

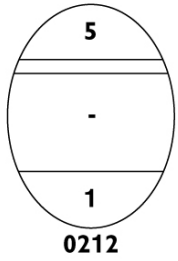
Example 14
8/10 total ice concentration. 3/10 of brash, 2/10 grey-white ice in medium floes, 3/10 grey ice in small floes and 1/10 of the brash is medium while 2/10 is thin. There is no thick or very thick brash present.



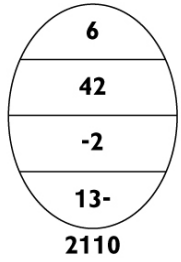
Example 15
9/10 total ice concentration. 2/10 brash (1/10 very thick brash, 1/10 thick brash and a trace of medium and thin brash), 4/10 grey ice in medium floes and 3/10 nilas in small floes.



Example 16
5/10 total ice concentration. All brash with 2/10 thick brash, 1/10 medium brash and 2/10 thin brash.



Example 17
6/10 total ice concentration. 4/10 brash (1/10 medium, 1/10 thick and 2/10 very thick) and 2/10 nilas in small floes.



3.9 Examples of Ice Charts

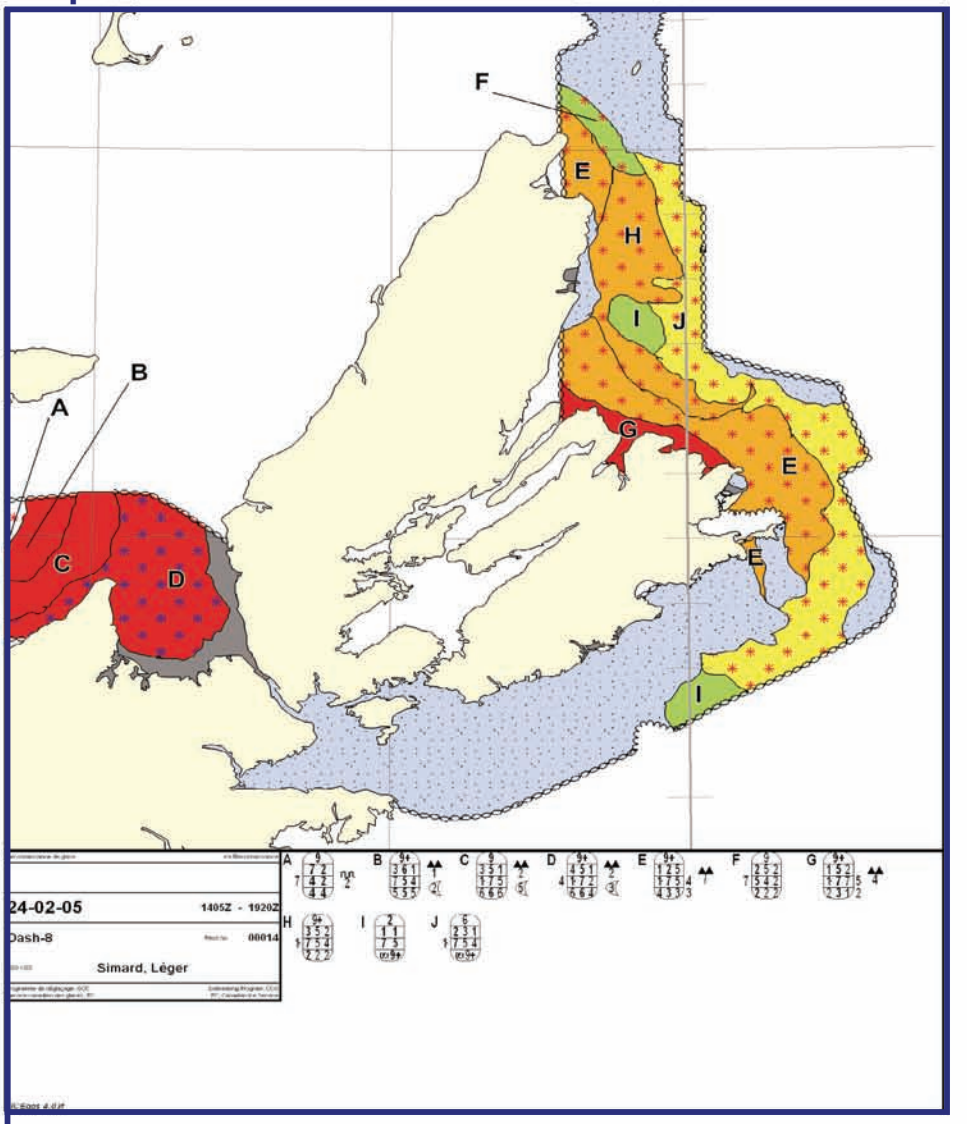


Figure 3.2: Ice Chart From a Sea-Ice Reconnaissance Flight

