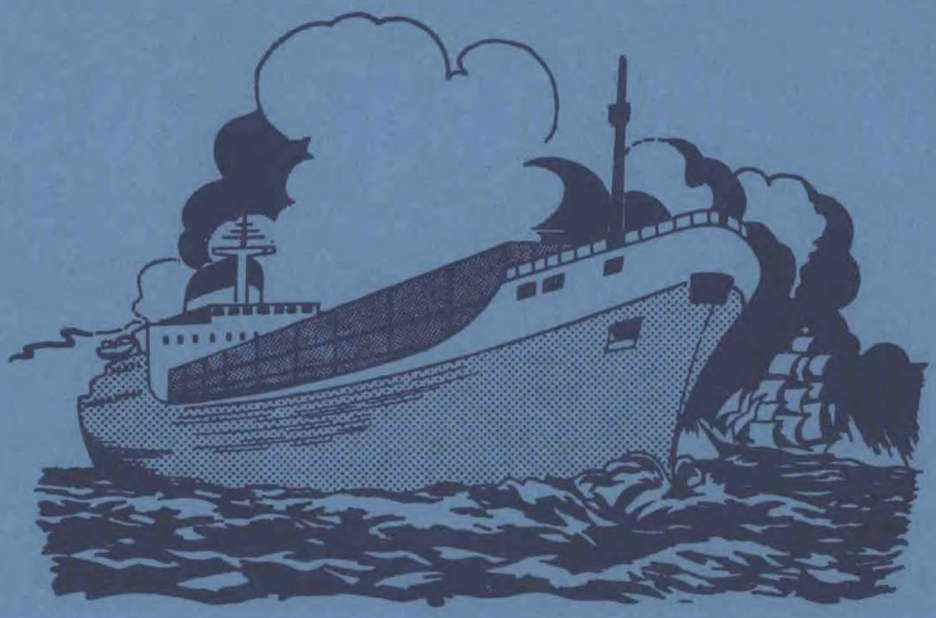
Met. O. 932

The Marine Observer

A quarterly journal of Maritime Meteorology



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THE MARINE OBSERVER

A QUARTERLY JOURNAL OF MARITIME METEOROLOGY PREPARED BY THE MARINE DIVISION OF THE METEOROLOGICAL OFFICE

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CONTENTS

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EXCELLENT AWARDS 1979

Following the practice commenced in 1924 of making awards to the Masters, Principal Observing Officers and Radio Officers of the 100 highest quality meteorological logbooks received in the preceding year, we once again publish a list of the recipients and their shipping companies in the July edition of this journal. The list for 1979 appears on page 99 to page 103 of this issue and it gives considerable pleasure to offer our congratulations to the Masters and Officers named therein. Once again our sympathies go to the many Masters and Officers whose logbooks received an excellent assessment but who have not qualified for an award.

As in former years the assessing of the logbooks has been undertaken with care, bearing in mind the type of ship, number of observing officers, whether a radio officer is carried, trade engaged in and many other factors. We have so many books where the observations themselves are first class, but without any extra material, that the inclusion of ocean current data and reports made in the additional remarks pages play a major part in boosting the marks to a required award standard. However, no matter how good the ocean current data and additional reports may be, the book will not make the grade if the observations themselves are not up to scratch.

From the 1201 logbooks received during 1979 the undermentioned 6 ships were considered to be the most outstanding:

1. m.v. *Glenpark* (Denholm Ship Management Ltd), Captain F. Danks
2. m.v. *Summity* (F. T. Everard and Sons Ltd), Captain W. G. Hunt
3. s.s. *ACT 1* (Blue Star Ship Management Ltd), Captain C. P. Leighton
4. m.v. *Mairangi Bay* (Container Fleets Ltd), Captain W. A. Murison
5. m.v. *Cape Ortegal* (Lyle Shipping Company Ltd), Captain W. A. Anderson
6. m.t. *St Jasper* (Thomas Hamling and Company Ltd), Skipper E. J. Johnson

Special congratulations are due to these ships, in particular m.v. *Summity* which is appearing in our short list for the third time (each time commanded by Captain W. G. Hunt) and to m.v. *Mairangi Bay* which is making her second appearance on the list. Photographs of the first 3 ships appear opposite page 104.

A total of 13 awards has been allotted to trawler skippers and radio officers, a high percentage from the much depleted U.K. trawler fleet. Awards to the only non-instrumental trawler together with awards to 4 MARID ships—vessels engaged on short-sea voyages which take sea temperatures only—appear separately after the main list.

The recipients of the awards will be notified by post and requested to provide an address to which the award may be sent. Any Master or Officer seeing his name in this list, or in any other list published by his Company before hearing directly from us, is requested to write and claim his award giving us a forwarding address.

The initial award is normally the *University Atlas* followed as a second award by *Cassell's English Dictionary*. The book selected this year as the third award is *Bligh* by Gavin Kennedy. The Atlas still appears to be very popular but this year there are so many officers appearing on the list for the first time that some of them will have to receive the Dictionary or, perhaps, even the book of the year instead of the Atlas. However, when they come up for a second award we will endeavour to have an Atlas available.

J.D.B.

EXCELLENT AWARDS (Year ended 31 December 1979)

Captain	Company
N. B. Airey	Ellerman Lines Ltd
A. G. Allson	Cayzer Irvine Shipping Co. Ltd
W. A. Anderson	Lyle Shipping Co. Ltd
I. Y. Batley	P. & O. S.N. Co.
P. St. Q. Beadon	Cayzer Irvine Shipping Co. Ltd
R. Bell	Ellerman Lines Ltd
F. G. Bevis	P. & O. S.N. Co.
B. S. Biggs	Cayzer Irvine Shipping Co. Ltd
J. Bold	Ocean Transport & Trading Ltd
A. F. Bonehill	Townsend-Thoresen Car Ferries Ltd
E. M. Bowen	Natural Environment Research Council
K. Bramley	Shell Tankers (U.K.) Ltd
W. Brettell	J. Marr & Sons Ltd
D. Brown	Ellerman Lines Ltd
D. G. Brown	Ocean Transport & Trading Ltd
G. Brown	F. T. Everard & Sons Ltd
J. M. Burn	P. & O. S.N. Co.
A. T. Campbell	Cayzer Irvine Shipping Co. Ltd
P. J. Clark	Container Fleets Ltd
M. J. Cole	British Antarctic Survey
A. Cookson	Manchester Liners Ltd
N. Corkill	Ellerman Lines Ltd
P. E. Craven	Boston Deep Sea Fisheries Ltd
F. Danks	J. & J. Denholm Ltd
T. K. Dawson	F. T. Everard & Son Ltd
M. Edward	Townsend-Thoresen Car Ferries Ltd
A. J. Evans	Ellerman Lines Ltd
W. A. Fitzgerald	Ocean Transport & Trading Ltd
J. R. French	Ministry of Agriculture, Fisheries & Food
T. Fyfe	Ben Line Steamers Ltd
J. S. Gavin	Bibby Line Ltd
W. P. Goldie	Ocean Transport & Trading Ltd
G. M. Gough	B.P. Tanker Co. Ltd
I. T. Groundwater	James Fisher & Sons Ltd
J. W. M. Guy	B.P. Tanker Co. Ltd
T. F. J. Harper	Esso Petroleum Co. Ltd
M. J. Heron	Container Fleets Ltd
R. A. Holmes	Cunard S.S. Co. Ltd
K. E. Howard	Container Fleets Ltd
L. E. Howell	Container Fleets Ltd
W. J. Howson	Cayzer Irvine Shipping Co. Ltd
W. G. Hunt	F. T. Everard & Sons Ltd
J. H. Hutson	Container Fleets Ltd
R. Hyam	Esso Petroleum Co. Ltd
J. Illingworth	Manchester Liners Ltd
E. L. Jackson	Cunard S.S. Co. Ltd
E. J. Johnson	T. Hamling & Co. Ltd
C. C. Jorgensen	Esso Petroleum Co. Ltd
T. E. Kelso	P. & O. S.N. Co.
J. N. Kerr	British United Trawlers Ltd
R. W. Kerley	Shell Tankers U.K. Ltd
J. S. Laidlaw	P. & O. S.N. Co.
S. J. Lawrence	British Antarctic Survey
C. P. Leighton	Blue Star Line Ltd
R. E. Lowther	P. & O. S.N. Co.
D. R. Mackillop	Blue Star Line Ltd
D. T. MacLachlan	Ocean Transport & Trading Ltd
F. P. McGuckin	Blue Star Line Ltd
D. McPhail	Blue Star Line Ltd
C. T. Marchant	Salen (U.K.) Ship Management Ltd
C. P. Margeson	Cunard S.S. Co. Ltd
T. Moor	Hadley Shipping Co. Ltd
H. J. Morrell	Gardline Shipping Ltd
J. K. Munday	London & Overseas Freighters Ltd
W. A. Murison	Container Fleets Ltd
Mr I. C. Murray	Thalassa (Offshore) Scotland Ltd
H. R. Owen	Bibby Line Ltd
A. J. Palmer	Ocean Transport & Trading Ltd
P. Parrott	Shell Tankers (U.K.) Ltd
E. M. S. Phelps	British Antarctic Survey
J. M. Phillips	Esso Petroleum Co. Ltd
R. H. Plant	Townsend-Thoresen Car Ferries Ltd

EXCELLENT AWARDS (*contd.*)

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R. A. Reay	Salen (U.K.) Ship Management Ltd
E. J. Reilly	Cable & Wireless Co. Ltd
A. J. A. Richards	F. T. Everard & Sons Ltd
D. Y. Roberts	Department of Trade
M. J. K. Rodaway	B.P. Tanker Co. Ltd
J. R. Rodger	Ben Line Steamers Ltd
B. Austen-Smith	P. & O. S.N. Co.
G. H. Selby-Smith	Natural Environment Research Council
A. M. Skellern	B.P. Tanker Co. Ltd
O. Springett	Geest Industries Ltd
A. Sugden	P. & O. S.N. Co.
L. Taylor	Manchester Liners Ltd
W. D. Templeman	Esso Petroleum Co. Ltd
J. S. Thorpe	Container Fleets Ltd
C. B. Tingle	Sir R. Ropner & Co. Ltd
R. Towell	B.P. Tanker Co. Ltd
J. A. Twiselton	F. T. Everard & Sons Ltd
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W. H. Walker	Maersk (U.K.) Co. Ltd
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J. St. H. Webber	Port Line Ltd
B. Wharam	Boston Deep Sea Fisheries Ltd
P. L. Whitehouse	F. T. Everard & Sons Ltd
T. W. Willows	Ocean Transport & Trading Ltd
J. P. Wishart	Ocean Transport & Trading Ltd
R. T. Wood	Container Fleets Ltd
E. Wooldridge	T. Hamling & Co. Ltd
T. D. Young	Cayzer Irvine Shipping Co. Ltd

Principal Observing Officer	Company
R. D. Anderson	Container Fleets Ltd
R. A. Bagnall	Ellerman Lines Ltd
P. E. Bailey	Cunard S.S. Co. Ltd
A. Ball††	T. Hamling & Co. Ltd
C. J. Batty	Cayzer Irvine Shipping Co. Ltd
A. A. Beattie	B.P. Tanker Co. Ltd
M. L. Bechley	Townsend-Thoresen Car Ferries Ltd
J. S. Blamires	London & Overseas Freighters Ltd
A. Bond	Manchester Liners Ltd
J. H. Brechin	B.P. Tanker Co. Ltd
M. B. J. Byford	P. & O. S.N. Co.
I. S. Cairns	Ocean Transport & Trading Ltd
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N. O. Carpenter	Container Fleets Ltd
R. A. Chadney	Cayzer Irvine Shipping Co. Ltd
A. W. Christie	P. & O. S.N. Co.
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M. Light	James Fisher & Sons Ltd
L. J. Loftus	B.P. Tanker Co. Ltd
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R. G. MacDonald	J. & J. Denholm Ltd
A. MacIntyre	F. T. Everard & Sons Ltd
I. McNaught	Bibby Line Ltd
P. B. Markides	Esso Petroleum Co. Ltd
S. L. Moorby	Western Shipping Ltd
R. E. Niven	Ellerman Lines Ltd
G. S. Nixon	Esso Petroleum Co. Ltd
D. R. Norman	Shell Tankers (U.K.) Ltd
P. T. Oldfield	Natural Environment Research Council
D. Parrish	Container Fleets Ltd
R. J. Pearson	P. & O. S.N. Co.
M. J. Pinder	Salen (U.K.) Ship Management Ltd

N. D. Cleave	Cunard S.S. Co. Ltd
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N. A. Cooke	Container Fleets Ltd
E. W. Cooper	Sugar Line Ltd
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W. D. Coverdale	Natural Environment Research Council
J. A. Dick	Blue Star Line Ltd
J. G. W. Dixon	Ocean Transport & Trading Ltd
P. Doyle	Manchester Liners Co. Ltd
N. J. Eliason	Port Line Ltd
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M. Forder	Esso Petroleum Co. Ltd
B. G. Fowler	P. & O. S.N. Co.
A. Fulcher	Boston Deep Sea Fisheries Ltd
R. Graham	Ministry of Agriculture Fisheries & Food
M. W. Hannah	Ocean Transport & Trading Ltd
D. Harding	Ocean Transport & Trading Ltd
W. J. M. Hargreaves	Bibby Line Ltd
D. P. Hawkins	Gardline Shipping Ltd
R. G. Head	Cayzer Irvine Shipping Co. Ltd
Eng Siang Heah	Ben Line Steamers Ltd
P. J. M. Hickmott	Cayzer Irvine Shipping Co. Ltd
J. R. Hollamby	Container Fleets Ltd
A. D. Honeyborne	Cunard S.S. Co. Ltd
D. A. Hore	Wallem Ship Management (U.K.) Ltd
J. C. Hoy	Container Fleets Ltd
T. J. Illingworth	Ocean Transport & Trading Ltd
P. Jameson	Shell Tankers (U.K.) Ltd
T. S. Johnston	Shell Tankers (U.K.) Ltd
C. P. Jones	Silver Line Ltd
R. M. Kendrick	Maersk (U.K.) Co. Ltd
J. A. Kent	P. & O. S.N. Co.
G. J. Knowles	Thalassa (Offshore) Scotland Ltd
R. C. Lauder	Lyle Shipping Co. Ltd
R. W. Lawrie	Ben Line Steamers Ltd
S. W. Ponter	Ellerman Lines Ltd
J. Potter	P. & O. S.N. Co.
P. G. Powell	F. T. Everard & Sons Ltd
M. J. Power	Container Fleets Ltd
G. S. A. Rasmussen	Ellerman Lines Ltd
A. M. T. Reading	British Antarctic Survey
I. Roberts	Esso Petroleum Co. Ltd
M. G. Robson	Ocean Transport & Trading Ltd
J. Ronald	B.P. Tanker Co. Ltd
I. A. Ross	Cayzer Irvine Shipping Co. Ltd
M. Ruane	Department of Trade
D. W. Saunders	Container Fleets Ltd
R. P. Sharman	B.P. Tanker Co. Ltd
C. Sheen	Boston Deep Sea Fisheries Ltd
N. B. H. Skinner	F. T. Everard & Sons Ltd
R. A. Somerville	Blue Star Line Ltd
R. Spall	British United Trawlers Ltd
D. Spurling	F. T. Everard & Sons Ltd
J. M. Stafford	P. & O. S.N. Co.
W. J. Stoker	Ocean Transport & Trading Ltd
T. Stone	Esso Petroleum Co. Ltd
P. M. Taylor	Shell Tankers (U.K.) Ltd
K. Thomas	Geest Industries Ltd
D. W. Thompson	Container Fleets Ltd
C. K. Urwin	Container Fleets Ltd
S. Wainwright	Cayzer Irvine Shipping Co. Ltd
P. R. Walton	Ellerman Lines Ltd
I. M. Ward	Cayzer Irvine Shipping Co. Ltd
A. S. Warman	J. Marr & Sons Ltd
D. P. Webb	Blue Star Line Ltd
D. G. Wilcockson	Sir R. Ropner & Co. Ltd
R. J. Williams	Cunard S.S. Co. Ltd
D. Wilson	Cable & Wireless Co. Ltd
P. G. Wright	Ocean Transport & Trading Ltd
J. C. S. Yeo	Hadley Shipping Co. Ltd

EXCELLENT AWARDS (*contd.*)

Radio Officer	Company
B. J. F. Adkin	P. & O. S.N. Co.
A. P. Alister	Redifon Telecommunications Ltd
N. A. Allison	Panocean-Anco Ltd
C. Anderson	P. & O. S.N. Co.
E. Avery	F. T. Everard & Sons Ltd
R. P. Bate	Container Fleets Ltd
K. Batty**	T. Hamling & Co. Ltd
K. Bent	Ocean Transport & Trading Ltd
J. Blackwell	Cayzer Irvine Shipping Co. Ltd
P. W. Bolton	International Marine Radio Co. Ltd
S. J. Braithwaite	Container Fleets Ltd
P. R. Breivik	Bibby Line Ltd
B. G. Bridge*	Weston Shipping Ltd
J. J. Briggs	P. & O. S.N. Co.
R. C. Briggs	International Marine Radio Co. Ltd
C. Brown	Marconi International Marine Co. Ltd
B. C. Bull	Townsend-Thoresen Car Ferries Ltd
M. D. A. Bull	P. & O. S.N. Co.
J. C. Byrne	Ellerman Lines Ltd
J. Cardownie	Cayzer Irvine Shipping Co. Ltd
C. S. Carver	Cunard S.S. Co. Ltd
A. C. Catt	International Marine Radio Co. Ltd
A. D. Clarke	International Marine Radio Co. Ltd
R. M. Clifford	P. & O. S.N. Co.
P. Cook	Container Fleets Ltd
M. J. Corry	Canadian Pacific Steamships Ltd
G. P. Curran	Marconi International Marine Co. Ltd
R. F. Davies	Radio & Electronic Services Ltd
B. T. Davis	P. & O. S.N. Co.
N. Doherty	Shell Tankers (U.K.) Ltd
R. Durstan	International Marine Radio Co. Ltd
W. J. Ferry	Dart Containerline Ltd
M. J. Fitzgerald	Cunard S.S. Co. Ltd
I. Forbes	P. & O. S.N. Co.
D. Galbraith	Cayzer Irvine Shipping Co. Ltd
P. Gooch	Ocean Transport & Trading Ltd
V. A. Gorny	Container Fleets Ltd
J. Kirkwood	Marconi International Marine Co. Ltd
D. Letcher	International Marine Radio Co. Ltd
A. D. Macgillivray	P. & O. S.N. Co.
I. Macleod	B.P. Tanker Co. Ltd
W. Macleod	Shell Tankers (U.K.) Ltd
D. A. C. MacRae	International Marine Radio Co. Ltd
D. McGovern	P. & O. S.N. Co.
S. McMurdo	Marconi International Marine Co. Ltd
R. Mallett	British Rail
I. E. A. Alland-Martin	International Marine Radio Co. Ltd
P. A. Mathews	Container Fleets Ltd
J. A. Maxwell	Cayzer Irvine Shipping Co. Ltd
D. C. Millar	International Marine Radio Co. Ltd
M. G. Moir	Bibby Line Ltd
I. Morgan	Marconi International Marine Co. Ltd
P. C. Morris	Townsend-Thoresen Car Ferries Ltd
B. A. Mullan	Container Fleets Ltd
K. Mutimear	Kelvin Hughes Ltd
H. M. O'Gorman	British Antarctic Survey
D. Owen	International Marine Radio Co. Ltd
R. A. Parsons*	F. T. Everard & Sons Ltd
H. G. Pask**	T. Hamling & Co. Ltd
I. Pentland-Price	B.P. Tanker Co. Ltd
S. E. Philpott	B.P. Tanker Co. Ltd
W. G. Pierce*	F. T. Everard & Sons Ltd
M. S. Price	Marconi International Marine Co. Ltd
P. S. Rivington	Cunard S.S. Co. Ltd
N. Samuel	Marconi International Marine Co. Ltd
N. E. Scott	International Marine Radio Co. Ltd
H. Segrave	United Marine Electronics (U.K.) Ltd
G. Selby	International Marine Radio Co. Ltd
M. J. Sheldon	Ellerman Lines Ltd
W. F. Shepherd	Container Fleets Ltd
R. Shone	P. & O. S.N. Co.
D. C. Short	Sir Wm. Reardon Smith & Sons Ltd
N. R. Smirk	International Marine Radio Co. Ltd
P. Latter-Stapley	Marconi International Marine Co. Ltd

J. Grange	Marconi International Marine Co. Ltd
G. P. Graus	P. & O. S.N. Co.
P. J. Griffin	Redifon Telecommunications Ltd
A. M. Guest	P. & O. S.N. Co.
N. Hadley	Marconi International Marine Co. Ltd
R. J. Harris	P. & O. S.N. Co.
M. J. Hearle	Newgate Shipping Co. Ltd
S. Hollingworth	International Marine Radio Co. Ltd
H. Hopkins	B.P. Tanker Co. Ltd
G. Hulse	Hadley Shipping Co. Ltd
D. Johnston	United Marine Electronics Ltd
A. W. Jones	Ocean Transport & Trading Ltd
P. Jordan	Marconi International Marine Co. Ltd
P. Keen	Redifon Telecommunications Ltd
R. Stevens	Ocean Transport & Trading Ltd
D. R. Taylor	International Marine Radio Co. Ltd
W. F. Taylor	Cunard S.S. Co. Ltd
W. G. Thomas	Cunard S.S. Co. Ltd
A. G. Thomson	Ocean Transport & Trading Ltd
C. K. Thornalley	Container Fleets Ltd
M. Tindall*	F. T. Everard & Sons Ltd
A. Titley	Container Fleets Ltd
R. L. G. Townsend-Rose	Marconi International Marine Co. Ltd
R. W. Wade**	British Antarctic Survey
B. Whiteford	Cayzer Irvine Shipping Co. Ltd
S. Williamson	Redifon Telecommunications Ltd
R. A. Wilson	Curnow Shipping Ltd
R. Woodward	P. & O. S.N. Co.

'MARID' SHIPS†

Captain	Principal Observing Officer	Radio Officer	Owners/Manager
A. Ogilby	T. A. Wright	T. H. Webb	Townsend-Thoresen Car Ferries Ltd
J. Hope-Smith	W. B. Wilson	P. Hornby	Esso Petroleum Co. Ltd
I. Leggatt	A. King	L. Cathie	P. & O. Normandy Ferries Ltd
D. Anderson	R. H. Edwards	B. Holdsworth	P. & O. S.N. Co.

TRAWLERS (non-instrumental)

Skipper	Radio Operator	Trawler Owners
P. Garner	A. Spence	Boyd Line Ltd

*Deck Officer
**Also Principal Observing Officer
†Vessels recruited for the purpose of observing and transmitting sea temperatures with non-instrumental observations in the North Sea.
††Trawler Skipper. Incorrectly included in Principal Observing Officers' List

July, August, September

The Marine Observers' Log is a quarterly selection of observations of interest and value. The observations are derived from the logbooks of marine observers and from individual manuscripts. Responsibility for each observation rests with the contributor.

Observing officers are reminded that preserved samples of discoloured water, luminescent water, etc. considerably enhance the value of such an observation. Port Meteorological Officers in the U.K. will supply bottles, preservative and instructions on request.

TYPHOON IRVING

Korean waters

m.v. *Wild Gannet*. Captain F. S. Angus. At anchor off Pusan. Observers, the Master, Mr M. J. Stopford, Chief Officer, Mr J. T. Jenkins, 2nd Officer and Mr A. R. Woodhouse, 3rd Officer.

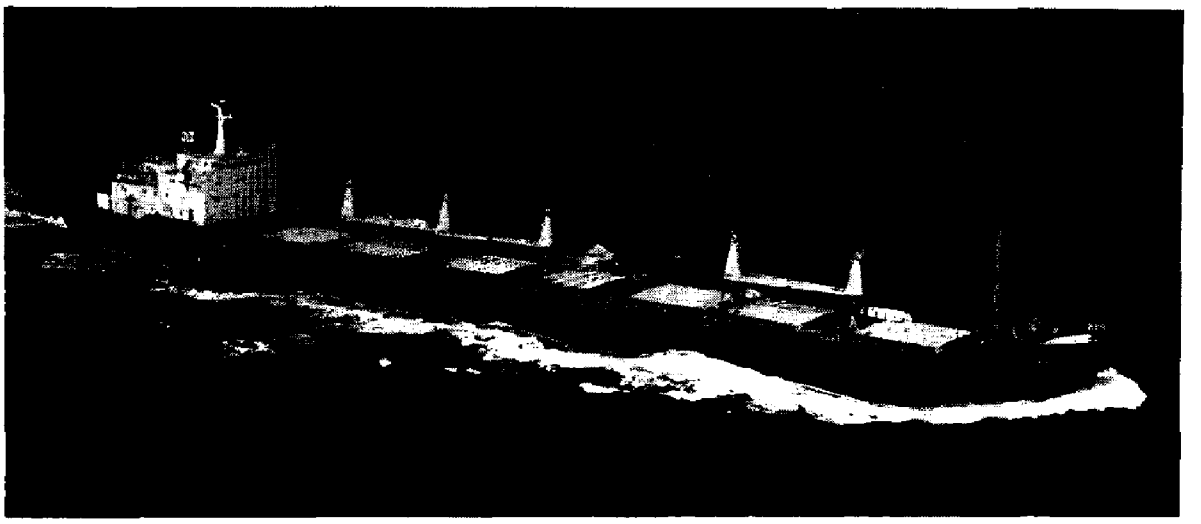
13 August 1979. At 1800 GMT typhoon Irving was reported to be in position 23° 00′ N, 125° 30′ E moving NNW at 15 knots, central pressure 965 mb, winds of 70 knots near the centre. At this time the vessel was at anchor off Pusan.

At 1000 on the 16th the vessel weighed anchor and course was set towards the Korea Strait in order to avoid the centre of the storm; by this time the storm had started to recurve and was reported to be in position 30° 48′ N, 123° 36′ E now moving north at 12 knots, central pressure 955 mb.

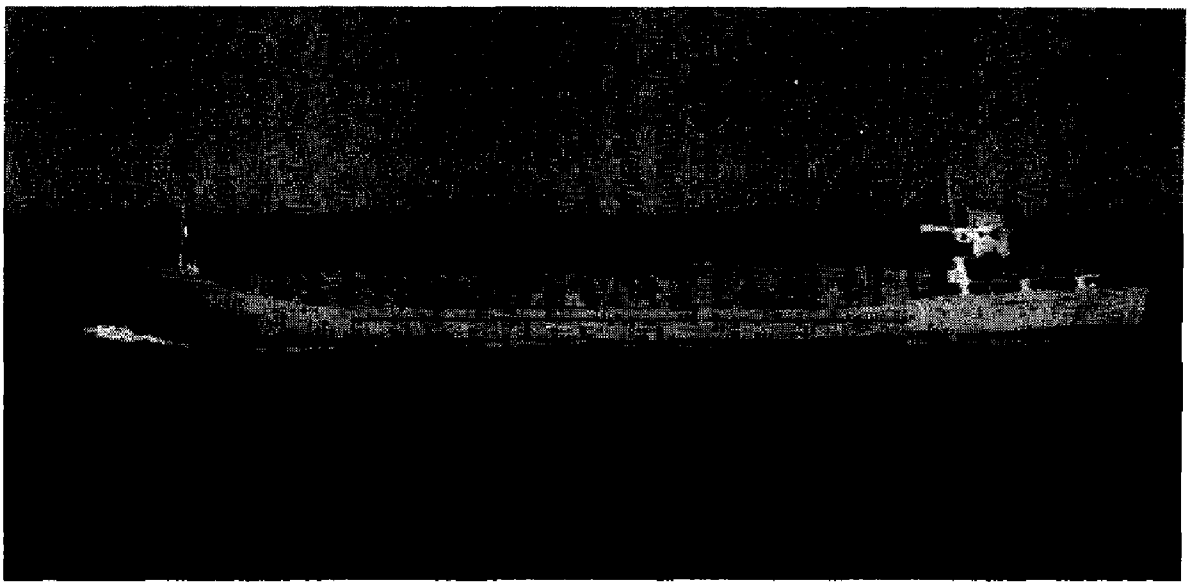
The following are extracts from the log as the storm proceeded on its path to the north of the vessel; at its closest approach the centre of the storm was approximately 100 n. mile away.

	GMT	
16 Aug.	0300	Wind E'S, force 3, barometric pressure 1004·0 mb, slight sea, moderate S'ly swell.
	0700	Wind NE, force 4, rough sea, heavy swell.
	1500	Wind SE, force 4, barometric pressure 1001·2 mb, moderate sea, heavy SE'ly swell.
	2300	Wind SE, force 6, barometric pressure 996·8 mb, rough sea, heavy SE'ly swell.
17 Aug.	0300	Wind SSE, force 8, barometric pressure 991·7 mb, rough sea, steep SE'ly swell.
	0700	Wind S'E, force 9, barometric pressure 987·0 mb, very rough sea, very heavy S'ly swell.

opposite page 104



Glenpark (Denholm Ship Management Ltd.) Captain F. Danks



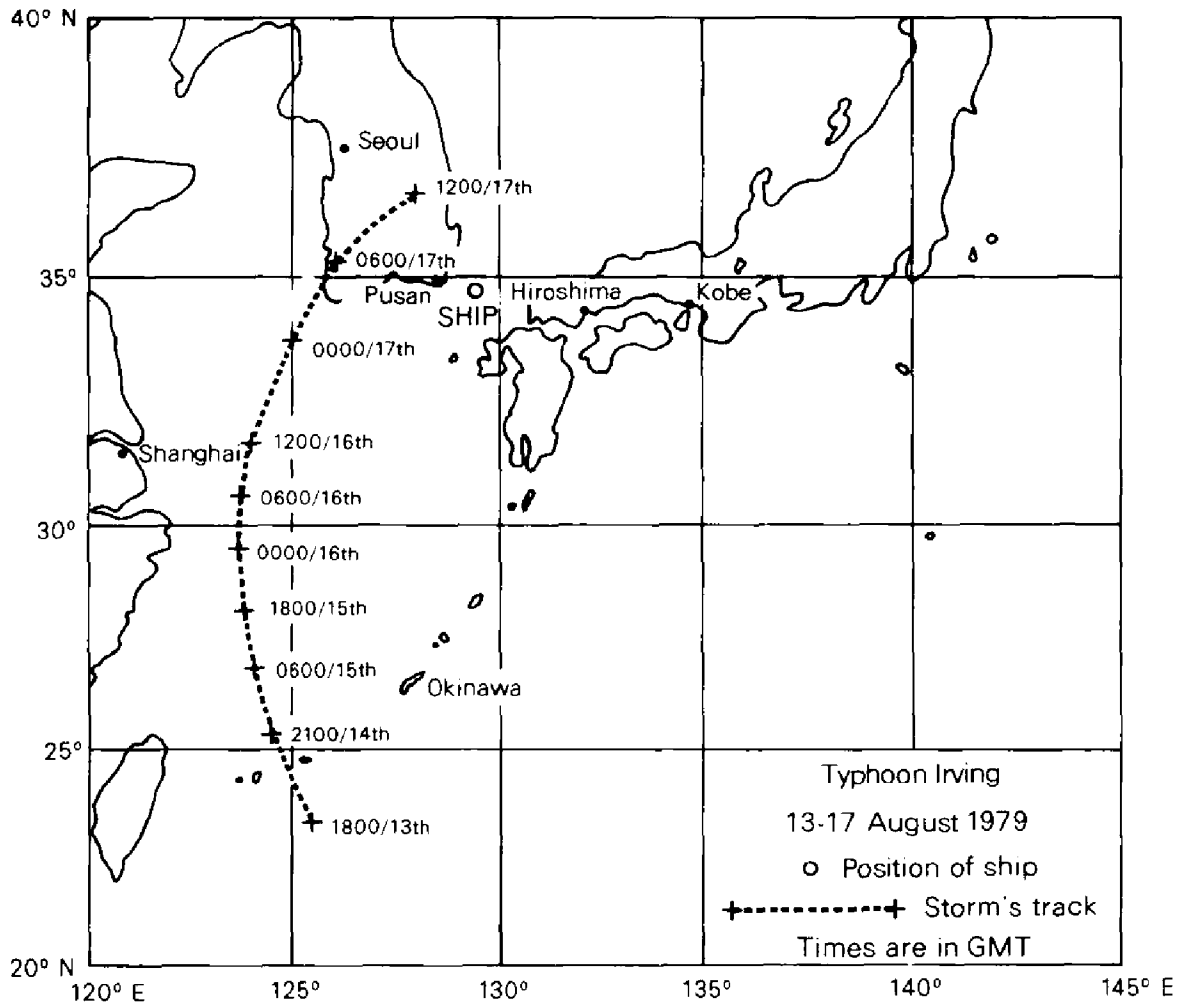
Summity (F. T. Everard & Sons Ltd.) Captain W. G. Hunt

ACT 1. (Blue Star Ship Management Ltd.) Captain C. P. Leighton

THE THREE SHIPS WHICH GAINED THE HIGHEST MARKINGS FOR THEIR METEOROLOGICAL LOGBOOKS DURING THE YEAR 1979 (*see* page 98)

opposite page 105

Waterspout observed from the *Loch Lomond* (*see* page 107)



1100 Wind SW'S, force 9, barometric pressure 988·6 mb, very rough sea, very heavy SSW'ly swell.

1900 Wind SW'W, force 7, barometric pressure 994·8 mb, very rough sea, heavy SW'ly swell.

18 Aug. 0300 Wind W, force 5, barometric pressure 1000·5 mb, moderate to rough sea, moderate WSW'ly swell.

Approx. position of ship at 1800 on the 13th: 35° 00′ N, 129° 00′ E.

Note. The storm first appeared on the 9th to the east of the Philippines moving west and, later, north-west. It reached typhoon strength on the 13th as it crossed the 20th parallel near 127° E and finally weakened over the Sea of Okhotsk on the 18th.

LINE SQUALLS

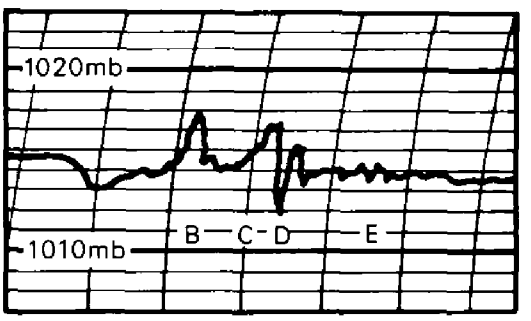
Mediterranean Sea

m.v. *Clan Graham.* Captain K. Morton. Suez to Avonmouth. Observers, Mr B. King, Chief Officer, Mr D. Armstrong, 2nd Officer and Mr P. Monks, 3rd Officer.

