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Isforholdene i de danske Farvande i Vinteren 1919—1920.

Bearbejdet af Kaptajn C. I. H. SPEERSCHNEIDER.

Oplysningerne om Isforholdene i den forløbne Vinter er indsamlede og bearbejdede paa lignende Maade som tidligere.

Tabel 1 viser Middeltemperaturen og Afgigelserne fra Normalen paa 7 Steder i Landet. Det fremgaar af Tabellen, at Afgigelserne var negative i December, Resten af Vinteren positive.

November 1919. Middellufttrykket *) var ved Skagen 757,1 mm, i Kjøbenhavn 757,6 mm, eller henholdsvis 2,3 og 2,4 mm lavere end normalt. Vindretningen var overvejende østlig. Frostdagenes **) Antal paa de i Tab. 2 nævnte 7 Stationer var 5—12.

December. Middellufttrykket, var ved Skagen 754,6 mm, i Kjøbenhavn 755,8 mm, eller henholdsvis 3,8 og 4,0 mm lavere end normalt. Vindretningen var overvejende sydlig eller sydøstlig. Frostdagenes Antal paa de i Tab. 2 nævnte Stationer var 9—16. Paa Fyrskibene, hvor Temperaturen aflæses 6 Gange i Døgnet, var den laveste Temperatur \div 8,4 (Læsø Trindel).

Januar 1920. Middellufttrykket var ved Skagen 753,6 mm, i Kjøbenhavn 757,0 mm, eller henholdsvis 7,0 og 5,1 mm lavere end normalt. Vindretningen var overvejende vestlig og sydvestlig. Frostdagenes Antal var mellem 5—11. Paa Fyrskibene var den laveste Temperatur \div 5,3 (Lappe-Grund).

*) reduceret til 0° C., Havets Overflade og Tyngden ved 45° Br.

**) I Beretningen for Vinteren 1918—19 betyder i dette Afsnit »Frostdage«, Dage hvor Minimumstemperaturen var under 0° . I denne Beretning forstaas ved Frostdage, Dage hvor Middeltemperaturen er under 0° , saaledes som man hidtil har brugt det i Tabel 2.

The State of the Ice in the Danish Waters during the Winter 1919—1920.

Prepared by Commander C. I. H. SPEERSCHNEIDER.

The information concerning the state of the ice during the past winter has been gathered in a similar manner as formerly.

Table I. shows the mean temperature of the air and the variations from the normal state at 7 different stations. It will be seen that the variations were negative during December while they were positive during the rest of the winter.

November 1919. The mean pressure of the air at the Scaw was 757.1 mm. and in Copenhagen 757.6 mm. or respectively 2,3 and 2,4 below the normal. Easterly winds were predominant. The number of frosty days at the 7 stations mentioned in Table 2 was 5—12.

December 1919. The mean pressure of the air at the Scaw was 754.6 mm. and in Copenhagen 755.8 mm., or respectively, 3,8 and 4.0 mm. below the normal. The predominant direction of the wind was southerly or southeasterly. At the two stations mentioned in Table 2 there were respectively 9 and 16 frosty days. At the light-ships, where the temperature is read 6 times in the 24 hours, the lowest temperature was $\div 8.4^{\circ}$ (Læsø Trindel).

January 1920. The mean pressure of the air at the Scaw was 753.6 mm., and in Copenhagen 757.0 mm. or respectively, 7.0 and 5.1 mm., below the normal. Westerly and southwesterly winds were predominant. The number of frosty days was, 5—16. At the lightships the lowest temperature was $\div 5.3^{\circ}$ (Lappe-Grund).

*) Reduced to 0° C., to the level of the sea, and the gravity at Lat. 45° .

**) In the report concerning the winter 1918—19 »frosty days« in this section mean days when the minimum temperature was below 0° , while »frosty days« in the present report mean days with a mean temperature below 0° , as it was formerly the rule in Table 2.

Februar. Middellufttrykket var ved Skagen 761.2 mm., i Kjøbenhavn 764.5 mm., eller henholdsvis 1.1 og 3.4 mm. højere end normalt. Vindretningen var overvejende omkring Vest og Sydvest, medens nordlige og østlige Vinde var forholdsvis sjældne. Frostdagenes Antal laa mellem 1 og 3. Paa Fyrskibene var den laveste Temperatur $\div 2.7$ (Lappe-Grund),

Marts. Middellufttrykket var ved Skagen 758.5 mm., i Kjøbenhavn 761.1 mm. eller henholdsvis 0.3 og 2.0 mm. højere end normalt. Vindretningen var oftest sydøstlig, sydlig eller vestlig. Der var ingen Frostdage. Paa Fyrskibene var den laveste Temperatur $\div 0.8$ (Lappe-Grund).

Tabel 2 viser de Frostperioder og Frostdage, som indtraf i Vinterens Løb. I 1ste Frostperiode dannedes der Is i de indre Farvande midt i November. 2den Frostperiode frembragte Is i de samme Farvande midt i December, i 3die Periode fortsattes Isdannelsen indtil ca. 6. Januar og paa Grund af de spredte Frostdage i Januar Maaned holdt Isen sig nogle Steder hele Januar Maaned ud. I Februar var der kun enkelte Frostdage med ringe Frost, der ikke kunde danne Is. Vinterens egentlige Frostperiode faldt saaledes i sidste Halvdel af December, men, som Følge af den ringe Frost, der indtraf saa tidlig paa Vinteren, kunde der ikke dannes Is i Hovedfarvandene.

Af Stationerne havde Randers den største Kuldesum (101.7), Samsø den mindste (49.3).

Tabel 3 viser Vandets Overfladetemperatur og Saltholdighed i Løbet af Vinteren; Middeltal er anført for hvert Tidøgn. Vandets Temperatur faldt jævnt i Begyndelsen af Vinteren, og naaede paa de fleste Steder sit laveste i første Tidøgn af Januar. Da der herefter ikke var nogen egentlig Frostperiode, steg Vandets Temperatur jævnt og langsomt Vinteren igennem. Ved Bornholm indtraf den laveste Temperatur dog i Slutningen af Februar Maaned.