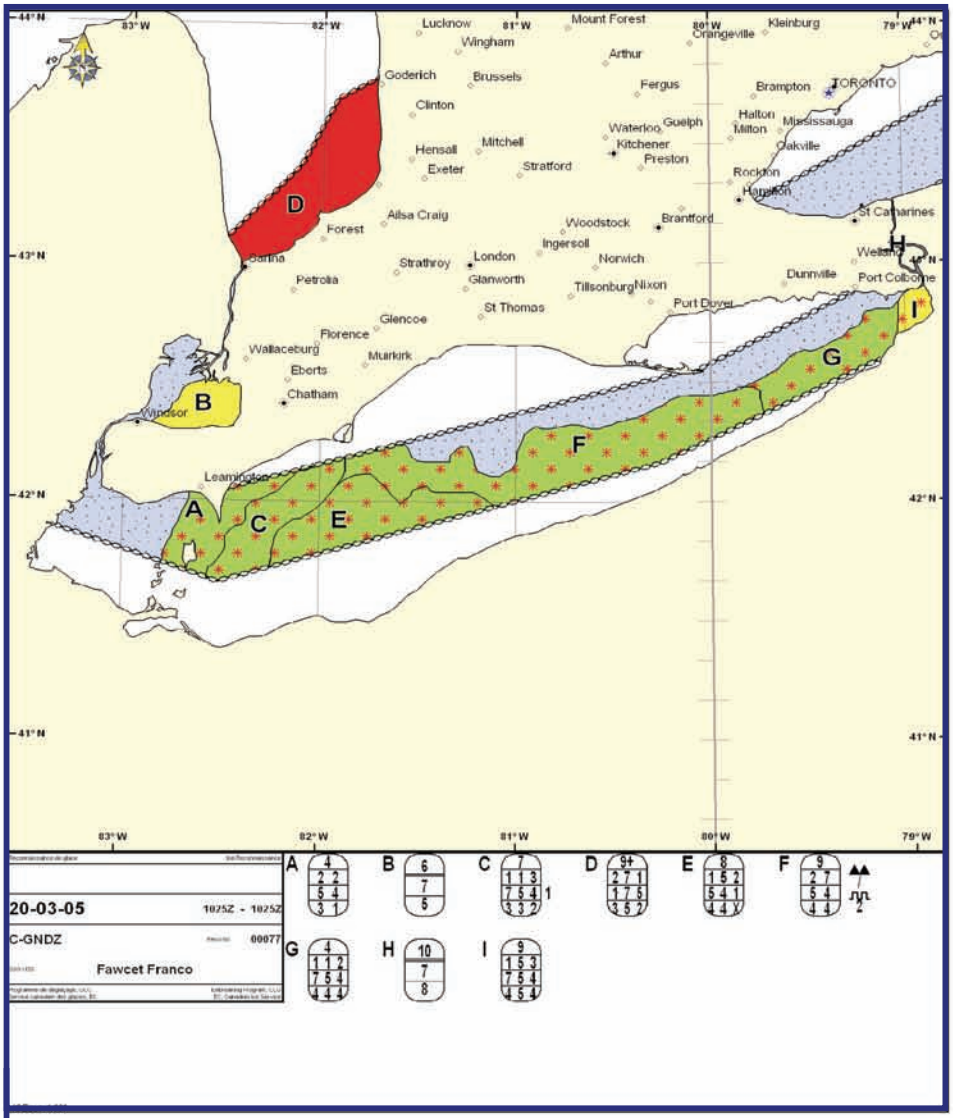


Figure 3.3: Ice Chart From a Lake-Ice Reconnaissance Flight

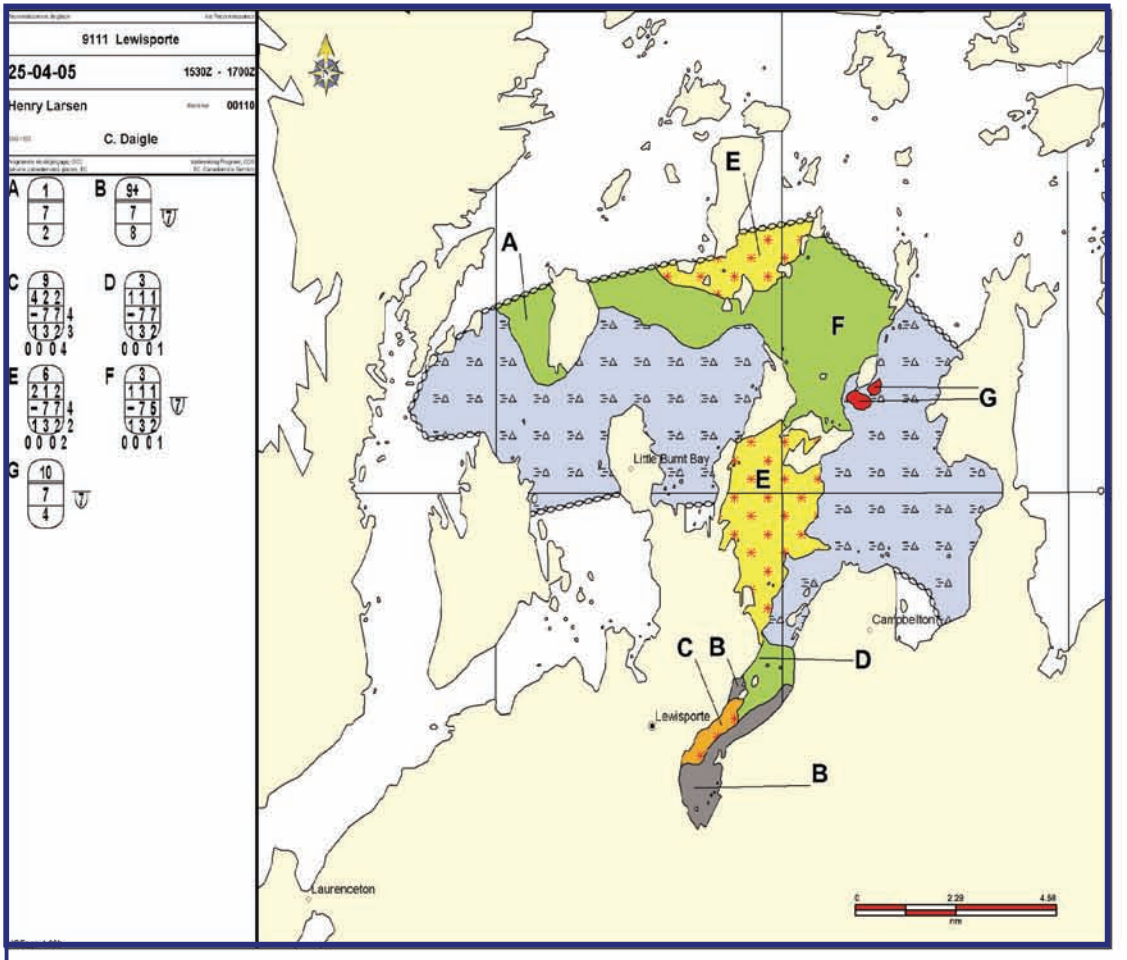


Figure 3.4: Daily Shipboard Ice Chart

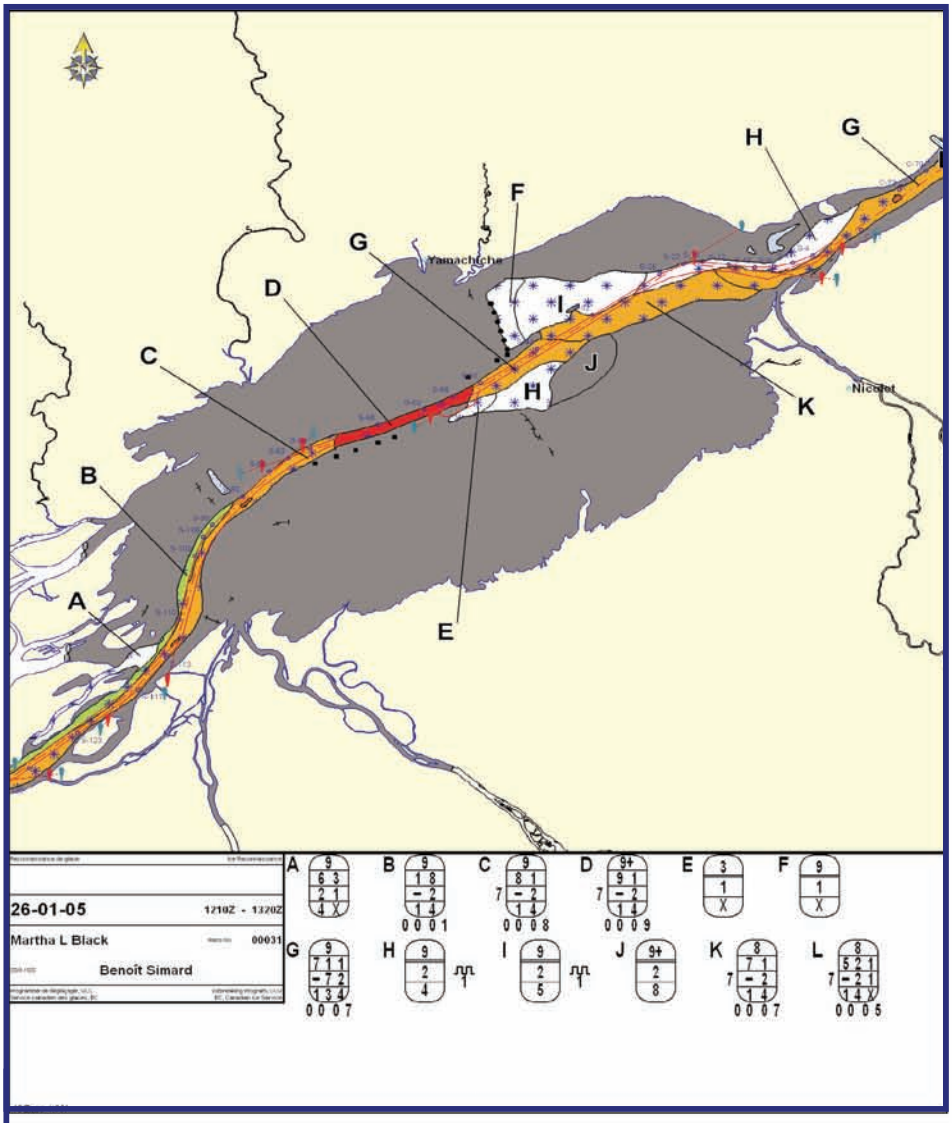


Figure 3.5: St Lawrence River Chart