1–2 July 1979. At 2030 GMT a belt of rain was observed on the radar screen at a distance of 25 n. mile north of the vessel. The wind at that time was N'E, force 3 and the air temperature 23·3°C. As the rain belt approached a marked drop in temperature was observed.

Rain commenced to fall at 2100 and was soon accompanied by frequent lightning. The wind increased to become NW, force 8–9 with gusts to force 11 and the visibility

was reduced by driving spray and very heavy rain. The barometric pressure rose by 2·5 millibars, see trace at B on barogram, then fell by a similar amount. These conditions were maintained until 2300 when the wind began to decrease in speed and only light rain was falling. The pressure continued to rise, see trace at C.



At 0015 on the 2nd heavy rain again accompanied by lightning began. The wind increased sharply to become NW, force 7–8 then further to force 10 with gusts to force 12. The visibility was reduced to nil by rain and spray and the barometric pressure fell by 5 millibars, see trace at D.

By 0200 the wind had moderated to become W, force 3, there were now moderate rain showers, the temperature was 23·4 and humidity 88 per cent.

These conditions prevailed until 0500 when a hailstorm with frequent lightning flashes commenced, see trace at E; the hail was found to measure 5 to 8 millimetres across. During this storm the vessel was struck by lightning and damage was sustained to the main aerial insulators, one being completely destroyed.

Position of ship at 2030 on the 1st: 36° 54′ N, 1° 50′ W.

Note. The synoptic weather charts for 1 July show that there was a shallow depression centred over Spain. The number of observing stations reporting towering cumulus or cumulonimbus throughout the day indicated that the air mass associated with this depression was markedly unstable. In the late evening and during the night thunderstorms developed over a wide area which extended from eastern and southern Spain to the north coast of Africa.

Line squalls and surface pressure changes, such as those encountered by the *Clan Graham,* are often associated with deep convective cloud. A squall or thunderstorm is frequently preceded by a down draught of cool air from the upper levels, this air may be cooled additionally by the evaporation of precipitation. As this air descends it will become warmer due to compression, but usually reaches the surface as a relatively cold current.

LINE SQUALL AND ST ELMO'S FIRE

Eastern North Atlantic

s.s. *Nordic Commander.* Captain R. MacKenzie. Abu al Bukhoosh (United Arab Emirates) to Rotterdam. Observers, Mr A. Brookes, 2nd Officer, Mrs Brookes and Mr M. Mohamed.

31 August 1979. The line squall was first observed on the radar screen, the weather at that time was: wind NW'ly, force 3, dry bulb 27·5°C, barometric pressure 1009·0 mb. At the arrival of the squall the wind became ENE'ly, force 8 and the dry bulb temperature fell to 24·2. The rain associated with the squall was heavy and accompanied by thunder and lightning.

Just before the storm reached its height a small inverted cone of blue light was observed coming from the top of the bridge-wing gyro compass repeater; this phenomenon was also observed on 2 bridge-wing whip aerial tips and the other bridge-wing gyro compass repeater. The lights appeared to consist of a large number of sand

particles such as one might expect in this area, the visibility, however, was about 9 n. mile except in the heaviest rain. Closer inspection of this phenomenon was not possible as it disappeared before any of the observers could get near enough to it, even the outstretched hand caused it to disappear.

One of the 2 bridge strip-light tubes was taken onto the bridge-wing and pointed upwards whereupon it was seen to glow at about a quarter of its normal brightness. Later the second tube was taken onto the bridge-wing where it also glowed in the same way and the total brightness was estimated to be sufficient to read by. This phenomenon occurred in only certain areas of the bridge-wing, in the lee of the wheel-house, for instance, there was no glow.

The 'electric-light exhibition' was observed for about 1½ hours after which the weather became overcast with moderate continuous rain, good visibility and wind ENE, force 5.

Position of ship: 12° 12′N, 17° 52′W.

WATERSPOUTS

Eastern North Pacific

m.v. *Loch Lomond.* Captain D. R. Perry. Long Beach to Balboa. Observers, Mr R. T. Hughes, 2nd Officer, Mr P. Stein, Radio Officer and Cadets M. Newton and D. Paul.

29 August 1979. At about 2100 GMT an area of disturbed sea was sighted about one n. mile off the starboard bow, the disturbance appeared to be a mass of swirling spray rising to a height of about 10 metres above the water. Shortly afterwards, a dark 'funnel' was observed reaching down from the cloud and almost making contact with the disturbed area, see photograph opposite page 105.

The surface wind at the time was S'E, force 3 and the waterspout was seen to be moving in a north-westerly direction towards the vessel, eventually passing about 200 metres down the starboard side. The spout was rotating in an anti-clockwise direction. The area of disturbed sea was estimated to be 20 metres and the diameter of the spout about 5 metres. What appeared to be a whirlpool formed at the base of the spout, but it was not possible to estimate the depth of the 'hollow' at the centre.

The phenomenon was observed for about 15 minutes after which the waterspout withdrew into the cloud, the base of which was estimated to be between 600 and 1000 feet.

Position of ship: 14° 48′N, 96° 55′W.

Mediterranean Sea

s.s. *Canberra.* Commodore F. B. Woolley, RNR. Southampton to Messina. Observers, Mr R. Ross, Chief Officer and Mr I. Jerman, 3rd Officer.

27 September 1979. The vessel was steaming on an easterly heading and apart from 2 oktas of cumulus and cumulonimbus on the eastern horizon, the sky was clear and everyone on board was enjoying a fine morning.

At 1030 GMT a waterspout was observed at the base of the cumulonimbus cloud. In its initial stages it consisted of a funnel-shaped formation emanating from the cloud. However, whilst this section was still some height above the sea, the surface of the water became agitated—the agitation was such that the vessel's radars were picking up an echo from the disturbance. Finally, after a period of 15 minutes from the original sighting, the upper and lower elements combined.

The waterspout was rotating in an anti-clockwise direction. It was also observed that the exterior of the spout took on what might be described as a 'shimmering appearance'. The diameter of the base of the spout was estimated to be 30 metres. The phenomenon was observed over a total period of 20 minutes.

At about 1100 two further waterspouts began to form at the base of the same cloud, these, however, failed to achieve the maturity of the first.

Weather conditions at 1030 were: dry bulb 21·1°C, wet bulb 16·8, sea temp. 22·8, barometric pressure 1028·0 and steady, wind E'N, force 3.

Position of ship: 37° 26′N, 7° 06′E.

ICEBERGS

Davis Strait

m.v. *Reynolds.* Captain J. K. Cooper. Rouen to Churchill (Canada). Observers, the Master and ship's company.

10 August 1979. At approximately 1300 GMT several stationary echoes were observed on the radar screen; between fog patches they were identified as icebergs.

During the next 24 hours numerous icebergs, sometimes as many as 20 at one time, were observed on the 12-mile range of the radar—the largest sighted were about 1000 metres long, 100 metres wide and 30 metres high—these were tabular bergs.

All the icebergs made good radar targets showing up at least 6 n. mile distant. Bergy bits and growlers were also observed; these usually appeared on the radar screen at a distance of 1 or 2 n. mile.

Most of the icebergs were weathered, had sharp edges and were dark blue in colour around the water-line.

The final sighting of the icebergs was made at 1300 on the 11th when the vessel was in the Hudson Strait.

Weather conditions at 1300 on the 10th were: dry bulb 6·5°C, wet bulb 6·5, sea temp. 7·0, wind calm, fog patches; and at 1300 on the 11th: dry bulb 4·5°C, wet bulb 4·5, sea temp. 3·0, light airs, visibility good.

Position of ship at 1300 on the 10th: 60° 30′N, 60° 55′W.

Position of ship at 1300 on the 11th: 62° 22′N, 72° 35′W.

EARTHQUAKE

Red Sea

m.v. *Wild Cormorant.* Captain E. T. Rowland. Hodeidah (Yemen) to Jeddah. Observer, Mr S. R. Allen, 3rd Officer.

17 July 1979. At 1708 GMT the vessel experienced a heavy shudder, the engine revolutions remained constant. The *Osaka Bay,* bearing 240°(T), distance 6·7 n. mile, also experienced the tremor. Other foreign-speaking persons were heard on VHF radio to use the word 'earthquake'.

At 1718 a second and less-violent tremor was experienced by the vessel and also by the *Osaka Bay.*

At 1843 a tremor of the same magnitude as that at 1718 was experienced, several seconds later the vessel rolled 4 times.

Position of ship: 17° 52′N, 40° 16′E.

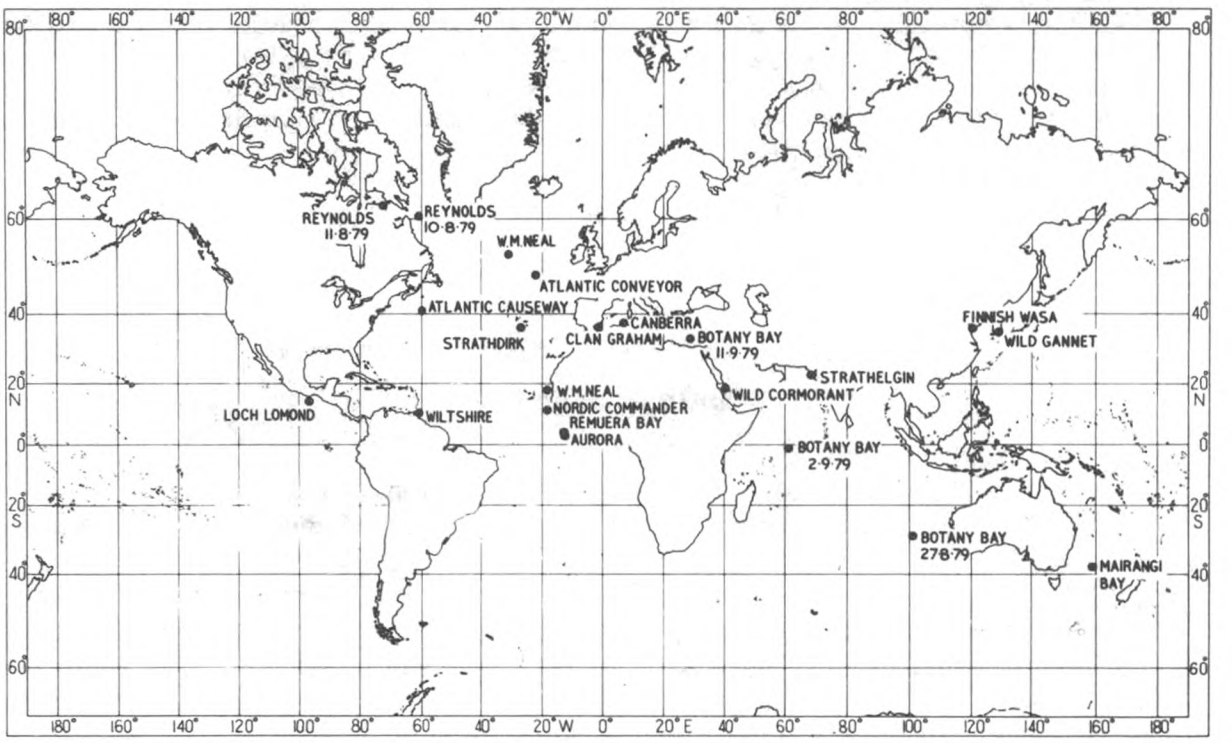
Note. Mr Graham Neilson of the Institute of Geological Sciences, comments:

'This earthquake originated in about 20°N 39°E at 17h 07m 24s and had a magnitude of 5 on the Richter Scale. It was recorded by the seismological observatories of Tehran, Tabriz, Uppsala, Norsar and Trieste.

'The Red Sea is prone to seismic activity as new crustal material is being formed along the centre of the area and being pushed out on both sides, moving Africa and Arabia apart. As this movement occurs so earthquakes take place due to different parts of the spreading centre moving at different rates. Almost all earthquakes in this area take place along the median ridge.

'A consequence of this movement is that the Jordan Rift Valley must have suffered northwards displacements along its eastern side and, from geological observations, this is found to be the case. It will also be seen that the coastlines on either side of the Red Sea fit almost exactly apart from the small area of overlap known as the Afar Triangle. This area is made up of rocks characteristic of the sea floor. Confirmation of this picture of what is happening in the Red Sea comes also from the pattern of magnetic anomalies in the area.

'The report from the *Wild Cormorant* is most valuable and I have sent a copy to the International Seismological Centre at Newbury for inclusion in their Bulletin'.



Position of ships whose reports appear in *'The Marine Observers' Log'*

COMMON PORPOISES

North Atlantic Ocean

s.s. *Atlantic Conveyor.* Captain D. M. Woolfenden. New York to Le Havre. Observer, Mr A. D. Honeyborne, 3rd Officer.

23 July 1979. At 2135 GMT a group of approximately 100 Common porpoises was observed jumping clear of the water close to the bow and in the wake of the vessel.

Mr Honeyborne adds that shortly after departure from New York the vessel experienced very heavy vibration of the port propeller shaft and that it was thought at the time that part of the propeller blade was missing. The voyage was continued with the port engine on reduced r.p.m. (approximately 105) but vibration, although reduced, was still present. He also adds that he had read the article on 'The International Dolphin Watch' in the April 1979 edition of *The Marine Observer* in which is stated that dolphins can discriminate between sound frequencies and asks, therefore, if this could be an explanation of the 'Aquatic Ballet' he had observed.

Position of ship: 48° 56′ N, 22° 41′ W.

Note. Mr D. A. McBrearty of the Department of Anatomy, University of Cambridge, comments:

'The Common porpoise, *Phocoena phocoena*, is the smallest cetacean seen in the North Atlantic, it seldom reaches a length over 1·6 metres; it is also the most common cetacean stranded

on the British coast. The small tubby body, rounded head and short triangular dorsal fin make it easily identifiable and unlikely to be confused with other animals. Large schools of 100 plus are not unknown, but usually it is seen in small groups of less than 10.

'It is interesting that on this occasion the animals approached the vessel, they are normally rather timid, seldom coming towards a ship and will turn away if you try to approach them. Unlike the dolphins they don't seem to enjoy the practice of bow-wave riding either. There is no doubt that the animal would hear the slow-turning propeller, but how it would interpret that noise I am afraid I don't know.

'A colleague, to whom I mentioned this, related a similar occurrence some years ago in the Tasman Sea. Perhaps they mistook the sounds for that of a trawler, the *Atlantic Conveyor* is somewhat larger, but I am told that depending upon the class of vessel, a trawler tows at about 125 to 250 r.p.m. I remember, some time ago, a rather ancient Spanish trawler from which I was making observations and not seeing any dolphins during the time the trawl was down. As soon as the donkey engine was engaged to haul up the trawl and the ship began to vibrate, dolphins appeared. Perhaps then it is a combination of a rhythmic beat of one propeller and vibration of another which had the desired effect.'

WHALES, DOLPHINS AND BLACKFISH

North Atlantic Ocean

m.v. *W. M. Neal.* Captain P. Atkinson.

The following are reports of sightings of whales, dolphins and Blackfish:

18 July 1979. Tubarão to Rotterdam. Observers, Mr D. A. Bance, 3rd Officer and Mr O. Segrave, Radio Officer.

At 1800 GMT a group of 8 Sperm whales was observed at an approximate distance of 500 metres from the vessel. The group consisted of 6 large whales each about 12 metres in length and 2 smaller, possibly young, about 8 metres in length.

They appeared to be basking just below the surface, only the dorsal fins appeared above the water, and blowing occasionally. One of the larger whales did raise its head out of the water at times and the square-headed profile was clearly visible.

Position of ship: 18° 22′ N, 18° 06′ W.

21 July 1979. Tubarão to Rotterdam. Observer, Mr D. A. Bance.

At 1945 a group of 12 Sperm whales was observed moving in an easterly direction at an approximate speed of 5 knots. They were about 10 metres in length and were swimming in pairs, side by side, just on the surface but occasionally moving further out of the water when the identification was made possible.

Position of ship: 32° 14′ N, 14° 25′ W.

25 August 1979. Antwerp to Seven Islands. Observer, Mr D. A. Bance.

At 1215 a large number of dolphins, in excess of 60, was observed all around the vessel. The majority were small, 2 to 2½ metres in length, and all were jumping clear of the water. They appeared to be feeding as there was a strong smell of fish and large numbers of sea-birds were flying and diving in the same area.

The dorsal fins of 2 Blackfish were also observed crossing the wake of the vessel and heading in a southerly direction.

Position of ship: 53° 25′ N, 31° 00′ W.

Note. Mr McBrearty comments:

'Sperm whales have a highly developed social order and are also polygynous, each breeding bull having several females in a harem during the breeding season. Bulls without a harem tend to remain solitary. Other groups may contain so-called "Batchelor bulls" which are immature, or "Nursery schools" comprising females and young calves.

'There is a marked sexual dimorphism in the Sperm whale with males growing to lengths of 15 to 18 metres and females to 11 to 12 metres. Calves are approximately 4 to 5 metres at birth.

'Blackfish, *Globicephala melaena*, are known to associate with other types of dolphin, notably white-beaked, *Lagenorhynchus albirostris*, and white-sided dolphins, *Lagenorhynchus acutus*, both of which occur in large schools.'

Indian Ocean

s.s. *Botany Bay*. Captain P. J. Clark. Melbourne to Jeddah. Observers, the Master and ship's company.

27 August 1979. Six False killer whales were sighted heading in a south-south-easterly direction.

Position of ship: 29° 39′S, 101° 35′E.

Note 1. Mr McBrearty comments:

'The original description of False killer whales was based on a sub-fossil skeleton which was found in the Lincolnshire fens in 1843. The first "live animal" was not taken until 1861 when a large school was attacked by fishermen in the Bay of Kiel. Since that time many other mass strandings have occurred throughout the world. It is found in all oceans principally in the warmer waters and mostly off shore. Adult size is about 6 metres and they feed primarily on fish and squid etc.'

Note 2. In his most recent letter to us, in which he identifies and comments on whale, dolphin and porpoise observations made by vessels of the VOF, Mr McBrearty commends observers on the wealth of information he receives and the great keenness displayed in compiling the observations. He stresses the importance in having as much detail as possible with regard to size, colour and dorsal fin shape and size. Bearing in mind that there are so many possibilities, a sketch or photograph, where possible, is most helpful in collating information on the animals, especially the lesser-known species.

FISH

Indian Ocean

s.s. *Botany Bay*. Captain P. J. Clark. Melbourne to Jeddah. Observers, the Master, Mr R. D. Anderson, 3rd Officer, Mr L. Robinson, Chief Engineer and Cadets P. Beggs and G. Nickerson.

2 September 1979. During the afternoon a squid, see photograph opposite page 112, was found on deck. It was believed to have been 'scooped up' during a period of heavy rolling on the previous night.

The overall length was 25·0 cm, body length 11·5 cm, body width 2·8 cm and width across fins 8·0 cm. The longer tentacles measured 10·1 cm, the shorter tentacles 4·8 cm.

The creature was a dull grey colour on the upper parts and lighter in colour on the lower parts. There were black spots on the head and body and small red/brown spots on the fins.

Position of ship: 1° 00′S, 61° 30′E.

Note. Dr F. Evans of the Dove Marine Laboratory, University of Newcastle upon Tyne, comments:

'Among 350 known species I cannot put a name to this squid. It has the outline of a near-surface type *Loligo* or *Uroteuthis*. It is just possible that it may have flown (glided) on board—some squid have this capacity although the fins of this specimen looked rather small for flight.'

BIRDS

North Atlantic Ocean

m.v. *Strathdirk*. Captain D. H. Roberts. Port Said to New Orleans. Observers, the Master and ship's company.

11 July 1979. At 1200 GMT a bird, see sketch, alighted on a container forward of the bridge.

It was light brown in colour with speckles or patches over the wings, breast and tail. There was a distinctive dark brown V-shape on the head, apex to the front; there also appeared to be a small crest or tuft of feathers on the head. The beak was about 15 centimetres in length and was slightly curved.

The bird stayed with us for about 15 minutes.

Position of ship: 36° 30′ N, 27° 12′ W.

Note 1. Captain G. S. Tuck, Chairman of the Royal Naval Birdwatching Society identified the bird as being a Whimbrel, *Neumenius phaeopus*.

Note 2. The Whimbrel breeds on moors, amongst boulders and rough grass on the verges of woods during May and June. It winters in Africa, southern Asia and South America.

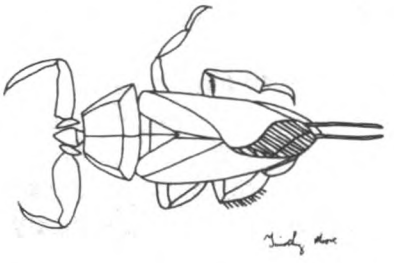
The male has a display flight which is accompanied by a trilling song, planing down to earth or tumbling down in a zig-zagging descent.

INSECTS

Caribbean Sea

m.v. *Wiltshire*. Captain P. Bytheway. At anchor, Port of Spain (Trinidad). Observers, Mr T. R. Moore, Chief Officer and Mr G. N. Penry, 2nd Officer.

6 August 1979. A dead and damaged specimen of a winged insect was found on deck, see sketch.



The insect was 72·5 mm in length and 42 mm in width, the upper part was a dull brown colour and the lower part pale green with dark stripes.

Position of ship: 10°40′ N, 61°20′ W.

Note. Mr L. Jessop of the British Museum (Natural History), comments:

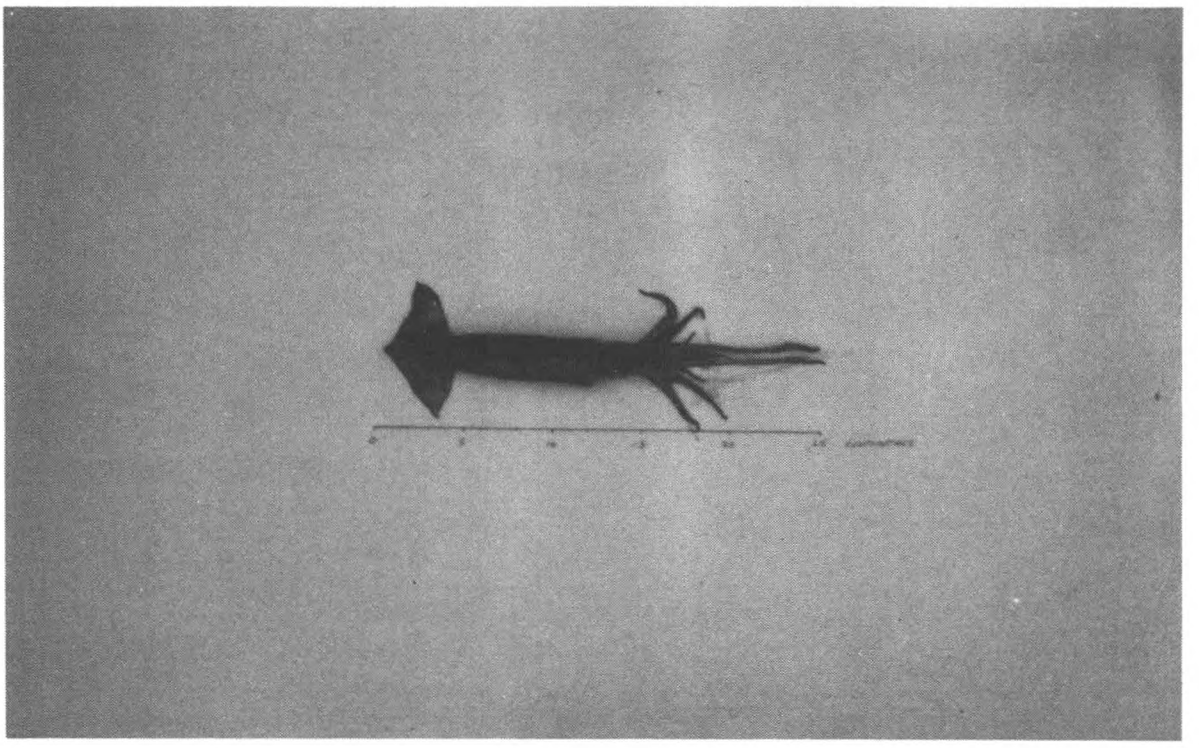
'This is a giant water bug, species *Lethocerus*. It is sometimes called the "electric light bug" in the United States because of its habit of flying towards light. It quite often stuns itself by flying into walls on which lights are hanging, this is probably how it got onto the ship's deck in such a condition.'

Yellow Sea

m.v. *Finnish Wasa*. Captain A. R. Tinsley. At anchor Tsingtao (China). Observer, Mr D. G. Green, 3rd Officer.

15 September 1979. At 1900 GMT the insect portrayed in the sketches was found on the floor of the Officers' bar, it was alive but appeared to have been liberally covered with an insecticide.

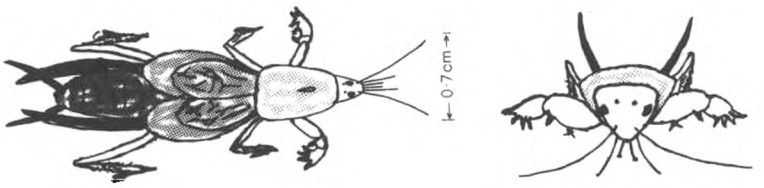
opposite page 112



Squid found on board the *Botany Bay* (*see* page 111)

opposite page 113

Presentation of barographs on 16 January 1980 at Bracknell. Left to right: Captain M. J. Pain (on behalf of Captain M. J. Winter); Captain and Mrs L. C. Taylor; Mr F. H. Bushby; Captain and Mrs F. C. Taylor and Captain and Mrs. L. E. Howell (*see* page 132)



The upper parts were a yellow colour, the colour of the lower parts resembled charcoal; both upper and lower parts were covered with a velvet-like layer of hair. The casing over the upper parts was dark grey with the same velvet-like hair. The wings folded along either side of the body and they were glossy black on the outside. The wing casing was dark brown with black blood-vessel-type lines.

The rear and central legs, similar to those of a grasshopper, were covered with fine black hair. The front legs were stocky and strong-looking. The outer part of the legs carried 4 claws tilted at an angle, the inner claw could be made to fit flush against a claw at the distant end of the upper leg thus forming a type of pincer. The insect was able to turn the head 50° to the left and right and 30° upwards. It was 3·2 centimetres long and about 0·7 centimetres wide.

A second insect was found on deck just outside the bar, it moved swiftly along the deck and made no attempt to fly.

Position of ship: 36°03′N, 120°20′E.

Mediterranean Sea

s.s. *Botany Bay*. Captain P. J. Clark. Port Said to Genoa. Observers, Mr R. D. Anderson, 3rd Officer and Mr D. Dines.

11 September 1979. During the morning the insect, illustrated in the sketch and thought to be a mole-cricket, was found by Mr Dines. On the previous day the vessel had passed through the Suez Canal and the insect was presumed to have come aboard during the Canal transit.

The creature was dark brown on the upper parts and sandy brown on the lower parts, the head and thorax were almost black. The feet were large and spade-like, it appeared as though they slotted into the 'fore-arms' to provide a large digging surface. The front legs were squat and powerful-looking, the other legs were the more-normal 'grasshopper' type.

The body was 4·2 centimetres long, wing length 3·8 centimetres and tip of antennae to wing-tip measured 7·0 centimetres.

All 4 wings were transparent with thick black veins. There was a small white triangular patch on the front of the jaws which were otherwise black.

Position of ship at 0600 GMT: 32°54′N, 28°54′E.

Note 1. Mr D. R. Ragge of the Department of Entomology, British Museum (Natural History), comments:

'This excellent drawing of the insect found on board the *Botany Bay* shows clearly that it was a mole-cricket (*Gryllotalpa*) as the 3rd Officer thought. Several closely similar species occur in the Mediterranean region, it is, however, not possible to be certain which one this is.'

Note 2. The specimen was sent by the Port Meteorological Officer, London to Mr B. C. Townsend at the British Museum. Mr Townsend adds that it is a female and that such are difficult to identify, but it is probably the European mole-cricket. This species is quite common throughout Europe and the eastern Mediterranean. Mole-crickets are principally subterranean in habit but will readily take to the wing in warm weather. They are often seen flying to lights on warm nights.'

BIOLUMINESCENCE

Eastern North Atlantic

m.v. *Aurora*. Captain W. D. Smith. Richards Bay to Le Havre. Observer, Mr R. C. West, 2nd Officer.

26 July 1979. At 0130 GMT bioluminescence in the form of bands and patches was observed; the bands were up to 100 metres in length and about 5 metres in width. The brightest of the bands emitted a diffuse white light. The patches were composed of single spots approximately 3 centimetres in diameter. The luminescence increased in intensity when lights were directed onto the water. The phenomenon was observed for 2½ hours.

At the time of the observation the wind was S, force 5 and the sea temperature 25·6° C.

Position of ship: 3°35′N, 12°30′W.

Note. Dr P.J. Herring of the Institute of Oceanographic Sciences, comments:

'The organisms associated with this observation are not identifiable. More than one type of animal appears to have been involved.'

Eastern North Atlantic

s.s. *Remuera Bay*. Captain J. H. Hutson. Rotterdam to Cape Town. Observer, Mr P. Pritchard, Chief Officer.

22 July 1979. At 0400 GMT bioluminescence in the form of long bands, up to 200 metres in length and 3 metres in width, was observed lying parallel to the wind direction. Individual organisms, measuring up to 4 centimetres in diameter, emitted a white light. The phenomenon was observed for 1½ hours.

Weather conditions at the time were: dry bulb 24·7° C, wet bulb 22·3, sea temp. 25·3.

Position of ship: 4°33′N, 12°44′W.

Note. Dr Herring comments:

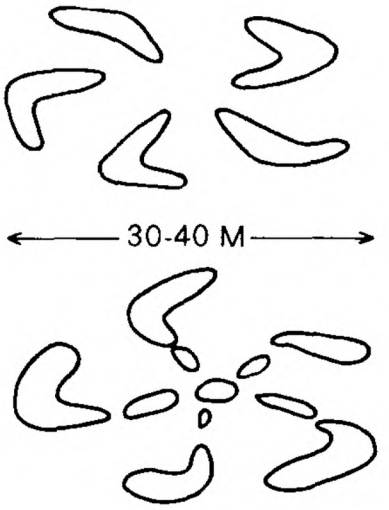
'This account is very similar to that of the *Aurora* and almost certainly involves similar organisms. Long bands of luminescence are typical in steady wind conditions, just as windrows of surface debris accumulate. Jelly-fish or comb-jellies might be the individual animals described, but I cannot be sure.'

Arabian Sea

m.v. *Strathelgin*. Captain B. Penman. Karachi to Hong Kong. Observers, Mr A. MacKenzie, 2nd Officer, Cadet I. Prior and Mr W. Lang.

10 July 1979. At 1200 GMT large patches of milky-grey bioluminescence were observed; the patches appeared to form circular patterns resembling cartwheels, some of the configurations, however, did not have the central hub, see sketch.

The patches pulsated at regular intervals (3 or 4 times per second). They moved in an anticlockwise direction until about 3 points abaft the beam where the direction of movement was reversed. On the beam they appeared to be at eye level, at all other times they were just above the surface of the water. The average size of the 'wheels' was 35 metres.



The phenomenon was observed for about 10 minutes, the pattern of the 'wheels' in the most dense areas was confused.

Weather conditions at the time were: dry bulb 26·7°C, wet bulb 25·2, sea temp. 27·4, barometric pressure 1012·5 mb, weather fine, wind SW, force 3-4.

Position of ship: 22°27′N, 68°00′E.

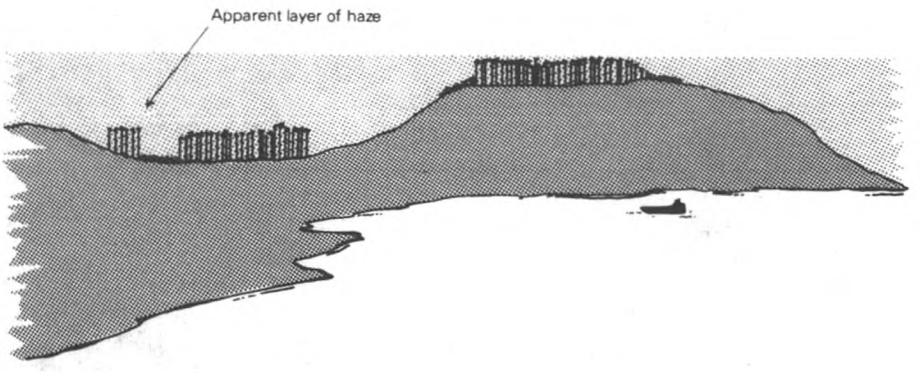
ABNORMAL REFRACTION

Tasman Sea

m.v. *Mairangi Bay*. Captain W. A. Murison. Melbourne to Sydney. Observers, the Master, Mr M. J. Power, 2nd Officer and Mr D. J. Izzard, 3rd Officer.

16 July 1979. Whilst on passage northwards passing New Zealand Star Bank, 13 n.mile south of Gabo Island on the Australian coast, abnormal refraction was observed.

The land was made up of low hills covered with trees which were silhouetted against the horizon. The sky was completely cloudless and there appeared to be a layer of shimmering haze above the land, see sketch; the trees also appeared to be elongated.



A vessel, approximately 10 000 tons gross, was observed close to the land and its approximate relative size in the sketch will give some idea of the height distortion of the trees; the trees were estimated to be 7 n.mile distant from the vessel. The sun was at an altitude of 30–40° and was fine on the starboard bow. Weather conditions were: dry bulb 11·7°C, wet bulb 9·6, sea temp. 14·1, barometric pressure 1030·8 mb.

Position of ship: 37°46′S, 159°50′E.

AURORA

Labrador Sea

m.v. *Reynolds*. Captain J. K. Cooper. Rouen to Churchill (Canada). Observers, Mr C. Hewitt, 2nd Officer and Mr M. Do Santos.

10 August 1979. At 0455 GMT 2 auroral rays were observed bearing 250° and 200°(T), both about 25° above the horizon. Three minutes later a third, smaller and broader, ray appeared between the first 2 about 35° above the horizon. After about a further minute all 3 rays, which had been of moderate brightness, had disappeared.

At 0508 a further ray of moderate brightness appeared bearing 290°(T) at an altitude of 40° above the horizon; this ray gradually became a rayed arc at an altitude of 90°. At 0512 another ray appeared bearing 272°(T) at an altitude of 10°, this was of moderate intensity at first, but after a few seconds became brilliant before finally disappearing. After a final ray, weak in intensity, which appeared at 0517, an auroral patch was observed bearing 250° to 258°(T) about 10° above the horizon. The patch, which was bright yellow and green in colour, gradually developed into a rayed band covering 3 oktas of the sky. The patch finally dispersed at 0529 and no further aurora was observed.

Position of ship at 0500: 59°38′N, 56°52′W.

Western North Atlantic

s.s. *Atlantic Causeway*. Captain J. K. Cooper. Baltimore to Southampton. Observers, the Master, Mr S. Sutherland and Mr M. G. Jevons, 2nd Officers and Mr A. P. Rodwell, 3rd Officer.