Den laveste Saltholdighed faldt paa forskellige Tider for de forskellige Stationer; for Kattegats Vedkom-

February. The mean pressure of the air at the Scaw was 761.2 mm. and in Copenhagen 764.5 mm. or respectively 1.1 and 3.4 mm. above the normal. The predominant direction of the wind was about west and souhtwest while northerly and easterly winds were comparatively rare. The number of frosty days was between 1 and 3. At the lightships the lowest temperature was $\div 2.7$ (Lappe-Grund).

March. The mean pressure of the air at the Scaw was 758.5 mm. and in Copenhagen 761.1 mm. or respectively 0.3 mm. and 2.0 mm. above the normal. The predominant direction of the wind was southeasterly, southerly and westerly. There were no frosty days. At the lightships the lowest temperature was $\div 0.8$ (Lappe Grund).

Table 2 gives the occurrence of frosty periods and frosty days during the winter. During the first frosty period ice was formed in the inner waters about the middle of November, during the second frosty period ice was formed in the same waters about the middle of December, and during the third period the formation af ice continued until January 6th and owing to the odd frosty days in the course af January the ice remained at some stations till the end of January. In February only a few frosty days occurred, and the frost was so slight that no ice was formed. Thus the frosty period proper of the winter occurred in the latter half on December, but as the frost was slight and set in so early no ice was formed in the main waters. Of all the stations Randers had the greatest amount of cold (101.7), Samsø the smallest (49.3).

Table 3 gives a general view of the temperature and the salinity of the surface water during the winter, the mean value being quoted for each decade. The temperature of the water sank smoothly during the beginning of the winter and at most of the stations the lowest temperature was observed in the first decade of January. As subsequently no regular frosty period occurred the temperature of the water rose smoothly and slowly during the rest of the winter. At Bornholm though the lowest temperature was obser ved about the end of February.

The lowest salinity was observed at different times at the various stations. In the Kattegat it was

mende var den lavest i December og for de sydlige Farvande i Slutningen af Februar og i Begyndelsen af Marts. Ved Bornholm var Saltholdigheden konstant hele Vinteren.

Den i tidligere Aar trykte Tabel 4 indeholdende de daglige Iagttigelser paa hver Station er udeladt. I Stedet for er der i Tabel 4 givet en Oversigt over samtlige Stationer i Landet, hvor der føres Observation over Isen.

For at hjælpe til en ensartet Bedømmelse er Isforholdene udtrykt ved Bogstaver, som har følgende Betydning:

Isfrit.....	A	Svær Driv-Is	F
Løs Sjap- og Kvadder-Is	B	Pak-Is	I
Sammenpakket Sjap- og Kvadder-Is	E	Tynd Fast-Is	D
Spredt Driv-Is	C	Svær Fast-Is.....	G
Driv-Is	K		

Til nærmere Forklaring paa disse Benævnelser tjener følgende Beskrivelse:

- B. *Sjap-Is* kaldes den Masse, der dannes af Sne og Vand eller af smaa Ispartikler, saalænge den ikke er frosset sammen endnu. *Kvadder-Is* kaldes de smaa, i Reglen afrundede Isflader eller Isklumper, som kan optræde for sig, førte sammen af Vind og Sø, men som hyppig træffes i Forbindelse med *Sjap-Is*.
- E. *Sammenpakket Sjap- og Kvadder-Is* er *Sjap-Is* eller *Kvadder-Is* eller begge Dele i Forening, som paa Grund af Kuling eller Strøm, eller mulig Hindring for Isens Bevægelse, er pakket sammen i en grød lignende Masse af antagelig Tykkelse.
- C. *Spredt Driv-Is*. Isflagør eller Iskodser, som med større Mellemrum er spredte over Farvandet, og som er i Drift.
- K. *Driv-Is*. Isflagør eller Iskodser i mere samlede Masser, som er i Drift.
- F. *Svær Driv-Is*. Svære Isflagør eller Iskodser i samlede Masser, som er i Drift.

lowest in December and in the southern waters it was lowest during the end of February and the beginning of March.

At Bornholm the salinity was constant throughout the winter.

The Table 4, which in former years gave the daily observations at each station, has been omitted and instead a new Table 4 has been compiled giving a view of all the stations in the country where observations concerning the ice are taken.

In order to further uniformity of judgement, the state of the ice is indicated by letters having the following signification.

Free of ice.....	A	Heavy drift ice	F
Brash and pancake ice	B	Pack	I
Packed brash and pancake ice	E	Screw ice	H
Open ice.....	C	Thin fixed ice.....	D
Drift ice	K	Heavy fixed ice.....	G

The following description gives a more precise explanation of the above designations:

- B. *Brash ice* is a mass consisting of snow and water or of very small pieces of ice not yet frozen together. *Pancake ice* consists of small, generally round, ice flakes or ice lumps. It may appear alone, brought together by the wind or the sea, but it often appears in connection with *brash ice*.
- E. *Packed brash and pancake ice* is brash ice or pancake ice or both at the same time, which has been packed together in a turbid mass of considerable thickness either by the wind or the current or by some obstruction to the free drift of the ice.
- C. *Open ice* is drifting ice flakes or hummock ice scattered over the water at greater intervals.
- K. *Drift ice* is drifting ice flakes or hummock ice in more collected masses.
- F. *Heavy drift ice* is drifting heavy ice floes or hummock ice in close masses.

- I. *Pak-Is.* Svære Iskodser, som af Kuling eller Strøm, eller, hvad oftest er Tilfældet, paa Grund af Indsnævring af Farvandet, er pakkede sammen til en svær tæt Masse.
- H. *Skrue-Is.* Is, som skruer.
- D. *Tynd Fast-Is.* En sammenfrosset, landfast Isflade af mindre Styrke.
- G. *Svær Fast-Is.* En sammenfrosset, landfast Isflade af betydelig Styrke.