18 September 1979. At 0215 GMT a weak glow, which increased in intensity to become a bright arc, was observed. At 0230 the arc's bearings were 305° to 020°(T) and the altitude approximately 10°. Shortly afterwards bright rays were observed to extend from the horizon through the arc to an altitude of 15° to 20°; the rays were uniform through the arc.

The arc began to decrease in intensity about 0700 when a red glow bearing 340°(T) at an altitude of 10°–20° was seen; the glow was observed for about 10 minutes. By 0745 the arc, which since 0700 had gradually become a moderate then weak glow, finally disappeared.

Position of ship at 0230: 40°40′N, 60°00′W.

551.509.313

Weather forecasting as a problem in fluid dynamics*

By Sir John Mason, F.R.S.
(Director-General, Meteorological Office)

Introduction

During the last decade the traditional, empirical and largely subjective methods of weather forecasting that depend heavily on the experience, skill and judgement of the individual human forecaster have gradually given way to objective mathematical predictions made with the help of powerful electronic digital computers. The whole operation, described in some detail by Mason (1973), consists of 3 stages: data acquisition and processing, analysis and prediction and consists basically of forming a 3-dimensional representation of the conditions prevailing through a large volume of the atmosphere at a particular moment of time and of predicting, from an observed initial state, the future evolution and movement of atmospheric disturbances and their associated weather. Using standardized observations and measurements, made simultaneously at fixed times over a large part of a continent or even a hemisphere and exchanged rapidly between different countries in universally agreed codes over a special global network of satellite, cable, radio- and picture-transmission channels, charts are constructed to depict the current distribution of atmospheric pressure, temperature, humidity, winds, etc. at the earth's surface and at a number of levels in the upper air and from these are evolved forecast charts showing the conditions expected some hours or days later.

Description of weather prediction models

The numerical predictions are objective, mathematical exercises based on a firm structure of physical theory that treats the atmosphere as a vast, turbulent, rotating fluid with energy sources and sinks. They involve the construction of physico-mathematical models which, although necessarily simplified compared with the complexity of the real atmosphere, must nevertheless adequately represent the physical and dynamical processes that are likely to control developments on the space and times scales of interest. In other words, the models must properly represent the relevant or significant scales of motion and their non-linear interactions, but smooth out all the smaller-scale motions that cannot be adequately observed or represented individually while allowing for their overall contribution to transport and energy-conversion processes by representing their statistically averaged properties in terms of larger-scale parameters that can be measured. The theory is based on the physical principles of conservation of momentum, mass, energy and water substance, the Newtonian (Navier-Stokes) equations of motions applied to a parcel of air, the laws of thermodynamics and the equation of state of a gas.

If we consider, at first, a dry atmosphere containing no water substance, the full set of governing equations is as follows:

Equations (1) and (2). Two equations describing the horizontal motions of the air in which the time rates of change of the E–W and N–S components of the wind are related to the forces exerted on the air by the rotation of the earth, by horizontal pressure gradients and by retarding forces such as friction and turbulence.

Equation (3). A similar equation describing the vertical motion of the air under the influence of forces that arise from gravity, vertical pressure gradients, rotation of the earth and from frictional and turbulent stresses.

Equation (4). An equation of continuity which relates changes in the density and velocity of the air in such a way that mass is everywhere conserved.

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Equation (5). A thermodynamic equation which relates the supply of heat to a parcel of air to the resultant changes of temperature and pressure.

Equation (6). An equation of state connecting the pressure, density and temperature of the air.

This set of 6 equations, which may be found in Mason (1971) involves 6 dependent variables: the 3 components of the wind and the pressure, density and temperature of the air, all expressed as functions of space and time. In order to include the effects of evaporation, condensation and precipitation of moisture, equations are added for the continuity of the water substance and the heating term is modified to include the release of latent heat.

Starting from a given initial situation and specified boundary conditions, the problem is to solve a system of simultaneous non-linear partial differential equations in 3 spatial dimensions with time as the fourth independent variable. In fact, the equations are formulated in such a manner that they allow the time variations of the above quantities to be determined from their spatial variations. Thus, in principle, if we can observe the initial values of all the variables at a network of discrete points filling the whole or a large part of the atmosphere, we can compute the initial time rate of change of each variable from the governing equations and then extrapolate over a short time interval to find a *predicted value* at each point in the network. Repeating this process step by step, we can build up a forecast of the fields of pressure, wind, temperature, humidity, etc.

In practice, the meteorologist measures the horizontal winds (by tracking balloons with radar) and the atmospheric pressure, temperature and humidity, but not the vertical component of the air motion since this is usually too small to measure directly although of the greatest importance in controlling cloud- and rain-forming processes. In order to get over this difficulty and, at the same time, eliminate the density of the air as a variable from the equations, we use pressure rather than height as the vertical co-ordinate, regarding this as an independent variable and introduce, as a dependent variable, the contour height, which is the height of a constant pressure (isobaric) surface. Maps of contour heights are very similar, in configuration and in their relation to the winds, to those of the corresponding pressure fields. The thermal structure of the atmosphere is described in terms of the thickness of the layers between isobaric surfaces, the thickness being proportional to the average temperature of the layer. In this system, the vertical velocity of the air is represented by the time rate of change of atmospheric pressure and is defined entirely by the horizontal wind field. Further simplification is introduced by rewriting the thermodynamic equation in a form that relates the vertical motion to changes in the non-adiabatic heating and the thickness of the layer, so that the dependent variables become the 2 horizontal components of the wind, the time rate of change of atmospheric pressure (closely related to the vertical motion), the contour height, thickness and humidity of the layers between isobaric surfaces and the precipitated water (rain and snow).

Such complex physico-mathematical models have been developed in the Meteorological Office and described by Burridge and Gadd (1977) to replace a simpler model which formed the basis of its daily forecasting operations between 1965 and 1972.

The current model is designed to simulate and predict the evolution of major weather systems over practically the whole of the northern hemisphere for several days ahead. The basic governing equations are essentially those described earlier and include those for the continuity of moisture. If a layer of air is unsaturated, the humidity is allowed to change by horizontal and vertical air motions and by evaporation of rain or snow falling into it from above. Once a layer reaches saturation, its excess moisture is deemed to condense and fall out as rain or snow (depending upon the temperature) into the layer below. The latent heat released or absorbed during the processes of condensation, evaporation, freezing and melting, is calculated and its dynamical consequences computed. The model allows for modification of the airflow by the underlying topography, for the frictional drag of the land and sea on the air and for horizontal eddy diffusion. Adjustments are also made to allow for the vertical transport of heat and moisture by both shallow and deep convective clouds that are smaller than the computational grid. In computing the exchanges of sensible and latent heat at the earth's

surface, the surface albedo is specified at each grid point in terms of the climatic conditions and the snow or ice cover and sea-surface temperatures are held at their monthly mean values. Even for short-period forecasts of 2 to 3 days, it is necessary to compute the heat lost by the atmosphere through long-wave radiation to space and the long-wave transfer between model layers including the effect of clouds and the ground, otherwise predicted temperatures for the middle and upper levels are too high.

In addition to this hemispheric model, the Meteorological Office runs a finer-mesh model, described by Bushby and Timpson (1967), Benwell and Timpson (1968) and Benwell *et al.* (1971), with very similar dynamics and physics but with a horizontal grid length of only 100 km limited to a 6400 km × 4800 km rectangle centred on the British Isles. This provides more detailed forecasts for the United Kingdom and western Europe up to 36 hours ahead, is particularly useful in making quantitative predictions of rainfall from depressions and fronts and distinguishes between widespread persistent rain and showery convective rainfall. Since the time-steps of the integration are one-third of those for the hemispheric model, the amount of computation, about 10^{10} numerical operations, is about the same and takes about 10 minutes on the IBM 360/195 computer.

Both models are run twice per day using the noon and midnight observations according to the following operational sequence. When the weather observations from practically the whole of the northern hemisphere, amounting to about one million coded groups per day, arrive at Bracknell, they are automatically checked, quality-controlled, corrected, edited and arranged in suitable format for input to the models by 2 dedicated smaller computers. The next stage is to produce analyses of the basic data and from these establish initial values of the dependent variables in the forecast equation. This involves the production, by various objective smoothing, curve- and plane-fitting techniques, of smooth continuous fields of contour heights and humidity mixing ratios from which can be extracted grid-point values over the whole area and for the 10 levels. The analysed fields are now subjected to an 'initialization' procedure to ensure consistency between the contour and wind fields. This involves the solution of 2 equations, one dealing with the non-divergent component of the wind field and the other with the divergent component and hence the vertical motion, to produce 'best' initial values of the contour height and the 3 wind components. These parameters together with grid-point values extracted from a smoothed initial humidity field are sorted in column format together with geographical, topographical and climatic constants, surface temperature and humidity parameters, to provide the starting conditions for step-wise integration of the predictive equations.

Example of a 5-day numerical forecast

By way of example, we shall now describe a series of computer forecasts predicting the marked change of weather that took place over the British Isles on 6 and 7 January 1979 when the spell of very cold weather that began on 30 December 1978 gave way to rapid thaw. This change was well predicted by the hemispheric model from 3 January and the further westerly progress of milder air into north-east Russia during the following 2 days was also well forecast.

Figure 1 shows the surface weather map based on observations made at 1200 GMT, 3 January 1979 when the weather was still very cold over the whole of the British Isles except north-west Scotland. Even the south-south-easterly winds over south-west England were very cold. There was no westerly flow over the Atlantic Ocean to bring milder maritime air into the country. The 24-hour forecast valid for midday on 4 January — see Figures 2(a)-(b) — indicated correctly that the depression to the south-west of the British Isles would move into France (its centre being very accurately placed with the central pressure predicted as 984 mb compared with the actual value of 980 mb), producing strong easterly winds on its northern flank. The mid-Atlantic ridge of high pressure was predicted to move eastwards and the deep depression over Labrador

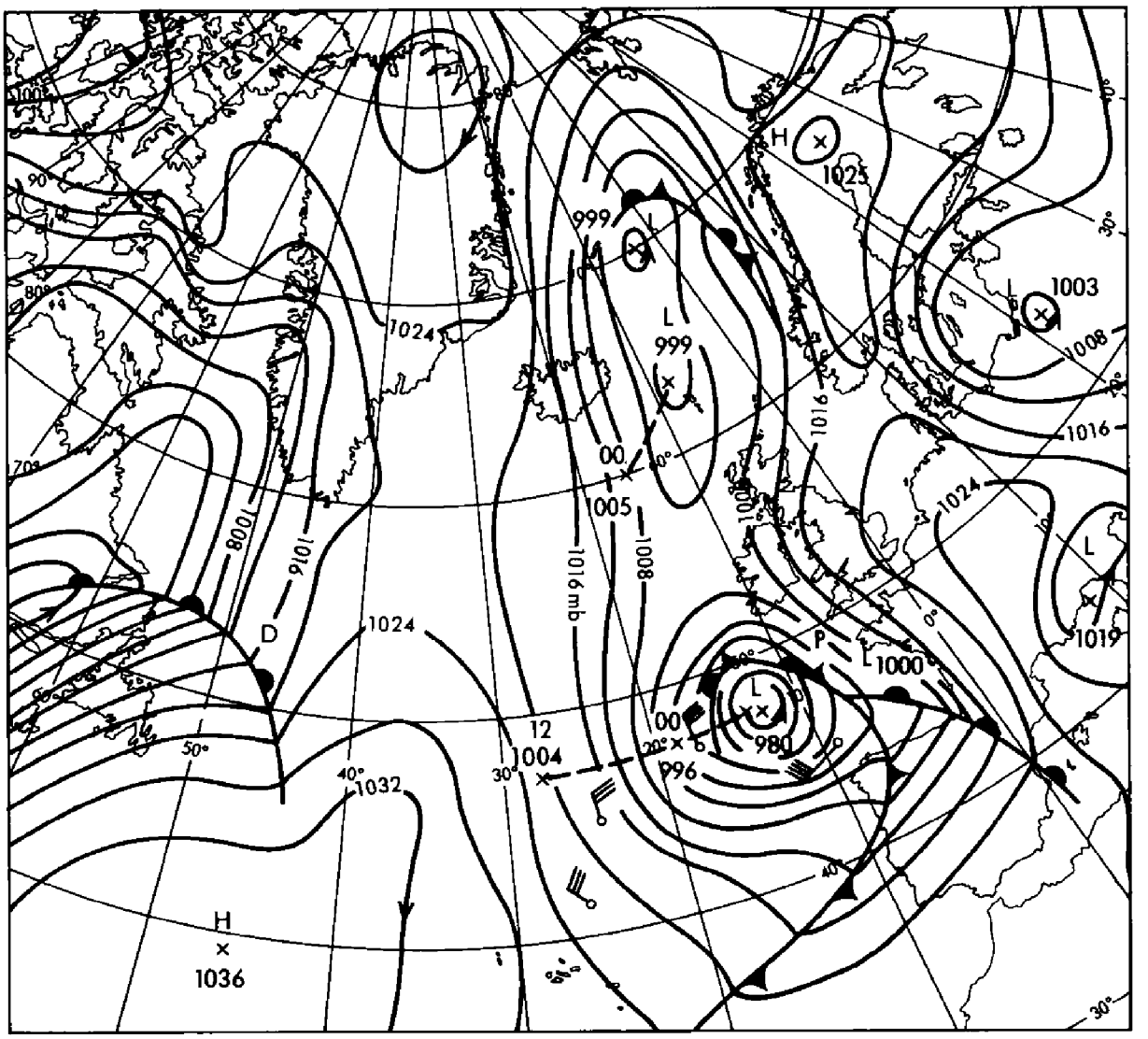

Figure 1. The actual surface weather map drawn from observations made at 1200 GMT on 3 January 1979. All the forecasts shown in subsequent diagrams are based on the observations made at this time

to move north-eastwards with the westerly airstream on its southern flank extending into the Atlantic.

Figure 3(a) shows that by 1200 on 6 January westerly winds had reached most of the British Isles and within 24 hours the thaw was under way. The 72-hour forecast for the time, Figure 3 (b), indicated a breakdown of the mid-Atlantic ridge allowing the westerly winds with their associated troughs of low pressure to progress and cover the northern half of the British Isles. Although this forecast did not anticipate the development of the anticyclone over continental Europe and of the depression over the Mediterranean particularly well, it gave a good indication of the breakdown of the cold weather régime. Figure 4(a), a chart of the actual situation at 1200 on 8 January, shows that by this time the westerlies and associated troughs covered the North Atlantic and the whole of Scandinavia whilst a new depression was approaching Newfoundland from the west. These developments were all indicated in the forecast made 5 days earlier depicted in Figure 4(b) which is the 120-hour forecast for 1200 on 8 January, based on observations made at 1200 on 3 January.

Precision and accuracy

The precision to be attempted and the accuracy likely to be achieved in predicting the location and timing of a particular weather feature will be dependent upon the time

range of the prediction, on the scale and life-time of the weather systems involved and on the spatial resolution of the forecasting model. Thus the fine-mesh model described earlier will predict the geographical position and central pressure of a major cyclone 1000 km diameter and lasting for 5 to 6 days within 50 km and 2 mb respectively. For a forecast made for only 24 hours ahead it is reasonable to attempt this degree of precision in relation to the accuracy achieved. However, the errors grow roughly exponentially as the forecast period is extended, so that although the model will continue to produce a deterministic and apparently precise forecast, precision and accuracy progressively diverge, and beyone 5 to 6 days the accuracy at the present time usually falls below useful limits.

At the other end of the scale, prediction of the location, movement and intensity of individual shower clouds, only 1–10 km in diameter and lasting for >1 hour, is impossible with present models which lack the requisite small-scale physics, observations and resolution. The best that can be done is to predict where and when the atmosphere is likely to become convectively unstable within a layer of restricted depth and so liable to sporadic outbreaks of showers, but there is no possibility of predicting exactly where and when a shower will actually appear. The forecast may then perforce take the form of say, 'a high risk of scattered showers, mostly light and of short duration' since they are likely to be almost randomly distributed. Indeed, a shower having been accurately located by radar or satellite, its subsequent motion and development can best be predicted by extrapolation, not necessarily linear extrapolation, of its recent evolution.

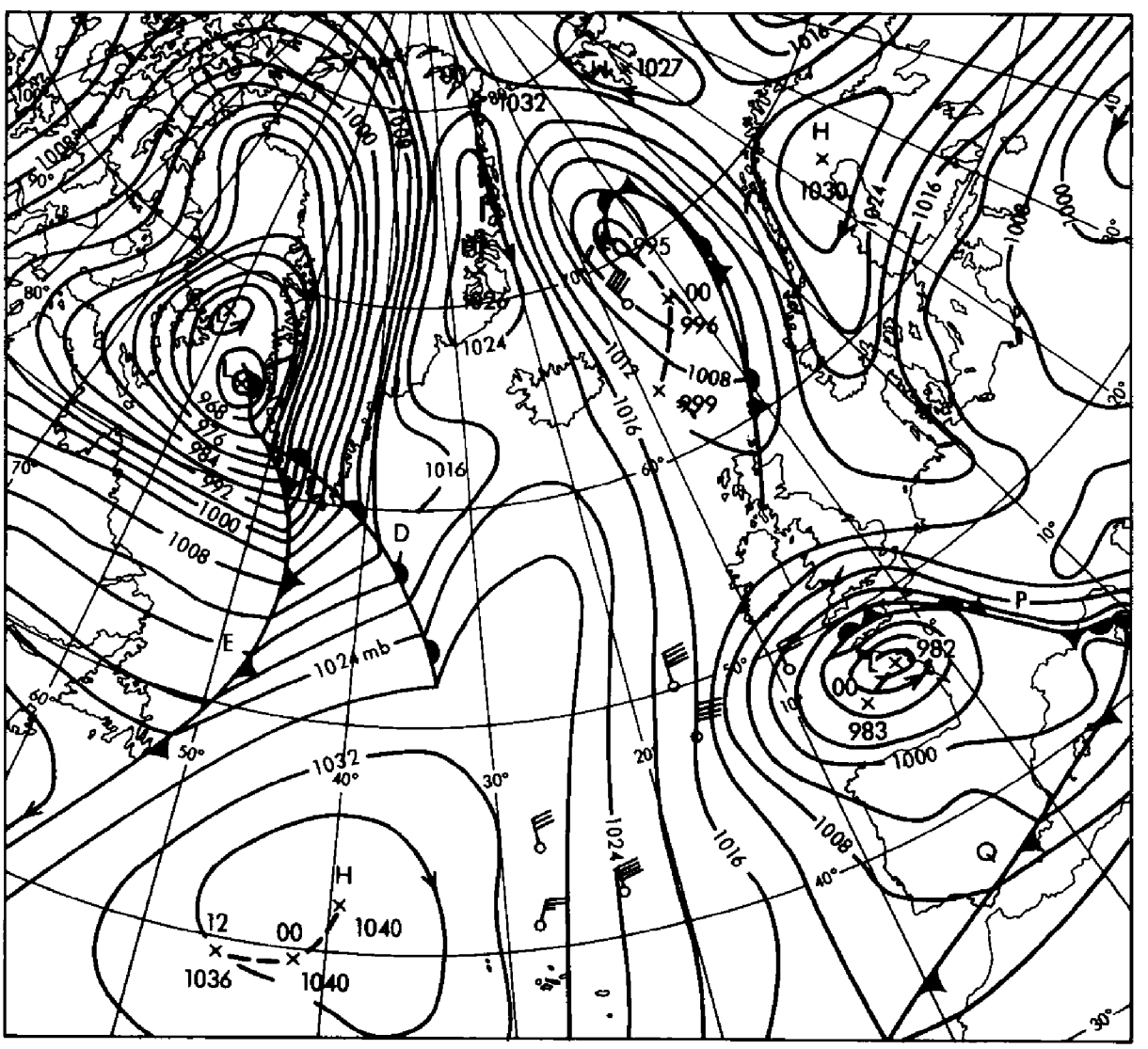

Figure 2(a). Actual surface weather map for 1200 GMT on 4 January 1979

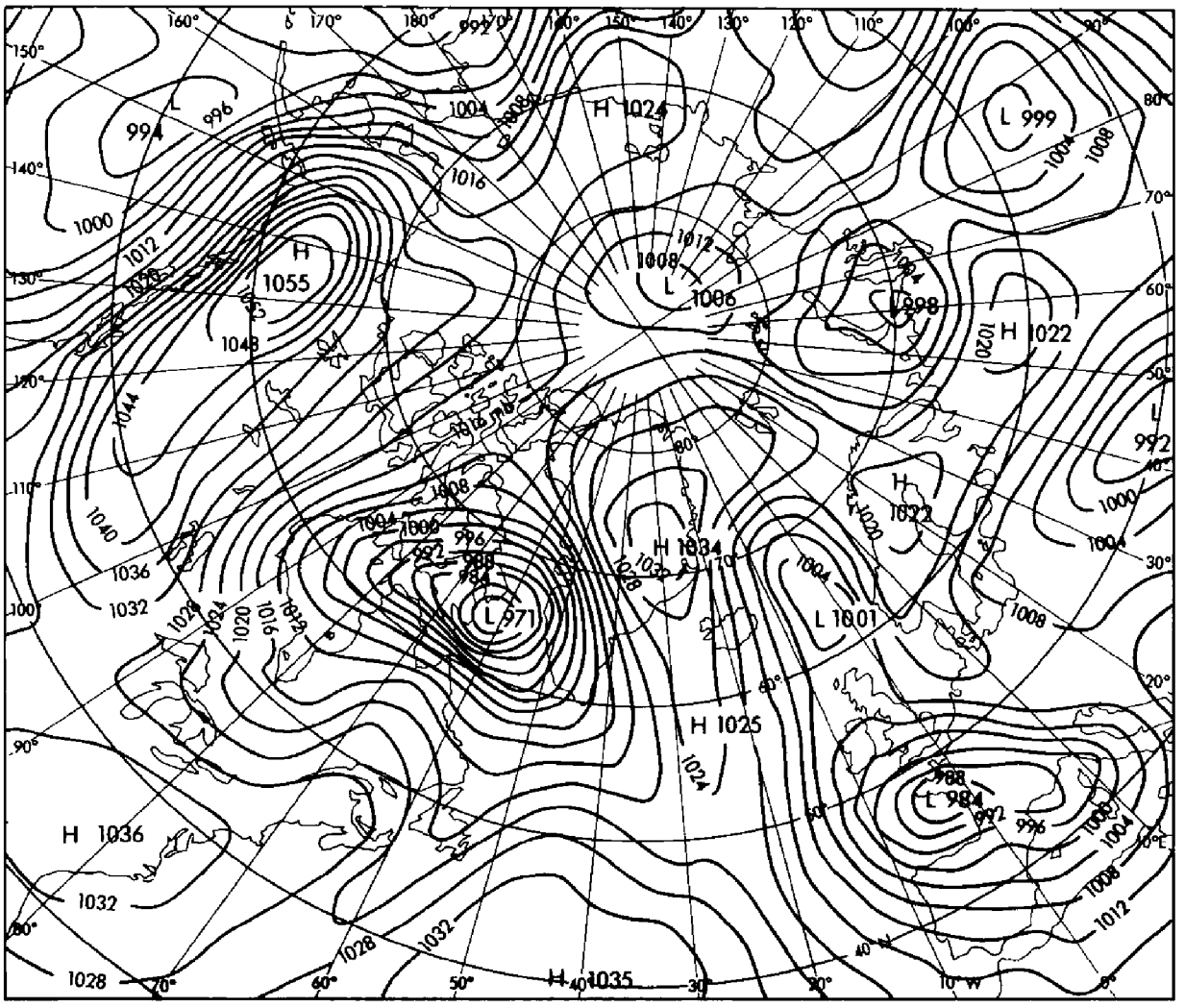

Figure 2(b). 24 hour computer forecast for 1200 GMT on 4 January 1979

In summary, it is not possible, by the intrinsic nature of the problem, to predict accurately the location of a small weather system for more than a short time in advance: precision may be possible at the expense of range, but a long-range forecast will necessarily be lacking in precision and detail. It is just not possible to achieve both precision and range in the same forecast.

The achievable accuracy for prediction on a particular time and space scale is limited by

(i) inadequacies in the coverage, frequency, accuracy and representativity of the observations used to define the initial state;

(ii) neglect in the models of some of the physical processes, especially small-scale processes, or their inadequate statistical representation;

(iii) computational errors which arise at each time-step of the integration and so build up cumulatively;

(iv) random fluctuations in the real turbulent atmosphere which are not represented in the model.

Although the models themselves are far from perfect, serious errors in short-range (1-to 5-day) weather predictions probably arise mainly from the lack of adequate observations, especially from over the oceans and remote land areas. Accurate longer-range predictions for a week or more ahead may not be possible without allowing for interaction between the atmosphere and at least the surface layers of the oceans that may produce anomalies in sea-surface temperature relative to the long-term average values. As to model deficiencies, it is difficult to distinguish between the effects of

numerical errors introduced by the finite-difference approximations to the continuous dynamical equations and those that arise because the equations themselves do not provide a complete and exact description of atmospheric behaviour, but the 2 sources of error appear to be of comparable importance. Some of the more important deficiencies arise from inadequate horizontal and vertical resolution and from inadequate representation of topography, precipitation, convection, horizontal eddy viscosity and surface drag. All require a good deal more research.

Verification and evaluation

While there is naturally much public interest in the accuracy of weather forecasts, their utility and economic value excites less comment, yet both accuracy and usefulness are important if forecasts are to be used to maximum advantage. It is convenient to distinguish between *verification*, in which the emphasis is on the degree of goodness of the forecasts when compared with the actual weather during the forecast period, and *operational evaluation*, in which the forecasts are judged in terms of their value or utility to the user. Verification of forecasts is undertaken by the Meteorological Office as a routine activity to provide an overall measure of the performance and effectiveness of the prediction models and techniques and to monitor the effects of changes introduced from time to time.

Many different types of forecast are issued to serve a wide variety of customers. Forecasts for the general public, disseminated mainly by television, radio and the press,

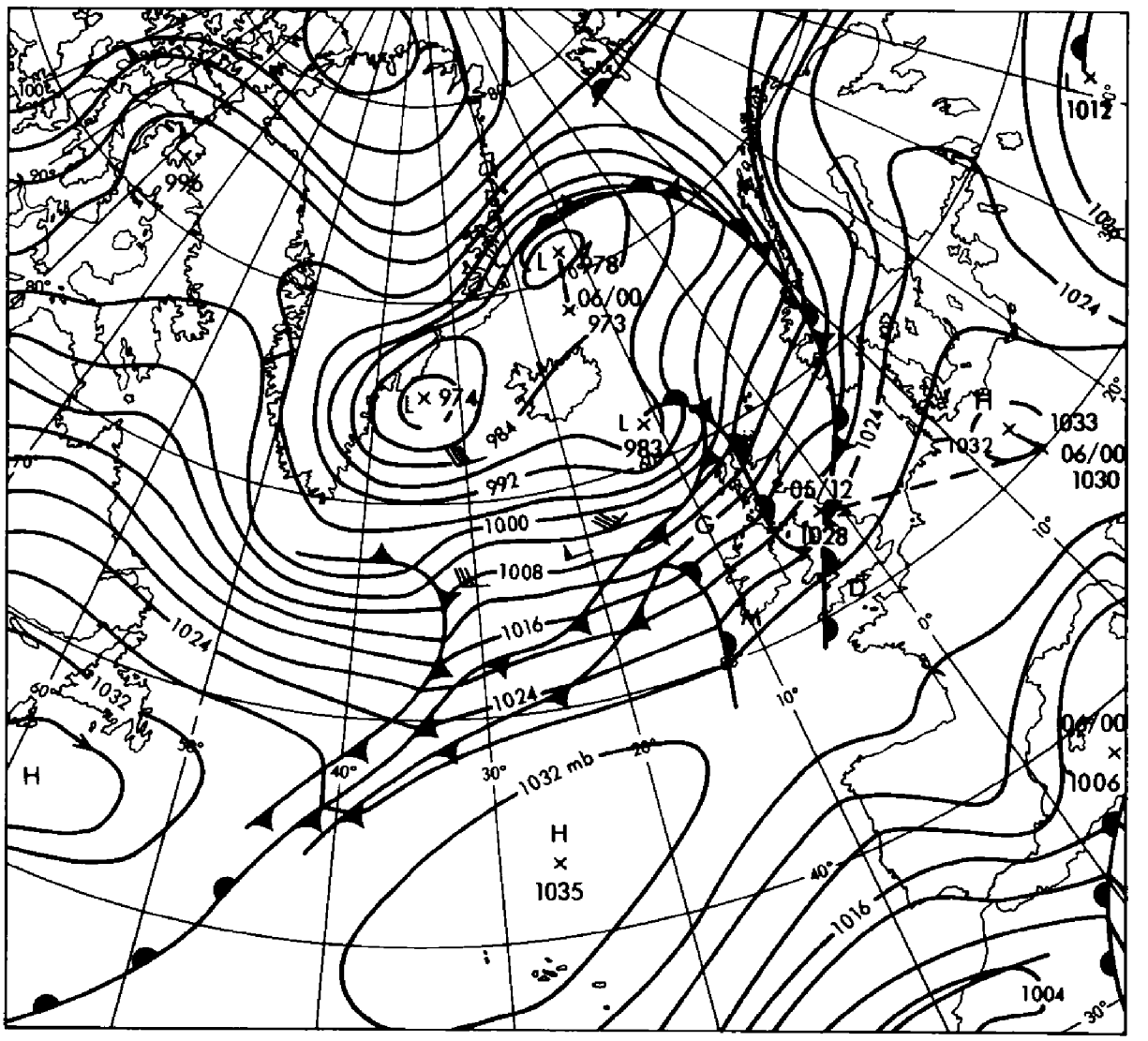

Figure 3(a). Actual surface weather map for 1200 GMT on 6 January 1979

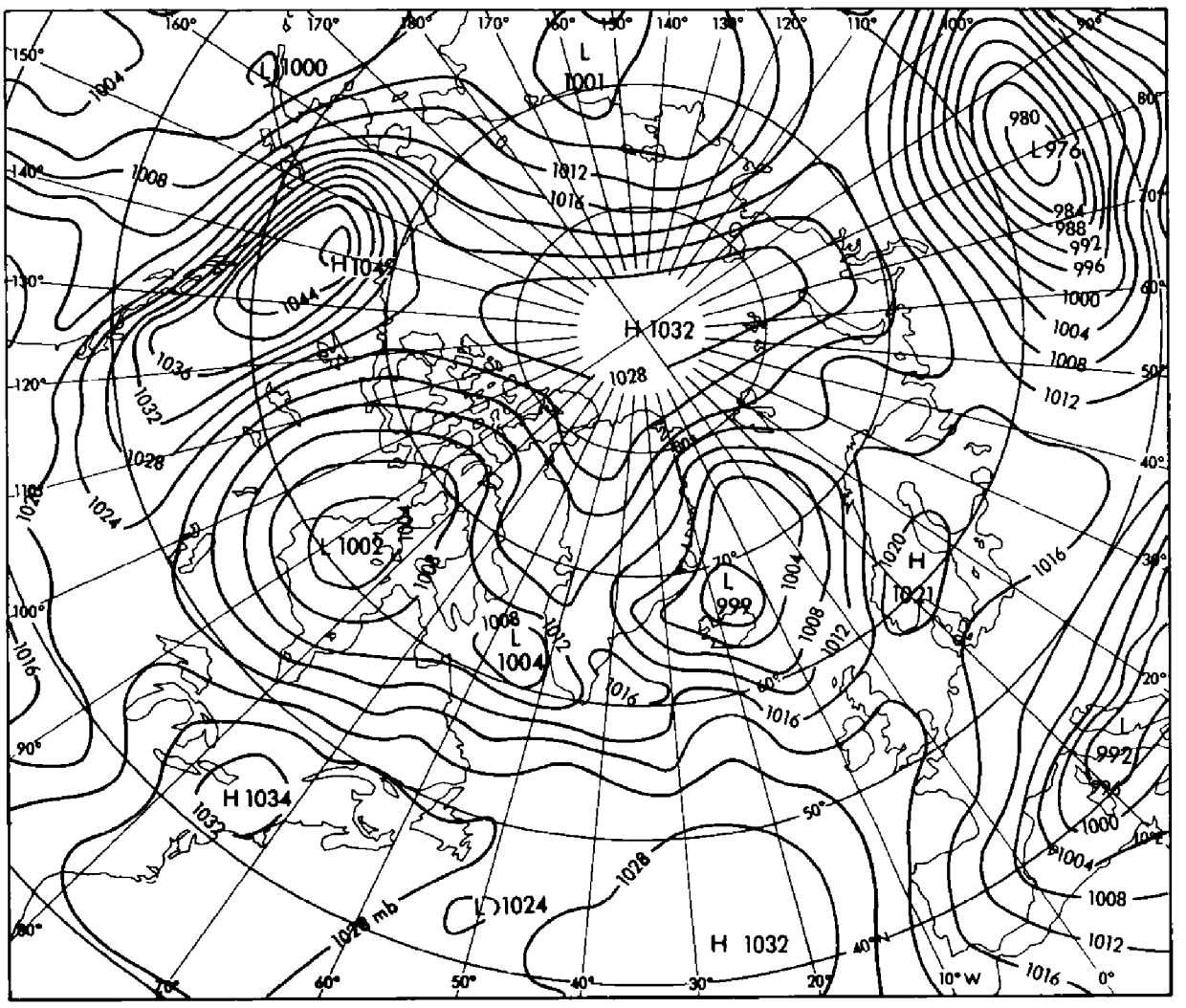

Figure 3(b). 72 hour computer forecast for 1200 GMT on 6 January 1979

are largely expressed in words. The 2 million forecasts made each year for civil and military aviation and the tailor-made forecasts for such weather-sensitive industries as electricity, gas, shipping and offshore oil and gas are usually presented in numerical form or by specially prepared charts. Meteorologists themselves make great use of prognostic charts, often the output of the numerical models and drawn by computer, of the expected distributions of atmospheric pressure, temperature, winds, rainfall, etc. An assessment of their accuracy can be made by comparison of forecast and actual values at a 3-dimensional network of grid points and is an objective and fairly straightforward exercise. Forecasts expressed in words have to be assessed subjectively and the results are inevitably less precise and more difficult to interpret. In an attempt to bridge the gap the Meteorological Office is conducting some experiments in which a computer is programmed to produce objective, worded forecasts from the output of the numerical prediction models.

A decade ago, before the introduction of advanced computer models, forecasts were rarely issued for more than 24 hours ahead and were less detailed and less accurate than those of today. The numerical methods have led to a greater degree of continuity, consistency and confidence in the forecasts than existed when they depended entirely on the personal experience and judgement of changing rosters of forecasters. Perhaps the single largest contribution to the numerical models has been to extend the range of surface forecasts from 1 to 3 days and to provide useful guidance up to 6 days ahead.

In the objective assessment of numerical forecasts, much attention is given to the forecast chart of the distribution of atmospheric pressure at the earth's surface on which weather forecasts for the general public are largely based. One standard test is to

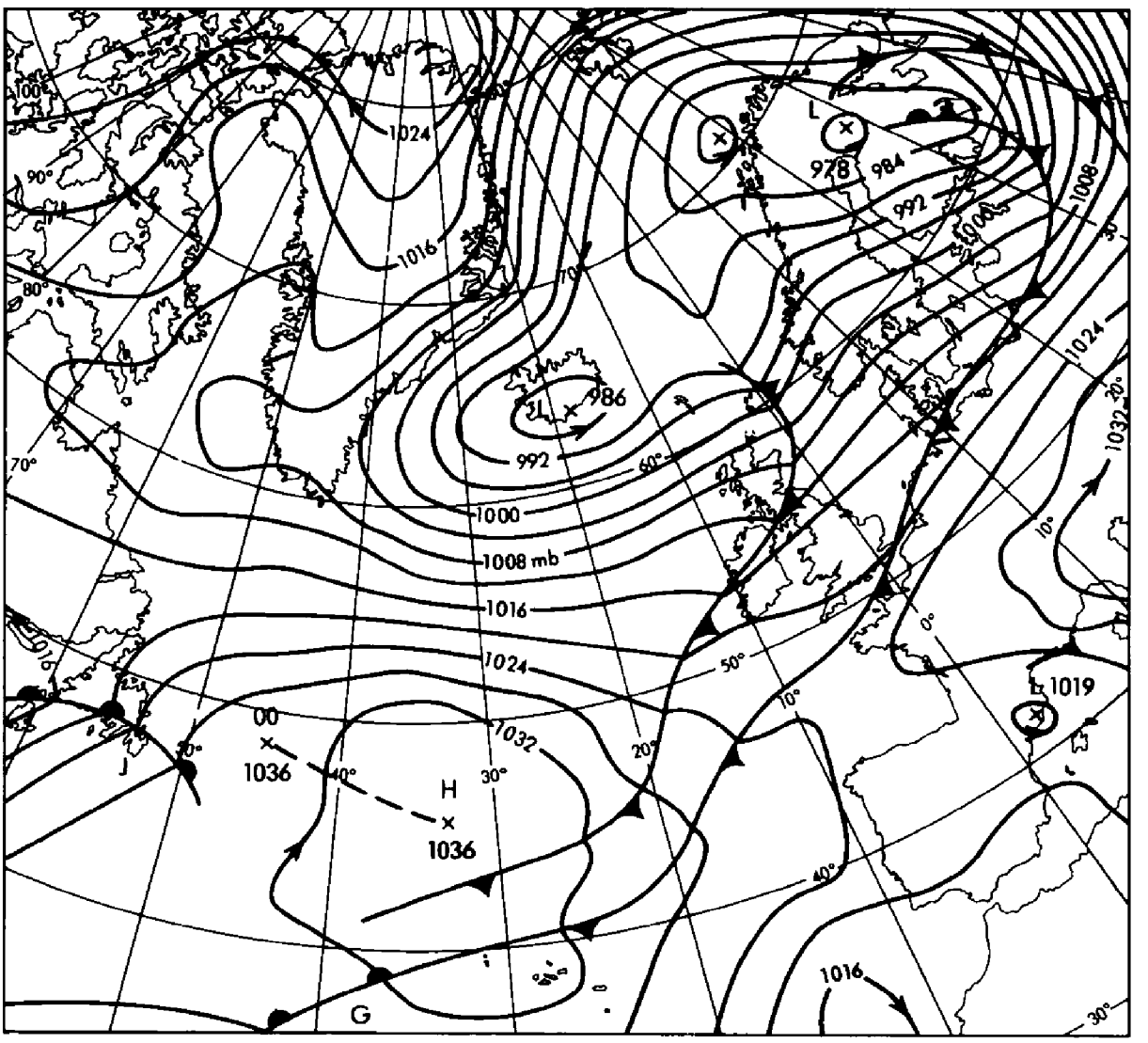

Figure 4(a). Actual surface weather map for 1200 GMT on 8 January 1979

compare the predicted height of the 1000 mb pressure surface at a large number of grid points with the corresponding heights on the 'actual' or verifying chart and then calculate the mean height error or 'bias' and the root mean square (r.m.s.) height error. Since it is a simple matter to derive the geostrophic winds from the pressure distribution, the r.m.s. vector wind error, which takes account of errors in both speed and direction of the wind, is also calculated*. The results of the analysis, some of which are shown in Figure 5, indicate that the mean height error or bias has now been almost entirely eliminated in surface forecasts up to 72 hours ahead whilst the r.m.s. height and vector wind errors have been substantially reduced so that the 72 hour and 48 hour forecasts are now about as good in these respects as the 48 hour and 24 hour forecasts were a decade ago. The statistics also show a marked improvement in forecast performance soon after the introduction of the 10-level models in August 1972 and a continuing steady improvement ever since. Figure 5 shows that the correlation coefficient between the forecast and observed 72 hour changes in the height of the 1000 mb pressure surface increased from only 0·32 to 0·65 during 1972/73 and has since increased to 0·72, whilst the correlation for 24 hour changes has improved from 0·77 to 0·85.

Predictions of air temperature made 24 hours in advance for the 1000 mb pressure surface of the hemispheric 10-level model show r.m.s. errors of about 3 K. However,

*This is a stringent test because, for example, a forecast wind of 30 knots ($\approx$15ms^{-1}), exact in magnitude but with a 30° error in direction, would have a vector error of 15 knots ($\approx$7·5 ms^{-1}).

these predictions may be improved by allowing for additional factors such as cloud cover and local effects so that 90 per cent of the 12 hour forecasts and 80 per cent of the 24 hour forecasts issued to the Gas and Electricity Boards are correct within ±2 K, only 1 per cent and 4 per cent respectively being in error by more than 5 K.

Even the first operational numerical 3-level model introduced in November 1965 proved markedly superior to subjective methods in forecasting winds and temperatures at upper levels for aviation and soon thereafter all such forecasts were based on computer methods. Numerical values of the forecast parameters are fed directly from the Meteorological Office computer into the airline computers for flight planning and also provide the basis of the meteorological advice (flight documentation) issued to aircrews. The numerical methods have led to the r.m.s. vector errors in the 24 hour forecasts of winds at 500 mb (18 000 ft) and 200 mb (40 000 ft) being halved from about 30 knots to about 15 knots. The 48 hour forecast errors of about 20 knots and the 72 hour errors of about 25 knots are now very little larger than those of the corresponding 24 hour and 48 hour forecasts only 5 years ago. Similar improvements appear in the r.m.s. height errors and the mean height errors have now been reduced to only a few metres. Again, as shown in Figure 6, marked improvements followed the introduction of the 10-level model which also produces better forecasts of the location and strength of the high-level jet streams.

Desirable standards of forecasting accuracy for civil aviation are set by the International Civil Aviation Organization (ICAO). They are: upper winds (at levels about 25 000 ft) within 20 knot vector difference on 90 per cent of occasions over a period of one hour's flying time and upper-air temperatures within ± 3 K on 90 per cent of occasions. The average r.m.s. errors in the 24 hour forecasts issued in 1978 were only

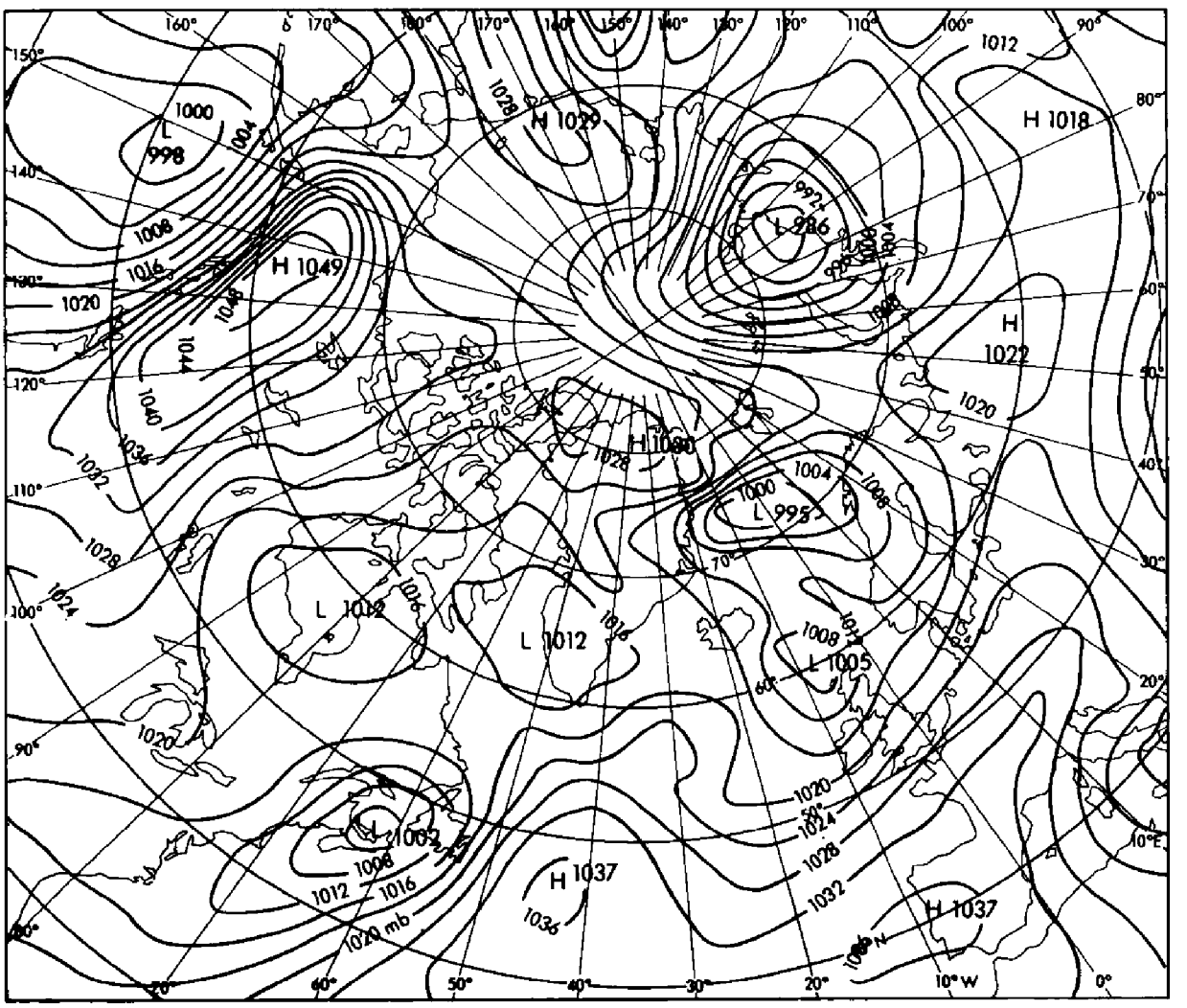

Figure 4(b). 120 hour computer forecast for 1200 GMT on 8 January 1979

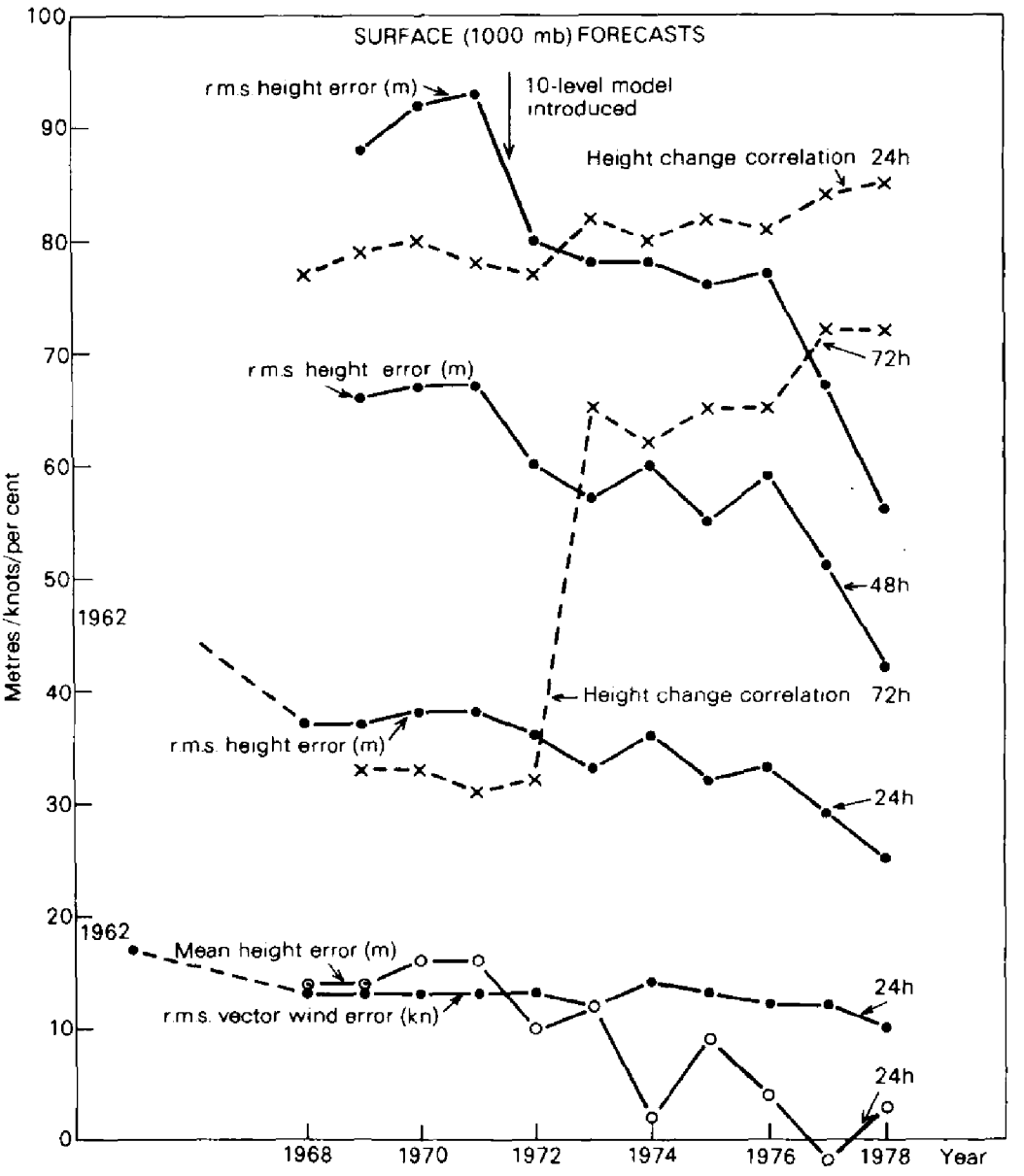

Figure 5. Errors in numerical forecasts of the height of the 1000 mb pressure surface and of the geostrophic winds showing continual improvement over the last decade

2 K and 14 knots at 500 mb and 3·5 K and 16 knots at 200 mb and since errors evaluated along 500-mile tracks (equivalent to about one hour's flying) are smaller than those for spot values at grid points, it appears that the ICAO requirements are now being met except perhaps in the vicinity of jet streams and areas of sharply changing gradients.

For longer-range model predictions, for up to 6 days ahead, the r.m.s. vector errors in the forecast winds at 500 mb, which average 16 knots after 24 hours, double during the next 3 days but are still below the errors of forecasts based on persistence after 6 days. A similar performance is achieved at the 1000 mb and 200 mb levels.

Whereas objective tests can be devised to assess the accuracy of numerical forecasts, it is much more difficult to assess written and spoken forecasts, which are largely descriptive and here the approach has to be more subjective. The difficulty lies in deciding what weights should be given to the various elements of the forecast in arriving at an overall figure of merit for the forecast as a whole. Although it is possible to design sensible systems of awarding 'skill-scores' for individual parameters such as temperature, wind, precipitation, etc., it is much more difficult to combine these individual marks into an overall score for the forecast as a whole. This is mainly because

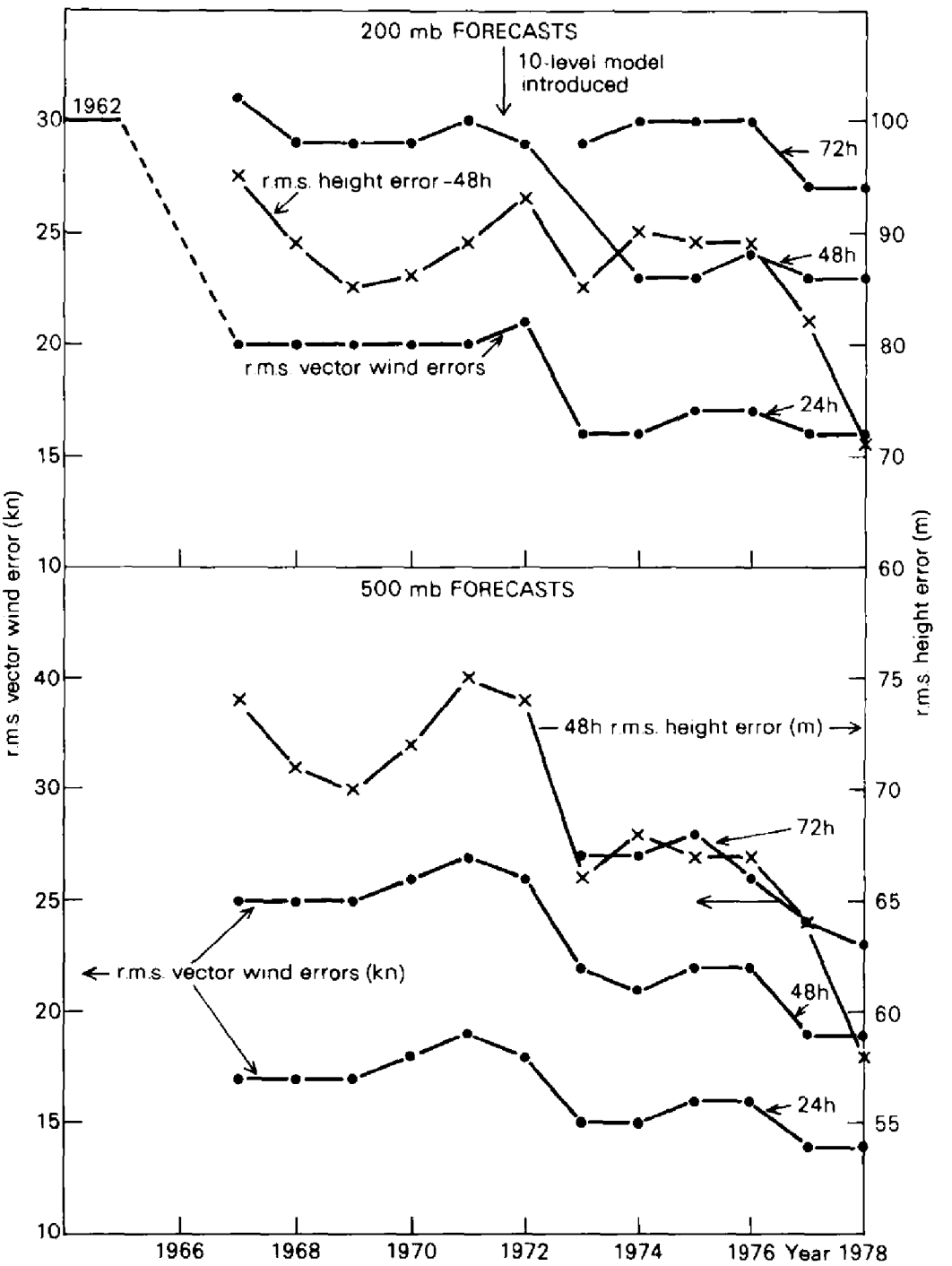

Figure 6. Errors in numerical forecasts of winds at 500 mb (≈18 000 ft) and 200 mb (≈40 000 ft) and in 48 hour forecasts of the height of those pressure surfaces

the weighting of the various factors will be judged differently by different users and should probably vary with season and climatic régime. Thus a forecast which gets high marks for temperature and wind but is a few hours out in predicting the arrival of a rain belt may be regarded as a complete failure by a farmer concerned with getting in the harvest whilst a yachtsman or a power engineer may judge it more leniently. Or, to take another example, an error of a few degrees in the forecast minimum temperature may be unimportant and pass almost unnoticed in midsummer, but a similar error may have very serious consequences when the temperature is near freezing.

Since August 1963 the Meteorological Office has applied a simple marking scheme to the 0755 BBC forecast valid for the following 16 hours and the 1755 forecast valid for the following 30 hours. The forecast for each of the 7 regions are checked by selected

Meteorological Office stations within the region. Each forecast is evaluated in terms of 4 parameters—wind speed and direction, weather (precipitation, fog, etc.), state of sky, and maximum temperature—each being awarded marks 2, 1 or 0 according to whether the forecast is regarded as correct, only partly correct, or incorrect. Since the scores turn out to be much the same for the 4 elements, an average mark is taken as a measure of the overall performance and avoids the difficulties of assigning different weighting factors to the various elements. Although the assessments are made at many different stations and by many individuals, there is a high degree of uniformity between the different regions. The 0755 forecast, as might be expected, is consistently more reliable than the 1755 forecast, the overall scores for 1978 being 86 and 78 per cent respectively.

These forecasts are based on guidance given by the Central Forecasting Office at Bracknell in country-wide 'synoptic reviews' issued some 2½ hours earlier. They, in turn, depend heavily on the predictions of the numerical models and have shown marked improvements in recent years. Whereas 10 years ago less than half of these guidance forecasts were essentially correct and 1 in 7 were seriously misleading, since 1972 two-thirds have given good guidance and only 1 in 15 has contained serious errors.

The overall improvement in the 2- and 3-day surface weather forecasts in recent years, which again are largely based on the numerical prognoses, is apparent from Table 1, showing the percentages of all forecasts falling within 3 performance categories.

Although these recent improvements may be attributed largely to the numerical models, the human forecaster still has a vital role to play in interpreting the computer products, in modifying them if he has good reason and in predicting the behaviour of small-scale weather systems and local phenomena such as thunderstorms, showers, fog, frost and ice which are not treated by the models. Indeed the improvements and advantages derived from numerical models may be largely nullified by forecasters lacking in experience and judgement of the real atmosphere.

Table 1. Evaluation of 48 hour and 72 hour surface forecasts

	48 hour forecast			72 hour forecast		
	A	B	C	A	B	C
	per cent			*per cent*		
1967	24	51	25	7	50	43
1972	50	37	13	27	45	28
1976	53	37	10	27	43	30
1977	59	32	9	31	46	23
1978	63	28	9	36	41	23

A—essentially correct. B—some errors, but none serious over the United Kingdom. C—misleading in some important respect.

Limits of atmospheric predictability

We now raise the crucial questions of whether there is for each scale of atmospheric motion a finite intrinsic time range of predictability beyond which it is not possible to make a deterministic forecast. This question is of fundamental importance for practical weather forecasting because the answer may set ultimate limits to what is achievable and to what is worth aiming at.

Smagorinsky (1969) has posed the question as follows: 'If we had a physically faithful model of the real atmosphere, an ability to specify fully the initial conditions for all spectral components, and committed no truncation error in numerically integrating the system of non-linear differential equations, could we expect to predict the atmospheric evolution from an initial state with infinite precision infinitely distant into the future? or, would small random perturbations (noise) develop in the model and amplify to the point at which numerical simulation departs from reality and ultimately become uncorrelated with the real atmosphere?' An answer to these questions might set an ultimate time limit to predictability beyond which no improvement, whether in models, initial conditions (observations) or computing power would increase the predictability of a given scale of atmospheric development.

Leading authorities such as Lorenz (1969) and Leith (1971, 1978) hold that a definite limit to predictability is set by the inherent instability of atmospheric motions and by their inherent non-linear and dissipative character. Robinson (1967, 1978) goes further and asserts that the modified Navier-Stokes equations (1–3) cannot be used to predict the mean motion of an atmospheric disturbance of horizontal scale L for times $t > L^2/K$ because it will lose its identity through the dissipative action of smaller eddies collectively represented by the lateral eddy diffusion coefficient K. Arguing on dimensional grounds that $K \approx L\bar{U}$, where $\bar{U}$ is the mean horizontal velocity of the flow, he arrives at a prediction time limit $t \approx L/\bar{U}$ which is equivalent to saying that the prediction time cannot exceed the time taken for the system to travel about one wavelength. For a middle latitude depression (cyclone) of $L = 5000$ km travelling at $U = 20$ ms^{-1}, this gives a time limit of *c.* 3 days. Extensive experience with operational forecasting models shows this estimate to be too pessimistic. It is possible to predict the evolution of systems over considerably longer times than it takes to displace them by one wavelength. It is possible to predict major depressions for at least 5 to 6 days ahead (see section 3) with even the present imperfect models and inadequate observations. Moreover, the models are able to predict the formation and development of depressions and even fronts which are not present or detectable in the smoothed fields of the initial state. The unreality of Robinson's treatment is further illustrated by its conclusion that finer resolution of the observational or computational grid would actually *reduce* the predictability time for larger-scale motions whereas experience shows that higher resolution leading to better description and prediction of the smaller scales also leads to improved simulation of the larger scales such as the planetary long waves.

A similar examination of the Navier-Stokes equations has been made by Leith and Kraichnan (1972) but treating the basic flow in spectral form and using a different closure hypothesis with a scale-dependent damping factor that ensures that interactions involving the smaller scales are heavily damped. They then define the predictability time as the time taken for the 'error energy' on any one scale to grow to one-half of the energy of that scale and arrive at periods at least 20 times greater than those of Robinson!

It is important to realize that these and similar analyses, which have attracted much attention and discussion, apply to predictions, from initial values, of the motions of an *unbounded* fluid in which motions of all scales are treated as decaying isotropic turbulence losing energy solely through a cascade of progressively smaller eddies and ultimately by molecular viscosity. Such a system has little in common with the real atmosphere which is bounded and largely forced from the planetary surface containing major energy sources and sinks and in which quasi-two-dimensional baroclinic disturbances such as the mobile cyclones and anticyclones tend to become stabilized through non-linear interactions with smaller scales, the latter being able to transfer energy to the larger-scale motions as well as dissipate it through small-scale turbulence. Moreover, large-scale forcing of the atmosphere as the result of differential heating, thermal contrasts between land and ocean, the large thermal capacity of the oceans and rotation of the earth tends to impose preferred scales of motion and confer stability especially at longer wavelengths.

For all these reasons atmospheric motions are almost certainly predictable over longer periods than Robinson's highly artificial calculations for an unforced system of decaying isotropic turbulence suggest. It is, however, very difficult to derive a convincing theoretical criterion for the predictability of a system as complex as the real atmosphere, so we have to appeal either to its observed behaviour or to the results of experiments with numerical models.

One approach is to determine from observations for how long the structure and evolution of weather systems are influenced by the initial state. The effects of such persistence may be measured by correlations between 2 sets of observations made at increasing time intervals apart. Tests made with 7 surface and upper-air observed parameters analysed on the spatial grid of the Meteorological Office 5-level global model indicate correlation coefficients of about 0·3 for observations made 10 days apart but falling to less than 0·1 for data sets 30 days apart.

Another way of studying predictability is to determine how fast small errors in the representation of the initial state will grow in a numerical model. The method involves running the model from a given set of initial parameters and again after a small random error is added at each grid point and following how rapidly the 2 simulations or predictions diverge. Experiments of this type with global models usually find that the errors double within a period of 2–4 days and suggest an upper limit of a few weeks for the prediction of day-to-day weather variations. Thus Smagorinsky (1969) reports the result of a test with a 9-level global model with horizontal grid spacing varying from 320 km at the Equator to 640 km at the Poles. Comparison trials were made for an observed (January) initial state and for a perturbed state in which a random temperature fluctuation of standard deviation 0·5 K was added to all grid points at all levels. The standard deviation σ of the temperature error (difference between the predicted temperatures of 2 runs) grew exponentially during the first 7 days with a doubling time of about 2½ days and thereafter more slowly. Nevertheless, after 3 weeks σ was still only about half the asymptotic value of the standard deviation of the difference between the predicted and initial (unperturbed) temperatures which was 5·5 K and taken as a measure of the natural variability.

This result is rather similar to that obtained for the growth rates of r.m.s. vector wind errors in the Meteorological Office hemispheric forecast model described above, where the errors doubled in the first 3 days but were still below the persistence values after 6 days. Some recent tests by Rowntree (personal communication) with a Meteorological Office global 5-level model for 3 winter seasons show that differences in the model atmosphere's evolution induced by changes in the initial data were detectable up to about 3 weeks later but thereafter any influence of the initial conditions was lost in the random noise. Moreover, correlation betwen *predicted* and *observed* states, both represented by 10-day averages at grid points, fell sharply from about 0·5 for the first 10-day period to about 0·1 for the third period.

All these results tend to indicate an upper limit of about one week for useful deterministic predictions with present models and observations but it is reasonable to hope for an extension to perhaps 2 to 3 weeks as both the models and their initial data improve.

Future outlook

Although forecasts issued to the general public are usually limited to 3 days ahead, the hemispheric model is run up to 6 days ahead once a day and the results provide the basis for the weekly farming forecast issued every Sunday. Although the model remains stable for much longer periods, the detailed predictions tend to deteriorate rather sharply beyond the fourth or fifth day. Reliable forecasts for a week or more ahead, which would be of a great economic value to weather-sensitive industries such as agriculture, building, fuel, power, water resources and food manufacture, will require improved models with higher resolution, better representation of the physics, especially of clouds and of convective, radiative and turbulent transfer processes and improved mathematical methods of integrating the equations in order to limit both the amount of computation and the errors involved. Geographical extension of the model, perhaps to cover the whole globe, improved observations from the oceanic and tropical regions and greater computing power will also be required. These are, however, *inherent* limitations in the predictability of atmospheric behaviour set by the cumulative effect of random, small-scale disturbances that cannot be directly observed or treated explicitly in the models. None-the-less, current research encourages us to think that it should be possible to forecast the evolution of major weather systems such as the mobile depressions of middle latitudes for about a week or 10 days ahead and to give a useful indication of general trends over periods of perhaps a month. In some recent experiments in which the model equations were integrated up to 50 days and the results averaged over 10-day

periods, the development of the long planetary waves, which largely determine the general character of the weather over periods of several weeks, was predicted quite well. A clearer idea of the possibilities should emerge when the recently inaugurated Global Weather Experiment, which made a continual, comprehensive survey of the global atmosphere for a period of 18 months, provides the models with input data sets of unprecedented quality and coverage.

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PRESENTATION OF BAROGRAPHS

As already announced in the January 1980 edition of this journal the 4 Masters qualifying for this award for the year ending 1978 were: Captain F. C. Taylor, P. & O. Strath Services; Captain L. C. Taylor, Manchester Liners Ltd; Captain M. J. Winter, Associated Maritime Co. Ltd and Captain L. E. Howell of Container Fleets.

At the very last moment it was found that Captain M. J. Winter would be unable to attend the ceremony but Captain M. J. Pain, Marine Superintendent of Associated Maritime Co. Ltd, kindly agreed to receive the award on Captain Winter's behalf.

For the benefit of those who may be unfamiliar with the method of selection of the recipients, the requirements needed to qualify for the Long-Service Award List are a

minimum of 18 years of voluntary observing which, combined with the number of logbooks received and the character thereof, decides the order of preference. It is rare indeed to find that the 18 years service run consecutively and frequently they are spread over a period of 30 years of more.

The practice of making these special awards was commenced in 1948 and since then there have only been 2 occasions when all 4 Masters were available at the same time. We had high hopes that this year would mark the third occasion, but unfortunately due to the unavoidable absence of Captain M. J. Winter this was not to be.

Notwithstanding the disappointment felt at Captain Winter's absence we were delighted to welcome the other 3 Masters and their wives. The managerial side of all 4 shipping companies was represented by: Captain A. C. Davies, Marine Manager, P. & O. Strath Services; Mr B. Hawthorn, Personnel Department, Manchester Liners; Captain M. J. Pain, Marine Superintendent, Associated Maritime Co. Ltd and Captain J. R. G. Hannah, Operations Manager of Container Fleets.

The ceremony took place at Meteorological Office Headquarters in Bracknell on 16 January 1980 when the presentations were made by Mr F. H. Bushby, Director of Services of the Meteorological Office, see photograph opposite page 113.

Prior to making the presentations, Mr Bushby expressed his thanks to the Voluntary Observing Fleet in general and then to the 4 recipients individually for their lengthy and exemplary services to meteorology; he also stressed the very great importance of ships' surface observations both now and in the foreseeable future. The Masters were then invited to examine their first meteorological logbooks and personal record cards.

Later, the visitors took luncheon with Mr Bushby and senior officers of the Meteorological Office, after which, the party was conducted through the Central Forecasting Office and the Telecommunications Centre.

J.D.B.

AURORA NOTES JULY TO SEPTEMBER 1979

By R. J. Livesey
(Co-ordinator of Auroral Observing, the Solar Section of the British Astronomical Association)

Aurora observations for the period are shown in the accompanying table.

Reviewing observations received from British Columbia to Europe, it seems that July began quietly and was followed by a low level of activity during the period the 14th to the 17th and on the 19th, 25th and 26th of the month. A little activity was reported on the 7th, 9th, 12th and 15th of August; minor reports were received between the 18th and the 28th. On the night of the 29th, however, activity, which varied from rayed arcs to all-sky aurora and accompanied by a magnetic storm, was widely observed. During September an isolated report was made on the 11th; there was more-widespread activity on the 13th to the 15th, the 17th to the 23rd and the 25th to the 29th.

Disturbance of the earth's magnetic field was also reported on the 13th and 20th of August and on the 18th and 21st of September.

Whereas it would seem that during the past 6 months there has been a marked decrease in the number of marine observations received, taken statistically, the level of observing from 1975 to date averages 10·9 observations per quarter; the frequency of marine observations of aurora bears no relation to the frequency and intensity of auroral storms. This suggests that the degree with which ships report sighting the aurora relates to the probability of suitable observers being near to the auroral zone. Reference to the Fritz Diagram, on page 40 of the January 1979 edition of *The Marine Observer*, will reveal that the bulk of ships reporting aurora are somewhere between the St Lawrence River, Shetland Isles, North Cape and Barents Sea—a curve lying close to, and eventually cutting, the zone of maximum auroral visibility.

Although satellite observations of meteorological features are standard practice, there is, as yet, no comparable monitoring of the aurora. Specific studies have been made with satellites and aircraft, but a satellite programme for continuous coverage of the aurora is not expected before 1986, therefore land- and marine-based visual and photographic observations taken all over the world still remain the fundamental method of keeping track of auroral activity. All visual observations are, consequently, still gratefully received.