Besejlingsforholdene er udtrykt ved Bogstaver, som har følgende Betydning :

Skibsfarten uhindret.....	N
» vanskelig for Sejlskibe	O
» vanskelig; for Sejlskibe kun mulig med Bugserhjælp.....	P
Skibsfarten lukket for Sejlskibe.....	Q
» kun mulig for kraftige Dampere	R
» kun mulig med Isbryderhjælp	S
» helt lukket	T
Rende holdes aaben med Isbryder.....	U

I Tabel 5 er for hvert Sted anført, hvormange Dage der har været Is af de forskellige Arter, og hvormange Dage Skibsfarten har været paavirket deraf. Endvidere findes Rubrikker for det samlede Dageantal med Is samt for Tiderne for første og sidste Ismeldung. Det maa dog erindres, at Stedet i Mellemtíden godt kan have været isfrit selv i længere Tid.

I sidste Rubrik er der for enkelte Pladser anført den største Tykkelse i cm, som Isen har naaet.

Oversigt over Isforholdene i de forskellige Farvande.

Jyllands Vestkyst var isfri hele Vinteren. I Graadyb var der af og til lidt Drivis i December og Januar. Esbjerg Havn havde Is i ca 5 Uger, medens Ringkjøbing Fjord havde Is i 13 Uger.

- I. *Pack* means heavy ice floes, which have been packed together in heavy, dense masses, either by the wind or the current or — as is generally the case — by a narrowing of the waters.
- H. *Screw ice* means ice that is screwing or nipping.
- D. *Thin fixed ice* means thin land ice.
- G. *Heavy fixed ice* means heavy land ice.

The conditions for navigation are indicated by letters having the following signification.

Navigation unimpeded.....	N
» difficult for sailing vessels	O
» difficult, impossible for sailing vessels without tug-boat.....	P
Navigation closed for sailing vessels.....	Q
» only possible for powerful steamers.....	R
» impossible without the assistance of icebreaker	S
» quite closed.....	T
Channel kept open by means of ice breaker	U

In Table 5 is for each station put down the number of days with ice of the various descriptions and the number of days on which navigation has been affected by the ice. Further rubrics will be found giving the total number of days with ice, and the dates of the first and the last report of ice. However, it must be noted, that in the interval the station may very well have been free of ice, even for a longer period.

In the last column is given — for some of the stations — the greatest thickness in cm, which the ice has attained.

Summary of the state of the ice in the various waters.

The West coast of Jutland was free of ice throughout the winter. In Graadyb a little drift ice appeared now and again in December and January. Esbjerg harbour had ice for about 5 weeks while Ringkjøbing Fjord had ice for 13 weeks.

I **Limfjorden** laa der allerede midt i November i en halv Snes Dage Is i Bugterne og de indre Fjorde. I Slutningen af December begyndte Isen igen, og blev de fleste Steder liggende Januar Maaned ud. Paa de mere aabne Steder laa Isen kun i Ugestid, mellem Hals og Nibe i 3 à 4 Uger, udfor Løgstør, ved Skive og Thisted i ca. 8 Uger. Skibsfarten var helt lukket i Skive Havn og Fjord i ca. 4 Uger.

Endnu i de første Dage af Februar var der nogen Is ved Aggersund og Løgstør samt i Thisted Bredning.

Kattegat og dets Havne beliggende ved det aabne Farvand var isfri hele Vinteren. Midt i November laa der en Ugestid lidt Is i Fjordene. I Decembers sidste Halvdel havde Fjordene etter Is som for Randers- og Mariager Fjords Vedkommende holdt sig hele Januar og senere var her isfri. Horsens Fjord havde Is i ca. 3 Uger, Odense Fjord i 7 og Randers- og Mariager Fjorde i 9 Uger.

Sundet var isfrit, og kun Helsingør Havn havde Is i 2 Dage.

Store Bælt var isfrit, medens Nakskov Havn og Fjord havde Is i ca. 4 Uger fra sidste Halvdel af December til midt i Januar.

Lille Bælt var isfrit, medens Vejle Fjord havde Is i ca. $4\frac{1}{2}$ Uge.

Femer-Bælt og den vestlige Østersø var isfri; Nysted Bredning havde Is i 4 Uger og Præstø Fjord i 6 Uger.

Ved **Bornholm** var der isfrit.

De indre Farvande. I Isefjorden begyndte Isdannelsen midt i November, Isen laa kun en Ugestid, men begyndte igen midt i December og fra 28. December til 12. Januar var al Sejlads paa Isefjordens indre Dele spærret af Is. Holbæk Fjord havde Is i 6 Uger, Roskilde Fjord i 11 Uger.

I **Smaalandsfarvandet** begyndte Isdannelsen ogsaa midt i November, men Isen laa kun i Ugestid; i December begyndte Isen igen og holdt sig gennemgaaende til midt i Januar; kun omkring Kallehave—Stege laa

In the bays and inner fjords of **Limfjorden** there was ice for about 10 days during the middle of November. About the end of December the ice again commenced to form and remained till the end of January. In the more open waters the ice only remained for about a week, between Hals and Nibe for 3 to 4 weeks, off Løgstør and at Skive and Thisted for about 8 weeks. Skive harbour and Fjord were closed to navigation for about 4 weeks.

During the first days of February there was still some ice at Aggersund and Løgstør and in Thisted Bredning.

The **Kattegat** was free of ice throughout the winter and so were the ports which are situated on the open coasts. During a week in the middle of November there was a little ice in the Fjords. In the latter half of December there was again ice in the Fjords and in Randers- and Mariager Fjord the ice remained till the end of January; afterwards there was no ice here. Horsens Fjord had ice for about 3 weeks, Odense Fjord for 7 weeks, Randers and Mariager Fjord for 9 weeks.

The **Sound** was free of ice, only Helsingør harbour had ice for 2 days.

The **Great Belt** was free of ice, while Nakskov harbour and Fjord had ice for about 4 weeks from the latter half of December till the middle of January.

The **Little Belt** was free of ice while Vejle Fjord had ice for about $4\frac{1}{2}$ weeks.

Femer Belt and the western part of the **Baltic** were free of ice. Nysted Bredning had ice for 4 weeks and Præstø Fjord for 6 weeks.