The history of auroral observing is a long one in view of it spectacular nature and the fact that only the human eye is necessary to determine its presence. Descriptions of auroral and aurora-like events go back in European and Asiatic records to the 7th Century BC and beyond. Ancient writers refer to sky fire, night suns, blood rain, milk rain, beams, pillars, torches and chasms. Although some of the events could perhaps be confused with the zodiacal light and comets, there is sufficient reliable evidence to infer the existence and frequency of auroral events through many centuries. Such records tend to confirm the variations in sunspot activity and indeed variations in the location of the earth's magnetic pole which have been determined or inferred from evidence of climatic changes, comparable naked-eye sunspot observations and rock magnetism, to name but a few scientific studies. The visual observer of today is, then, following in the footsteps of a very long lineage of predecessors covering the full span of recorded civilization.

Although it might appear in these notes that prominence is given to observations in the northern hemisphere, contributions from marine observers in the southern hemisphere are equally important. In broad terms auroral conditions take place simultaneously and at the same geomagnetic latitude in the 2 hemispheres—a good auroral display in the southern oceans will have its counterpart at the conjugate point in the north. Experimental proof of this fact came when the USA exploded rocket-carried atomic bombs in 1958 during their Argus test programme in the South Atlantic. The result was a man-made radiation belt which persisted for several days following each of the 3 detonations. An auroral display was observed on one of the occasions at the conjugate magnetic point to that of the detonation, i.e. in the Azores.

Considering that we are still referring to the Japanese, Chinese and Greek auroral observations of the pre-Christian era, one can only conclude by encouraging new generations of marine observers to follow the free translation of the motto of the Royal Astronomical Society and 'Observe Everything that Shines'. One never knows the value of one's observation in the years to come.

DATE 1979	SHIP	GEOGRAPHIC POSITION		TIME (GMT)	FORMS
2 Aug. ..	*Spey Bridge*	56°18'N	16°40'W	0000–0100	N
10	*Reynolds*	59°38'N	56°52'W	0455–0529	R, RdA, R, P, RdB
20	*John Murray*	53°59'N	7°20'E	2145–2340	R, mR, HRdA, N
29	*Admiral Beaufort* ..	57°00'N	20°00'W	2226–2345	RdA, RdB, aHB, N
18 Sep. ..	*Atlantic Causeway* ..	40°40'N	60°00'W	0215–0245	G, HA, RdA, G
20	*Wild Fulmar*	57°35'N	11°14'E	2218–2228	N, qRdA, N
21	*Atlantic Causeway* ..	48°48'N	27°06'W	0015–0135	G, pRdG, R

KEY: A = arc, a = active, B = band, G = glow, H = homogeneous, m = multiple, P = patch, p = pulsating, q = quiet, R = ray, Rd = rayed, N = unspecified form.

Marine Aurora Observations July to September 1979

ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FROM JANUARY TO FEBRUARY 1980

The charts on pages 40 and 41 display the actual and normal ice edges (4/10 cover), sea-surface and air temperatures and surface-pressure anomalies (departures from the mean) so that the abnormality of any month may be readily observed. (The wind anomaly bears the same relationship to lines of equal pressure anomaly as wind does to isobars. Buys Ballot's law can therefore be applied to determine the direction of the wind anomaly). Southern and eastern iceberg limits will be displayed during the iceberg season (roughly February to July). In any month when sightings have been abnormally frequent (or infrequent) this will be discussed briefly in the text.

The periods used for the normals are as follows. Ice: 1966–75 (Meteorological Office). Surface pressure: 1951–70 (Meteorological Office). Air temperature: 1951–60 (US Department of Commerce, 1965). Sea-surface temperature: area north of 68°N, 1854–1914 and 1920–50 (Meteorological Office, 1966), area south of 68°N, 1854–1958 (US Navy, 1967).

JANUARY

In Davis Strait and the Labrador Sea, with an anomaly of south-easterly winds and above average temperatures, ice extended less than normal during January so that by the end of the month there were substantial deficits. (In fact, towards the end of January air temperatures were 3–5° above freezing, off the west coast of Greenland resulting in break up and some recession through Davis Strait). Ice was also slow to form in the Gulf of St Lawrence and the shipping routes to the river ports were still mostly open water by the end of January. In the Greenland Sea, where pressure and temperature anomalies were weak, the deficits of ice during recent months were reduced. In the Barents Sea, however, there was some anomaly for cold easterly winds and the continued formation of new and young ice resulted in ice extending south and west of the normal position. Ice conditions in the Baltic Seas were near normal, although pack ice was slow to form in the Gulfs of Finland and Riga.

FEBRUARY

Pressure was lower than normal south of Greenland. With an anomaly for northerly winds over eastern Canada the deficits of ice in Davis Strait, the Labrador Sea and the Gulf of St Lawrence were reduced and east of Newfoundland ice extended south of the normal position. There was, however, little change in the pattern of sea ice anomaly east of Greenland. The anomaly for southerly winds resulted in a continuing deficit in the Greenland Sea. In the Barents Sea, although there was a marked change to an anomaly for milder westerly winds, ice remained south of the normal position throughout the month. In the Baltic Seas, cold mainly anticyclonic weather persisted and the formation of new ice along the coasts of Poland and Germany and at times in the Skagerrak and Kattegat created some problems for shipping.

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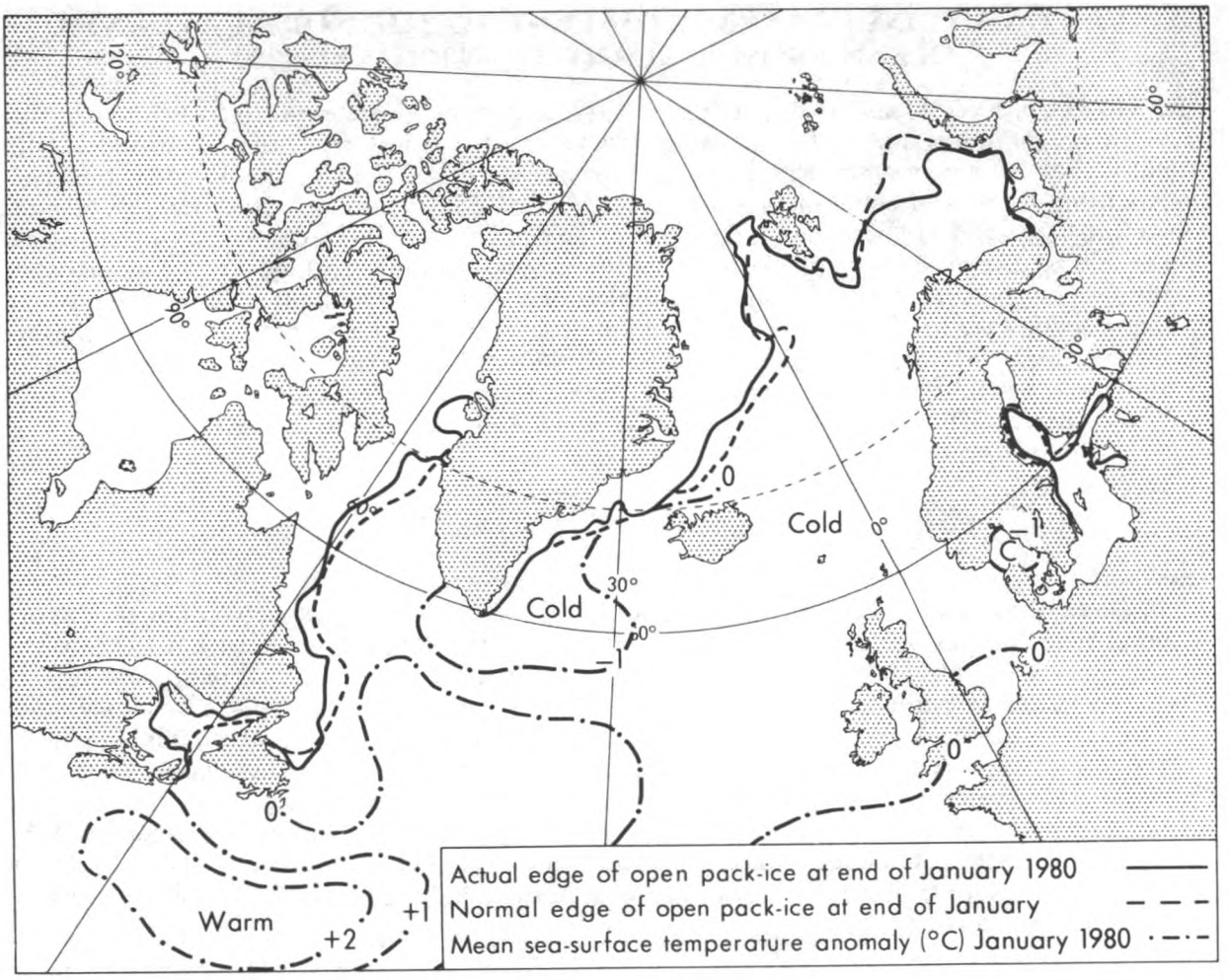
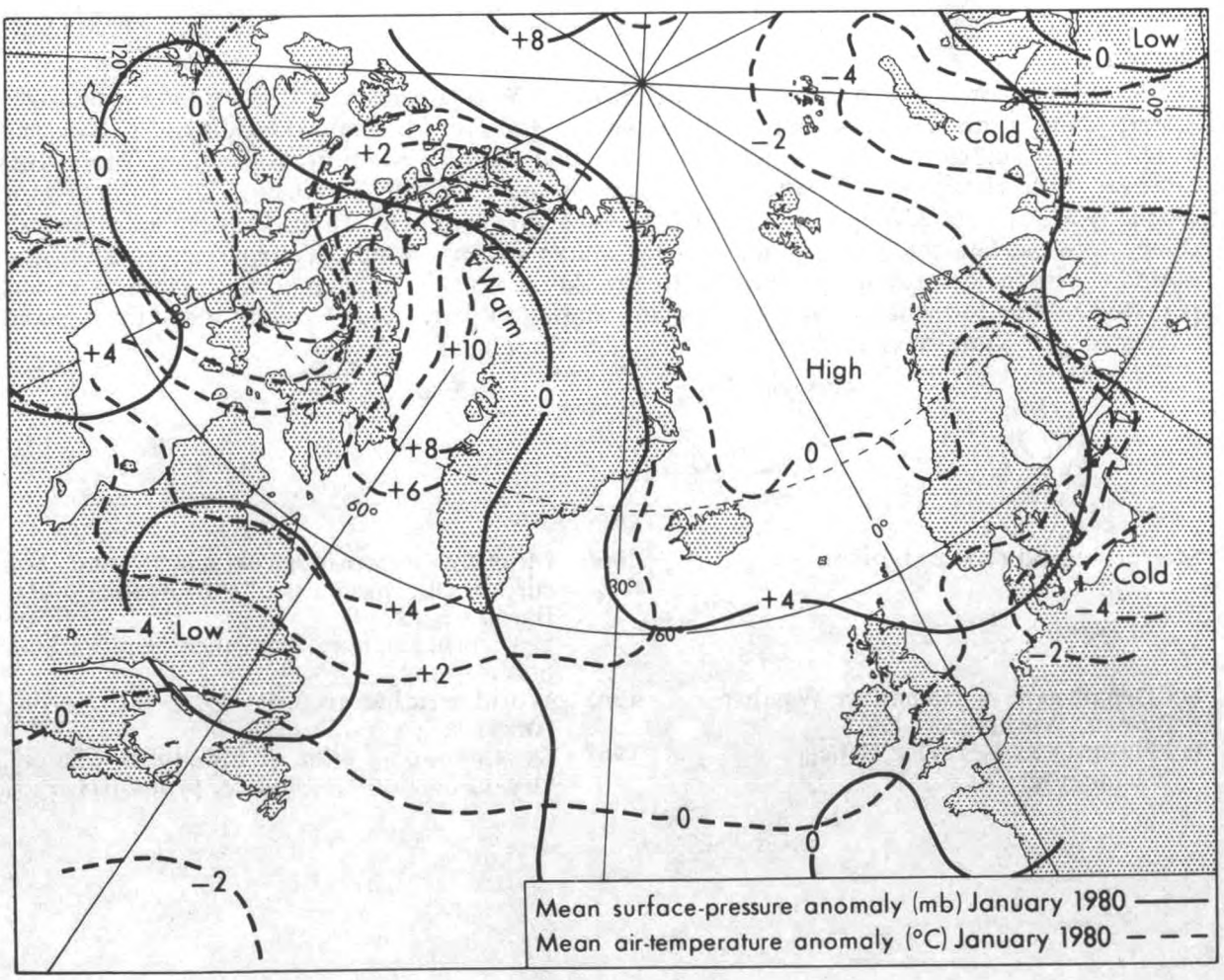
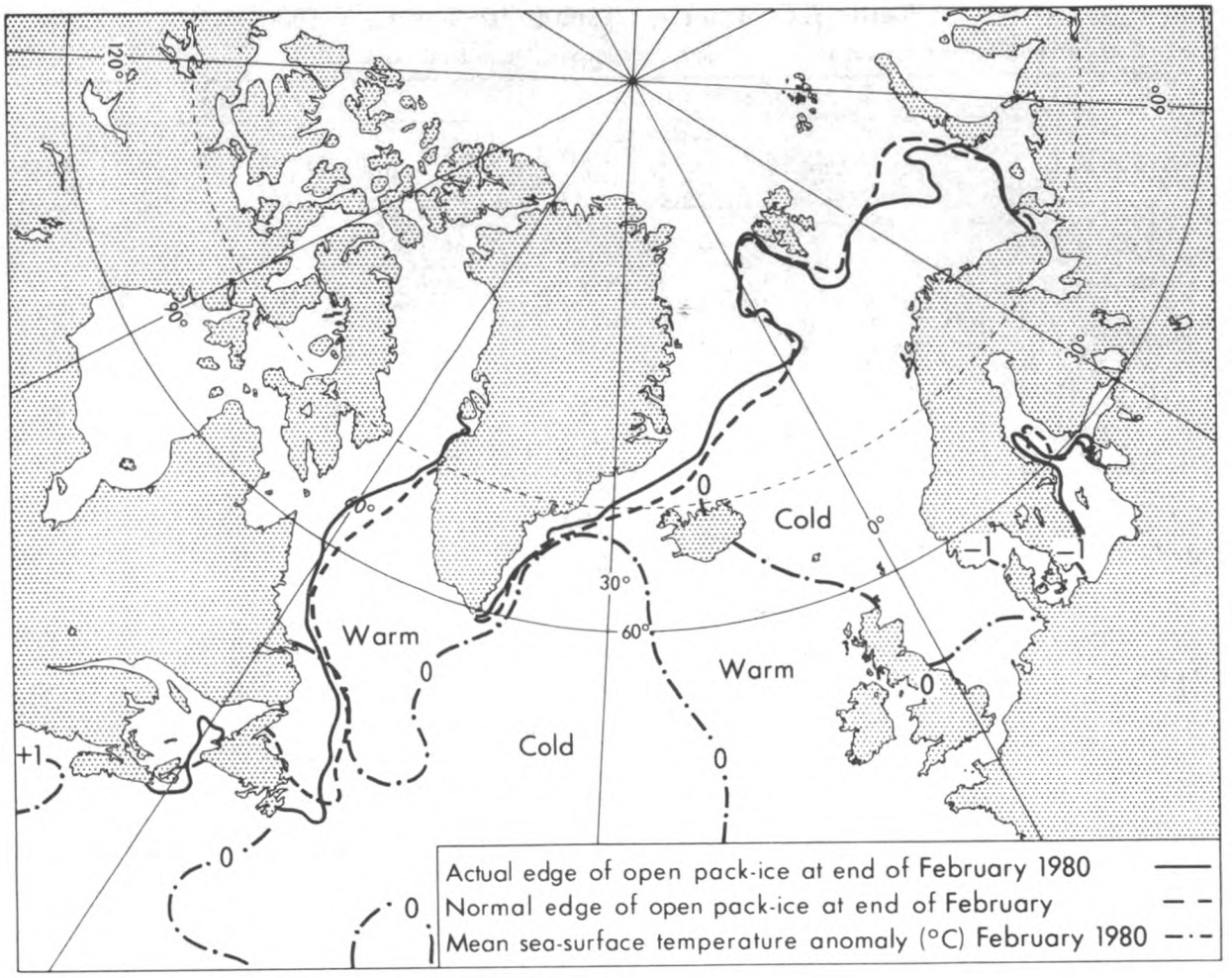
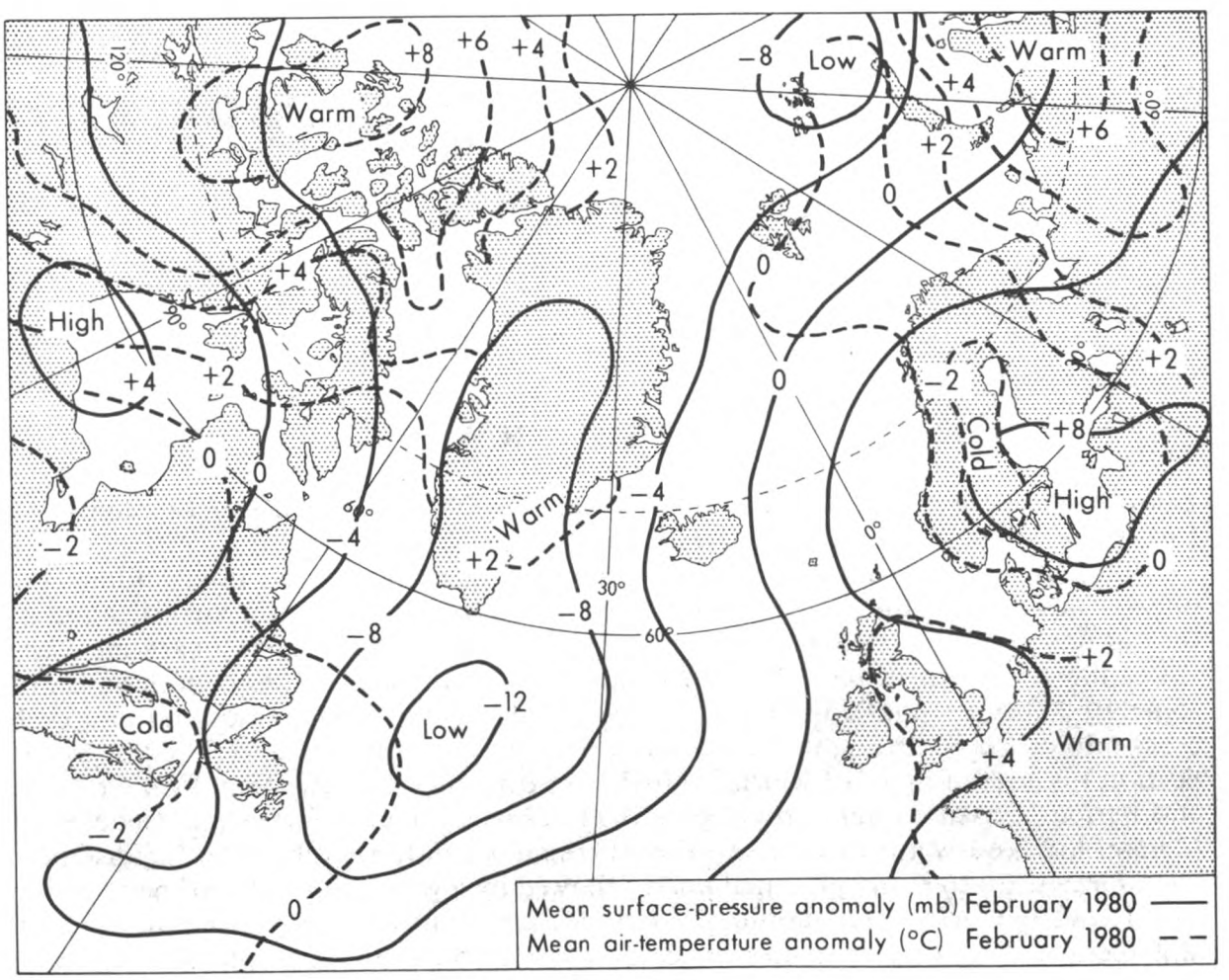

Cold
Cold
Warm
Actual edge of open pack-ice at end of January 1980
Normal edge of open pack-ice at end of January
Mean sea-surface temperature anomaly (°C) January 1980


Low
Cold
Warm
High
Cold
Low
Mean surface-pressure anomaly (mb) January 1980
Mean air-temperature anomaly (°C) January 1980


120°
60°
0°
30°
60°
Cold
Warm
Warm
Cold
0
−1
+1
Actual edge of open pack-ice at end of February 1980
Normal edge of open pack-ice at end of February
Mean sea-surface temperature anomaly (°C) February 1980


120°
60°
0°
30°
60°
Warm
Low
Warm
High
Cold
Warm
Cold
High
Low
Warm
+8
+6
+4
+2
0
−2
−4
−8
−12
Mean surface-pressure anomaly (mb) February 1980
Mean air-temperature anomaly (°C) February 1980

Baltic Ice Summary: January to February 1980

No ice was reported at the following stations during the period: Visby, Flensburg, Aarhus

STATION	JANUARY									FEBRUARY								
	LENGTH OF SEASON		ICE DAYS			NAVIGATION CONDITIONS			ACCUMULATED DEGREE DAYS	LENGTH OF SEASON		ICE DAYS			NAVIGATION CONDITIONS			ACCUMULATED DEGREE DAYS
	A	B	C	D	E	F	G	H	I	A	B	C	D	E	F	G	H	I
Leningrad	1	31	31	0	31	10	21	0	441	1	29	29	28	1	0	29	0	699
Riga	1	31	25	6	1	18	0	0	277	1	29	29	29	0	12	17	0	475
Pyarnu	1	31	31	31	0	0	0	31	—	1	29	29	29	0	0	0	29	—
Viborg	1	31	31	31	0	0	31	0	—	1	29	29	29	0	0	29	0	—
Ventspils	1	31	19	0	0	10	0	0	—	1	29	29	0	0	13	0	0	—
Tallin	27	31	5	0	2	4	0	0	—	1	29	29	1	26	0	29	0	—
Helsinki	4	31	28	8	0	26	1	0	395	1	29	29	29	0	0	29	0	639
Mariehamn	29	31	3	0	0	3	0	0	219	1	29	29	25	0	27	2	0	441
Turku	21	31	11	3	0	8	0	0	378	1	29	29	29	0	8	21	0	623
Mantyluoto	18	31	14	4	0	13	1	0	—	1	29	29	29	0	1	28	0	—
Vaaso	1	31	31	31	0	0	31	0	418	1	29	29	29	0	0	29	0	701
Oulu	1	31	31	31	0	0	31	0	609	1	29	29	29	0	0	29	0	995
Roytta	4	31	28	0	25	0	28	0	—	1	29	29	0	29	0	29	0	—
Bredskar	9	31	17	5	0	17	0	0	—	1	29	29	16	3	10	19	0	—
Sundsvall	1	31	31	31	0	31	0	0	—	1	29	29	28	1	11	18	0	—
Stockholm	1	31	31	31	0	31	0	0	241	1	29	29	29	0	29	0	0	409
Kalmar	22	31	10	0	4	10	0	0	130	1	29	29	0	16	29	0	0	239
Skelleftea	1	31	30	13	0	9	21	0	—	1	29	29	29	0	1	28	0	—
Göteburg	0	0	0	0	0	0	0	0	—	5	29	20	0	0	16	0	0	—
Emden	17	26	10	0	1	10	0	0	—	0	0	0	0	0	0	0	0	—
Lübeck	14	29	14	0	0	6	0	0	—	0	0	0	0	0	0	0	0	—
Hamburg	14	31	18	0	11	17	1	0	83	0	0	0	0	0	0	0	0	43
Bremerhaven	20	20	1	0	0	0	0	0	—	0	0	0	0	0	0	0	0	—
Kiel	14	14	1	0	0	0	0	0	—	0	0	0	0	0	0	0	0	—
Stettin	8	31	24	0	0	18	0	0	185	1	21	21	0	0	19	0	0	192
Gdansk	7	7	1	0	0	0	0	0	214	0	0	0	0	0	0	0	0	315
Stralsund	7	31	25	24	0	13	10	0	—	1	29	29	10	0	26	3	0	—
Rostock	9	22	14	9	0	7	0	0	—	0	0	0	0	0	0	0	0	—
Copenhagen	0	0	0	0	0	0	0	0	60	5	9	5	0	0	1	0	0	99
Oslo	0	0	0	0	0	0	0	0	331	8	29	22	18	3	29	0	0	579
Kristiansund	0	0	0	0	0	0	0	0		7	22	8	1	0	3	0	0	

CODE:

A First day ice reported.
B Last day ice reported.
C No. of days that ice was reported.
D No. of days continuous land-fast ice.
E No. of days of pack-ice.
F No. of days dangerous to navigation, but assistance not required.
G No. of days assistance required.
H No. of days closed to navigation.
I Accumulated degree-days of air temperature (°C) where known.*

*These figures give a rough measure of the first probability of the formation of sea ice, and later the progress of the growth and its thickness. They are derived from daily averages of temperature (00 + 06 + 12 + 18 GMT) and are the sum of the number of the degrees Celsius below zero experienced each day during the period of sustained frost.

Book Review

Lloyd's Maritime Atlas. 12th Edition. 288 mm × 224 mm. Lloyd's of London Press Ltd, Lime Street, London EC3M 7HA. 1980. Price: £9.00

Although there is little apparent change in the format of this edition, the improvement lies in the increase in page size which makes for clearer identification of the various ports thus enhancing the book's value as a quick reference maritime atlas.

For those who might be unfamiliar with this publication, the Atlas contains a list of some 10 000 ports and shipping places each with its geographical position and each cross-referenced to the appropriate map. The Atlas is divided into 3 major parts. Section I is a set of maps of which the first is a world map showing 'Bad Weather Areas and Periods' based on data provided by the UK Meteorological Office and Det Norske Meteorologiske Institut of Oslo. Section II contains a distance table showing distances from Gravesend to many principal ports followed by a geographical list of ports of the world together with their latitude, longitudes and map reference. Section III is an alphabetical index of port names which are given appropriate geographical numbers in

order that the reader may refer back to Section II which, in turn, advises which map to use in Section I.

This very comprehensive, but still compact, Atlas has proved of great value to the Marine Division of the Meteorological Office in general and to the Ship Routeing Service in particular. It is very gratifying to note that it continues to be up-dated regularly—a must in any publication of this nature. It should continue to be an indispensable part of any shipowner's or other interested organisation's library of every-day reference books.

A.P.

Personalities

OBITUARY.—It was with great regret that we learned of the sudden death in hospital of CAPTAIN J. BOLD of Ocean Fleets Ltd on 4 February 1980 at the age of 52 years.

John Bold joined Alfred Holt and Company in 1944 as a Midshipman and progressed through the ranks until appointed Master in 1968. His last command was the *Cardigan Bay*.

Captain Bold sent us his first meteorological logbook from the *Glaucus* in 1953. Since then we have received a further 25 logbooks bearing his name of which 15 were classed as Excellent. He received Excellent Awards in 1975, 1978, 1979 and 1980.

We extend our sincere condolences to his widow and family.

OBITUARY.—It is with regret that we have to record the recent death of MR F. SCOTT, 2nd Officer, of Sealink UK Ltd after a short illness.

Mr Scott joined Alfred Holt and Company in 1952 as a Midshipman. On gaining his Mate's Certificate in 1959 he transferred to the Straits Steamship Company of Singapore and, after obtaining his Master's Certificate in 1967, commanded some of their vessels. In 1969 he returned to the UK and joined Sealink UK Ltd serving as 2nd/Chief Officer in the various train ferries and container ships. More recently he served in the passenger car ferries *St George* and *St Edmund*.

We understand that Mr Scott rendered much valuable voluntary meteorological service to the Singapore Meteorological Office whilst serving in the Straits Steamship Company and he also made a valuable contribution to meteorological observing on board the *St George* and *St Edmund*.

We extend our sincere condolences to his widow and family.

RETIREMENT.—MR P. A. BYRNE, Radio Officer, retired on 17 November 1979 from Marconi International Marine Company after 37 years service.

Patrick Byrne joined Marconi on 5 June 1941 as Radio Officer and served in various vessels including *British Splendour* and *Port Hobart* until 1962. He was then appointed to vessels owned by Manchester Liners Ltd for the remainder of his sea-going career.

We received the first meteorological logbook bearing Mr Byrne's name from the *Silveroak* in 1953. Since then we have received a further 36 books of which 14 were classed as Excellent. He received Excellent Awards in 1955, 1963, 1970, 1971, 1973, 1975 and 1978.

We wish him a long, healthy and happy retirement.

Fleet Lists

GREAT BRITAIN (Information dated 25.3.80)

The following is a list of British ships which have been equipped with instruments and which voluntarily co-operate with the Marine Division of the Meteorological Office.

The names of the Masters, Observing Officers and Senior Radio Officers are given as ascertained from the last written returns received. The date of receipt of the last return received is given in the second column. An asterisk indicates a new recruitment who has not yet sent in a logbook.

All returns received from observing ships will be acknowledged, direct to the ship, by the Marine Superintendent of the Meteorological Office.

The Port Meteorological Officers will make personal calls on the Masters and Observing Officers as opportunity offers, or on notification from the ship at any time when their services are desired.

Excellent Awards are made at the end of each calendar year. The names of the Masters, Principal Observing Officers and Senior Officers gaining these awards are published each July in *The Marine Observer*.

It is requested that prior notification of changes of service, probable periods of lay-up, transfer of Master or other circumstances which may prevent the continuance of voluntary meteorological service at sea, may be made to a Port Meteorological Officer or to the Marine Superintendent of the Meteorological Office at Bracknell.

Masters and Officers are invited to point out any errors or omissions which may occur in the list.

Selected Ships

NAME OF VESSEL	LAST RETURN	MASTER	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNER/MANAGER
Abbey	14. 3.80	D. G. Pugh	G. M. Webster, A. F. Wood	G. S. Graham	Furness Withy (General Shipping) Ltd
Acavus	14.12.79	A. W. Aitken	P. C. J. Ellaby, D. G. Wallen, G. J. Turner	A. Burns	Shell Tankers (U.K.) Ltd
Act 1	3.12.79	C. P. Leighton	D. P. Webb, M. R. Atkinson, M. Jenkins	D. Owen	Blue Star Line Ltd
Act 2	17. 3.80	L. J. Brown	P. K. Dryden, R. J. Hawkins, R. C. Hyde-Linaker	P. W. Eccleson	Cunard S.S. Co. Ltd
Act 6	10.12.79	T. G. S. Ward	R. J. Williams, D. J. Balderston, R. Critchlow	H. Jefferson	Cunard S.S. Co. Ltd
Act 7	23. 1.80	D. M. McPhail	R. S. Emerson, J. Webber, I. Venables	K. Gardener	Blue Star Line Ltd
Adviser	15. 8.79	R. Smith	E. Hanson, N. A. Jardine	C. Brown	T. & J. Harrison Ltd
Aeneas	14. 2.80	A. J. Palmer	R. I. Sime	P. J. Robertson	Ocean Transport & Trading Ltd
Afric Star	11. 1.80	P. Stevens	P. Dawson, S. J. Nichols, T. K. Orrell	P. Nee	Blue Star Line Ltd
Ajana	15.11.79	D. A. Dickinson	S. L. Long, J. E. Lyon, H. Goulden	P. D. Sutcliffe	P. & O. S.N. Co.
Albright Explorer	12. 2.80	J. H. Kitching	T. Wright, W. Hutchings, D. A. Maclean	H. A. Chambers	James Fisher & Sons Ltd
Albright Pioneer	21. 1.80	H. Thompson	W. J. Hutchinson, J. G. Nixon, G. D. Goulding	J. Callaghan	James Fisher & Sons Ltd
Alert	27. 6.79	R. M. Tuckwell	D. P. Drew, I. Lewin, M. White	D. Vowles	Post Office
Algol	3. 7.79	I. J. Tait	M. G. Hancock, M. J. O'Sullivan, R. W. Gott	P. Orpwood	Silver Line Ltd
Alinda	21. 3.80	W. Brierly	T. M. Armstrong, N. J. Griffiths, D. J. Seabrooke	T. W. Slater	Shell Tankers (U.K.) Ltd
Almeda Star	10. 7.79	P. W. W. Hunt			Blue Star Line Ltd
Almeria Star	17. 1.80	J. Calabase	P. Dixon, R. James, N. Colling	P. Dempsey	Blue Star Line Ltd
Alsatia	26.10.79	D. M. Kissane	J. M. Brawt, C. H. Denny, D. E. Percy	J. S. Barlow	Cunard S.S. Co. Ltd
Amastra	10. 3.80	J. Connolly	R. J. Mills, L. Wassell, B. Mitchell	A. M. Ponsford	Shell Tankers (U.K.) Ltd
America Star	30. 5.79	J. F. Rowe	D. R. Morgan		Blue Star Line Ltd
Anchises	8.10.79	J. M. Watterson	S. F. Gallimore, P. W. Boocock, M. Bregazzi	T. J. Smith	Ocean Transport & Trading Ltd
Anco Challenger	10. 8.79	R. E. Sawers	D. Smith, R. M. Thorley	F. J. Glynn	Panocean-Anco Ltd
Anco Champion	21.11.79	D. O. Williams	P. R. Gray, J. Thomson, S. K. Varley	H. Thompson	Panocean-Anco Ltd
Anco Charger	15. 5.79	K. Lewis	M. R. Champion, C. M. Langlands	C. D. Rollinson	Panocean-Anco Ltd
Anco Chaser	21. 5.79	E. Grant	P. R. Shayler, J. Dipple	M. Furlong	Panocean-Anco Ltd
Anco Empress	1. 2.80	G. Maciver	A. Marits, A. Brown, J. Dipple	S. Lines	Panocean-Anco Ltd
Anco Endeavour	30.10.79	G. L. Milburn	M. J. Walker, G. W. McKenzie	R. P. Billet	Panocean-Anco Ltd
Anco Enterprise	18. 2.80	B. Hammond	A. J. MacPherson, R. Kes, J. K. Husain	R. P. Bradsell	Panocean-Anco Ltd
Anco Princess	12.12.79	T. M. Fairclough	A. M. Spooner, C. Langlands, C. Gallafant	S. A. Potter	Panocean-Anco Ltd
Anco Sceptre	2. 1.80	A. S. Banyard	T. T. Kheng	M. R. Dunn	Panocean-Anco Ltd
Anco Sovereign	25. 1.80	H. Watson	G. W. H. Bowles, P. R. Anderson, C. P. Bordas	L. D. McCabe	Panocean-Anco Ltd

Anco Stane	25.10.79	T. Luke	M. W. S. Royall, G. Thorne, A. Blore	R. C. J. Humby	Panocean-Anco Ltd
Anco Templar	22. 8.79	E. V. Kennard	K. Warne, D. Smith, J. W. Aries	P. Keen	Panocean-Anco Ltd
Andalucia Star	11. 1.80	W. T. Pitcher	A. N. MacKean, N. B. Meek, P. C. Mitchell	A. Bickford	Blue Star Line Ltd
Andania	31. 1.80	P. R. R. Ramsay	P. R. Phibbs, D. M. Robinson, R. Brooks	F. Tordoff	Cunard S.S. Co. Ltd
Andes	31. 7.79	C. W. Alison	M. J. Davies, T. Dawson	A. Booth	Furness Withy (General Shipping) Ltd
Andria	11. 2.80	J. R. Dit Leschery	I. M. Percival, J. Richardson, I. Tranter	M. Price	Cunard S.S. Co. Ltd
Annuity	3.10.79	D. G. Munro	R. E. Stafford, A. P. Scott		F. T. Everard & Sons Ltd
Apapa Palm	11. 7.79	J. P. Millar			Palm Line Ltd
Appleby	30.10.79	H. W. Finn	D. Kemp, J. King, R. Whyte	C. Titheridge	Sir R. Ropner & Co. Ltd
Arctic Troll	24. 1.80	L. R. Bell	K. Cassidy, D. Wood, J. Sharp	A. J. Pampling	J. & J. Denholm Ltd
Armadale	22.11.79	A. C. R. Murray	P. R. Bryant, P. D. Orman, J. Beck	J. O'Flynn	P. & O. S.N. Co.
Asian Adventuress	*	D. McNaughton-Smith	J. L. Kerr, R. C. Corbett	M. Lee	Matheson Shipping Services Ltd
Asian Forest	*	R. A. French	P. J. Mooney, G. P. Sandhu, Wong Hak Yu	H. H. Cheung	J. & J. Denholm Ltd
Asprella	11. 6.79	G. Turnbull	D. L. Gillies, C. S. Bull, S. K. M. Turnbull	M. J. Brimacombe	Shell Tankers (U.K.) Ltd
Astronomer	*	R. J. Smith	N. A. Jardine, S. Watson, M. H. Farmer	C. J. Hawkridge	T. & J. Harrison Ltd
Ataman	23.11.79	J. P. Wishart	W. J. Stoker, D. A. L. Best, R. J. Hughes	B. L. Drake	Ocean Transport & Trading Ltd
Atlantic I	19. 2.80	N. N. Nail	C. Harris, A. Donald		Atlantic Drilling Co. Ltd
Atlantic II	*	P. J. Warren	R. Sharp, A. Kemp	M. Winter	Atlantic Drilling Co. Ltd
Atlantic Causeway	14. 1.80	J. K. Cooper	A. D. Honeybourne, S. E. W. Sutherland	R. F. Davies	Cunard S.S. Co. Ltd
Atlantic Conveyor	24. 1.80	C. P. Margeson	G. H. Rees, D. W. Unsworth, C. J. Houghton	J. Guthrie	Cunard S.S. Co. Ltd
Atlantic Project	19. 7.79	J. B. Clemenson	N. D. Cleave, G. Bates, M. V. Colman	W. G. Thomas	Cunard S.S. Co. Ltd
Atlantic Prosper	24. 9.79	J. A. Oscroft	J. P. Collins, P. A. Pettitt, D. M. Nicholson	A. R. Taylor	Cunard S.S. Co. Ltd
Aurora	16. 1.80	E. D. Stewart	F. A. M. Hayes, K. Underhill, D. P. Beckett	A. R. Watt	P. & O. S.N. Co.
Australind	2.11.79	A. C. R. Murray	G. Campbell, R. Davidson, C. Smith	A. Goldstone	P. & O. S.N. Co.
Avelona Star	4. 3.80	R. Brownbill	M. P. Harris, R. A. Hamilton	K. A. Ellison	Blue Star Line Ltd
Avon Forest	4. 2.80	M. M. Linday	J. Cripps, R. G. Pym, E. J. Withers	J. Hynes	Harrison (Clyde) Ltd
Balmoral Universal	3. 1.80	J. K. Currie	D. A. Jackson, G. Paxton, P. L. White	R. Hough	Cayzer Irvine Shipping Co. Ltd
Baltic Enterprise	21. 2.80	C. Hunter	K. Archer, P. Green, T. Macguire	P. E. Hornby	United Baltic Corp. Ltd
Baltic Valiant	28. 1.80	J. G. Collins	K. Archer, S. J. Davies, M. J. Kearney	I. A. Muschamp	United Baltic Corp. Ltd
Bamenda Palm	1. 2.80	M. Hurley	R. W. Fitzsimon, D. Woods, G. Broome	L. Holt	Palm Line Ltd
Banbury	4. 4.79	R. J. Sankey	T. M. Graham, I. Wright, P. Harraway	P. Hutchinson	Houlder Bros. & Co. Ltd
Barcelona	23.11.79	D. B. C. Morris	R. J. Lewis, D. B. Morris, N. D. Crockett	W. McIntosh	Cayzer Irvine Shipping Co. Ltd
Baron Ardrossan	30. 4.79	D. White	N. C. Smith, L. G. Morison, J. Paget	R. A. S. MacMeikan	Scottish Ship Management Ltd
Baron Belhaven	27. 9.79	I. Taylor	H. L. Hardie, R. C. Lauder, K. B. Singer	J. C. McMullan	Scottish Ship Management Ltd
Baron Napier	6.12.78	J. Mackay	W. J. McKie, P. Buckley, J. M. Maciver	D. E. Gudgeon	Scottish Ship Management Ltd
Beaverbank	18.10.79	W. Ellarby	J. L. Melvin, J. P. Johnston, T. N. Wilkinson	G. Richards	Bank Line Ltd
Belloc	*	I. L. Hughes	-. Atkinson, -. Luff, W. R. Houghton-Boreham	-. Slater	Blue Star Line Ltd
Ben Ocean Lancer	19.11.79	D. Wright	G. W. Day, A. A. Davidson, J. N. MacNash	H. M. S. Cherry	Ben Line Steamers Ltd
Benalder	3. .80	A. McKenzie	R. W. Lawrie	P. M. Shillcock	Ben Line Steamers Ltd
Benarty	28.11.79	T. P. Barr	G. L. Craigen, J. A. McIntosh, T. W. Carr	J. F. Vinall	Ben Line Steamers Ltd
Benavon	8. 1.80	J. R. Morrison	R. Hamilton, B. Spaven	W. Paterson	Ben Line Containers Ltd
Bendearg	14.12.79	R. McPhee	I. F. Gibson, I. Aitchison	T. Drummond	Ben Line Steamers Ltd
Benedict	25. 1.80	J. C. Harris	M. J. O'Keefe, M. Locke, C. Grayson	P. Davies	Blue Star Line Ltd
Benefactor	28. 2.79	I. Barbour	N. Redeiro, G. Walters, R. Halhead	W. Hughes	T. & J. Harrison Ltd
Benhope	15. 1.80	A. S. Hamilton	A. R. Pullan, J. H. Clark	W. J. Campbell	Ben Line Steamers Ltd
Bennevis	17. 4.79	A. Burnett	W. Pottinger, R. S. Walker, J. A. McIntosh	P. S. G. Hannon	Ben Line Steamers Ltd
Benstac	4. 9.79	G. Reid			Ben Line Steamers Ltd
Benvorlich	8. 1.80	I. R. Ansell	D. Gilmour, D. Keillor, A. D. Gibson	H. E. Broomfield	Ben Line Steamers Ltd
Birchbank	7. 2.80	A. B. Osbourne	S. Braund, G. Copping, G. Himsworth	R. Smith	Bank Line Ltd
Blenheim	3.12.79	J. Smethurst	S. Poole, A. J. V. Weller	B. McArthur	Fred Olsen Ltd
Bonnieway	6. 8.79	A. Sillars	M. Brook, F. G. Yeulett, A. J. Gorringe	P. Hammond	Newgate Shipping Co. Ltd
Boniface	28. 9.79	D. Eckworth	A. Tibboth, N. Barr, M. J. Walker	N. Maclean	Blue Star Line Ltd
Booker Challenge	*	J. C. Pearson	P. T. Lunt, R. Grant, E. Jeffries	D. A. C. MacRae	Booker Line Ltd
Booker Crusade	*	E. G. Puddifer	I. S. W. Niblock, J. Steadman, R. Bell	A. Roberts	Booker Line Ltd
Booker Viking	15. 2.80	R. Dunne	J. Tebay, T. Fugill, G. Davies	A. Murphy	Booker Line Ltd
Border Castle	17. 1.80	A. E. Marshall	S. Chapman, C. J. Harding	C. A. Kemp	B. P. Tanker Co. Ltd

Selected Ships (*contd.*)

NAME OF VESSEL	LAST RETURN	MASTER	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNER/MANAGER
Border Falcon	18. 2.80	D. Campbell	P. C. Hullah, S. Punton, A. Chylak	R. M. King	B. P. Tanker Co. Ltd
Border Pele	5. 3.80	D. O. W. Jones	A. J. Lange, R. Daffiell	A. Littlefar	B. P. Tanker Co. Ltd
Border Shepherd	30.11.79	T. J. Taylor	R. N. Dixon, C. R. White	D. Gill	B. P. Tanker Co. Ltd
Boswell	*	L. Hughes	P. L. Hobson, R. C. Corfield	A. W. Slater	Blue Star Line Ltd
Botany Bay	27. 9.79	P. J. Clark	R. D. Anderson, P. K. Maccorquodale, G. P. Farrel	B. Mullan	Container Fleets Ltd
Bransfield	4. 6.79	S. J. Lawrence	H. F. Monckton, A. M. T. Reading, J. C. Smart	H. M. O'Gorman	British Antarctic Survey
Briarthorn	*	J. McEwan	B. Seaman, A. Devine		Sir Wm. Coe Ltd
British Avon	29.11.79	G. Barber	S. F. Hines	T. Cook	B.P. Tanker Co. Ltd
British Beech	21. 1.80	T. M. Y. Richards	H. C. Patience, R. E. Taylor, R. Friar	E. A. McGauran	B.P. Tanker Co. Ltd
British Centaur	21. 1.80	I. K. Miller	G. R. J. Joshua, D. W. Rice, R. A. Nolan	K. R. Mitchell	B.P. Tanker Co. Ltd
British Commerce	6.12.79	D. Goodwin	M. J. Fordham, S. Oliver, P. D. Jackson	J. Sutherland	B.P. Tanker Co. Ltd
British Commodore	2.11.78	R. F. Shaw	D. Horsburgh, G. W. Harman	N. Richardson	B.P. Tanker Co. Ltd
British Dart	31. 1.80	P. N. Johnson	A. J. Hindley, J. Shannon, R. M. Kempson	M. H. Shaw	B.P. Tanker Co. Ltd
British Dragoon	21.12.79	T. Y. Marrs	J. H. Brechin, D. J. Williamson, D. F. Campbell	A. Bateman	B.P. Tanker Co. Ltd
British Esk	20.12.79	C. Burley	K. W. Bainbridge, C. A. Everson, I. Clark	A. Horton	B.P. Tanker Co. Ltd
British Explorer	3. 3.80	J. C. Wilson	S. R. Mitchell, N. Southan, M. Pockington	P. E. Davies	B.P. Tanker Co. Ltd
British Fern	24. 7.79	I. Black	P. Donaldson, I. Pellowe	C. J. Ellery	B.P. Tanker Co. Ltd
British Forth	10. 3.80	P. R. Waller	P. J. Holcroft, A. D. Haworth	K. R. Jones	B.P. Tanker Co. Ltd
British Hawthorn	*	-. Dawson	D. R. Beatie, J. G. Holland, P. Charda	P. H. Wales	B.P. Tanker Co. Ltd
British Hazel	7. 2.80	H. Phillips	A. P. Yates, N. Carrington, N. E. Pomicter	M. Liddle	B.P. Tanker Co. Ltd
British Holly	18. 2.80	E. Twemlow	C. B. Moon, N. Fleming, N. E. Pomicter	M. Smithard	B.P. Tanker Co. Ltd
British Ivy	10.10.79	J. C. Pinkney	R. I. Webber, C. S. Renton, P. MacKenzie	P. Henderson	B.P. Tanker Co. Ltd
British Kennet	24. 3.80	R. J. Nener	I. J. Maxted, G. R. Snow	G. R. Wilson	B.P. Tanker Co. Ltd
British Laurel	25. 6.79	A. Skellern	M. Tomkins, R. D. Nicholls		B.P. Tanker Co. Ltd
British Liberty	20. 3.80	M. McCarthy	S. White, M. A. Baker, R. S. Tremlett	S. Gilmour	B.P. Tanker Co. Ltd
British Loyalty	18. 1.80	D. Coombes	T. Whittaker	J. Macdonald	B.P. Tanker Co. Ltd
British Maple	15. 1.80	K. J. Mackay	R. Raeburn, D. H. Blake	M. Ferrier	B.P. Tanker Co. Ltd
British Patience	13. 2.80	N. Brookes	R. W. Fleming, N. J. Fleming	S. Slattery	B.P. Tanker Co. Ltd
British Pioneer	3. 3.80	J. Thomson	P. J. Holcroft, L. Reidy, M. J. Buchanan	M. J. White	B.P. Tanker Co. Ltd
British Poplar	19. 3.80	S. C. Davies	P. J. Gildea-Evans, P. S. Cassidy, K. McVicar	C. F. Handel	B.P. Tanker Co. Ltd
British Pride	5. 6.79	H. F. Scott-Dickins	T. M. Brennan, J. Crooks, T. Bright	W. K. Ryan	B.P. Tanker Co. Ltd
British Promise	8. 2.80	R. J. Payne	D. J. Williamson, A. Feltham, A. Brown	B. Matten	B.P. Tanker Co. Ltd
British Ranger	11. 1.80	J. Guy	J. A. Little, R. I. Gibson, P. Mayhew	C. P. Hill	B.P. Tanker Co. Ltd
British Resolution	*	M. Stephenson	J. Reid, P. Darlow, J. Kilby, S. MacDonald	R. Kent	B.P. Tanker Co. Ltd
British Respect	30. 1.80	J. S. Allen	P. D. Jackson, J. M. Banfield	D. Wear	B.P. Tanker Co. Ltd
British Security	11.12.79	P. Edmondson	C. P. Mullett, H. Conlon	D. Bone	B.P. Tanker Co. Ltd
British Spey	24. 5.79	M. Searle	P. C. Hullah	D. Bone	B.P. Tanker Co. Ltd
British Tamar	21.12.79	C. Evans	M. K. Paradowski, A. Feltham	J. C. Wadsworth	B.P. Tanker Co. Ltd
British Tay	5.11.79	R. Longhorn	K. C. Gardiner, P. J. Grant, F. E. Urem	M. Spencer	B.P. Tanker Co. Ltd
British Tenacity	19. 2.80	J. Lambert	W. McFadzean, G. P. Meadway	R. Lodge	B.P. Tanker Co. Ltd
British Test	17.12.79	I. A. Oliphant	K. Lorimmer, R. J. Kendall	D. Walker	B.P. Tanker Co. Ltd
British Trent	9. 8.79	L. V. McGeogh	D. A. Brown, S. P. Cochrane, T. J. W. Hunter	H. F. Sharkey	B.P. Tanker Co. Ltd
British Trident	21. 2.80	R. Taylor	T. P. Smith, J. G. M. Watt, P. A. Martin	B. J. Padfield	B.P. Tanker Co. Ltd
British Unity	14.11.79	D. C. Dalton	M. J. Evans, M. R. Dickinson	K. Kielty	B.P. Tanker Co. Ltd
British Vanguard	*	P. Ekbeck	D. Grant, B. Fraser	J. Rhind	Furness Salvesen (Agencies) Ltd
British Viking	21. 2.80	A. Buschini	W. G. Finnie, P. W. Barber, P. J. Gilbert	P. Curtis	Furness Salvesen (Agencies) Ltd
British Vine	31.12.79	F. W. Lamb	I. Hodge, B. Dusart	S. Johns	B.P. Tanker Co. Ltd
British Voyager	*	M. Allison	C. Nicolson, M. Henderson, -. Watson		Furness Salvesen (Agencies) Ltd
Bronte	30.10.79	M. J. MacNeil	D. Darlington, U. Roche, C. Bufton	R. F. Collins	Blue Star Line Ltd

Browning	*	G. Round	L. Crawford, R. Tucker, N. A. Ianson	A. Moss	Blue Star Line Ltd
C. P. Discoverer	17.12.79	A. Whyte	M. J. Hefferman, R. F. Hawley, A. C. Matthews	T. Graves	Canadian Pacific Steamships Ltd
C. P. Trader	31.12.79	D. Greenhalgh	A. N. Williams	G. D. Pople	Canadian Pacific Steamships Ltd
C. P. Voyageur	21. 3.80	P. Roberts	S. E. Westcott, C. Harling, P. Bland	D. J. Atkinson	Canadian Pacific Steamships Ltd
Cable Venture	13. 3.79	J. Fenwick	P. R. Woodward	K. C. Jackson	Cable & Wireless Ltd
California Star	12.11.79	J. King	M. Daniels, C. Mundy, P. Harding	D. Iveson	Blue Star Line Ltd
Canberra	16. 1.80	E. B. Woolley	R. N. Siddall	J. Morrison	P. & O. S.N. Co.
Canterbury Star	17. 3.80	G. Ferriday	P. Richards, J. A. Simpson, T. P. Green	D. H. Letcher	Blue Star Line Ltd
Capalonga	1.11.79		P. P. Simkins	P. Grundy	Thalassa (Offshore) Scotland Ltd
Cape Horn	6. 7.79	D. L. Innes	J. S. Millar, D. Cursiter, P. Brennan	T. S. Davies	Lyle Shipping Co. Ltd
Cape Leeuwin	13. 9.79	G. W. Roger	M. H. F. Kenny, R. Keig, L. Brewer	J. H. Kell	Lyle Shipping Co. Ltd
Cape Ortegal	26. 2.80	D. I. Jones	W. J. Esler, B. P. Andrew	J. G. McMullan	Lyle Shipping Co. Ltd
Cape Rodney	20. 3.80	A. M. Fraser	J. S. Millar, H. Aitchison, P. Brennan	D. W. Humble	Lyle Shipping Co. Ltd
Carchester	25. 1.80	A. R. Whittleton	R. Robinson, C. Bunt, W. Stewart	M. Baig	Ellerman Lines Ltd
Cardigan Bay	21. 3.80	D. M. Belk	J. D. G. Williams, N. Bolland, W. G. C. Wallace	W. C. Phillips	Ocean Transport & Trading Ltd
Carinthia	2. 1.80	P. Sherriff	S. C. Parvin, D. G. Atkinson, R. O. Garner	T. J. Burgess	Cunard S.S. Co. Ltd
Carmania	20. 7.79	G. Carling	S. J. Daniel, D. M. Robinson	T. R. Pardoe	Cunard S.S. Co. Ltd
Cast Dolphin	30.11.79	C. MacRonald	N. P. Bassett, L. G. Andrews, S. H. M. Lee	P. Wilson	Denholm Maclay Co. Ltd
Cast Orca	22. 1.80	E. Williams			Denholm Maclay Co. Ltd
Cast Seal	3. 1.80	H. E. Jones	B. R. G. Tasker, I. F. Stewart, G. M. Barber	D. Stewart	Denholm Maclay Co. Ltd
Cedarbank	28. 4.78	J. Townsley	B. M. Bennett, W. E. Lewis, S. Crowther	S. Martin	Bank Line Ltd
Celtic Endeavour	*	R. S. Stephens	H. Prigg, F. Duffin		C. M. Willie & Co. (Shipowners) Ltd
Challenger	13. 2.80	G. M. Long	R. Coombs, M. Putman		Natural Environment Research Council
Choctaw II	25. 8.78	N. J. W. Middlehurst			Santa Fe (U.K.) Ltd
Cicero	2. 1.80	G. F. Reed	C. Jacklin, D. Narey	R. Milner	Ellerman Wilson Line Ltd
Cirolana	13. 3.80	T. H. Finn	F. W. Brown, E. W. Pearson, E. T. Hall	M. J. Clarkson	Ministry of Agriculture, Fisheries & Food
City of Canterbury	5.11.79	A. A. Ramsden	K. Stone	R. Knott	Ellerman Lines Ltd
City of Durban	2. 1.80	N. B. Airey	P. R. Walton, K. McGeorge, M. L. Kinnear	S. Kirkwood	Ellerman Lines Ltd
City of Edinburgh	24. 1.80	J. E. Pritchard	H. C. Miller, F. Anderson, M. Burbridge	J. Crocket	Ben Line Containers Ltd
City of Hull	28.11.78	F. Smith	F. P. Coenen, P. M. S. Turner, T. Gwynne	M. H. Curran	Ellerman Lines Ltd
City of Liverpool	16.10.79	D. B. A. Roe	S. P. J. Dancer, S. Mortimer, P. A. Agate	M. Curran	Ellerman Lines Ltd
City of London	27. 9.79	I. C. Dorse	J. J. Duncan, D. A. K. Bamford	E. A. Rogers	Ellerman Lines Ltd
City of Plymouth	*	S. M. Thredkeld	M. Molyneaux, M. McDowell		Ellerman Lines Ltd
City of Winchester	26. 6.79	K. G. MacLean	G. D. Williams, D. MacPherson, T. Oliver	R. B. Hall	Ellerman Lines Ltd
City of York	8. 1.80	J. A. MacLeod	K. J. Littlewood, T. J. Foot, W. MacRitche	M. S. Skinner	Ellerman Lines Ltd
Clan Alpine	16.10.79	T. Aitchison	A. R. Wilson, P. W. Brown, I. E. Walker-Spicer	W. Latus	Cayzer Irvine Shipping Co. Ltd
Clan Graham	16. 7.79	K. Morton	P. A. Monks, B. King, D. Armstrong	D. Fletcher	Cayzer Irvine Shipping Co. Ltd
Clan Grant	7. 6.79	R. M. Bessant	J. S. Dix, R. S. Wadham, D. Mugalu	I. C. Petrie	Cayzer Irvine Shipping Co. Ltd
Clan MacGillivray	27. 9.79	R. A. G. Simmons	P. H. Evans, P. Austin, D. J. Lewington	R. M. Mercer	Cayzer Irvine Shipping Co. Ltd
Clan MacGregor	11.12.79	G. S. Gann	H. J. Mwasigallah, I. Scott, M. W. H. Williams	G. Wright	Cayzer Irvine Shipping Co. Ltd
Clione	28. 1.80	J. R. French	G. F. Lee, R. F. Graham		Ministry of Agriculture Fisheries & Food
Cloverbank	12.12.79	K. J. Wallace	D. H. O'Neill, N. W. Hunt, M. Causon	R. M. Scobie	Bank Line Ltd
Cluden	14. 2.80	M. S. Cavaghan	L. F. Ho, C. W. Hirst, L. C. Ha	Y. E. Li	Matheson Shipping Services Ltd
Clytoneus	29.10.79	J. K. Winn	D. J. Capper, P. W. R. Ankers, K. Gibson	P. M. Dolphin	Ocean Transport & Trading Ltd
Columbia Star	11. 2.80	T. D. Brewster	P. C. Jarvis, K. Lumby, A. Milligan	P. R. Webster	Blue Star Line Ltd
Conon Forest	14. 1.80	B. Hill	L. Kruzins, W. Foster, O. S. Montgomery	M. O'Grady	J. & J. Denholm Ltd
Corabank	24. 1.80	B. Z. Gerstel	W. J. McFadyen, N. D. Hosegood, R. G. Humby	J. McKendry	Bank Line Ltd
Corella	1.12.77	J. E. M. Balfour			Ministry of Agriculture Fisheries & Food
Crestbank	15.10.79	B. J. Peterson	A. Sawyers, C. J. Butters, R. Riley	D. Cobb	Bank Line Ltd
Cumbria	12. 2.80	J. S. Rutherford	H. J. Barton, I. R. Wilson, C. J. Langdon	N. French	Hadley Shipping Co. Ltd
Dacebank	*	T. D. Faithful	W. Mather, L. Parker, M. Thompson	N. Marwood	Bank Line Ltd
Darina	24. 1.80	J. Price	I. C. McKay, N. B. Campbell	A. H. G. Wall	Shell Tankers (U.K.) Ltd
Dart America	31.12.79	K. W. Keithley	M. Tansley, C. D. Eke	I. D. Hay	Associated Maritime Co. Ltd
Dart Atlantic	16. 1.80	K. McLeod	S. J. Kitchen, C. S. Gaukroger, R. Copeland	W. J. Ferry	Bibby Line Ltd
Dart Canada	3. 3.80	K. Keithley	C. D. Eke, P. Springett, M. O'Carroll	J. Williams	Associated Maritime Co. Ltd
Derwent	*	C. J. Welch	R. Brooke, J. Exroy	D. Hobson	Furness Withy (General Shipping) Ltd

Selected Ships (*contd.*)

NAME OF VESSEL	LAST RETURN	MASTER	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNER/MANAGER
Deseado	12. 2.80	J. J. Rutter	P. Reynolds, I. Johnson	E. Connely	Furness Withy (General Shipping) Ltd
Devonbrook	*	G. Bowman	D. McElroy , I. J. Kissack, C. Sutherland	G. Hull	Comben Longstaff & Co. Ltd
Discovery	28.11.79	J. J. Moran	J. D. Noden, S. Jackson	I. J. C. Stevenson	Natural Environment Research Council
Donga	3. 1.80	F. M. Howe	A. G. Liversedge, P. Bolton	B. Lowe	Ocean Transport & Trading Ltd
Donnington	15. 9.77	G. B. Panes	G. A. Hunter, P. Barratt, D. Matthews	M. Berrisford	Stephenson Clark Ltd
Dover Universal	14. 8.79	W. Howson	B. T. Marks, M. Negus, F. J. Mack	R. Hough	Cayzer Irvine Shipping Co. Ltd
Drupa	23.10.79	B. B. Pearson	R. Varley, M. South	J. R. Williamson	Shell Tankers (U.K.) Ltd
Dumbaia	7. 2.80	G. D. Warren	M. J. May, I. H. Boothroyd, J. P. H. Fisher	C. J. Wallington	Ocean Transport & Trading Ltd
Dunelmia	4. 2.80	W. M. Newport	P. A. Rickard, A. Turner, A. Holder	P. J. Wallingotn	Furness Withy (General Shipping) Ltd
Dunstanburgh Castle	10. 5.77	T. Wilson	J. Greig, S. Sowerby	D. Warner	Ben Line Steamers Ltd
Durhambrook	1. 6.79	C. J. Marchant	T. L. Hooper, G. E. Shearer, W. G. King-Wood	P. J. Abbey	Comben Longstaff & Co. Ltd
Egidia	28. 8.79	G. Robson	M. M. Manekshaw, W. Paton, A. G. Murray	J. M. Belaney	Walter Runciman & Co. Ltd
Elk	5. 3.80	M. R. Godfrey	R. Blaiklock		P. & O. S.N. Co.
Encounter Bay	21. 1.80	J. Cosker	M. Leech, C. C. Young, S. D. Smith	P. Cooper	Container Fleets Ltd
Erskine Bridge	18. 2.80	A. A. Walker	R. Griffiths, M. L. Miller, B. Rogers	D. M. Rennie	Silver Line Ltd
Esso Aberdeen	3.12.79	W. McMaster	A. Taylor, K. Shears	J. D. Rennie	Esso Petroleum Co. Ltd
Esso Caledonia	16.10.79	J. M. Phillips	M. Gardener, M. E. Poullion, G. Chant	D. Leeson	Esso Petroleum Co. Ltd
Esso Cambria	26. 6.79	T. Jemison	M. Poulloin, T. Lowe, L. J. Burne	R. J. Evans	Esso Petroleum Co. Ltd
Esso Dalriada	24. 7.79	I. D. Smith	G. R. F. Foulger, I. E. Vinowles	J. M. Shand	Esso Petroleum Co. Ltd
Esso Demetia	19. 6.79	T. F. Harper	G. S. Nixon, M. Adams	R. E. Byng	Esso Petroleum Co. Ltd
Esso Hibernia	27.11.79	R. Hyam	P. B. Markides, W. Gundry, K. Lightbody	P. Latter-Stapley	Esso Petroleum Co. Ltd
Esso Northumbria	26. 2.80	F. Stubbs	G. D. Morris, J. Donaldson	B. Holness	Esso Petroleum Co. Ltd
Esso Scotia	18. 2.80	R. N. Noakes	G. R. Foulgar, A. C. Lowe	P. J. Rowe	Esso Petroleum Co. Ltd
Esso Ulidia	7. 1.80	R. B. Walker	V. Harcourt-Smith, T. E. Knowles, G. S. Nixon	N. R. Hadley	Esso Petroleum Co. Ltd
Esso Warwickshire	3. 3.80	C. G. Jorgensen	M. P. Thorphincks, R. Brogden, T. Kee	I. Morgan	Esso Petroleum Co. Ltd
Ethel Everard	13. 9.79	G. R. Hare	N. B. H. Skinner, W. G. Pierce		F. T. Everard & Sons Ltd
Eucadia	17. 3.80	D. Lamont	J. Aynsley, J. C. Priest, A. S. Longbottom	J. Hanly	Walter Runciman & Co. Ltd
Explorer (F.R.S.)	19. 8.77	J. Gillon	A. Murray, W. Ferguson	J. A. Main	Department of Agriculture & Fisheries for Scotland
Fenbank	19.4. 79	W. W. Davies	S. D. Crowther, T. N. Morris, W. M. Esler	L. C. Robinson	Bank Line Ltd
Fengtien	*	G. A. Drewery	Chan Chi Keung, D. C. Morgan, M. J. Phillips	Wu Yuk Fun	J. Swire & Sons. Ltd
Finnrose	28. 1.80	M. Williams	D. E. Maciver, W. A. Lowe, J. Bissett	S. A. White	Denholm Maclay Co. Ltd
Firbank	3.12.79	N. J. Munro	V. P. Stevens, R. J. Pritchard, A. L. Watson	R. Dallimore	Bank Line Ltd
Fleetbank	12.11.79	W. W. Davies	W. B. McDonnell, C. E. Gell, J. Cumming	C. A. Dillon	Bank Line Ltd
Flinders Bay	10.12.79	M. J. Meron	I. Chamberlain, P. Wood	R. B. Redhead	Container Fleets Ltd
Foochow	7.11.78	O. A. Overland	C. K. Jung, Y. S. Keung	C. S. Man	John Swire & Sons Ltd
Fort Hamilton	8. 1.80	G. Fraser	C. P. M. Lucas, J. A. Fletcher	R. P. Philpot	Canadian Pacific Steamships Ltd
Fort Victoria	4. 2.80	T. L. Simpson	R. E. Musgrove, R. A. Williams, A. J. Arnot	R. V. Cluennell	Canadian Pacific Steamship Ltd
Forties Kiwi	26. 2.80	G. M. Gough	D. W. Palmer, I. V. Hawkeswood	I. MacLeod	B. P. Tanker Co. Ltd
Fresno City	21.12.79	R. I. Crawford	P. C. Harding, A. B. Jaggers, A. Thomson	D. C. Short	Sir Wm. Reardon Smith & Sons Ltd
Gambada	21.11.79	G. McDermott	N. Langrish, G. Aubitya, J. H. Lyall	D. W. Hirons	P. & O. S.N. Co.
Gandara	25. 7.79	R. Bailey	C. W. Raymond, J. D. Owen	D. Robinson	P. & O. S.N. Co.
Gardline Locater	15. 2.80	A. Morrice	W. Mitchinson		Gardline Shipping Ltd
Gardline Tracker	17.12.79	R. D. Cadwalader	D. Bailey, J. Nicklin, R. S. James		Gardline Shipping Ltd
Garinda	30. 7.79	R. Turney	M. F. Tibbles, S. Chopra, S. C. Davis	H. A. Jones	P. & O. S.N. Co.
Gazana	9. 1.80	R. J. Pilley	G. Penberthy, R. Spencer, K. Berry	T. Searle	P. & O. S.N. Co.
Geestcrest	19. 2.80	G. de Ferry Foster	E. S. Mathews		Geest Industries Ltd
Geestland	3. 3.80	P. W. Groves	K. T. Thomas, C. M. Davies, M. F. Tomlinson	D. R. Whitehead	Geest Industries Ltd
Geeststar	24. 3.80	D. Boon	M. Holden, P. J. Gaydon	G. Selby	Geest Industries Ltd