At **Bornholm** the Baltic was free of ice.

The inner waters. In Isefjorden the formation of the ice commenced about the middle of November; the ice only remained for a week but formed again about the middle of December, and from December 28. to January 12. all navigation in the inner parts of Isefjorden was blocked by the ice. Holbæk Fjord had ice for 6 weeks and Roskilde Fjord for 11 weeks.

In **Smaalandsfarvandet** the formation of the ice also commenced about the middle of November, but the ice only remained for about a week. In December the ice formed again and generally remained till the middle of January and only at Kallehave—Stege the ice remained till the end of the month. Skjelskør,

Isen Maaned den ud. Skjelskør, Bandholm og Guldborgsund havde Is i 3 à 4 Uger, Ulvsund ca. 13 Uger.

I Farvandet Syd for Fyen fandtes kun ubetydelig Is.

Helt isfri var 68 Stationer; 20 Stationer havde Is i mere end 1 Maaned, 2 Stationer i mere end 2 Maaneder. Det højeste Antal Dage med Is, 90, havde Ringkjøbing Fjord. Den første Is viste sig den 4. November (Aggersund), den sidste Is saas den 13. Febr. (Limfjorden udfor Løgstør).

Isens Tykkelse blev maalt fra 22 Stationer. Største Tykkelse af Isen blev maalt i Limfjorden 10—25 cm.; i de sydlige Farvande 6—18 cm. Pakis blev maalt til 60 à 100 cm.

Tabel 6 viser, hvor længe Fyrskibene gennemsnitlig har været inddraget for Is; det fremgaar af Tabellen, at Fyrskibene indenfor Skagen som Regel inddrages i 1 af 3 Vintre. Naar Fyrskibene inddrages, bliver de gennemsnitlig inde i 5 à 6 Uger.

Ismeldingstjenesten, som træder i Virksomhed, naar Isen begynder at optræde i Hovedfarvandene, var ikke etableret. Af 27 Vintre har Ismeldingstjenesten været etableret i 9, hvilket svarer til Is i Hovedfarvandene i 1 af 3 Vintre. I ingen af Vintrene er Ismeldingstjenesten begyndt før 25. Januar.

Til Sammenligning mellem de forskellige Vintre tjener Tabel 7, hvor Tallene angiver det gennemsnitlige Antal Dage med Is for de forskellige Slags Farvande og Havne. Det ses heraf, at Vinteren 1919—20 ikke havde megen Is, idet Gennemsnitstallet af Antal Isdage for »Alle Stationer« var 11.8, medens Gennemsnittet for 14 Aar er 16.4 Dage med Is.

De sidste 14 Vintre grupperer sig med Hensyn til Isdagenes Antal i 2 skarpt adskilte Grupper. For fire isrige Vintre er Gennemsnittet 36.4 Dage med Is med Grænserne 30.3 og 44.9. Af disse fire Vintre havde Vinteren 1916—1917 en Del mere Is, 44.9 Dage, end de andre 3 isrige Vintre og maa derfor betragtes som en særlig langvarig Isvinter. Gennemsnittet for de 10 isfattige Vintre er 8.4 Dage med Is og med Grænserne 2.4 og 15.3 Dage. Gennemsnitlig er saaledes 1 af 3 Vintre en Isvinter.

Bandholm og Guldborgsund had ice for 3 to 4 weeks and Ulvsund for 11 weeks.

In the waters south of the Funen there was only very little ice

68 stations were completely free of ice, 20 stations had ice for more than a month and 2 stations for more than 2 months. The highest number of days with ice was 90 which was reported from Ringkjøbing Fjord. The first ice appeared on November 4. (Aggersund) while the last ice was observed on February 13. (Limfjorden off Løgstør).

The thickness of the ice was measured at 22 stations, and the greatest thickness 10—25 cm. was measured in Limfjorden, while it only attained a thickness of 6—18 cm. in the southern waters.

The thickness of the pack ice was about 60—100 cm.

Table 6 gives a general view of the withdrawal of the lightships on account of ice. It will be seen from the table that the lightships inside the Scaw as a rule are withdrawn every third winter. When the lightships ore withdrawn the withdrawal usually lasts 5 to 6 weeks.

The ice signal service, which is carried into effect when the ice begins to appear in the main wa ters was not established. The ice signal service has been, established during 9 winters out of 27, which corresponds with the appearance of ice in the main fairways during 1 winter out of 3. The ice signal service has never been established before January 25.

To compare the various winters Table 7 has been compiled the ciphers of which give the average number of days with ice in the various waters and harbours. It will appear from this table that there was not much ice during the winter 1919—1920 the mean number of days with ice at all the stations being 11.8 while the mean for 14 years is' 16.4 days with ice.

Relative to the number of days with ice the last 14 winters form 2 distinctly different groups. During the 4 cold winters the mean is 36.4 days with ice the limits being 30.3 and 44.9 days. Out of these 4 winters the winter 1916—1917 had the highest number of days with ice 44.9 and must therefore be considered as an unusually long ice winter. The mean of the 10 mild winters is 8.4 days with ice; the limits being 2.4 and 15.3 days. Thus on an avarage 1 winter out of 3 is a cold winter.

Meteorologisk Institut bringer sin Tak til alle de Observatorer, hvis Iagttagelser har gjort det muligt at fremkomme med de foreliggende Oplysninger om Isforholdene i de danske Farvande i Vinteren 1919—1920.

Maj 1920.

The Meteorological Institute herewith desires to express its thanks to the many observers who have rendered it possible to publish the present particulars concerning the state of the ice in the Danish waters during the winter 1919—1920.

May 1920.

tab. 1.

Luftens Middeltemperatur samt Afgigelserne fra Normalen i Vinteren 1919—1920.

The mean-temperature of the air and the variations from the normal temperature during the winter 1919—1920.

		Fanø (Nordby)	Skagen (Fyret)	Randers (Strømmen)	Samsø (Tranebjerg)	Bogø (Navig. Skolen)	Kjøbenhavn (Met. Inst.)	Hammershus (Sandvig)
December	Middeltemp..	0.1	0.5	— 0.5	0.5	0.4	0.7	1.1
	Afgelsen ..	— 0.8	— 1.3	— 0.8	— 1.3	— 0.8	— 0.7	— 0.8
Januar	Middeltemp..	1.6	0.7	0.8	0.8	0.9	1.0	0.7
	Afgelsen ..	+ 1.7	0.0	+ 1.3	+ 0.4	+ 1.2	+ 0.9	+ 0.4
Februar	Middeltemp..	3.7	2.7	3.0	2.7	2.6	3.1	2.2
	Afgelsen ..	+ 3.8	+ 2.7	+ 3.6	+ 2.5	+ 2.7	+ 3.2	+ 2.1
Marts	Middeltemp..	5.1	4.1	4.9	4.6	4.9	4.8	4.1
	Afgelsen ..	+ 3.6	+ 2.8	+ 3.6	+ 2.9	+ 3.2	+ 3.4	+ 2.9

tab. 2.

Frostperioderne og Frostdagene i Vinteren 1919—1920.

The frosty periods and frosty days during the winter 1919—1920.

	1ste Frostperiode <i>1st frosty period</i>	2den Frostperiode <i>2nd frosty period</i>	3die Frostperiode <i>3rd frosty period</i>	Frostdage <i>frosty days</i>	Frostdage <i>frosty days</i>		Samlet Kuldesum. <i>Total amount of cold</i>
Fanø (Nordby)	a 10/11—16/11	8/12—17/12	25/12—29/12	4/1—6/1 3 — 8.4	9/1 1 — 0.7—0.1	15/1 1 — 0.7	6/2 1 — 0.7
	b 7	10	5				
	c — 17.2	— 23.2	— 20.9				— 71.2
Skagen (Fyret)	a 8/11—17/11	8/12—10/12	22/12—30/12	4/1—7/1 4 — 7.4	11/1—12/1 2 — 2.4—1.4	15/1 2 — 5.6	7/2 1 — 0.2
	b 10	3	9				2 — 2.6
	c — 15.9	— 2.7	— 26.5				— 64.7
Randers (Strømmen)	a 8/11—18/11 11 1	8/12—17/12 8 m. Afb.	22/12—29/12 8	4/1—11/1 6 m. Afb. — 12.3	15/1 1 — 1.3	21/1 2 — 1.1—4.4	28/1—29/1 2 — 2.3—0.9
	b — 26.4	— 2.0	— 18.6				
	c		— 32.4				— 101.7
Samsø (Tranebjerg)	a 10/11—18/11 9 1	9/12—17/12 8 m. Afb.	28/12—29/12 6 m. Afb. — 9.0	4/1—7/1 4 — 7.1	11/1 1 — 0.7—1.0	15/1 2 — 4.8	28/1—29/1 2 — 1.7
	b	— 6.5	— 0.3				
	c		— 18.2				— 49.3
Bogø Navig. Skolen)	a 10/11—18/11	9/12—17/12	25/12—29/12	3/1—7/1 5 — 7.7	15/1 1 — 0.4—0.1	22/1 1 — 0.1—6.1	27/1—29/1 2 — 2.0
	b	8 m. Afb.	8 m. Afb.				
	c	— 10.9	— 13.2				— 57.1
Kjøbenhavn (Met. Inst.)	a 9/11—18/11	9/12—17/12	25/12—29/12	4/1—7/1 5 — 17.9	15/1 1 — 6.5	22/1 1 — 0.9—0.8	27/1—29/1 2 — 7.1
	b	10	5				
	c	— 13.2	— 6.7				— 55.6
Hammershus (Sandvig)	a 10/11—18/11	9/12—17/12	28/12—29/12	4/1—7/1 4 — 12.7	15/1 1 — 4.4	22/1 1 — 1.0—0.4	26/1—30/1 5 — 13.0
	b	5 m. Afb.	5 m. Afb.				
	c	— 8.3	— 7.2				— 50.4

nm. I: a er Frostperiodens Varighed (the duration of the frosty period).

b er Antal af Dage, hvis Middeltemperatur var under 0° (number of days with a mean-temperature below 0°).

c er Kuldesummen (Produktet af Frostperiodens Middeltemperatur og Dageantallet) (the amount of cold (the product of the mean-temperature of the frosty period and the number of days of the period)).

m. Afb. betyder med Afbrydelse (with interruption).

Tab. 3.

Middeltal af Vandets Overfladetemperatur og Saltholdighed Kl. 8 Fm. i Vinteren 1919

The mean temperature and salinity of the surface water at 8 a. m. during the winter 1919-1920.

(Det øverste Tal i hver Rubrik angiver Temperaturen, det underste Saltholdigheden i %oo.)

(The upper number in each rubric indicates the temperature, the lower the salinity in ‰).