Geest-tide	10. 3.80	O. Springett			Geest Industries Ltd
Gene Trefethen	17.10.78	I. L. Stevens			International Ore Carriers Ltd
Gladstone Star	21. 3.80	E. C. Smith	Ho Seng Cheng, S. A. J. Banks, J. Bottwood	R. Durston	Blue Star Line Ltd
Glenpark	14.12.79	C. P. W. White	G. B. MacConachie, H. Murray, R. Montgomery	R. Mamo	J. & J. Denholm Ltd
Gold Varda	17.10.78	M. J. Wharf	D. J. Smith, G. C. Rautraya, J. J. Neill	G. W. Cunnane	Haverton Shipping Ltd
Gomba Challenge	13. 2.80	P. R. Skelton	D. V. Addison, A. S. Anslow	J. Delany	Common Bros Ltd
Goth	22. 2.80	J. N. Kerr	R. Spall		British United Trawlers
Gothia Team	17. 1.80	J. M. Gatherer	M. Gough, R. Kelly, J. E. Tirel	K. A. Ellison	J. & J. Denholm Ltd
Grey Hunter	30.10.79	S. A. Walker	D. Flannagan, A. G. Knox, G. Noble	P. S. G. Hannon	Ben Line Steamers Ltd
Grey Warrior	21. 1.80	M. P. Tennant	R. S. Basford, A. J. Airey, C. R. Graham	W. D. Godden	Ben Line Steamers Ltd
Gulf Hawk	*	E. B. Daubeny			Gulf (Shipowners) Ltd
Halifax Star	29. 8.79	A. J. Cheshire	A. Johns, T. J. Burleton	E. Smith	Blue Star Line Ltd
Helenus	7. 1.80	M. P. Stone	C. B. Noon, W. Stobie, M. V. Hobbs	A. D. Siggs	Ocean Transport & Trading Ltd
Herefordshire	2.11.79	J. R. Woodfield	S. J. Kitchen, P. G. Williams, J. H. Lowe	B. Coen	Bibby Line Ltd
Historian	19.11.79	A. T. Creer	D. G. Jones, M. R. Irwin, B. H. Jones		T. & J. Harrison Ltd
Ibn Abdoun	21. 8.79	R. Owens	J. R. Wilson, A. N. Zeidan	T. B. Byrne	United Arab Shipping Co. Ltd
Ibn Rushd	28. 8.79	M. Murfin	J. Luther, B. McIntyre, P. W. Hayes	D. Manson	United Arab Shipping Co. Ltd
Irish Wasa	4. 6.79	J. Adams	I. Drysdale, M. McGregor, J. A. Freegard	J. L. W. Williams	Salen (U.K.) Ship Management Ltd
Jack Wharton	10. 9.79	A. J. A. Richards	P. V. Lowery, M. S. Ricketts, J. A. Chapman		F. T. Everard & Sons Ltd
Jamaica Producer	22. 2.80	H. Nixon	P. E. Smith, R. Wooding, R. K. Taylor	J. E. T. Lodge	Jamaica Producer Marketing Co. Ltd
Jedforest	16. 1.80	J. Hanna	J. R. Smith, K. Scott	R. Harrison	P. & O. S.N. Co.
Jervis Bay	8. 2.80	J. K. Blackburn	R. Arlington, D. Craig Thomson, G. Farrell	D. K. Alcock	Container Fleets Ltd
John Biscoe	23. 3.79	E. M. S. Phelps	J. P. Garner	R. Wade	British Antarctic Survey
John Murray	2. 1.80	P. H. Warne	P. J. MacDermott, R. E. Hagley, P. J. Oldfield		Natural Environment Research Council
Josefa	*	M. C. Hurst	G. P. Eyles, N. Jerrum, M. Slayman	B. J. Carter	Sir Wm. Reardon Smith & Sons Ltd
Jura	31. 1.80	R. Mill-Irving	A. McKenzie, D. Bevridge, I. Pollock		Department of Agriculture & Fisheries for Scotland
King Alfred	13.12.79	M. N. Ure	S. P. Harris, N. Jones, A. J. Blackler	J. Maxwell	Cayzer Irvine Shipping Co. Ltd
King Charles	14. 1.80	P. C. Byrne	J. G. Sweetman, P. M. J. O'Sullivan, M. J. Gardener	J. A. Tomlinson	Cayzer Irvine Shipping Co. Ltd
King George	10. 3.80	R. R. Will	P. D. Hall, P. Walsh, S. Renfree	J. Blackwell	Cayzer Irvine Shipping Co. Ltd
King Richard	23.10.79	C. D. De F. Hedges	C. R. Precious, B. R. Richmond, S. J. Ivey	G. Walker	Cayzer Irvine Shipping Co. Ltd
King William	27.11.79	A. T. Campbell	A. R. Wilson, T. Whittaker, R. Milne	G. Stone	Cayzer Irvine Shipping Co. Ltd
Kinpurnie Universal	26. 9.79	L. Bainton	J. D. Primrose, M. Jackson, N. Bennett	T. J. Martel	Cayzer Irvine Shipping Co. Ltd
Kowloon Bay	4. 1.80	W. P. Goldie	T. M. Allister, S. T. Houldsworth	K. Bent	Ocean Transport & Trading Ltd
Lackenby	18.12.79	C. B. Tingle	J. Baxter, W. Mitchel, D. G. Wilcockson	G. Savage	Sir R. Ropner & Co. Ltd
Laganbank	14. 5.79	P. Ireland	G. J. Copping, O. L. Millar, A. H. Coulter	P. Chadwick	Bank Line Ltd
Lancashire	28. 1.80	D. R. Clayton	P. J. Bindon, J. R. Hughes, A. M. Moore	J. Palethorpe	Bibby Line Ltd
Leven Fisher	1. 8.79	J. M. Stewart	M. Grimshaw, D. Little, D. Mannering	M. Clarkson	James Fisher & Sons Ltd
Lindfield	21. 1.80	J. Williams	S. Thair, W. J. Howard, A. W. Jones	A. Lafond	Furness Withy (General Shipping) Ltd
Linguist	30.10.79	J. Maddison	T. P. Connor, P. Basham	B. Coward	T. & J. Harrison Ltd
Liverpool Bay	12. 3.80	T. W. Willows	A. E. Spencer	A. G. Thomson	Ocean Transport & Trading Ltd
Loch Lomond	6.12.79	J. F. Houghton	A. Wallace, G. W. Morrison, A. Reid	T. J. C. Stevenson	J. & J. Denholm Ltd
Loch Maree	5. 9.79	J. R. K. Corrin	A. S. Ingram, P. W. Fisken	J. G. Aherne	J. & J. Denholm Ltd
London Baron	21. 4.78	W. W. Brown	J. L. Atkins, J. R. Lonsdale, R. Crawford	P. S. Melton	London & Overseas Freighters Ltd
London Confidence	20. 3.80	D. J. D. Woodley	J. L. David, E. L. Nicolaysen, D. J. Bearne	P. Barber	London & Overseas Freighters Ltd
London Earl	31. 1.80	R. C. Mortimer	R. Fullager, N. B. Balls, J. Attwater	H. L. D. Nolan	London & Overseas Freighters Ltd
London Pride	5. 2.80	A. Smith	B. Woodward, K. T. Cederholm	F. R. Gerstner	London & Overseas Freighters Ltd
Lycaon	*	H. K. Timbrell	M. G. MacDonald, K. M. Seery, A. B. Johnson	D. H. Storar	Ocean Transport & Trading Ltd
Lynton Grange	5. 7.79	N. Oddy	C. P. Brabban, B. L. Bass	G. S. Graham	Houlder Bros. & Co. Ltd
Maersk Cadet	18. 2.80	W. H. Walker	G. Walkinshaw, N. Alcazar, M. Aldrich	M. D. Fraser	Maersk (U.K.) Co. Ltd
Maersk Commander	29. 1.79	G. Thompson	R. M. Kenorick, J. P. Evanson	J. D. Walsh	Maersk (U.K.) Co. Ltd
Magdalena	5.11.79	T. C Mullings	P. Kerry, K. G. Keen	C. Dunwoody	Fyffes Group Ltd
Mairangi Bay	3. 3.80	P. J. Clark	M. J. Power, A. J. Ball	C. E. Hughes	Container Fleets Ltd
Manchester Concept	18.10.79	N. W. Cockshoot	R. G. O'Toole, D. Teal, W. Moss	J. Hartley	Manchester Liners Ltd
Manchester Concorde	19. 3.79	P. N. Fielding	N. P. Sherry, D. McKay	W. E. Harrison	Manchester Liners Ltd
Manchester Crusade	17. 3.80	D. R. Llewellyn	R. Ashurst, A. Ellis, J. R. Norcliffe	W. F. Stirling	Manchester Liners Ltd

Selected Ships (*contd.*)

NAME OF VESSEL	LAST RETURN	MASTER	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNER/MANAGER
Manchester Renown	18.10.79	D. R. Llewellyn	A. Talbot, C. Livingstone, P. Doyle	W. E. Harrison	Manchester Liners Ltd
Manchester Reward	13. 3.80	J. E. Askew	A. Ashurst, B. Larcombe, E. P. Garbutt	B. R. A. Maskell	Manchester Liners Ltd
Manchester Vanguard	21.11.79	J. McKay	J. R. K. Vickery, R. A. Brown, C. Livingstone	F. Farthing	Manchester Liners Ltd
Manchester Vigour	20. 8.79	N. W. Cockshoot	M. Broadhead, C. P. A. Bell, J. A. P. Hall	H. Holdridge	Manchester Liners Ltd
Manchester Zeal	13.11.79	G. Shadbolt	M. A. Carter, M. Gadd, C. R. Darnley	P. Wilson	Manchester Liners Ltd
Marseille	14. 1.80	J. Illingworth	M. A. Carter, C. R. Darnley, C. Williams	R. MacKay	Manchester Liners Ltd
Masirah	16.11.79	M. L. Coombs	B. Robinson, A. P. Haxby	C. B. Hardie	Cunard S.S. Co. Ltd
Matco Avon	22. 2.80	P. J. Walters	R. J. MacLeod, G. Robinson	I. R. Francis	Mobil Shipping Co. Ltd
Matco Thames	24. 9.79	P. Kelly	I. A. McLeod, A. Lane, J. W. Parkinson	A. King	Mobil Shipping Co. Ltd
Mayfield	4. 3.80	H. E. Hoyle	G. R. Jackson, D. Petty, M. Warrior	B. J. Dunniece	Furness Withy (General Shipping) Ltd
Melampus	*	C. Sandy	G. Griffiths, I. A. Pakula	P. D. Stapleton	Ocean Transport & Trading Ltd
Miranda	3. 5.79	D. Y. Roberts		N. Hadley	Department of Trade
Montreal Star	25.11.79	J. Atkins	M. Goodfellow	W. Ward	Blue Star Line Ltd
Morant	13. 6.79	B. Hodges	P. Charter, M. Curtis, C. Barker	H. O. Gaskell	Fyffes Group Ltd
Moraybank	4. 6.79	T. D. Scott	S. J. Curtis, S. Veltman	A. F. Cross	Bank Line Ltd
Naticina	*	R. W. Kerley	M. J. Durant-Eele, S. Gallaway, G. Denny	R. Sykes	Shell Tankers (U.K.) Ltd
Nessbank	20. 2.80	J. W. Greatorex	T. N. Morris, D. B. Pirie, A. Wilson	R. P. Palmer	Bank Line Ltd
New Westminster City	26. 2.80	M. E. Jones	W. Barnes, I. C. Stutt	S. Whitmore	Sir Wm. Reardon Smith & Sons Ltd
New York Star	21. 2.80	G. Ferriday	D. Turney, M. J. D'Ardenne, D. Turney	R. Kit	Blue Star Line Ltd
Newburn	14. 2.78	W. Woodman	R. J. Johnston	P. H. Crowe	Common Brothers Ltd
Nordic Commander	14. 2.80	J. Blaber	T. R. J. Popplewell		J. & J. Denholm Ltd
Norman Lady	13. 2.80	J. W. Murray	P. D. Barrett, P. N. Ralph	J. D. Wadden	Buries Marks Ltd
Norse Marshal	24. 1.75	A. Barker	N. Stark, H. Syed		Harrison (Clyde) Ltd
Norse Viking	22. 1.80	R. W. Henderson	P. Munro, J. Jennings, W. K. Mutch	C. Humphrey	Cardigan Shipping Co. Ltd
Opalia	3.12.79	S. W. Dean	M. J. Honey, A. S. Burgess, R. Salmon	A. Cook	Shell Tankers (U.K.) Ltd
Orduna	18.12.79	S. Gibson	C. L. Chilott, K. Thompson, J. Clark	M. P. J. Davie	Furness Withy (General Shipping) Ltd
Oropesa	12. 2.80	R. T. Riley	S. Clark, N. R. Aldridge	W. McCartney	Furness Withy (General Shipping) Ltd
Oroya	17. 3.80	G. E. Turner	R. J. Ellis, M. P. Molloy, D. Phillips	W. D. Mullan	Furness Withy (General Shipping) Ltd
Osaka Bay	7. 3.80	R. Dinne	M. D. Moore, K. Owen, K. Campbell	M. S. McLaren	Ocean Transport & Trading Ltd
Overseas Adventurer	*	G. F. Jacobs	A. Follett, R. Kitchener, M. Webber	R. Cunningham	London & Overseas Freighters Ltd
Overseas Argonaut	24. 1.80	A. C. McNab	J. L. Atkins, B. C. Watkins, K. J. McClymont	C. Stuart	London & Overseas Freighters Ltd
Pacific Fisher	17. 7.79	I. J. Groundwater	M. Light, N. R. Howlett, J. Ross	R. C. Briggs	James Fisher & Sons Ltd
Pacific Swan	29. 1.80	J. L. Lundberg	D. Farmer, R. G. Flynn, P. G. Hobson	A. C. Catt	James Fisher & Sons Ltd
Pacific Wasa	25.10.79	R. A. Reay	M. J. Pinder, C. Morgan, J. Bashforth	H. Segrave	Salen (U.K.) Ship Management Ltd
Partula	9. 7.79	L. J. Walton	D. M. Jones, G. Dunlop, A. Smith	A. Price	Shell Tankers (U.K.) Ltd
Patroclus	10. 1.79	R. M. Simpson	M. P. Desaney, S. A. Rajadura	J. Bridge	Ocean Transport & Trading Ltd
Pegu	13.11.79	S. B. Gilliat	I. A. Pakula, J. Prosser, E. Garrick	P. Croll	Ocean Transport & Trading Ltd
Phrontis	6. 7.79	J. M. Dick	M. Safiuddin, F. Jackson, J. B. Lambri, I. Offland	T. J. Flatley	Ocean Transport & Trading Ltd
Pikebank	5. 3.80	J. F. Beckett	M. P. Donnelly, R. Sneddon, M. MacInnes	J. Murray	Bank Line Ltd
Pole Star	3. 1.79	N. Morrison	W. Tullock, A. D. Welch		Northern Lighthouse Board
Pollenger	14. 1.80	J. McMurtry	M. I. Shenton, S. D. Clinch	P. Hemmerman	P. & O. S.N. Co.
Pomella	11.10.79	S. Cutler	J. Rushton, J. G. Tarling, A. C. Atkins	D. C. Grafton	Shell Tankers (U.K.) Ltd
Port Alberni City	16.11.79	L. R. Staines	R. K. Villars, I. Boulton, I. M. Stewart	K. Sellar	Sir Wm. Reardon Smith & Sons Ltd
Port Caroline	8. 1.79	W. J. Williams	M. J. S. Hartnell, M. G. Lange	N. L. Jenner	Port Line Ltd
Port Chalmers	20. 4.79	P. E. Packwood	W. J. Headon, D. S. Hughan, C. Edwards	S. Myland	Port Line Ltd
Queen Elizabeth 2	26. 9.79	D. Ridley	J. Dunford, P. A. Chandler, D. M. Sisson		Cunard S.S. Co. Ltd
Recorder	20.12.79	E. J. Reilly	K. Moore, P. Hare, D. Wilson	S. Haslett	Cable & Wireless Ltd
Remuera Bay	19. 3.80	J. H. Hutson	R. D. Abderson, B. Graham, J. M. Kelleher	B. A. Mullan	Container Fleets Ltd
Resolution Bay	6. 2.80	W. Murison	D. R. Lewis, C. Johnston, P. Wilson	W. Kay	Container Fleets Ltd

Retreiver	9. 5.79	J. H. Killick	P. S. D. Worrall, D. S. MacFarlane	D. Steel	Cable & Wireless Ltd
Reynolds	28. 9.79	J. Cooper	J. Meier, E. H. Dillen, C. Hewitt	G. Davison	Bolton S.S. Co. Ltd
Ringnes	15.10.79	M. J. Meyers	M. G. Smith	B. Sewell	Jebsens (U.K.) Ltd
Ripon Grange	7.11.79	B. Ditchburn	P. C. Waiton, E. W. Evans, D. Stewart-Taylor	P. G. Corkin	Houlder Bros. & Co. Ltd
Riverbank	10. 1.80	E. T. Rees	W. M. Esler, B. D. Miller, G. A. Foster	D. A. Keohane	Bank Line Ltd
Riverina	13. 2.80	J. R. Richmond	A. C. A. Butcher, T. H. Lawrence, M. J. Rudd	D. Brooks	Furness Withy (General Shipping) Ltd
Roachbank	4. 2.80	R. M. Ireland	P. N. Hill, S. J. Messruther, P. Moulds	G. B. Randell	Bank Line Ltd
Rockhampton Star	25. 2.80	A. H. White	J. M. Ayre, J. B. Harbord	D. C. Millar	Blue Star Line Ltd
Roebuck	28.12.79	B. R. Smith	J. Spurgeon	B. P. Clarke	Furness Withy (General Shipping) Ltd
Ros Castle	23.11.79	R. C. Thomas	B. W. Wood, I. G. Morriston, J. Brown	R. Sadler	Ben Line Steamers Ltd
Royal Prince	10.12.79	E. Buckle	M. G. Price, T. W. Mitchell		Furness Withy (General Shipping) Ltd
Rubens	14. 6.79	J. D. Cooper	T. R. Niven, I. Woodier, C. Hewitt	C. Booth	Bolton Steam Shipping Co. Ltd
Ruddbank	11.12.79	C. B. Davies	J. K. Ward, K. Gray, R. G. Penhalgon	J. P. Quine	Bank Line Ltd
St. Benedict	18.10.77	T. Doyle	T. P. Barrett		T. Hamling & Co. Ltd
St. Edmund	20. 2.80	F. Wilkins	M. D. Horn, C. Winterton, P. Perera	T. Plant	British Rail
St. George	14. 1.80	K. C. Wood	L. Roskell	R. Mallett	British Rail
St. Helena	19.11.79	M. L. M. Smith	W. F. Hughes, R. J. Murray, C. J. Hughes	K. Wharton	Curnow Shipping Ltd
St. Jason	6.11.79	A. Ball	H. G. Pask		T. Hamling & Co. Ltd
Samaria	8. 2.80	G. F. Kay	J. D. Cook, C. Kingston, A. J. Turner	D. E. Beech	Cunard S.S. Co. Ltd
Sapphire Bounty	*	A. I. McKinnon	A. Morris, M. Masters, M. L. Russell	P. Fieldhouse	Sea Containers (Chartering) Ltd
Saxonia	12. 9.79	M. S. Polson	M. Stenzel, M. A. Clark, C. M. Bathgate	F. Tordoff	Cunard S.S. Co. Ltd
Scotia	8. 1.79	J. McBride	I. C. McLeod	L. Kesson	Department of Agriculture & Fisheries fo Scotland
Scotspark	20. 4.79	F. Danks	H. Livingston, D. G. Malcolm, D. Hope	A. L. Gosling	J. & J. Denholm Ltd
Scottish Eagle	*	J. Caley	R. Collins, P. Simpson, R. G. Ward	T. Martal	Cayzer Irvine Shipping Co. Ltd
Scottish Lion	*	A. D. Terras	R. Collins, J. Dingle, H. Cameron	D. J. Oakden	Cayzer Irvine Shipping Co. Ltd
Scythia	29. 8.79	D. Moore	J. Van Wyck, R. B. Lloyd, P. Rafferty	H. Grattan	Cunard S.S. Co. Ltd
Seaforth Clansman	6. 3.79	J. Ritchie	G. J. Lawson, C. Wilmot, J. M. Hughes	M. H. Stalker	Seaforth Maritime Ltd
Seatrain Saratoga	*	T. Sutherland	F. C. Maciver, J. Ray, A. McLeod, T. McLeod		J. & J. Denholm Ltd
Semac 1	*	J. M. Dobeson	M. J. Wiggett, D. Laycock, P. Nellany, J. McConville	G. Bowels	Seamac Services
Serenia	17. 1.80	B. Bowtell	J. F. Reeder, P. J. Monsink		Shell Tankers (U.K.) Ltd
Servia	14. 1.80	J. G. Whyte	D. Knight, S. Millar, F. B. Hawkins	T. May	Cunard S.S. Co. Ltd
Shackleton	10. 1.80	G. H. Selby-Smith	A. R. Louch, P. T. Oldfield, E. M. Bowen	W. D. Scott	Natural Environment Research Council
Sherbro	7. 9.79	R. McL. Munro	R. W. Chamberlain, M. G. S. Johnson	J. Crotty	Ocean Transport & Trading Ltd
Shetland Shore	2. 1.80	A. P. Alexander	C. McKenny		Offshore Marine Ltd
Shirrabank	2.11.77	G. D. Scott	M. J. Banks		Bank Line Ltd
Shonga	16. 1.80	R. Wild	M. J. Russell, A. Hulme, P. A. E. Sambrook	R. A. Brown	Ocean Transport & Trading Ltd
Silverfjord	3.12.79	N. Sandes	A. P. McCall, E. P. Bailey, A. M. Huntington	P. Millar	Silver Line Ltd
Silvermain	25.10.78	M. E. Harris	J. W. Malham, A. G. Morcom, A. P. Montgomery	B. Wilkinson	Silver Line Ltd
Sinbad Saxon	*	H. Scott	J. Carter, . Wyman	E. L. Smith	Jebsens (U.K.) Ltd
Sincerity	9. 4.79	T. Vaughan			F. T. Everard & Sons Ltd
Singularity	31. 1.80	A. J. A. Richards	P. G. Powell		F. T. Everard & Sons. Ltd
Sivand	12. 3.80	J. G. Bell	J. B. Greenhalgh, A. D. Haworth, B. M. Kempson	H. F. Sharkey	Irano-British Ship Service Co. Ltd
Snow Ball	*	G. Hogg	J. Clamp, M. Allisson, S. Smith	D. Drummond	Salen (U.K.) Ship Management Ltd
Sokoto	*	S. A. MacInnes	E. Lloyd, M. Bagley, B. Sommerhill	J. N. Nolan	Ocean Transport & Trading Ltd
Southgate	*	F. H. Wolias	S. Brazier, E. Potter, G. Stephenson	K. Watkinson	Turnbull Scott Management Ltd
Southland Star	7. 1.80	R. K. Bilton	B. P. Stockdale, A. M. Ashton, R. Guy	M. Stokes	Blue Star Line Ltd
Speciality	18. 2.80	E. Lear	E. Crossin, G. Hobbs, M. Irwin		F. T. Everard & Sons Ltd
Spey Bridge	3. 1.80	J. Wyness	J. Hammond, C. Gray, M. G. E. Robinson	M. Williams	Silver Line Ltd
Spraynes	24. 3.80	A. M. Smart	P. Sutcliffe, S. Bounds	S. R. Chalkley	Jebsens (U.K.) Ltd
Star Blackford	28.11.79	M. F. Haley	C. L. White, P. M. S. Turner, J. G. Melrose	I. W. Hart	Blandford Shipping Co. Ltd
Star Bulford	24. 3.80	R. S. Beswick	R. Burns, A. C. Ogilvy, W. P. Broadley	S. Chapman	Blandford Shipping Co. Ltd
Star World	24. 3.80	I. C. Rollo	S. P. Lai, N. M. Gaibi, P. Cooney		Marine Navigation Co. Ltd
Starman Anglia	29. 3.79	P. W. Hutchinson	S. A. Whittle, D. Barnicoat, J. P. Spencer	R. Kit	Blue Star Line Ltd
Stonepool	9. 7.79	J. Jennings	J. Anderson, N. H. Cooper		Sir R. Ropner & Co. Ltd
Strathdevon	7. 1.80	A. Aston	A. C. N. Wedge, N. W. Stephenson, O. S. Horsburgh	J. Bilton	P. & O. S.N. Co.

Selected Ships (*contd.*)

NAME OF VESSEL	LAST RETURN	MASTER	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNER/MANAGER
Strathdirk	17. 9.79	F. L. Heard	M. B. J. Byford, P. D. Davies, S. Sharma	J. E. R. Johnston	P. & O. S.N. Co.
Strathdoon	15.11.79	E. H. Wrightson	D. A. Booker, D. Pierce, R. Bloomfield	W. Blacklaws	P. & O. S.N. Co.
Strathduns	8. 2.80	P. M. Pitcairn	R. N. Hocking, D. T. Simpson, W. G. Hughes	G. Bradshaw	P. & O. S.N. Co.
Stratheden	5. 1.80	M. H. Wilson	J. A. Kent, R. A. M. Leighton, R. C. Bloomfield	N. W. Harrison	P. & O. S.N. Co.
Strathelgin	6. 2.80	A. Dorkins	M. T. L. Parkinson, D. Gates, A. MacKenzie	A. D. Hutchinson	P. & O. S.N. Co.
Stratherrol	24. 9.79	M. Robinson	M. A. Cook, R. Loraines, S. Mathews	W. A. A. C. Speirs	P. & O. S.N. Co.
Strathesk	1. 8.79	A. M. Jenkins	G. Lace, C. Lewis	K. McBrayne	P. & O. S.N. Co.
Strathettrick	7. 3.80	D. Foster	N. MacLean, A. McCullock, J. Nicholson	P. Moore	P. & O. S.N. Co.
Strathewe	18.12.79	J. M. Burn	J. C. Etheridge, I. Blackley, D. J. Tomkiss	A. Guest	P. & O. S.N. Co.
Streambank	29.11.79	H. Barber	J. L. Edens	J. L. Baker	Bank Line Ltd
Summity	24. 3.80	W. G. Hunt	P. Smith, S. M. Manson		F. T. Everard & Sons Ltd
Sunnyway	25. 2.80	R. M. Bessant	K. J. Bondel, M. A. T. McMillan, J. R. Harris	P. Hammond	Newgate Shipping Co. Ltd
Supremity	11. 9.79	A. Mackinnon	B. Hollywood, A. Browne		F. T. Everard & Sons Ltd
Surrey	24. 3.80	P. Bishop	A. K. Humphrey, P. Iveson, M. B. Dowikowski	A. Dobson	Ellerman Wilson Line Ltd
Tacoma City	8. 8.79	M. C. Hurst	I. C. Miller, R. E. Baker	R. G. Miller	Sir Wm. Reardon Smith & Sons Ltd
Tantalus	24. 1.80	J. O. Jones	P. B. Cunningham, K. M. Seery, C. A. Galbrath	M. P. Atherton	Ocean Transport & Trading Ltd
Tenchbank	7. 3.80	W. H. Martin	S. Bland, L. R. Jones, W. Bryce		Bank Line Ltd
Texaco Brussels	16.11.79	P. A. Heckingbottom	L. C. Chan		Texaco Overseas Tankship (U.K.) Ltd
Texaco Gloucester	7. 9.79	T. Page	R. Samson, L. Kingsbury, A. Lastique		Texaco Overseas Tankship (U.K.) Ltd
Texaco Singapore	20.11.79	N. Baker	R. D. Sawdon, A. James, D. J. Bowerman	T. O'Meili	Texaco Overseas Tankship (U.K.) Ltd
Thamesfield	12. 6.79	P. Hansen	R. C. Burn, R. Hamilton, N. Patteson	R. D. Campbell	Hunting & Sons Ltd
Timaru Star	21. 5.79	A. Chivers	S. M. Scott, K. D. Pykett, J. D. Willis-Richards	D. MacNaughton	Blue Star Line Ltd
Tokyo Bay	7. 3.80	A. A. Rundle	J. G. W. Dixon, H. B. Gobey, W. Broadbeat	J. S. Evans	Ocean Transport & Trading Ltd
Tourmaline	28.11.78	P. R. Thompson	P. E. Cormican		Wm. Robertson & Co. Ltd
Townsville Star	14.12.78	A. J. Cheshire	M. A. Barker, J. Saunders, N. Colling	R. Dawson	Blue Star Line Ltd
Trader	13. 3.80	S. Marlowe	P. G. Wood, P. N. Musoke-Wamala, K. Lancaster	K. Alexander	T. & J. Harrison Ltd
Trinculo	11.12.79	J. Russell	S. D. Harvey, S. N. Malins, L. Y. Davis	P. Kelly	Bowring S.S. Co. Ltd
Trojan Star	18. 3.80	J. A. H. Gray	D. J. Dawson, A. J. Brown, M. J. Haines	E. Smith	Blue Star Line Ltd
Troll Lake	15. 2.80	M. Thorp	C. V. Gnanakone, S. Macbeth	D. I. McClean	J. & J. Denholm Ltd
Troll Park	14. 3.80	R. W. Cotter	T. Lehane, I. A. Souter, E. W. Lauritsen	A. P. Austen	J. & J. Denholm Ltd
Trongate	24. 3.80	T. Price	R. J. Hockham, M. Drewery, C. P. Moore	B. Donaldson	Turnbull Scott Management Ltd
Troutbank	*	G. Tully	E. F. S. Harrison, R. Ward, J. Nippers	N. Smirk	Bank Line Ltd
Tuscan Star	*	J. L. Needham	J. S. Gayton, J. M. Jarratt, P. A. Harding	G. Shaw	Blue Star Line Ltd
Uganda	20. 8.79	J. W. Terry	R. Brooke-Hart, R. M. Oliver	K. Gibson	P. & O. S.N. Co.
Vancouver Forest	4. 1.80	J. F. Houghton	A. D. MacLeod, D. J. Kelley, F. W. Brown	M. McCormack	J. & J. Denholm Ltd
Vendee	8. 8.79	A. Sugden	J. A. Kent, S. White, L. Hesketh	P. Whyley	P. & O. S.N. Co.
Victoria City	17. 1.80	G. Garlick	P. A. Bullard, J. Henderson	D. S. H. Thomson	Sir Wm. Reardon Smith & Sons Ltd
Vosges	7. 9.79	T. E. Kelso	J. C. Holmes, D. J. Perry, T. U. Owen	J. Moon	P. & O. S.N. Co.
W. M. Neal	20. 9.79	P. Atkinson	D. A. Bance, J. McClaskie, J. Radcliffe	O'Neal Segrave	Canadian Pacific Steamships Ltd
Wellington Star	20.11.79	D. R. MacKillop	M. C. Brown, F. K. Robertson, J. A. Dick	P. W. Bolton	Blue Star Line Ltd
Wellpark	27.11.79	G. A. Anderson	A. Crofts, M. A. W. Brown, S. J. Card	R. M. Rigg	J. & J. Denholm Ltd
Welsh City	4. 3.80	A. D. Lightfoot	A. C. Prosser, J. Pearsall, I. A. Smith	M. W. Savory	Sir Wm. Reardon Smith & Sons Ltd
Welsh Voyager	13. 7.79	P. Baxter	N. Childs, A. M. Grant, J. Cunningham	W. J. Sutton	Welsh Overseas Freighters Ltd
Westra	18. 4.78	D. R. G. Stephen			Dept. of Agriculture & Fisheries for Scotland
Whitethorn	*	A. Anthony	M. Blackburn, H. Notman, I. Dodd		Sir William Coe Ltd
Wild Cormorant	18. 1.80	T. E. Rowland	D. J. Barnett, G. Everitt	A. J. Rose	P. & O. S.N. Co.
Wild Curlew	4. 1.80	M. A. Hill	A. S. Bolton, M. J. Winterbottom, D. S. MacDonald	B. T. Davis	P. & O. S.N. Co.
Wild Flamingo	10. 7.79	P. Lay	R. J. Pearson, M. Pellett, D. Lewis	A. D. Macgillivray	P. & O. S.N. Co.

Wild Fulmar	22.11.79	R. C. Lister	M. Fowler, R. Lorains, M. R. Gould	P. A. Whyley	P. & O. S.N. Co.
Wild Gannet	17.10.79	F. S. Angus	A. R. Woodhouse, J. T. Jenkins, D. P. Morton	W. A. A. C. Spirs	P. & O. S.N. Co.
Wild Grebe	13. 9.79	A. J. Hughes	R. J. Lennon, P. C. Hornett, J. R. Mace	C. Anderson	P. & O. S.N. Co.
Wild Mallard	7.12.79	F. C. Taylor	P. Tarrant, P. Cowdell, D. Moorhouse	R. Woodward	P. & O. S.N. Co.
Wild Marlin	7. 3.80	H. C. Hynard	S. N. Monks, R. O. Wilson, R. P. Lonsdale	C. A. Anderson	P. & O. S.N. Co.
Wiltshire	3. 1.80	R. A. F. Edwards	D. J. Richards, G. N. Penry, S. H. Gledhill	R. C. Cook	Bibby Line Ltd
Winchester Universal	13. 9.79	O. Barnsley	S. Milnec, I. A. S. Dearie, G. Mobbs	J. Sharpley	Cayzer Irvine Shipping Co. Ltd
Yorkshire	14.11.79	W. A. D. Davies	L. A. Montalto, D. Jenkinson, R. W. Gott	C. J. Simpson	Bibby Line Ltd
Zinnia	*	B. Rowlands	N. Reid, J. Wright, B. Hildred	D. G. Priestland	Stag Line Ltd

Supplementary Ships

NAME OF VESSEL	LAST RETURN	MASTER	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNER/MANAGER
Apollo	1. 2.77	J. Earl	H. Bond, A. M. Jones		Bristol S.N. Co. Ltd
Ardmore	23. 1.80	M. J. Carter			P. & O. S.N. Co.
Baltic Viking	*	D. Sinclair	N. Maude, D. Stone		United Baltic Corp. Ltd
Benjamin Bowring	*		C. F. Balaporia, D. Peck, P. Polley		Bowring S.S. Co. Ltd
Cairncarrier	*	G. W. Horn	A. Fischbacher, J. L. A. Robinson		Furness Withy (General Shipping) Ltd
Caroline Weston	13. 3.80	G. C. Thomas	S. L. Moorby, D. J. McPhail		Weston Shipping Co. Ltd
Cast Petrel	*				J. & J. Denholm Ltd
Decca Surveyor	*	T. Sheehan	H. Skelton		Oil Search Marine Management
Earl Godwin	10. 9.79	F. Ilor	M. L. Shakesby	P. A. Lloyd	British Rail
Echo	6. 3.78	W. R. Kays	K. Parkin, R. D. Smithson		Bristol S.N. Co. Ltd
Invincible	6. 8.79	A. Atkinson			British United Trawlers Ltd
Kirkella	*	W. Brettal	T. Scannel		J. Marr & Sons Ltd
Kurd	13. 6.77	C. Thresh	H. Bryant	H. Bryant	British United Trawlers Ltd
Lord Mount Stephen	1.10.79	G. Walterson	A. Edwards, B. C. Scott, D. A. Tripping	M. J. Corry	Canadian Pacific Steamships Ltd
Methane Princess	24. 3.80	M. Goddard	P. Hudson	W. Carty	Shell Tankers (U.K.) Ltd
Methane Progress	30. 1.80	D. H. G. Mortimer	I. S. Watson		Shell Tankers (U.K.) Ltd
Oil Hustler	*	N. Brown	L. Elms		Ocean Inchcape Ltd
Oil Supplier	*	C. Cunningham	G. J. S. Ives, M. Kirk		Ocean Inchcape Ltd
Princess Anne	9.10.79	P. E. Craven	C. Sheen, A. Fulcher		Boston Deep Sea Fisheries Ltd
Radcliffe Trader	*	S. J. Hurlstone	M. Shepherd, P. Derham		E. T. Radcliffe S.S. Co. Ltd
Rocknes	13.12.77	J. G. Sleight	W. Brackenbridge, D. P. Platt, E. G. Everingham	P. J. Linnett	Jebsens (U.K.) Ltd
St. Jasper	10. 9.79	E. Johnson	K. Batty	K. Batty	T. Hamling & Co. Ltd
St. Ola	*	J. Tulloch	A. Johnson		P. & O. S.N. Co.
Tor Caledonia	*	T. Miller	-. Rodgers, -. Normandale	R. Davies	Tor Line Ltd
Tor Gothia	2.11.79	R. Barrett	C. Rowland, G. S. Hart	R. E. Stewart	Tor Line Ltd
Vegaman	19. 9.78	M. Blight	S. G. Turner, M. C. Jones	L. P. Greeve	C. Rowbotham & Sons Management Ltd
Viking Valiant	17.10.79	A. Bonehill	D. Parsons, C. E. Walford	C. D. Arnold	Townsend-Thoresen Car Ferries Ltd
Viking Venturer	4. 3.80	A. F. Bonehill	D. A. Parsons, W. J. C. Clarke, G. L. Coulson	P. C. Morris	Townsend-Thoresen Car Ferries Ltd

Light-vessels

NAME OF VESSEL	MASTER
Channel	R. Owen, E. Jaeger
Dowsing	A. S. Richards, F. J. Turner
East Goodwin	L. Mortimer, A. Everett
Falls	A. H. Robinson, C. E. Woods
Humber	F. W. Grice, S. F. Goose
Newarp	G. A. Harris, L. R. Long
Royal Sovereign (Lt. Tower)	R. W. P. Jeffers, W. G. Trebilcook
St. Gowan	P. Roche, M. J. Shearer
Seven Stones	T. G. Northcott, R. W. Goddard
Shipwash	R. Cadman, W. F. Dalby
Smith's Knoll	J. Cocilrill, F. Harrison
South Rock	C. Dunigan, J. Moguan
Tongue	F. G. Edwards, B. W. Mead
Varne	F. Betts, J. Rudd

'Marid' Ships

The following is a list of ships recruited for the observing and reporting of sea temperatures from coastal waters of Great Britain. Masters are requested to point out any errors or omissions in the list.