1919—1920	Skagens-Rev	Læsø-Rende	Anholt-Knob	Lappe-Grund	Oddesund	Aalborg	Middelfart	Svendborg-Sund	Kolby-Kaas	Sprogø	Kjels-Nor	Middelgrunds-førstet	Masnedø
1/12—10/12	4.5 31.9	4.7 25.4	4.0 22.5	3.8 19.4	2.2 31.1	1.2 23.4	5.5 20.8	4.3 19.4	3.8 19.7	4.4 20.1	4.3 20.8	5.0 12.6	3.7 12.7
11/12—20/12	4.1 32.2	2.9 24.5	2.7 23.3	2.4 10.6	-0.7 29.6	-1.0 24.0	2.8 17.5	2.3 18.9	2.7 20.3	2.3 16.2	2.1 16.1	3.5 9.5	2.4 9.0
21/12—31/12	1.8 30.5	1.5 25.8	1.5 24.1	1.3 17.3	-0.7 30.3	-1.1 23.7	1.8 19.0	0.1 18.5	1.4 20.6	1.5 18.8	1.5 18.5	2.6 16.3	1.2 11.3
1/1—10/1	2.3 32.8	1.1 27.3	1.4 25.1	0.6 14.9	-0.9 30.2	-1.0 21.1	0.9 19.9	-0.5 18.7	0.6 21.3	0.7 18.2	0.6 17.6	1.9 11.0	0.5 12.2
11/1—20/1	1.4 32.5	1.2 27.6	1.5 27.5	1.2 23.0	-0.2 29.9	-0.7 21.2	1.3 21.4	1.0 19.8	1.1 24.1	1.7 23.3	1.6 23.1	1.9 19.4	1.0 16.4
21/1—31/1	1.9 32.0	1.0 26.8	1.4 27.0	0.9 13.8	0.4 28.7	-0.7 14.5	1.4 20.8	1.3 18.7	1.3 24.4	1.2 20.0	1.1 19.8	1.7 12.5	1.8 11.7
1/2—10/2	2.2 31.2	1.3 26.8	1.3 25.3	1.1 16.7	1.6 29.4	0.4 12.3	1.5 19.6	1.3 18.3	— —	1.4 17.3	1.3 16.1	1.8 12.2	1.4 12.3
11/2—20/2	2.8 31.5	1.5 27.8	1.5 25.3	1.5 19.2	2.5 28.6	1.1 20.1	1.8 20.7	1.9 19.1	— —	1.6 21.9	1.7 20.2	2.0 13.1	1.6 12.9
21/2—29/2	2.7 31.5	1.7 26.2	1.5 24.2	1.7 13.2	2.4 27.5	1.8 16.3	2.3 19.3	2.4 18.2	— —	2.0 17.0	1.8 15.6	2.2 10.2	2.1 11.9
1/3—10/3	3.9 31.4	2.9 26.8	2.3 25.3	2.6 19.5	3.9 28.3	3.9 24.3	2.8 21.6	3.2 19.4	— —	2.6 20.3	2.6 19.6	3.2 17.3	3.0 14.0
11/3—20/3	3.6 31.9	2.3 26.5	2.3 24.4	2.5 10.5	3.1 28.0	2.7 23.5	3.0 19.4	3.6 18.2	— —	2.7 16.7	2.8 16.9	3.0 10.4	2.9 11.4
21/3—31/3	4.6 31.7	3.7 26.1	3.6 22.8	3.8 12.9	5.3 27.9	5.7 24.2	4.3 19.3	4.7 18.6	— —	4.0 15.7	4.0 16.1	3.4 12.7	4.5 11.2

Tab. 4.

Liste over alle observationssteder.

List of all iceobservation stations.

Jyllands Vestkyst.		
Esbjerg	Mariager Fjord.	Kallundborg Fjord
Graadyb	Indl. til Mariager Fjord	St. Bælt udfor Romssø
Farv. v. Vyl Fyrskib	Katteg. v. Rand. og Mariag. Fjd.	Kjerteminde Bugt
Ringkj. Fjord nordl. Del	Randers Fjord	Nyborg Havn
	Indløb til Randers Fjord	Nyborg Fjord
Limfjorden.	Grenaa Havn	Vesterrenden
Thyborøn Kanal	Kattegat ved Grenaa	Østerrenden
Lemvig Havn og Lem Vig	Kattegat ved Hjelm	Korsør Havn
Nissum Bredning	Æbeltoft Vig	St. Bælt ved Omø
Oddsund	Aarhus Bugt	St. Bælt ved Albuen
Struer Havn og Bugt	Aarhus Havn	Nakskov Fjord
Thisted Bredning	Horsens Havn og Fjord	Indløb til Nakskov Fjord
Sallingsund	Farv. Vest for Samsø	St. Bælt ved Kjelsnor
Skive Havn og Fjord	Farv. Syd for Samsø	
Løgstør Bredning	Odense Havn og Kanal	Lille Bælt.
Limfjorden udfør Løgstør	Odense Fjord	Farv. udfør Æbelø
Limfjorden udfør Nibe	Odense Gab	Vejle Havn og Fjord
Aggersund	Mellem Revnsø og Samsø	Bogense Havn
Limfjorden udfør Aalborg	Farvandet udfør Sejrø	Fredericia Havn
Limfjorden Aalborg-Hals	Farv. ved »Schultz's Grund«	Lille Bælt ved Middelfart
	Kattegat ved Hesselø	Kolding Havn og Fjord
Kattegat.		Lille Bælt ved Assens
Ved Skagen	Sundet.	Farvandet udfør Skjoldnæs
Skagen Havn	Farv. udfør Nakkehoved	
Ved Hirtsholmene	Farvandet ved Helsingør	Østersøen.
Frederikshavn	Helsingør Havn	Rødby Havn
Læsø Rende	Sundet ved Kjøbenhavns	Femerbælt udfør Rødby
Frhvn.-Gøteb. vestl. Del	Kjøbenhavns Havn	Nysted Bredning
Frhvn.-Gøteb. østl. Del	Drogden	Farvandet udfør Gjedser
Kattegat Øst for Læsø	Flinterenden	Farvandet udfør Møen
Kattegat Øst for Anholt	Farv. Syd for Drogden	Faxe Bugt, inderste Del
Anholt Havn	Kjøge Bugt, inderste Del	Præstø Havn og Fjord
Udenfor Hals Barre	Farvandet ved Stevns	
	Store Bælt.	Bornholm.
	Kallbg. Havn & indenf. Gisseløre	Rønne Havn
		Østersøen ved Rønne

'ab. 5.

	Isforholdene State of ice												Besejlingsforholdene Navigation												Bemærkninger Remarks	
	Løs Sjæl- og Kvædderis b	Sammenpalitet e	Sjæl- og Kvædderis c	Spredt Drivis k	Drivis f	Svær Drivis i	Pakis h	Skrueis d	Tynd Fastis g	Med Is; n	Skibsf. uhindret o	Skibsf. vanskelig p	f. Sejls. k. m. B. q	Skibsf. lukket r	Skibsf. kun mulig for kraft. Damps. s	Skibsf. kun mulig med Isbryderhj. t	Rende holdes u	Aantal Dage ned Is aaaben m. Isbryder v	Antal Dage med Is aaaben m. Isbryder w	Første Ismelding x	Sidste Ismelding y	Isens største Tykkelse i cm Greatest thickness of ice in cm z				
Jyllands Vestkyst.																										
Esbjerg	2	4	25	3	..	..	..	..	..	14	17	3	..	..	..	..	..	34	18/11	13/1	25	100	19	Drivis
Graadyb	2	1	20	4	..	..	..	..	..	13	10	4	..	..	..	..	..	27	15/11	15/1	100	100	100	
Ringkjøbing Fjord (nordl. Del)	2	2	8	25	3	II	5	I	33	2	II	3	7	7	7	..	60	90	9/11	6/2	19	19	19			
Limfjorden.																										
Thyborøn Kanal	I	I	I	I	..	..	..	..	..	2	..	..	..	..	..	..	..	3	16/11	6/1	10	10	10	
Lemvig Havn og Lem Vig	I	..	3	..	..	..	..	I	18	..	..	5	6	12	..	..	23	13	13/11	8/1	10	10	10	
Nissum Bredning	7	..	2	..	..	..	..	..	..	9	..	..	..	..	..	..	..	9	13/11	21/1	—	—	—	
Oddsund	4	2	..	..	..	..	..	..	..	3	3	..	..	..	..	..	..	6	27/12	1/1	—	—	—	
Thisted Bredning . . . . .	..	27	3	9	..	..	..	4	..	..	7	15	9	12	..	..	..	43	16/11	4/2	—	—	—	
Sallingsund	3	..	6	..	..	..	..	..	..	2	..	3	6	2	..	..	..	46	29/12	8/1	—	—	—	
Skive Havn og Fjord	2	..	5	..	..	..	..	..	..	12	27	..	..	7	..	..	27	3	19/1	31/1	18	18	18	
Løgstør Bredning	7	..	4	..	3	24	..	..	..	..	7	3	I	27	..	..	..	38	25/12	31/1	—	—	—	
Limfjorden udfor Løgstør . . . . .	..	..	14	..	..	30	..	..	..	..	14	7	..	23	..	..	..	44	2/1	13/2	—	—	—	
Limfjorden udfor Nibe . . . . .	..	..	8	..	..	..	..	..	..	13	10	..	..	31	..	..	..	31	28/12	22/1	25	25	25	
Aggersund . . . . .	..	I	25	1	8	3	3	4	23	13	7	15	13	2	..	..	18	68	4/1	12/2	60	60	60	
Limfjorden udfor Aalborg . . . . .	..	8	4	..	..	8	..	..	..	..	4	3	5	8	..	..	..	20	25/12	12/1	10	10	10	
Limfjorden Aalborg-Hals . . . . .	..	5	..	6	..	..	..	..	..	II	..	..	6	5	11	..	..	22	27/12	17/1	10	10	10	
Kattegat.																										
Frederikshavn	3	..	..	..	..	..	..	..	..	I	2	..	..	..	..	..	..	3	30/12	1/1	—	—	—	
Mariager Fjord . . . . .	..	..	12	..	..	..	13	..	19	16	..	19	12	..	17	..	12	60	13/11	31/1	—	—	—	
Indløb til Mariager Fjord	5	22	..	2	3	..	..	..	17	..	3	10	33	..	3	..	..	49	17/11	3/2	—	—	—	
Randers Fjord	7	5	6	8	I	..	..	..	35	..	5	11	46	..	..	..	..	62	10/11	2/2	—	—	—	
Indløb til Randers Fjord	5	II	35	..	..	..	..	..	13	..	17	4	43	..	..	..	23	64	13/11	3/2	—	—	—	
Aarhus Havn	2	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	2	28/12	29/12	—	—	—	
Horsens Havn og Fjord	I	..	..	..	..	..	..	..	19	..	I	3	16	..	..	..	..	5	15/11	10/1	—	—	—	
Odense Havn og Kanal	2	8	7	I	..	4	..	..	II	I	I	13	20	..	..	..	..	34	16/11	12/1	2	2	2	
Odense Fjord	4	..	14	..	..	..	..	..	8	..	7	19	..	..	..	..	26	17/11	12/1	10	10	10		
Odense Gab . . . . .	..	..	13	..	I	..	..	..	..	II	I	..	..	..	..	..	14	29/12	11/1	14	14	14		
Sundet.																		I	6/1	6/1	—	—	—			
Farv. ved Helsingør . . . . .	..	..	1	..	..	..	..	..	..	..	I	..	2	..	..	..	..	2	6/1	7/1	—	—	—	
Helsingør Havn	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	6/1	7/1	—	—	—	
Store Bælt.																		26	15/11	15/1	18	18	18			
Nakskov Fjord . . . . .	..	..	7	..	..	..	2	17	..	..	3	23	..	..	..	..	..	2	15/11	16/11	18	18	18	
Indløbet til Nakskov Fjord	2	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	—
Lille Bælt.																		19	14/11	8/1	—	—	—			
Vejle Havn og Fjord	I	31	21	10	19	31	18/11	8/1	—	—	—		
Kolding Havn og Fjord	2	4	3	I	II	3	19	19	22	18/11	8/1	10	10	10		
Østersøen.																		33	17/11	18/1	18	18	18			
Nysted Bredning	2	..	..	..	..	..	..	..	19	12	2	6	11	2	12	..	3	45	16/11	19/1	14	14	14	
Præstø Havn og Fjord	8	2	2	..	10	23	2	13	5	5	13	I	6	..	45	16/11	19/1	14	14	14		
Isefjorden.																										
Indløbet til Rørvig	7	9	..	..	..	..	..	..	..	..	9	7	..	..	..	..	..	16	25/12	9/1	—	—	—	
Nykøbing Havn og Fjord	3	2	..	8	5	..	..	..	12	..	..	5	12	..	..	..	..	17	30/12	30/1	—	—	—	
Holbæk Havn og Fjord . . . . .	..	..	I	..	I	..	..	..	25	5	..	..	16	14	8	5	..	43	14/11	20/1	—	—	—	
Roskilde Havn . . . . .	..	..	3	..	9	3	..	..	II	29	..	19	..	7	7	..	..	51	14/11	2/2	14	14	14	
Roskilde Fjord . . . . .	..	..	3	..	9	3	..	..	II	29	..	19	..	7	7	..	..	55	14/11	31/1	12	12	12	
Smaalandsfarvandet.																										
Skjelskør Havn og Fjord	I	2	7	..	..	..	..	..	..	..	3	9	7	..	..	..	..	19	15/11	18/1	—	—	—	
Karrebæksminde Havn	5	..	..	..	..	..	..	..	..	..	5	..	..	..	..	..	..	5	3/1	7/1	—	—	—	
Staaldybet	3	I	13	2	..	..	..	..	..	12	7	..	..	..	..	..	..	19	11/12	7/1	—	—	—	
Bandholm Havn	4	23	4	23	3	27	10/12	12/1	13	13	13		
Farvandet udfor Bandholm	4	..	6	7	..	..	..	..	..	II	..	6	..	..	..	..	..	17	27/12	12/1	10	10	10	
Guldborg Sund udf. Nykøbing	..	..	7	..	..	..	..	..	II	..	..	..	18	..	..	..	..	18	17/11	18/1	6	6	6	
Guldborg Sund nordl. Del. . . . .	..	..	7	..	..	..	..	..	II	..	..	..	18	..	..	..	..	18	17/11	18/1	6	6	6	
Guldborg . . . . .	..	27	..	..	..	..	..	..	..	..	..	27	..	..	..	..	..	27	18/11	14/1	—	—	—	
Kallehave-Stegede	II	I	15	I	9	13	II	8	30	I	..	9	22	5	62	13/11	31/1	16	16	16		
Bøgestrømmen . . . . .	..	..	..	..	..	5	..	..	8	..	5	..	8	..	..	..	..	21	29/12	18/1	—	—	—	
Farvandet S. for Fyen.																										
Faaborg Havn og Fjord	6	..	..	..	..	..	..	..	..	..	6	..	..	..	..	..	..	6	8/1	13/1	—	—	—	
Rudkjøbing Havn . . . . .	..	..	..	..	..	..	..	..	..	..	2	..	2	..	..	..	..	2	29/12	30/12	—	—	—	
Rudkjøbing Løb nordre Del.	2	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	2	29/12	30/12	—	—	—	
Marstal Havn	3	..	..	..	..	..	..	..	..	..	8	..	II	..	..	..	..	II	17/12	4/1	—	—	—	
Farvandet ved Marstal	I	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	I	27/12	27/12	—	—	—	