NAME OF VESSEL	MASTER	OWNER/MANAGER
Anglezark	B. Smith	Effluent Services
Arco Severn	I. J. Constance	A. B. C. (Marine) Ltd
Arco Thames	C. M. Hart	A. B. C. (Marine) Ltd
Avalon	R. M. Lidgate	British Rail
Bass Shore	S. Sage	Offshore Marine Ltd
Beacon Point	G. H. Cubbon	Christian Salvesen (Shipping) Ltd
Brenda	R. Mill-Irving	Dept. of Agriculture & Fisheries for Scotland
Brian Boroime	J. Bakewell	British Rail
Caesarea	M. E. Bodiam	British Rail
Caledonian Princess	J. D. Macmillan	British Rail
Clansman	D. Maclean	Caledonia MacBrayne Ltd
Claymore	M. Kennedy	Caledonia MacBrayne Ltd
Columba	J. P. Gray	Caledonia MacBrayne Ltd
Cymbeline	J. C. Woodbridge	Furness Withy (General Shipping) Ltd
Dolphin Point	J. Rendal	Ocean Transport & Trading Ltd
Doric Ferry	J. Costain	Atlantic S.N. Co. Ltd
Dragon	P. C. Woods	Southern Ferries Ltd
Earl William	P. Baker	British Rail
Esso Clyde	R. H. Rendell	Esso Petroleum Co. Ltd
Esso Fawley	D. Ling	Esso Petroleum Co. Ltd
Esso Mersey	J. H. Smith	Esso Petroleum Co. Ltd
Esso Milford Haven	W. L. Lowndes	Esso Petroleum Co. Ltd
Esso Severn	G. R. Rowe	Esso Petroleum Co. Ltd
Fort Point	D. Keen	Christian Salvesen (Shipping) Ltd
Garrison Point	D. J. Sutherland	Hudson S.S. Co. Ltd
Hebrides	J. M. McQueen	Caledonia MacBrayne Ltd
Hilary Weston	S. Pollock	Weston Shipping Ltd
L. M. Odin	D. Thompson	Land & Marine Engineering Ltd
Mairi Everard	M. Parker	F. T. Everard & Sons Ltd
Modan	J. Bott	Wm. Lindsay (Shipowners) Ltd
Mole Venture	T. Pollitt	C. M. S. Shipping Co. Ltd
Navigator	B. D. Davidson	Decca Navigator Co. Ltd
Oswestry Grange	W. Backhouse	Furness Withy (General Shipping) Ltd
Penelope Everard	D. Stewart	F. T. Everard & Sons Ltd
Pharos	K. F. Davidson	Northern Lighthouse Board
Rhodri Mawr	F. Wilkins	British Rail
St. Clair	D. C. Gray	P. & O. S.N. Co.
St. Columba	L. R. Evans	British Rail
Shell Refiner	D. Kerr	Shell U.K. Ltd
Somersetbrook	B. Mumby	Comben Longstaff & Co. Ltd
Suavity	—. Salisbury	F. T. Everard & Sons Ltd
Suffolk Shore	R. Dawson	Offshore Marine Ltd
Sumburgh Head	A. Alvis	Christian Salvesen (Shipping) Ltd
Ulster Queen	D. Anderson	Belfast S.S. Co. Ltd
Vigilant	D. Rattary	Dept. of Agriculture & Fisheries for Scotland
Wendy Weston	A. G. Agnew	Weston Shipping Ltd
Whitegate	C. H. Roberts	Turnbull Scott Management Ltd
Wilmington	N. Ramsey	Stephenson Clarke Shipping Ltd

BRITISH COMMONWEALTH

The following lists give the names of Selected and Supplementary Ships and the number of Auxiliary Ships where known (i.e. those which only report in 'sparse areas'), which voluntarily co-operate with meteorological services of the British Commonwealth. *Information for these lists is required by 31 March each year. Information for the January corrective lists is required by 30 September each year.*

AUSTRALIA (Information dated 26.2.80)

NAME OF VESSEL	OWNER/MANAGER
Advara	Southern Shipping Line
Al Khaleej	Kuwait Shipping Co.
Al Kuwait	Kuwait Shipping Co.
Al Shuwaikh	Kuwait Shipping Co.
Al Yasrah	Rural Exporters and Traders Pty. Ltd
Andros	Australia-West Pacific Line
Anna Prestheus	John Prestheus Redori
Anro Australia	Australian National Line
Arafura	Australia-Japan Container Line
Ariake	Australia-Japan Container Line
Ariane	Overseas Containers Australia Pty. Ltd
Aurore	Weeke Ship Hong Kong Ltd
Australia Star	Blue Star Line
Australian Emblem	Australian National Line
Australian Endeavour	Australian National Line
Australian Enterprise	Australian National Line
Australian Escort	Australian National Line
Australian Explorer	Australian National Line
Australian Exporter	Australian National Line
Australian Pioneer	Australian National Line
Australian Progress	Australian National Line
Australian Prospector	Australian National Line
Australian Venture	Australian National Line
Baron Maclay	Scottish Shipping Management Ltd
Baron Wemyss	Scottish Shipping Management Ltd
Bass Trader	Australian National Line
Boogalla	W. A. State Shipping Service
B. P. Endeavour	B. P. Tankers Pty. Ltd
B. P. Enterprise	B. P. Tankers Pty. Ltd
Cape Don	Department of Transport
Cape Grafton	Scottish Shipping Management Ltd
Cape Hawke	British Phosphate Commission
Cape Moreton	Department of Transport
Cape Pillar	Department of Transport
Centaur	Blue Funnel Line
Curtis Capricorn	Clutha Development Pty. Ltd
Curtis Oceanic	Clutha Development Pty. Ltd
Clydebank	Bank Line Ltd
Corabank	Bank Line Ltd
Coral Chief	New Guinea-Australian Pty. Ltd
Danny F	Rachrid Fares Enterprises Pty. Ltd
Darwin Trader	Australian National Line
Dilkara	ACTA Pty. Ltd
Doha	Patridis Agencies Pty. Ltd
Dona Clausen	Clausen Shipping Line
Eastern Academy	Burns Phillip Co.
Edward Wilshaw	Cable and Wireless Pty. Ltd
Eigamoiya	Nauru Pacific Shipping Line
Empress of Australia	Australian National Line
Eugene McDermott	Geophysical Services International
Forthbank	Bank Line Ltd
Gerringong	W. A. State Shipping Co.
Iron Arnhem	Broken Hill Pty. Co. Ltd
Iron Bogong	Broken Hill Pty. Co. Ltd
Iron Endeavour	Broken Hill Pty. Co. Ltd
Iron Hunter	Broken Hill Pty. Co. Ltd
Iron York	Broken Hill Pty. Co. Ltd
Ivybank	Bank Line Ltd
John Burke	John Burke Pty. Ltd
Khalij Express	Gulf Ship Lines Ltd
Kimberley	W. A. State Shipping Service
Kota Bali	Pacific International
Kristinbakke	Knutsen Line
Lalandia	Scan Austral East Asiatic Shipping Co.
Linda Clausen	Clausen Shipping Co.
Mashaallah	Cunard Steam Ship Co. Ltd
Meadowbank	Bank Line Ltd
Melbourne Trader	Australian National Line
Mount Newman	Australian National Line
Nimos	New Guinea Australia Line
Nuigini Express	New Guinea Express Line Ltd
Nyanda	W. A. State Shipping Service
Opal Bounty	Sea Containers Services Ltd
Ormistow	C. S. R. C. Ltd
Papuan Chief	Nedlloyd Swire Pty. Ltd
Persia	Rachrid Fares Enterprises Pty. Ltd
Ravenswood	Furness Withy (Australia) Pty. Ltd
Regional Endeavour	Drillships Ltd
Sea Princess	P. & O. Australia Ltd

Australia (*contd.*)

NAME OF VESSEL	OWNER/MANAGER
Sedco 445	Woodside-Burmah Oil Ltd
Sedco 471	Phillips Australia Oil Co.
Sedco 472	Esso Australia
Sid McGrath	John Burke Pty. Ltd
Strathmay	P. & O. Australia Ltd
Strathmeigle	P. & O. Australia Ltd
Strathmere	P. & O. Australia Ltd
Strathmuir	P. & O. Australia Ltd
Surenes	Jebsen Line
Sydney Trader	Australian National Line
Tombarra	Scan Austral East Asiatic Shipping Line
Tourcoing	Scan Austral East Asiatic Shipping Line
Townsville Trader	Australian National Line
Tricolor	Scan Austral East Asiatic Shipping Line
Turquoise Bounty	Sea Containers Services Ltd
Tropic Fury	Tropic Island Shipping Pty. Ltd
Yarrah River	Australian National Line

CANADA (Information dated 1.1.80)

NAME OF VESSEL	OWNER/MANAGER
A. T. Cameron	Government of Canada
Achilles	Ocean Transport & Trading Ltd
Alert	Government of Canada
Allunga	Australian National Line
Baffin	Government of Canada
Bayfield	Government of Canada
Bernes	Jebsen (U.K.) Ltd
Bluenose	Canadian National (Marine)
Bolnes	Jebsen (U.K.) Ltd
Borgnes	Jebsen (U.K.) Ltd
Camsell	Government of Canada
Canmar Kigoriak	Dome Petroleum Ltd
Cape Grenville	Scottish Ship Management Ltd
Cape Roger	Government of Canada
Cardiff City	Sir William Reardon Smith & Sons
Chebucto	Government of Canada
Chi Grace	Chi Yuen Navigation Co. Ltd
Chi Trust	Chi Yuen Navigation Co. Ltd
Cygnus	Government of Canada
Dawson	Government of Canada
Devon City	Reardon Smith Lines
D'Iberville	Government of Canada
Dilkara	ACTA Pty. Ltd
Discoverer Seven Seas	Maclaren Marex Ltd
Eastern Maid	Indo China S.N. Co. Ltd
Eastern Moon	Indo China S.N. Co. Ltd
Federal Nova	Federal Offshore Services Ltd
Fjellines	Reederei J. Jost (Germany)
Fort Calgary	Canadian Pacific Steamships Ltd
Fort Kamloops	Canadian Pacific Steamships Ltd
Fort Nelson	Canadian Pacific Steamships Ltd
Fort Walsh	Canadian Pacific Steamships Ltd
Fort Yale	Canadian Pacific Steamships Ltd
Franklin	Government of Canada
Fruition	Ocean Tramping Co. Ltd
Furunes	Jebsen (U.K.) Ltd
G. B. Reed	Government of Canada
Glomar Atlantic	Maclaren Marex Ltd
Grenfell	Government of Canada
Gulf Canada	Gulf Canada Ltd
Gulf MacKenzie	Gulf Canada Ltd
Gypsum Empress	Fundy Gypsum Co.
H 1070	Kent Lines Ltd
Hudson	Government of Canada
Island Princess	Princess Cruises
Ixia	Stag Lines Ltd
J. E. Bernier	Government of Canada
John A. MacDonald	Government of Canada
John Cabot	Government of Canada
Keewatin	Northern Transportation Co.
Komovi	Government of Canada
Labrador	Government of Canada
Lac Erie	Government of Canada
La Primavera	Buries Markes Ltd
Leda	Seaboard Shipping Ltd
Limnos	Government of Canada
Louisburg	Government of Canada
Louis S. St. Laurent	Government of Canada
Marine Evangeline	Canadian National (Marine)
Maxwell	Government of Canada
Montcalm	Government of Canada
Nahidik	Government of Canada
Namao	Government of Canada
Nordkap	Norden Steamship Company Ltd
Nordpol	Norden Steamship Company Ltd
Normal McLeod Rogers	Government of Canada
Northern Shell	Shell Oil (Canada) Ltd
Oriana	P. & O. Lines Ltd
Pacific Princess	P. & O. Lines Ltd
Pandora II	Government of Canada
Parizeau	Government of Canada
Pelerin	MacLaren Marex Ltd
Pelican	MacLaren Marex Ltd
Petrel	MacLaren Marex Ltd
Pierre Radisson	Government of Canada
Port Vancouver	Canadian Pacific Steamships Ltd
Princess of Acadia	Canadian National (Marine)
Queen of Prince Rupert	British Columbia Ferries
Sedco 707	MacLaren Marex Ltd
Sedco 709	MacLaren Marex Ltd
Simon Fraser	Government of Canada
Sir Humphrey Gilbert	Government of Canada
Sir William Alexander	Government of Canada
St. Lawrence Navigator	Leitch Transportation Ltd
Snowball	Salen U.K. Ship Management
Star Boxford	Star Shipping Ltd
Sun Princess	P. & O. Lines Ltd
T. Akasaka	Canadian Pacific Steamships Ltd
Tasman Sea	North Pacific Shipping

Canada (*contd.*)

NAME OF VESSEL	OWNER/MANAGER
Theron	Government of Canada
Thomas Carleton	Government of Canada
Thor I	Thor Dahl Lines
Thorscape	Thor Dahl Lines
Thorswave	Thor Dahl Lines
Tupper	Government of Canada
Walter E. Foster	Government of Canada
W. C. van Horne	Canadian Pacific Steamships Ltd
Westocean	Jardine Matheson Ship Management
Zapata Ugland	MacLaren Marex Ltd

Auxiliary ships:
Canada has 85 ocean-going Auxiliary Ships and 89 Auxiliary Ships operating on the Great Lakes and Inland Waters.

HONG KONG (Information dated 19.3.80)

NAME OF VESSEL	MASTER	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNER/MANAGER
Asian Jade	A. L. Carter	A. A. Browning, H. D. Ripley, T. Kaiteie	Chan Kam Yim	Mercury Shipping Co. Ltd
Asian Pearl	C. R. Humphry	A. C. Davidson, M. A. Hayes, P. Bundy	Lam Wing Shui	Swire Pacific Ship Management Ltd
Barber Perseus	G. Fisher	B. Jones, R. Bell, R. Hopwood	B. Oldroyd	Barber Wilhelmsen Agencies Ltd
Barber Tonsberg	F. Johansen	P. Harstad, P. Wettre, V. Kristoffersen	A. Ingebrethsen	Barber Wilhelmsen Agencies Ltd
Benrinnes	R. C. Thomas	A. J. M. Wilson, H. C. MacCowan, R. F. Sherwood	D. J. Murray	The Ben Line Steamers Ltd
Cape St. Mary	H. M. Chan	Y. S. Kwok, M. S. Ngau	K. H. Li	Agriculture & Fisheries Dept. H.K. Govt.
Coral Princess	M. T. Anderson	D. W. Fellows, G. L. Bent, M. Baker, N. McNee	Chan Hak Wai	Swire Pacific Ship Management Ltd
Eastern Muse	A. W. Webber	P. A. Chambers, Ip Pak Cheung, S. J. Webber	J. D. Neville	The Indo-China S.N. Co. (H.K.) Ltd
Funing	G. Cornforth	R. P. Fairbrother, Ng Wan Chin, S. Sarang	Zimmon Marr	Swire Pacific Ship Management Ltd
Halldis	O. H. Andersen	T. Egeland, K. I. Henriksen, A. Larsen	Wong Shiu Man	Thoresen & Co. Ltd
Hongkong Container	R. F. H. Mason		Hui Tak-keung	Hongkong Export Lines, Ltd
Hupeh	R. Kennet	J. D. S. F. Bird, R. H. Lewis, S. P. Komorowski	Sajid Ali	Swire Pacific Ship Management Ltd
IBN Malik	J. H. Jenkinson	J. W. D'Mello, D. S. Winser, I. G. Black	M. S. Hogan	Jardine, Matheson & Co. Ltd
Kwangsi	J. W. G. Wilby	P. D. Clarke, S. J. Hall, M. P. Lee	Hui Sai Ying	Swire Pacific Ship Managment Ltd
Kweichow	F. Cunningham	S. J. Barber, M. J. O. Pemberton, C. A. Frappell	Yam Siu Ning	Swire Pacific Ship Management Ltd
Laertes				Swire Shipping (Agencies) Ltd
Lamma Island				Hong Kong Island Line
Maersk Tempo	J. A. Thomas	F. Reutens, T. S. Yeow, P. C. Yeo	A. T. Lim	Maersk Line (Hong Kong) Ltd
Manaoloeverett	Ariston D. Roxas	Ignacio G. Daco, Francisco P. Anchuelo, E. T. Bullicer	N. A. Lachica	Everett Steamship Corporation S/A
Melampus	J. Ray	R. Harvey, J. Darauto, M. Wild	D. Miller	Barber Wilhelmsen Agencies Ltd
Memnon	W. Bowden	D. Custance, S. Hussein, W. Kirrane	J. Sergent	Barber Wilhelmsen Agencies Ltd
Menelaus	C. Windsor	P. Burden, P. Singh, A. Lewis	J. Coles	Barber Wilhelmsen Agencies Ltd
Mui Kim	James Keates	J. E. De Souza, M. Z. B. Hitam, L. D. Dordas	Leung Nam Chiu	Hongkong Borneo Shipping Co. Ltd
Oriental Ambassador	A. R. Dyason		Leung Chi-yung	Hongkong Export Lines Ltd
Oriental Chief	G. Mitchell		Au Chi-shing	Hongkong Export Lines Ltd
Oriental Expert	F. G. Dagger		Yim Kee	Hongkong Export Lines Ltd
Pabloeverett	C. G. Villanueva	M. E. Ismael, C. S. Pilapil, D. P. Nepomuceno	R. B. Tablada	Everett Steamship Corporation S/A
Pampa Argentina				Everett Steamship Corporation S/A
Patagonia Argentina	A. D. Irarra	Carlo Esquivel, Antonio Sarate, Edgardo Nunez	Ramen Nieto	Everett Steamship Corporation S/A
Poyang	H. J. Staff	J. H. Third, D. F. Baker, P. Lewis	Chan Chui Man	Swire Pacific Ship Management Ltd
Ramoneverett	V. P. Rondain Jr.	E. R. Almazan, T. C. C. Yuson, Mario C. Carlo	E. C. Santos	Everett Steamship Corporation S/A
Singwind	G. T. Henshaw	Ng Chew Ming, Lim Ewe Seng		Shun Cheong S.N. Co. Ltd
Sinkiang	C. J. H. Ennion	Lee Ka Mo, A. Vata, R. Noble	Hsu Yeh Chung	Swire Pacific Ship Management Ltd
Strathfife				Swire Shipping (Agencies) Ltd
Strathfyne				Swire Shipping (Agencies) Ltd
Taifookshan	Yeung Wai Sum	Chung Kwok Ling, Kai Chi Keung, Tong Joo Phoon	Cheung Kam Tim	Shun Cheong S.N. Co. Ltd
Taipoosek	Ko Keng Jen	Chan Wing Lok, D. Alam, Wong Jee Jwee	Pang Ping Man	Shun Cheong S.N. Co. Ltd
Taronga	R. Ambjornsen	R. Lillebo, U. Palsule, A. Rattan	A. Deshmukh	Barber Wilhelmsen Agencies Ltd
Thomaseverett	J. S. Vapor	F. F. Tubojan, D. C. Osano, R. D. Mercado Jr.	P. S. Salvador	Everett Steamship Corporation S/A
Torrens	L. Oksenvag	I. Hansen, S. Palat, V. Manjeshwar	S. Parkhi	Barber Wilhelmsen Agencies Ltd

INDIA (Information dated 1.1.80)

NAME OF VESSEL	OWNER
Selected Ships:	
Akbar	Mogul Line Ltd
Andamans	Shipping Corporation of India
Chidambaram	Shipping Corporation of India
Dwarka	British India Steam Navigation Co.
Gavasheni	National Institute of Oceanography
Indian Security	India Steam Navigation Co.
Jal Azad	Scindia Steam Navigation Co.
Jaladhanya	Scindia Steam Navigation Co.
Jaladharma	Scindia Steam Navigation Co.
Jaladhruv	Scindia Steam Navigation Co.
Jalaganga	Scindia Steam Navigation Co.
Jalagirija	Scindia Steam Navigation Co.
Jalagomati	Scindia Steam Navigation Co.
Jalagouri	Scindia Steam Navigation Co.
Jalajyoti	Scindia Steam Navigation Co.
Jalakanta	Scindia Steam Navigation Co.
Jalakrishna	Scindia Steam Navigation Co.
Jalapalaka	Scindia Steam Navigation Co.
Laxmi Sagar	Parekh Ocean Carriers
Lok Sevak	Mogul Line Ltd
State of Assam	Shipping Corporation of India
State of Bihar	Shipping Corporation of India
State of Gujarat	Shipping Corporation of India
State of Kutch	Shipping Corporation of India
State of Maharashtra	Shipping Corporation of India
State of Orissa	Shipping Corporation of India
State of Punjab	Shipping Corporation of India
State of Tamil Nadu	Shipping Corporation of India
State of Tr. Cochin	Shipping Corporation of India
State of Uttar Pradesh	Shipping Corporation of India
Vishva Anurag	Shipping Corporation of India
Vishva Maya	Shipping Corporation of India
Vishva Prabha	Shipping Corporation of India
Vishva Sagar	Parekh Ocean Carriers
Vishva Sudha	Shipping Corporation of India
Supplementary Ships:	
Ajanta	Shipping Corporation of India
Al Gilani	Allanna Lines Ltd
Annapoorna	Shipping Corporation of India
Anupama	Shipping Corporation of India
Apj Ambika	Apeejay Lines Ltd
Apj Anand	Apeejay Lines Ltd
Apj Anjali	Apeejay Lines Ltd
Aradhana	Shipping Corporation of India
Archana	Shipping Corporation of India
Arunachala Pradesh	Shipping Corporation of India
Bailadila	Shipping Corporation of India
Barauni	Shipping Corporation of India
Bellary	Shipping Corporation of India
Bhagat Singh	Shipping Corporation of India
Bhaskar	Shipping Corporation of India
B.R. Ambedkar	Shipping Corporation of India
Chanakya	Shipping Corporation of India
Chatrapati Shivaji	Shipping Corporation of India
Chennai Javam	South India Shipping Corporation
Chennai Muyarchi	South India Shipping Corporation
Chennai Ookkam	South India Shipping Corporation
Chennai Perumai	South India Shipping Corporation
Chennai Selvam	South India Shipping Corporation
Desh Bandhu	Shipping Corporation of India
Desh Deep	Shipping Corporation of India
Devaray	Shipping Corporation of India
Diglipur	Shipping Corporation of India
Harshavardhan	Shipping Corporation of India
Indian Endurance	India Steamship Co.
Indian Explorer	India Steamship Co.
Indian Faith	India Steamship Co.
Indian Fame	India Steamship Co.
Indian Fraternity	India Steamship Co.
Indian Freedom	India Steamship Co.
Indian Grace	India Steamship Co.
Indian Industry	India Steamship Co.
Indian Prestige	India Steamship Co.
Indian Progress	India Steamship Co.
Indian Prosperity	India Steamship Co.
Indian Tribune	India Steamship Co.
Indian Triumph	India Steamship Co.
Indian Trust	India Steamship Co.
Indian Valour	India Steamship Co.
Indian Venture	India Steamship Co.
Jag Anjali	Great Eastern Shipping Co.
Jag Dev	Great Eastern Shipping Co.
Jag Dharma	Great Eastern Shipping Co.
Jag Doot	Great Eastern Shipping Co.
Jag Jiwan	Great Eastern Shipping Co.
Jag Jyoti	Great Eastern Shipping Co.
Jag Manek	Great Eastern Shipping Co.

India (*contd.*)

NAME OF VESSEL	OWNER
Jag Prakesh	Great Eastern Shipping Co.
Jag Ravi	Great Eastern Shipping Co.
Jag Rekha	Great Eastern Shipping Co.
Jag Shakti	Great Eastern Shipping Co.
Jag Shanti	Great Eastern Shipping Co.
Jagat Neta	Dempo Steamship Co.
Jagat Samrat	Dempo Steamship Co.
Jagat Swamini	Dempo Steamship Co.
Jagat Vijeta	Dempo Steamship Co.
Jalabala	Scindia Steam Navigation Co.
Jaladharati	Scindia Steam Navigation Co.
Jaladhir	Scindia Steam Navigation Co.
Jaladurga	Scindia Steam Navigation Co.
Jaladuta	Scindia Steam Navigation Co.
Jalagomati	Scindia Steam Navigation Co.
Jalakala	Scindia Steam Navigation Co.
Jalakendra	Scindia Steam Navigation Co.
Jalakirti	Scindia Steam Navigation Co.
Jalamani	Scindia Steam Navigation Co.
Jalamatsya	Scindia Steam Navigation Co.
Jalamayur	Scindia Steam Navigation Co.
Jalamohan	Scindia Steam Navigation Co.
Jalamokambi	Scindia Steam Navigation Co.
Jalamorari	Scindia Steam Navigation Co.
Jalapankhi	Scindia Steam Navigation Co.
Jalarajan	Scindia Steam Navigation Co.
Jalarashmi	Scindia Steam Navigation Co.
Jalaratna	Scindia Steam Navigation Co.
Jalatapi	Scindia Steam Navigation Co.
Jalatarang	Scindia Steam Navigation Co.
Jalavallabh	Scindia Steam Navigation Co.
Jalavijaya	Scindia Steam Navigation Co.
Jalayamini	Scindia Steam Navigation Co.
Jalayamuna	Scindia Steam Navigation Co.
Jana Priya	Mogul Line Ltd
Jana Vijaya	Mogul Line Ltd
Jawaharlal Nehru	Shipping Corporation of India
Jay Ambika	Jayashee Shipping Co.
Jaynarayan Vyas	Shipping Corporation of India
Kairali	Kerala Shipping Co.
Kanchan Junga	Shipping Corporation of India
Kanishka	Shipping Corporation of India
Karnataka	Karnataka Shipping Co.
Kedarnath	Himalaya Shipping Co.
Lal Bahadur Shastri	Shipping Corporation of India
Laxmi	Shipping Corporation of India
Lokamanya Tilak	Shipping Corporation of India
Lok Manya	Mogul Line Ltd
Lok Nayak	Mogul Line Ltd
Lok Palak	Mogul Line Ltd
Lok Sahayyak	Mogul Line Ltd
Lok Vihar	Mogul Line Ltd
Lok Vinay	Mogul Line Ltd
Lok Vivek	Mogul Line Ltd
Mahabharat	South East Asia Shipping Co.
Mahabhakti	South East Asia Shipping Co.
Mahabir	South East Asia Shipping Co.
Maharashmi	South East Asia Shipping Co.
Majavijay	South East Asia Shipping Co.
Maratha Mellody	Chowgule Shipping Co.
Maratha Progress	Chowgule Shipping Co.
Maratha Providence	Chowgule Shipping Co.
Marjan	Indo Oceanic Shipping Co.
Meghreb	Indo Oceanic Shipping Co.
Mizoram	Shipping Corporation of India
MMP Wealth	MMP Lines Ltd
Nandakala	Essar Constructions and Carriers
Netaji Subhash Pose	Shipping Corporation of India
Noncowery	Shipping Corporation of India
Onge	Shipping Corporation of India
Prabhu Daya	Tolani Shipping Co.
Prabhu Gopal	Tolani Shipping Co.
Prabhu Satram	Tolani Shipping Co.
Rafi Ahmad Kidwait	Shipping Corporation of India
Ratna Kirti	Ratnakar Shipping Co.
Ratna Nandini	Ratnakar Shipping Co.
Ratna Shobhana	Ratnakar Shipping Co.
Ratna Usha	Ratnakar Shipping Co.
Ratna Vandana	Ratnakar Shipping Co.
Rishi Vishva Mitra	Garware Shipping Corporation
Sagar Deep	Shipping Corporation of India
Sagar Samrat	Shipping Corporation of India
Sahajahan	Shipping Corporation of India
Samudra Gupta	Shipping Corporation of India
Sanchi	Shipping Corporation of India
Sarojini Naidu	Shipping Corporation of India
Satya Kamal	Seven Seas Transportation Ltd
Satya Murti	Shipping Corporation of India
Satya Padam	Seven Seas Transportation Ltd

India (*contd.*)

NAME OF VESSEL	OWNER
Satya Sohan	Seven Seas Transportation Ltd
Shompen	Shipping Corporation of India
State of Andhra Pradesh	Shipping Corporation of India
State of Himachala Pradesh	Shipping Corporation of India
State of Kerala	Shipping Corporation of India
State of Madhya Pradesh	Shipping Corporation of India
State of Manipur	Shipping Corporation of India
State of Meghalaya	Shipping Corporation of India
State of Mysore	Shipping Corporation of India
State of Nagaland	Shipping Corporation of India
State of Rajasthan	Shipping Corporation of India
State of West Bengal	Shipping Corporation of India
Tamilanna	Pompoohar Shipping Co.
Teesta	MacKinnon Mackenzie and Co.
Unibaksha	Universal Shipping Co.
Vallabha Bhai Patel	Shipping Corporation of India
Varun Yan	Thakur Shipping Co.
Vijaya Jyoti	West Asia Shipping Co.
Vishva Abha	Shipping Corporation of India
Vishva Aditya	Shipping Corporation of India
Vishva Ajay	Shipping Corporation of India
Visha Ambar	Shipping Corporation of India
Vishva Amitabh	Shipping Corporation of India
Vishva Apurva	Shipping Corporation of India
Vishva Asha	Shipping Corporation of India
Vishva Bandhan	Shipping Corporation of India
Vishva Bhakti	Shipping Corporation of India
Vishva Bindu	Shipping Corporation of India
Vishva Chetana	Shipping Corporation of India
Vishva Dharma	Shipping Corporation of India
Vishva Jyoti	Shipping Corporation of India
Vishva Kalyan	Shipping Corporation of India
Vishva Karuna	Shipping Corporation of India
Vishva Kaushal	Shipping Corporation of India
Vishva Kirti	Shipping Corporation of India
Vishva Madhuri	Shipping Corporation of India
Vishva Mahima	Shipping Corporation of India
Vishva Mamta	Shipping Corporation of India
Vishva Mangal	Shipping Corporation of India
Vishva Mohini	Shipping Corporation of India
Vishva Nayak	Shipping Corporation of India
Vishva Nidhi	Shipping Corporation of India
Vishva Pratap	Shipping Corporation of India
Vishva Pratibha	Shipping Corporation of India
Vishva Prayas	Shipping Corporation of India
Vishva Prem	Shipping Corporation of India
Vishva Rekha	Shipping Corporation of India
Vishva Sandesh	Shipping Corporation of India
Vishva Seva	Shipping Corporation of India
Vishva Shakti	Shipping Corporation of India
Vishva Shobha	Shipping Corporation of India
Vishva Sidhi	Shipping Corporation of India
Vishva Tarang	Shipping Corporation of India
Vishva Tej	Shipping Corporation of India
Vishva Tirth	Shipping Corporation of India
Vishva Umang	Shipping Corporation of India
Vishva Vibhuti	Shipping Corporation of India
Vishva Vijay	Shipping Corporation of India
Vishva Vikas	Shipping Corporation of India
Vishva Vinay	Shipping Corporation of India
Vishva Vivek	Shipping Corporation of India
Vishva Yash	Shipping Corporation of India
Vivekanand	Shipping Corporation of India
Vishveshwarayya	Shipping Corporation of India
Yerewa	Shipping Corporation of India
Zakir Hussain	Shipping Corporation of India

Auxiliary Ships:
India has 32 Auxiliary Ships

NEW ZEALAND (Information dated 1.2.80)

NAME OF VESSEL	OWNER/MANAGER
Selected Ships:	
Act 3	Blue Port Act (N.Z.) Ltd
Act 4	Blue Port Act (N.Z.) Ltd
Act 5	Blue Port Act (N.Z.) Ltd
Amokura	Union S.S. Co. N.Z. Ltd
Aotea	Container Fleets N.Z. Ltd
Bounty	Sofrana Uniline
Bulknes	Shipping Corporation of N.Z.
Capitaine Kermadec	Sofrana Uniline
Coastal Trader	Shipping Corporation of N.Z.
Dunedin	Maritime Carriers Ltd
Eagle Arrow	Gearbulk Ltd
Erne	Union S.S. Co. N.Z. Ltd
Fetu Moana	Shipping Corporation of N.Z.
Fijian	Reef Shipping Agencies
Forum Nuigini	Pacific Forum Line
Forum Somoa	Pacific Forum Line
Golden Bay	Tarakohe Shipping Co. Ltd
Holmdale	Union S.S. Co. N.Z. Ltd
James Cook	N.Z. Government (Fisheries Research)
Karetu	Union S.S. Co. N.Z. Ltd
Kolle D	Nauru Pacific Line
Kotuku	Union S.S. Co. N.Z. Ltd
Kuaka	Union S.S. Co. N.Z. Ltd
Lake Eyre	Australian National Line
Marama	Union S.S. Co. N.Z. Ltd
N.Z. Pacific	Shipping Corporation of N.Z.
N.Z. Star	Blue Port Act (N.Z.) Ltd
N.Z. Waitangi	Shipping Corporation of N.Z.
Ngahere	Union S.S. Co. N.Z. Ltd
Ngakuta	Union S.S. Co. N.Z. Ltd
Ngapara	Union S.S. Co. N.Z. Ltd
Nuivakai	Dolphin Shipping Co. Ltd
Pacific Installer	Swire Northern Offshore
Tangaroa	N.Z. Government (Oceanographic Research)
Tasman Enterprise	Tasman Pulp & Paper Co. Ltd
Tasman Venture	Development Finance Co.
Tiare Moana	Shipping Corporation of N.Z.
Titoki	Anchor-Dorman Ltd
Tui Cakau II	Pacific Lines Ltd
Union Auckland	Union S.S. Co. N.Z. Ltd
Union Hobart	Union S.S. Co. N.Z. Ltd
Union Lyttelton	Union S.S. Co. N.Z. Ltd
Union Rotoiti	Union S.S. Co. N.Z. Ltd
Union Rotorua	Union S.S. Co. N.Z. Ltd
Valetta	British Phosphate Commission
Waitaki	Maritime Carriers Ltd
Westport	N.Z. Cement Holdings Ltd
Supplementary Ships:	
Arahanga	N.Z. Railways
Aramoana	N.Z. Railways
Aranui	N.Z. Railways
Aratika	N.Z. Railways
Columbus Virginia	Columbus Line
Wessermunde	Hanseatische Hochseefischerei

Auxiliary Ships:
New Zealand also has a fleet of 15 Auxiliary Ships currently reporting.

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