Oversigt over Inddragningen af danske Fyrskibe under Isforhold.

Oplysningerne begynder 1879*)

*Withdrawal of Danish light-ships during ice.
The reports commence 1879*).*

	Vinteren 1919—1920		Antal Dage fra Station paa Grund af Is <i>Number of days of the station on account of ice</i>	Har siden 1879 været inddraget <i>Withdrawn since 1879</i>			Bemærkninger <i>Remarks</i>
	Inddraget withdrawn	Udlagt replaced		i Antal Vintre <i>Number of winters</i>	Alt Dage Total number of days	Antal Dage pr. Vinter med Is <i>Number of days pr. winter with ice</i>	
Horns-Rev.....			Var inddraget af andre Aarsager end Is i Vinteren 1919—20.	—	1	3	3
Vyl.....			Withdrawn during the winter 1919—20 from other causes than ice.	—	1	12	12
Graadyb			—	1	8	8	*) {Udlagt i 1906. Established in 1906.
Skagens-Rev	—	—	—	11	394	36	
Læsø-Trindel	—	—	—	12	431	36	
Læsø-Rende	—	—	—	13	463	36	
Østre-Flak	—	—	—	3	89	30	*) {Udlagt i Juli 1908. Established in July 1908.
Anholt-Knob.....	—	—	—	14	509	36	
Schultz-Grund	—	—	—	13	524	40	
Lappe-Grund	—	—	—	14	364	26	*) {Oplysningerne begynder 1883. The reports commence 1883.
Drogden	—	—	—	14	561	40	
Gjedser-Rev	Som Horns-Rev	—	12	521	43		

Tab. 7.

Sammenligning mellem de forskellige Vintre.

Comparison between the various winters.

Antal Dage med Is for: <i>Number of days with ice in:</i>	1906 —07	1907 —08	1908 —09	1909 —10	1910 —11	1911 —12	1912 —13	1913 —14	1914 —15	1915 —16	1916 —17	1917 —18	1918 —19	1919 —20
Aabne Farvande..... <i>(The fairways)</i>	6.6	0.2	18.6	0.1	0.0	17.7	0.3	0.1	0.0	0.1	21.4	1.2	0.7	0.0
Havne ved aabent Farvand..... <i>(Harbours situated at the fairways)</i>	17.4	2.9	28.4	2.2	0.5	20.4	3.2	2.1	0.5	2.7	33.5	6.1	4.4	2.7
Tildels lukkede Farvande..... <i>(Partly closed waters)</i>	24.2	6.7	41.0	2.1	0.2	35.1	6.2	4.6	2.7	3.7	50.7	9.1	8.5	6.9
Havne ved indelukkede Farvande..... <i>(Harbours situated in closed waters)</i>	52.8	25.5	69.2	14.2	9.6	49.1	18.4	15.0	16.9	18.1	71.6	34.3	28.6	24.8
Indelukkede Farynde..... <i>(Closed waters)</i>	57.9	32.2	66.3	20.7	5.6	52.9	19.1	16.6	19.3	22.1	78.5	48.1	31.1	41.0
Alle Stationer..... <i>(All stations)</i>	30.3	10.1	38.8	5.7	2.4	31.5	7.4	6.0	6.1	7.3	44.9	15.3	11.6	11.9
Middeltal af Kuldemængde for Stat. i Tab. II.. <i>(Mean amount of cold for the stations in Tab. II.)</i>	121.1	65.8	151.6	37.9	23.9	128.6	31.9	49.2	66.3	68.2	169.5	79.4	65.2	64.3